Sept. 6, 1966 E. K. KARLSSON ETAL 3,270,879

PNEUMATIC INCLINED CURRENT SEPARATOR

Filed Jan. 10, 1963 4 Sheets-Sheet 1

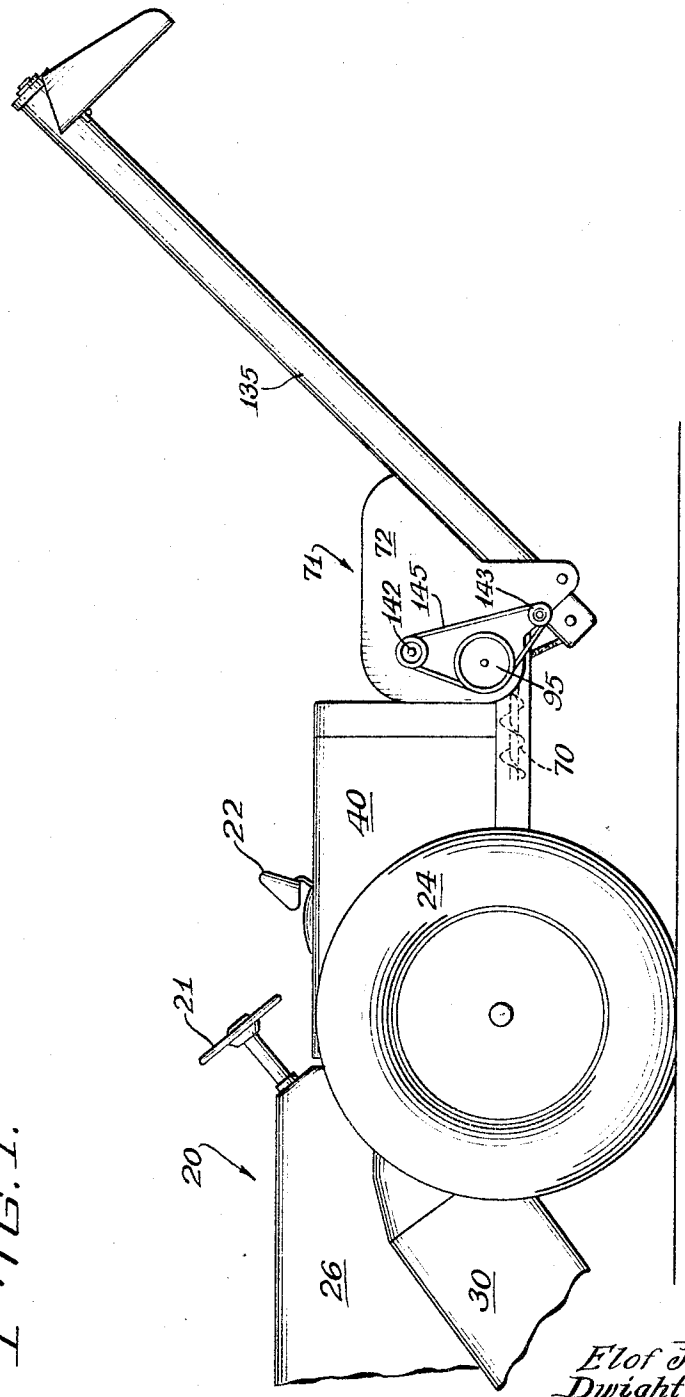


FIG. 1.

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PNEUMATIC INCLINED CURRENT SEPARATOR

Filed Jan. 10, 1963 4 Sheets-Sheet 2

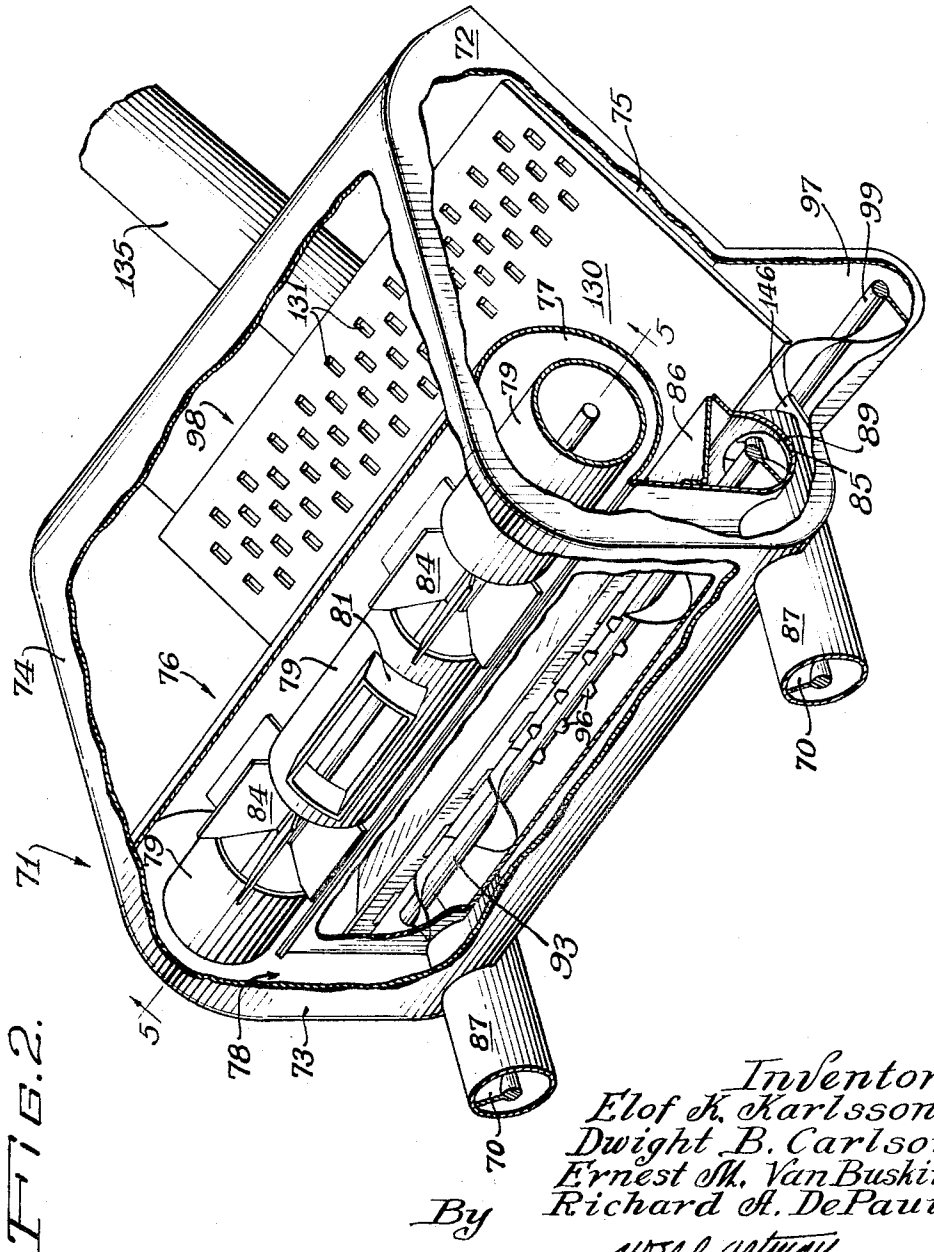


FIG. 2.

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Filed Jan. 10, 1963 4 Sheets-Sheet 3

FIG. 4.

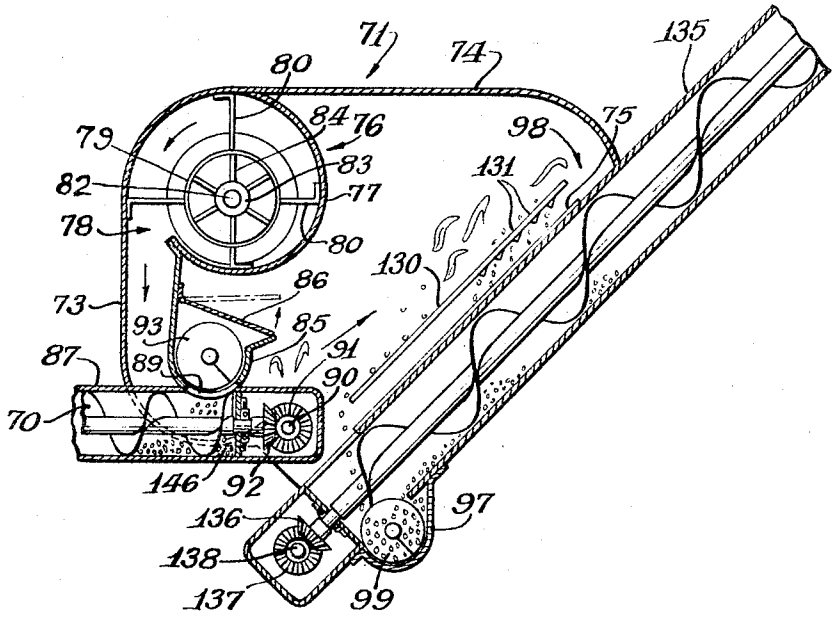
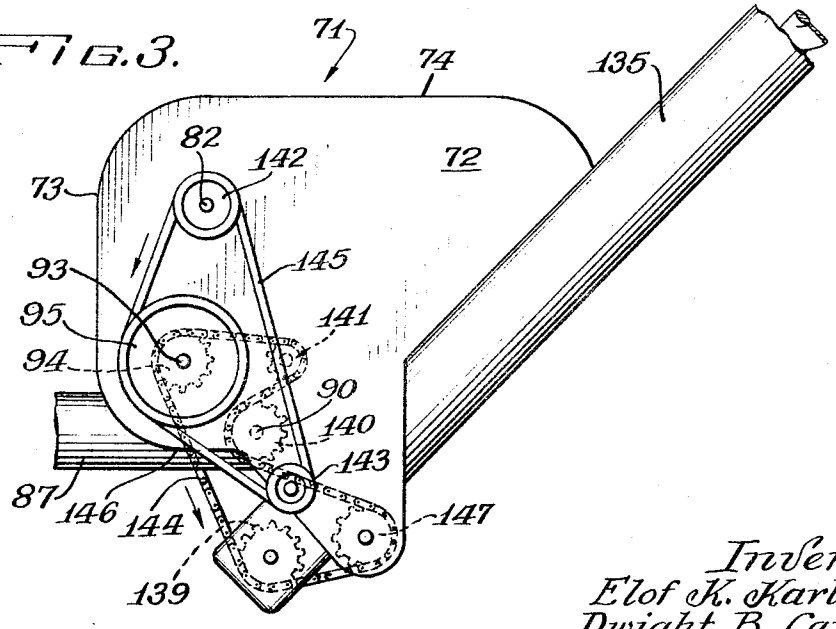


FIG. 3.



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PNEUMATIC INCLINED CURRENT SEPARATOR

Filed Jan. 10, 1963 4 Sheets-Sheet 4

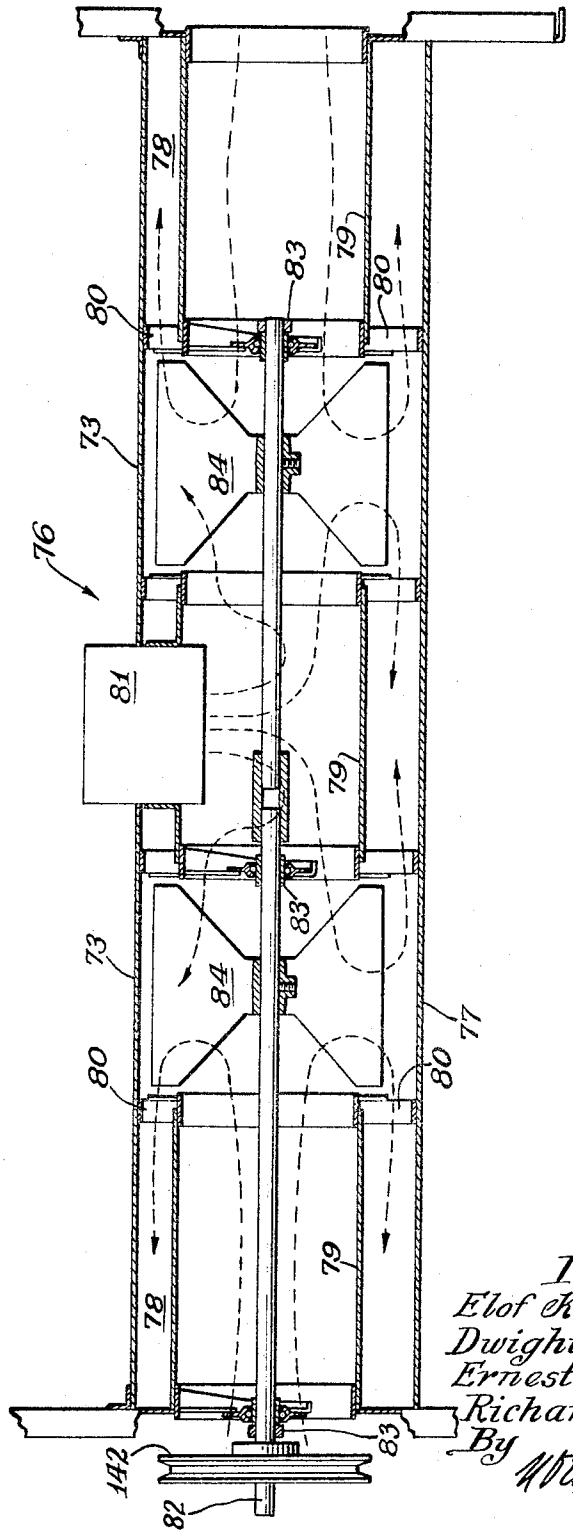


Fig. 5.

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United States Patent Office 3,270,879 Patented Sept. 6, 1966

3,270,879

PNEUMATIC INCLINED CURRENT SEPARATOR

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Filed Jan. 10, 1963, Ser. No. 250,625
5 Claims. (Cl. 209—34)

The present invention is directed to material cleaning apparatus and more particularly to an improved cleaning apparatus for separating light trash and dirt from shelled corn as the shelled corn is fed towards the depository.

Recent advances have been made in the apparatus for and the technique of picking and shelling corn. A substantially improved picker sheller is disclosed and claimed in the copending patent to Elof K. Karlsson entitled "Crop Picking and Treating Apparatus," No. 3,126,688 of March 31, 1964, filed January 31, 1962, and assigned to the assignee of this invention. Among the salient improvements set forth in Patent No. 3,126,688 is the complete elimination of any intermediate husking or conveying step with the picked corn going directly to a shelling apparatus and thence into a depository such as a trailing wagon. A system of fans and suction units is also set forth and illustrated therein to provide an air stream which serves to assist in the removal of dust, dirt and light trash from the shelling unit itself. However, in order to deposit as clean a sample as is practical in the trailing wagon, it is desirable to provide some additional cleaning apparatus located in the conveying system between the shelling unit and the trailing wagon.

An additional cleaning apparatus such as this, is disclosed and claimed in the copending patent to Ernest M. Van Buskirk and Richard A. DePauw entitled "Crop Material Cleaning Apparatus," No. 3,119,768 of January 28, 1964, filed March 29, 1962, and assigned to the assignee of this invention. The present application discloses a crop cleaning unit that differs in several respects from that disclosed in the application referred to above. In the present application the relationship of the various elements of the unit is such that only a relatively low layer of material must be built up in the trough to permit spilling over the lip. This, of course, will require less power in the material distributing auger and less material will remain in the machine at the conclusion of operation. Also, a hinged door has been provided over the distributing trough which is opened by the rising material and functions to distribute the material over the entire length of the trough before material begins spilling over the lip. The relationship between the fan and the various distributing means enables a hopper unit having a lower center of gravity to be built. An adequate supply of air is available to the blowers by providing inlets in both the hopper sides and the central portion.

An object of the present invention is the provision of a cleaning apparatus for crop material which is both efficient and uniform in its operation.

Another object is to provide a cleaning apparatus for crop material that will require a minimum of power for its operation.

A further object of the invention is to provide a cleaning apparatus for crop material that will meter the material evenly over the entire lateral width of a stream of cleaning air.

Still another object is to provide a crop material cleaning hopper unit having a low center of gravity.

Yet another object of the present invention is the provision of a cleaning apparatus for crop material having a blower unit therein having sufficient air inlet means and is

adapted to direct an even stream of cleaning air across the area of crop spilling.

These and other objects of the invention will become more apparent from the specification and drawings wherein:

FIGURE 1 is a side view of the preferred embodiment of the invention as related to the disclosure in the above identified application;

FIGURE 2 is a perspective view of the hopper unit having some portions cut away;

FIGURE 3 is a side elevation view of the hopper unit;

FIGURE 4 is a sectional view of the hopper unit; and

FIGURE 5 is a plan view of the blower section of a hopper unit having portions of the hopper unit cut away.

Referring now to the drawings wherein like reference characters designate like or corresponding parts throughout the several views, there is shown in FIGURE 1 portions of a conventional tractor **20** including a steering wheel **21**, a seat **22**, rear drive wheels **24** and the hood portion **26**. Cut material such as ears of corn are picked up within picker unit **30**, transferred to and shelled within sheller unit **40** and the shelled corn is transported rearwardly by a longitudinal feed auger **70**. All is described in the above identified copending applications. The major components of the present invention are generally located within a hopper or chamber unit **71** which includes a first gathering auger **93** disposed transversely of the tractor and sheller at the rear thereof. The first gathering auger **93** is in communication with each of the longitudinal feed augers **70** that receive the shelled corn and transport it to the rear of the tractor and its associated components.

More specifically, the hopper or chamber unit **71** has a generally rectangular shape including sides **72**, a front wall **73**, a top wall **74**, a horizontal bottom wall **146** and an inclined rear wall **75**. The fan unit **76** as can be best seen in FIGURE 4 is formed by a continuation of the front wall **73** in which forms a tube internally of the hopper unit across its entire width. The tube formed by the continuation **77** is not closed, but rather has an open portion designated **78** extending across its entire width forming the air outlet for the fan unit **76**. As can best be seen by referring to FIGURES 4 and 5, the fan unit is provided with an inner tube **79** having three sections. The first and third sections of inner tube **79** extend through the sides **72** of the hopper unit. The sides **72** of the hopper unit have apertures corresponding in size to tube **79** and the tube is secured to the sides **72** about the periphery of these apertures. The inner ends of the first and third sections of the inner tube **79** are supported by radial brackets **80** connected to the front wall **73** and its continuation **77**. The central section of the inner tube **79** is likewise supported by radial brackets **80** at a position such that there is a space between the first and second section and the second and third section of said inner tube **79**. The central section of the inner tube **79** has a duct **81** as best seen in FIGURE 2 extending therefrom through an aperture formed in the front wall **73** of the hopper unit thereby forming an air intake port. A central shaft **82** is mounted internally of the inner tube **79** by bearings **83**. As can be best seen in FIGURE 5, said shaft **82** has an end portion that extends outwardly from the left hand side of the hopper unit. A pair of air moving means or radial fans **84** are secured to said central shaft in the spaces provided by the three sections of said inner tube **79**. As indicated in FIGURE 5, fan blades **84** draw air through the first and third sections of said inner tube and through the duct **81** connected to the central section of said inner tube. The fan blades **84** as seen in FIGURE 4, rotate in a counterclockwise direction causing the air to move in the direction indicated by the arrows in said figure.

Referring now to FIGURES 2 and 4, a sheet of mate-

rial having a J-shaped cross section is provided internally of the hopper unit. The leg of said J-shaped sheet is substantially parallel to the front wall **73** and the end portion thereof is secured to the terminal edge of the continuation **77** of said front wall. The hook portion of said J-shaped sheet forms a trough **85** that extends across the entire lateral extend of the hopper unit. The leg portion of said J-shaped sheet in cooperation with the parallel front wall **73** forms a passageway through which the air blown by the fan unit **76** is directed. A horizontal bottom wall **146** extends rearwardly from front wall **73** below the hook portion of the J-shaped sheet forming therewith guide means for directing a stream of air beneath trough **85**. A hinged lid **86** is provided for closing the trough formed by said J-shaped sheet the purpose of which will be discussed later.

A pair of longitudinal tubes **87** extend through the front wall **73** of the hopper unit and intersect the trough **85**. Apertures are formed in both the trough **85** and the longitudinal tubes **87** at their intersection to provide a passageway designated **89**. The left hand tube **87** is closed at its end internally of the hopper unit. The right hand tube **87** is also closed. However, as best seen in FIGURE 4, it extends slightly further and houses a stud shaft **90** which extends to the right side **72** of the hopper unit. A bevel gear **91** is secured to stud shaft **90** internally of the extension of said longitudinal tube **87**. Said longitudinal tubes **87** contain the longitudinal feed augers **70** that convey the material rearwardly from the sheller units **40**. The core of the right hand longitudinal feed auger **70** has secured thereto a bevel gear **92** which meshes with the bevel gear **91** of stud shaft **90** and thus power is provided to the hopper unit through the longitudinal feed auger **70**.

A first gathering auger **93** is journaled in the sides **72** of the hopper unit and is located within the trough **85**. The core of said first gathering auger has end portions that extend through both sides **72**. The end portion extending through the right side **72** has secured thereto a sprocket **94** and the end portion extending through the left side **72** has a pulley **95** secured thereto. This pulley and sprocket are part of the drive mechanism and will be discussed further in relation to the drive system. The flightings of said first gathering auger **93** are arranged such that material will be fed centrally from both ends of the auger. The flightings of said first gathering auger **93** can be discontinued in its central section and be placed with lugs **96** as illustrated in FIGURE 2. The inclined rear wall **75** of the hopper unit terminates in a material collecting means or trough **97** which is connected to front wall **73** by the horizontal bottom wall **146** to form the closed surface of the hopper unit. The upper edge of said inclined rear wall **75** does not connect to top wall **74**, but rather terminates short of the top wall forming a trash disposal opening **98**. A second gathering auger **99** is journaled in the sides **72** of the hopper unit having flightings adapted to convey the material to the center of said second gathering auger. Said second gathering auger has an end portion extending through the right side **72** and has secured thereto a sprocket **147**.

A deflector plate or blastboard **130** extends across the bottom of the hopper unit in parallel relationship to the inclined rear wall **75** spaced slightly above said rear wall. Apertures **131** are formed in the deflector plate or blastboard of such a size to permit material such as shelled corn to pass through.

An elevator designated **135** is secured to the hopper unit along the central portion of said inclined rear wall **75**. Said elevator extends into trough **97** and terminates above and to the rear of the hopper unit. As illustrated in FIGURE 4, the elevator is of the auger type, it has an end portion extending through the wall of said trough **97** having a bevel gear **136** secured thereto that meshes with a second bevel gear **137** secured to a shaft **138** having a sprocket **139** secured to its other end which extends outwardly from the right hand side of the hopper unit.

Referring now to FIGURE 3, the drive arrangement for the hopper unit will be discussed. The sprocket **140** is secured to the stub shaft **90** outwardly of the right hand side **72** of the hopper unit. An idler sprocket **141** is journaled on the side walls **72** externally of the hopper unit and sprockets **141**, **94**, **139**, **147**, and **140** all lie in a common plane and are connected by a continuous chain **144**. A pulley **142** is secured to the end portion of central shaft **82** that extends outwardly from the unit through the left hand side **72**. An idler pulley **143** is journalled in the left hand side wall **72** of the hopper unit in a common plane with pulleys **95** and **142**. A continuous belt **145** connects pulleys **95**, **142**, and **143**. The hopper unit receives its drive through the right hand longitudinal auger **70** which provides rotary motion to sprocket **140** through bevel gears **91** and **92**. The rotary motion of sprocket **140** is transmitted to sprockets **94**, **139**, and **147** through the continuous chain **144**. Sprocket **139** provides rotary motion for the elevator **135** through shafts **138** and bevel gears **136** and **137**. Sprocket **147** is connected to the second gathering auger and thereby provides rotary motion to said auger. Sprocket **94** is secured to one end of the first gathering auger **93**. The rotary motion is thereby provided to said auger and also to the pulley **95** secured to the other end of said auger. The central shaft **82** of the fan unit has secured thereto pulley **142** and rotary motion is transmitted from pulley **95** to the fan unit through the continuous belt **145**.

Operation of the invention

As the tractor **20** with the picking and shelling units mounted thereon is directed through a field of standing corn, for example, the ears are picked by picking units **30** and shelled in sheller units **40**, and the shelled corn is then transported rearwardly through longitudinal tubes **87** and then into trough **85** through passageways **89** formed at the intersection. As the material is fed rearwardly by the longitudinal augers **70** it passes upwardly through the passageways **89** into the trough **85** where it is spread evenly throughout the trough by the first gathering auger **93**. When the trough **85** has been filled the material will open the hinged lid **86** and permit the material to spill over the lip of the trough. The downward force of the hinged lid **86** is such that if material were to collect at one point along the trough **85** the upward force of the material would not be sufficient to lift the lid but would rather cause the material to spread evenly along the trough. Thus, it is seen that the material will not spill over the edge of the trough until the trough has been evenly filled and when the material does begin to spill over the edge, it will spill in an even manner across the length of the trough.

The fan unit will draw air inwardly through the apertures formed by the juncture of the inner tube **79** with the sides **72** of the hopper and also through the duct **81** communicating with the central section of said inner tube **79**. This air will follow the passageway formed by the front wall **73** and the J-shaped sheet forming trough **85**. The air will thus be directed in a path across the lip of said trough **85** and towards said deflector plate or blastboard **130**. The material spilling over the edge of trough **85** will fall through this air stream, some of the grain falling directly into trough **97** while other grain and trash will be carried by the stream of air against the deflector plate **130**. The grain thrown against the deflector plate **130** will pass through the apertures **131** formed in the deflector plate and slide down the inclined rear wall **75** of the hopper unit and into the trough **97**. The trash will continue up the deflector plate **130** and will exit the hopper unit through the trash disposal opening **98**. The grain falling into the trough **97** will be conveyed centrally of the trough **97** by the second gathering auger **99** where it will encounter the elevator **135** which will

convey the cleaned material upwardly and rearwardly to a trailing wagon or the like.

Thus it is seen that a cleaning unit for shelled corn has been provided including a fan unit which supplies an even stream of air across the path of uniformly spilling grain.

What is claimed is:

1. A shelled corn cleaning unit comprising a hopper unit including a front vertical wall having an upper continuation rolled upon itself forming a cylinder internally of said hopper and extending across its upper front edge, said continuation terminating rearwardly of said front vertical wall such that the cylinder is not closed, a fan unit within said cylinder adapted to force air to the opening between the front vertical wall and the terminal edge of said continuation, a J-shaped sheet including a leg portion and a hook portion secured to the terminal edge of said continuation having said leg portion substantially parallel to said front vertical wall and said hook portion opening towards the rear of said hopper and terminating along a lip located relatively close to the bottom of said hook portion such that a shallow material trough is formed, a horizontal bottom wall connected to and extending rearwardly from said front vertical wall and forming in cooperation with said hook portion of the J-shaped sheet guide means for directing a stream of air beneath said trough, means for supply shelled corn to said trough, and means within said trough for spreading said shelled corn evenly across said trough such that it will spill evenly over its lip and fall through the stream of air.

2. The invention as set forth in claim 1 wherein a lid is hinged to the leg portion of said J-shaped sheet forming a cover for said trough that can be opened by the pressure of the rising corn in the trough when the corn has been spread evenly across the trough and pressure is being exerted by the rising corn across the entire width of said lid.

3. The invention as set forth in claim 2 wherein said hopper unit further includes an inclined rear wall, a blastboard having apertures formed therein overlying said inclined rear wall, a trash disposal opening above said inclined rear wall and said blastboard, material collecting means connecting said horizontal bottom wall to said inclined rear wall, and said guide means being located with respect to said blastboard such that the air stream is directed against the lower portion of said blastboard at an acute angle.

4. The invention as forth in claim 1 wherein said hopper unit further includes an inclined rear wall, a blast board having apertures formed therein overlying said inclined rear wall, a trash disposal opening above said inclined rear wall and said blastboard, material collecting means connecting said horizontal bottom wall to said inclined rear wall, and said guide means being located with respect to said blastboard such that the air stream is directed against the lower portion of said blastboard at an acute angle.

5. The invention as set forth in claim 1 wherein said fan unit comprises a tube smaller in diameter than said cylinder, said tube being divided into three sections, each mounted concentrically along said cylinder, the outer sections of said tube extending through the sides of said hopper unit forming air inlet passages, a duct secured to the central section of said tube and opening through the hopper wall to provide another air inlet passage, an air moving means mounted within said cylinder between the central and outer sections of said tube for drawing air in through said air inlet passages and forcing it between said guide means and beneath said trough.

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