# United States Patent [19]

**Hansen, Jr.**

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[54] **TOBACCO LEAF HANDLING AND DISTRIBUTING APPARATUS**


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[73] Assignee: **AMF Incorporated**, White Plains, N.Y.



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[52] **U.S. Cl.** ..... **198/45**; 222/227

[51] **Int. Cl.** ..... **B65g 47/18**; B65g 47/44

[58] **Field of Search** ..... 198/44, 45, 29; 302/27, 302/28; 222/227, 200, 201; 209/73; 193/43 C, 43 D; 100/168



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[57] **ABSTRACT**

A hopper with metering rollers provides articles at a predetermined rate which are intercepted by sets of oscillating or agitating rods thereby providing a shower of appropriately distributed articles to a conveyor for delivery.


**8 Claims, 3 Drawing Figures**

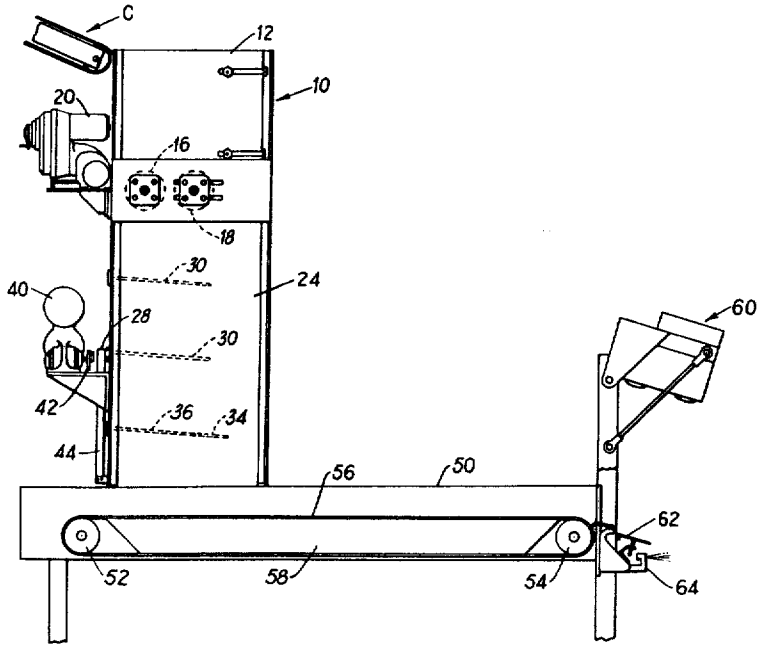

FIG. 1

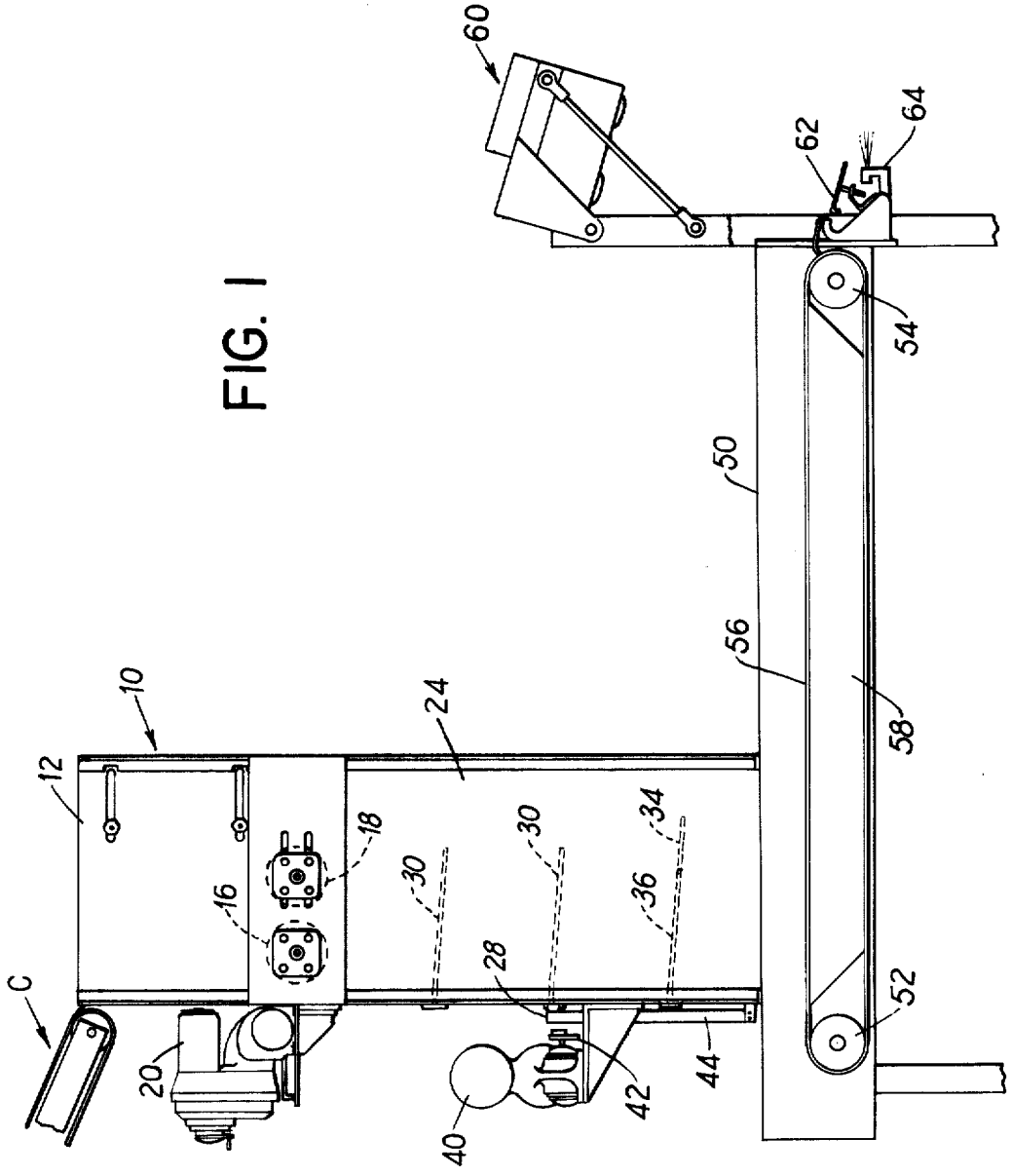

FIG. 2

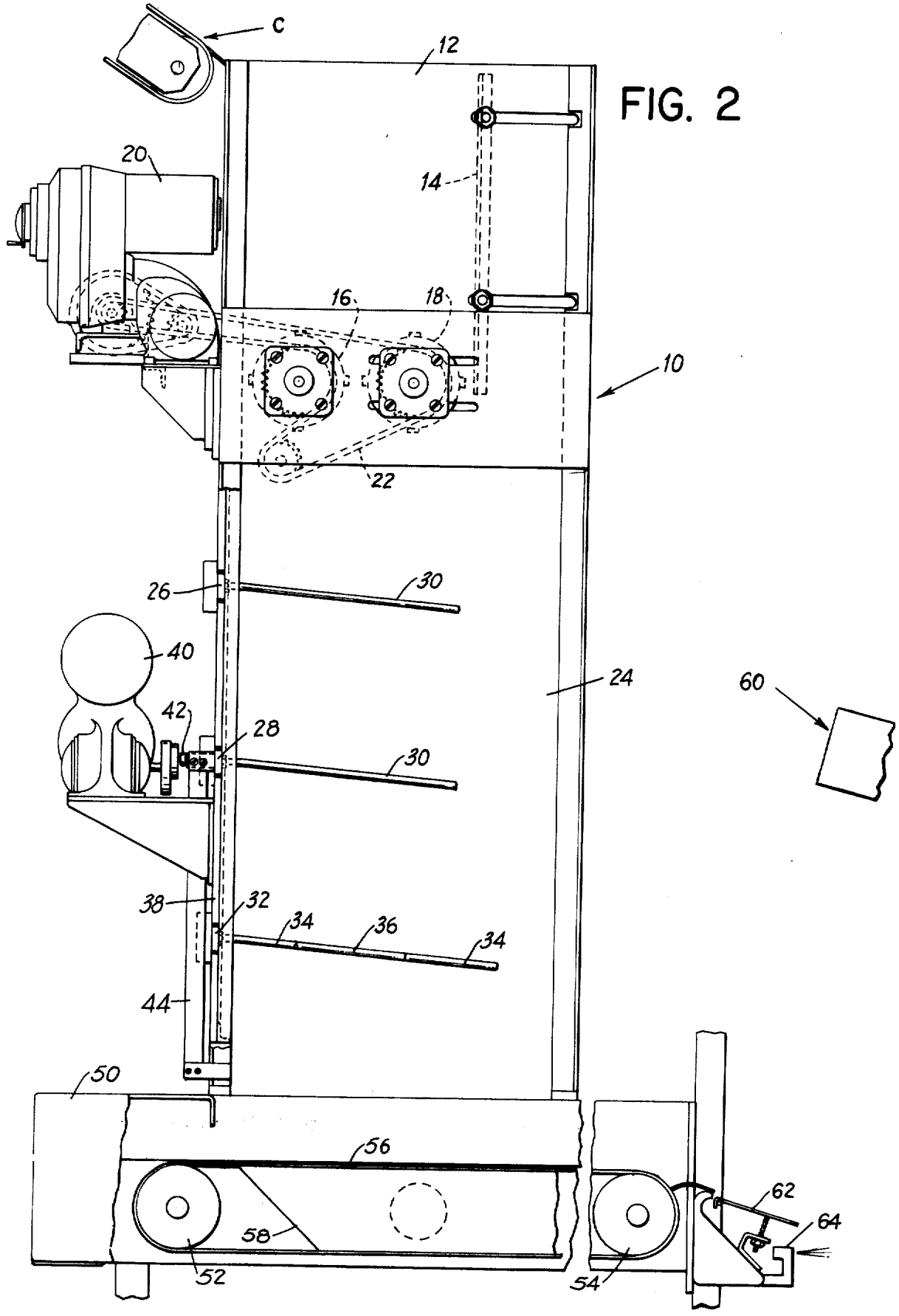
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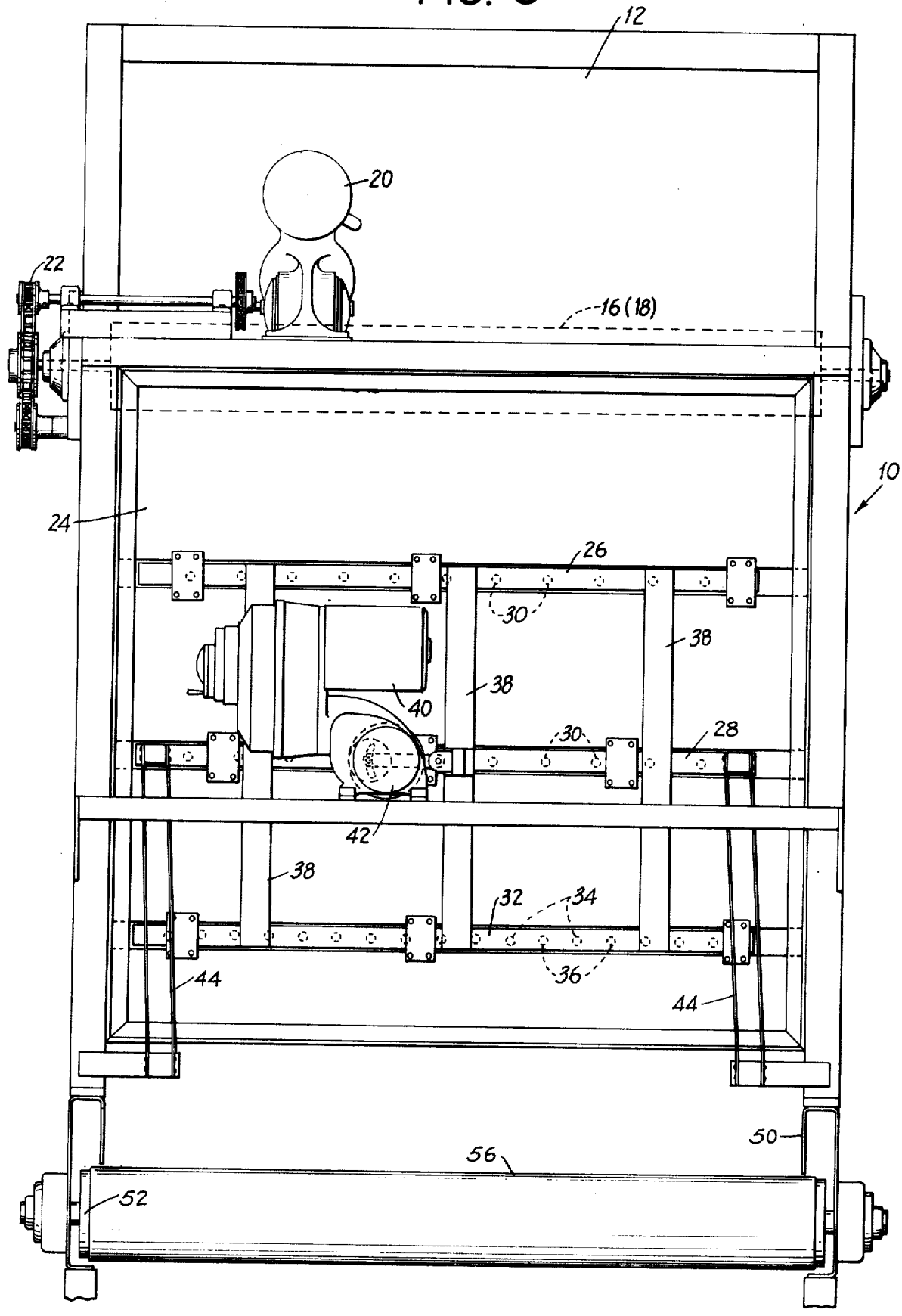
FIG. 3



# TOBACCO LEAF HANDLING AND DISTRIBUTING APPARATUS

This invention relates generally to the processing of plant leaves and more particularly to apparatus for appropriately spreading a large bulk flow of leaves on a belt type conveyor for grading or sorting.

This invention is particularly adapted for use with tobacco leaves and therefore will be described in this environment. While this may be a preferred embodiment, this invention is not to be construed as being limited thereto.

Tobacco leaves are harvested at a desired degree of maturity and are subsequently cured, usually with the circulation of air, and/or with applied heat and moisture. This curing process alters the color of the leaves generally from a shade of green to a shade of yellow or light brown, depending on the type of tobacco. However, because of the variability in natural grown plants, and due to the uncertainty of the exact degree of maturity of the leaves when harvested, the effect of the curing process on a random group of leaves is such that all leaves do not achieve the desired color. Those leaves which do not achieve the desired color are considered selectively objectionable for use in the subsequent manufacture of smoking articles for reasons of appearance or of taste. Therefore, the tobacco leaf processor will normally sort the leaves procured from the markets in order to remove the leaves with objectionable color in order that the largest bulk of remaining leaves is of higher quality.

In the currently accepted mode of grading or sorting, the tobacco leaves are conditioned by adding moisture to make them suitably pliable and resistant to breakage from mechanical handling and are then conveyed to a flow splitting device to separate the total flow into lesser rates of flow to permit searching for quality. Until recently the reduced flow was diverted to a conveyor belt which conveyed the flow of tobacco leaves at a suitable speed and height past human sorting personnel who visually observed the leaves and manually picked objectionable leaves and foreign matter out of the flow. It can be seen that this method of sorting entails a considerable amount of hand labor which is not only slow and expensive, but is somewhat inaccurate and unreliable.

With the development of optical/electronic equipment for automatically scanning and grading a flow of tobacco leaves, the rate of flow of the leaves to the scanners can be increased. As shown in U.S. Pat. No. 3,750,882 granted Aug. 7, 1973 to G. W. Hays entitled Automatic Grader, apparatus is provided to receive a bulk flow of tobacco leaves which are spread on a belt type conveyor to provide a stream of leaves to be scanned by an optical/electronic unit for automatic grading.

Present grading units are provided with multiple scanning means disposed in spaced series laterally relative to the direction of flow of tobacco leaves to be graded. Therefore, leaves provided to the belt type conveyor must be adequately spread laterally to provide each of the scanning means with a substantially continuous stream of leaves.

In addition to the lateral spread of leaves, the rate of flow of leaves to the belt type conveyor must be properly related to the speed of the conveyor so that leaves to be graded are not covered by others. The distribution means for proper delivery of leaves should break up pads and clumps cause by the leaves tending to adhere to one another. Accordingly, the distributing means for efficient operation of the grading unit should provide a distributed blanket of leaves which preferably covers the conveyor with substantially all of the leaves thereof exposed to one of the scanning means.



Tobacco is grown in many different areas, and in several varieties. In addition, the leaves of a particular variety grown in a particular area, while generally graded at the time of harvest according to relative location on the stalk of a plant, frequently require additional grading for color quality of the leaf. Variables, in the crop as well as the quality specified by the manufacturer eventually manufacturing the intended smoking article, determine the degree of perfection required in the sorting function in the leaf processing plant. As a result, the density of the leaves on the belt type conveyor can vary according to the type of leaves being graded and the quality of the leaves desired. It should be realized that the desired speed of the belt type conveyor will vary depending upon the physical characteristics of the particular leaves being graded to prevent leaves from flying.

An object of the present invention is to provide a belt type conveyor with a well distributed blanket of leaves which are disposed at random on the belt with a minimal amount of overlap.

Another object of the present invention is to provide leaf feeding and distributing means for the foregoing which inlcudes positive feeding means which can be varied or adjusted to deliver leaves at a predetermined desired rate determined by the characteristics of the leaves being delivered and/or the speed of the conveyor.

And another object of the present invention is to provide the leaf feeding and distributing means with a mechanism for separating leaves received from the feeding means and showering the separated leaves on to the conveyor; the mechanism distributing the leaves laterally relative to the conveyor and the conveyor moving under the leaf feeding and distributing means causing longitudinal distribution of the leaves.

The foregoing and other objects and advantages will appear more fully hereinafter from a consideration of the detailed description which follows, taken together with the accompanying drawings wherein a single embodiment of the invention is illustrated by way of example. It is to be expressly understood, however, that the drawings are for illustration purposes only, and are not to be construed as defining the limits of the invention.

FIG. 1 is a side elevational view of a preferred embodiment of the invention;

FIG. 2 is an enlarged side elevational view of the distribution and conveyor means of FIG. 1 with portions thereof broken away to more clearly illustrate internal operating parts of such apparatus; and

FIG. 3 is a rear elevational view of the apparatus of FIG. 2.

Referring now to the drawings and particularly to FIGS. 1 and 2, an infeed conveyor C provides a bulk flow of tobacco leaves to a hopper 12 at the upper end of the novel leaf feeding and distributing means 10. The infeed conveyor C, which forms no part of the present invention, is provided with the usual gate or diverting means for controlling the flow of tobacco leaves in the normal manner to the hopper 12 in response to signals from well known sensing means (not shown) to main-

tain a substantially full supply of leaves in the hopper.

The tobacco leaves are fed from or metered out of the hopper **12** at a predetermined rate to a distribution chamber **24** where the leaves are separated from each other and shower down on to a belt type conveyor **56** forming a well spread or distributed blanket of leaves, as will be further discussed in greater detail. The belt type conveyor **56** mounted on spaced rollers **52** and **54** in a base frame **50** on which the leaf feeding and distributing means or tower **10** is supported, is driven by a variable speed motor (not shown) at a predetermined speed to propel the tobacco leaves in a ballistic path initially in substantially a horizontal plane. The belt type conveyor **56** is relatively of a high speed type conveyor and a vacuum or suction box arrangement **58** may be required to prevent tobacco leaves from prematurely flying off the conveyor.

A background plate **62** is mounted on the front of the frame **50** beneath the ballistic path and an optical/electronic unit **60** is also mounted on the front of the frame **50** above the ballistic path. The background plate **62** which extends at least the full width of the belt type conveyor **56,** establishes at least a single color criterian for the leaves and is disposed in very close proximity to the path of the leaves to obviate undue errors from shadows, optical range variations and the like. The optical/electronic unit **60** may be of any suitable type such as shown, described and claimed in copending application Ser. No. 277,499 filed Aug. 3, 1972 as a continuation of now abandoned application Ser. No. 145,444, which examines or senses the color of each leaf as it passes over the background plate **62** and compares the sensed color to the established color criterian or criteria.

A reject unit **64** is mounted on the ballistic path and is operable by the optical/electronic unit **60** to divert leaves found thereby to be not in conformance with the established color criteria to a secondary collection area (not shown) while leaves of acceptable color continue along the ballistic path to a primary collection area (not shown).

The optical/electronic unit **60** is provided with a plurality of optical barrels which scan overlapping adjacent areas of the background plate **62.** Therefore, the tobacco leaves being showered on to the conveyor **56** do not have to form aligned rows on the conveyor. Instead, the tobacco leaves should be suitably spaced or distributed in a random pattern. The reject unit **64** is provided with a plurality of jets connected through valves to a source of compressed air, at least one jet being provided for each scanning barrel of the optical/electronic unit **60.** When a tobacco leaf found not in conformance within the established color criterian or criteria passes through the area scanned by a particular barrel, the optical/electronic unit **60** provides a signal to open a valve and the corresponding jet will provide a puff of air to blow the unacceptable leaf out of its ballistic path.

More specifically, the novel leaf feeding and distributing means in the form of a tower **10** is provided with a rear wall and side walls, as shown. The hopper **12** at the upper end of the tower **10** is provided with a front wall **14** while the bottom is formed by a pair of rollers **16** and **18** supported at their ends by the usual bearing means connected to the tower side walls. The rear roller **16** is rotatable on a fixed axis and is disposed adjacent the rear wall of the hopper **12.** The front roller **18** is rotatable on an adjustable or positionable axis so the roller **18** can be moved toward and away from the roller **16** to vary the spacing therebetween. The front wall **14** of the hopper **12** is movable toward and away from the rear wall so that it always can be positioned adjacent the front roller **18.**

A motor **20,** preferably variable speed rotates the rollers **16** and **18** oppositely to one another through conventional drive means **22** such as a pulley and cable arrangement as shown. The rollers **16** and **18,** which are preferably provided with sets of lug bars as shown or other well known surface deformations, form positive leaf feeding or metering means for providing an appropriate amount of well distributed tobacco leaves to the belt type conveyor **56** which will neither overload nor starve the optical/electronic unit **60** for maximum leaf grading efficiency.

The amount of tobacco leaves fed from the hopper **12** to the distribution chamber **24** can be varied by varying the speed of the rollers **16** and **18,** by varying the spacing between the rollers or a combination of both. When the tobacco leaves fed to the hopper **12** by the infeed conveyor C are relatively well separated and the spacing between the rollers **16** and **18** is appropriate for the physical character of the tobacco leaves to be graded, the speed of the rollers **16** and **18** can be adjusted relative to the speed of the belt type conveyor **56.** The space between the rollers **16** and **18** must be sufficiently large to pass the desired amount of leaves therethrough, and to pass pads and/or clumps without undue destruction to the leaves.

Three horizontal bars **26, 28** and **32** are slidably mounted in tracks or bearings at the rear wall of the distribution chamber **24** in vertically spaced relation to one another. A plurality of horizontally spaced vertical tie bars **38** suitably connect the horizontal bars **26, 28** and **30** together to form a frame. A motor **40,** preferably variable speed, causes the frame formed by the bars **26, 28, 32** and **38** to oscillate laterally by substantially conventional drive means which includes stroke adjustment means such as an adjustable cam or eccentric mechanism **42,** as shown.

The upper two bars **26** and **28** are each provided with an equally spaced series of parallel rods **30** which extend toward the front of the chamber **24.** The lowest bar **32** is provided with an equally spaced series of alternate rods **34** and **36;** rods **34** being longer than rods **30** and rods **36** being shorter than rods **30.** Preferably, the two series of rods **30** are equal in number which are set directly above and below one another while the series of rods **34** and **36** is greater in number than either series of rods **30.** It has been found that offsetting the rods **30, 34** and **36** approximately 5° from the horizontal, so the free front ends of the rods are lower than the rear ends fixed to the bars **26, 28** and **30,** will prevent leaves from hanging up and finally after sufficient build-up causing a jam or blockage in the distribution chamber **24.**

A pair of leaf spring assemblies **44** are connected between the sides of the formed oscillating frame and the sides of the tower **10** to absorb enertial forces and reduce vibration caused by the oscillating frame.

It now should be readily understood that the rollers **16** and **18,** which are adjustably spaced and have a variable speed drive, form a positive leaf metering or feed means which has no deleterious effects on the tobacco leaves and has an adjustable speed to be set relative to

the speed of the belt type conveyor **56** for providing an appropriate amount of tobacco leaves to form a blanket of well separated leaves on the conveyor for grading.

Longitudinal separation of tobacco leaves on the belt type conveyor **56** results from the forward movement of the top run of the conveyor beneath the tower **10.** The tobacco leaves being fed from the hopper **12** to the distribution chamber **24** are impacted by the laterally oscillating rods **30, 34** and **36** which tend to separate leaves which may be in pads or clumps and provide desired lateral leaf separation or distribution as they shower down on to the belt type conveyor **56.** The rods **30, 34** and **36** together with the formed oscillating frame and the drive means therefor provide a multi-stage impact type leaf separating and distributing mechanism.

As an example of the effectiveness of the novel metering and distributing means **10,** 1,500 pounds per hour of well separated bright tobacco leaf was delivered, to be graded by a 48 inch wide belt type conveyor **56** running at a speed of approximately 450 feet per minute.

A relative small amount, approximately 10% of the total amount of the tobacco leaves delivered by the infeed conveyor C to the hopper **12** were in pads or clumps of moderate size. The pair of rollers **16** and **18,** each being 4 inches in diameter, was driven at four revolutions per minute on centers spaced 6 inches apart thereby providing a 2 inch space or slot between the roller faces through which the tobacco leaves were fed to the distribution chamber **24.** The rods **30, 34** and **36** laterally oscillated at the rate of 350 cycles per minute with a stroke of 2 inches to break up pads or clumps and to laterally separate the tobacco leaves being showered down on to the belt type conveyor **56.**

Although but a single embodiment of the invention has been illustrated and described in detail, it is to be expressly understood that the invention is not limited thereto. Various changes may also be made in the design and arrangement of the parts without departing from the spirit and scope of the invention as the same now will be understood by those skilled in the art.

I claim:

**1.** Apparatus for delivering distributed articles, comprising:

a conveyor for delivering articles along a predetermined path,

first means for positively metering at a predetermined rate articles to be delivered.

a hopper for receiving a supply of articles to be delivered and a pair of laterally spaced apart rotatable members forming the bottom of said hopper providing said first means;

said rotatable members being rotated in directions each opposite to the other on substantially parallel axes disposed transverse to the path along which the articles are delivered, and

second means being disposed substantially horizontally for receiving metered articles and oscillating for distributing such articles in a lateral direction relative to the predetermined path along which said articles are delivered,

said second means showering such articles on to said conveyor so that the relative movement of said conveyor distributes the showered articles on said conveyor in a longitudinal direction relative to the predetermined path along which such articles are delivered.

**2.** Apparatus in accordance with claim **1,** and

means for moving one of said rotatable members toward and away from the other to change the space therebetween thereby varying the metering rate.

**3.** Apparatus in accordance with claim **1,** and

means for changing the speed of said rotatable members thereby varying the metering rate.

**4.** Apparatus for delivering distributed articles, comprising:

a conveyor for delivering articles along a predetermined path,

first means for positively metering at a predetermined rate articles to be delivered, and

second means for receiving metered articles and for distributing such articles in a lateral direction relative to the predetermined path along which said articles are delivered and showering such articles on to said conveyor so that the relative movement of said conveyor distributes the showered articles on said conveyor in a longitudinal direction relative to the predetermined path along which such articles are delivered,

said second means comprising bar means oscillating laterally relative to the predetermined path along which the articles are delivered, and

a plurality of spaced substantially horizontal parallel rods connected to said bar means and extending therefrom in a longitudinal direction relative to the predetermined path along which the articles are delivered, and

said rods being moved laterally by said oscillating bar means for engaging and distributing the metered articles.

**5.** Apparatus in accordance with claim **4,** and

said rods being disposed in a plurality of spaced series, each series being spaced vertically from the others.

**6.** Apparatus in accordance with claim **5,** and said first means comprising:

a hopper for receiving a supply of articles to be delivered, and

a pair of spaced apart rotatable members forming the bottom of said hopper,

said rotatable members being rotated in directions each opposite to the other on substantially parallel axes disposed transverse to the path along which the articles are delivered.

**7.** Apparatus in accordance with claim **6,** and

means for moving one of said rotatable members toward and away from the other to change the space therebetween thereby varying the metering rate.

**8.** Apparatus in accordance with claim **7,** and

means for changing the speed of said rotatable members thereby varying the metering rate.

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