Aug. 21, 1956 T. LINDQUIST 2,759,449

FLOCK APPLYING MACHINE

Filed Oct. 5, 1954 2 Sheets-Sheet 1

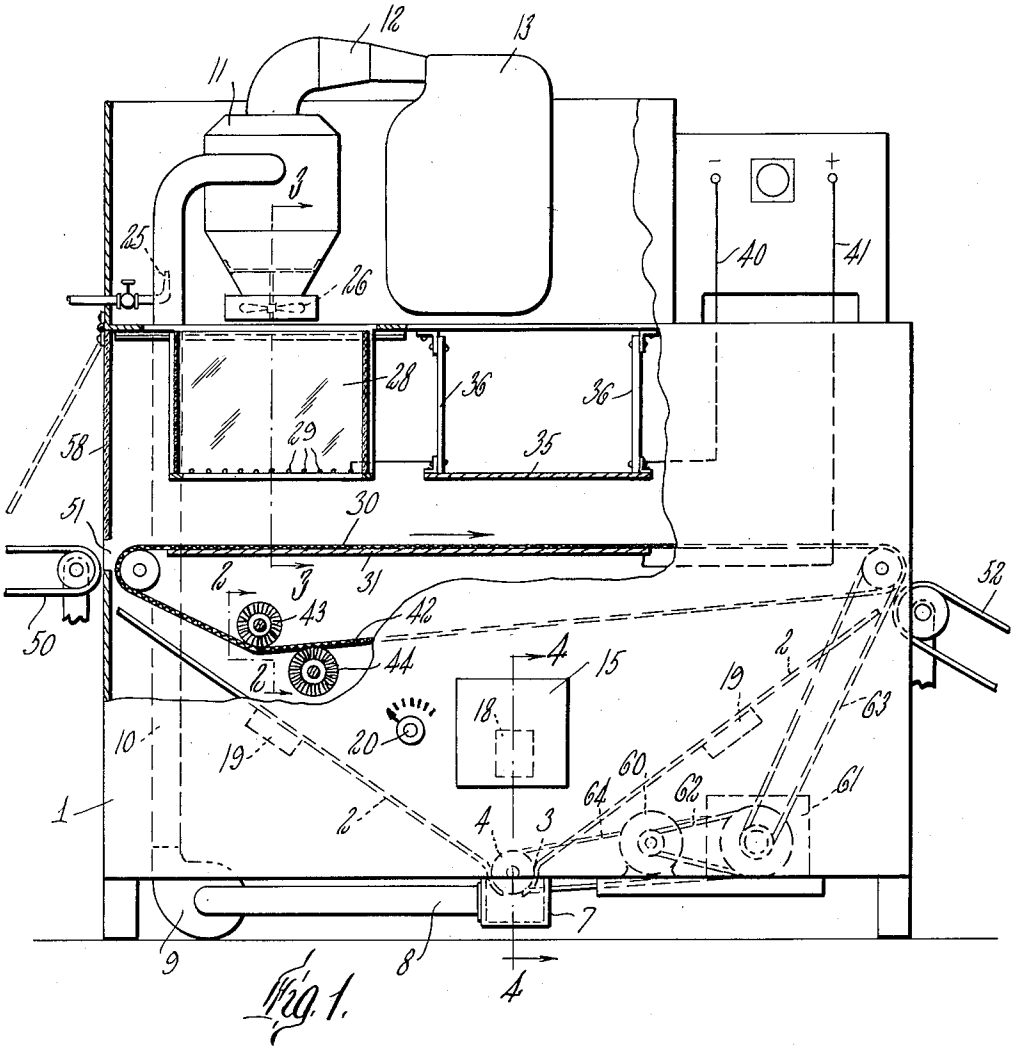

Fig. 1.

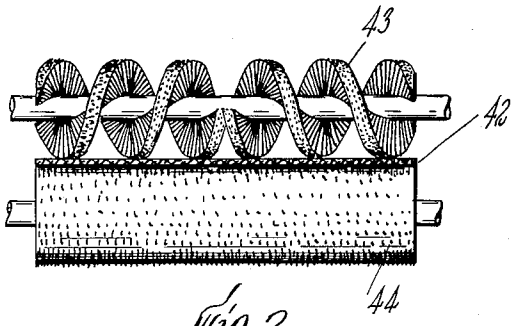

Fig. 2.

Inventor
Theodore Lindquist
by Wright Brown Quinby & Woods,
Attys.

Aug. 21, 1956 T. LINDQUIST 2,759,449

FLOCK APPLYING MACHINE

Filed Oct. 5, 1954 2 Sheets-Sheet 2

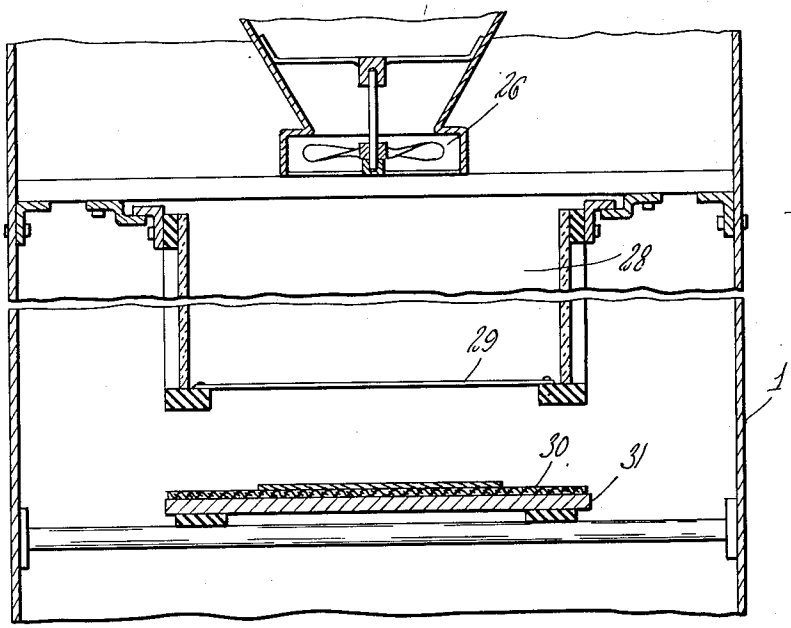

Fig. 3.

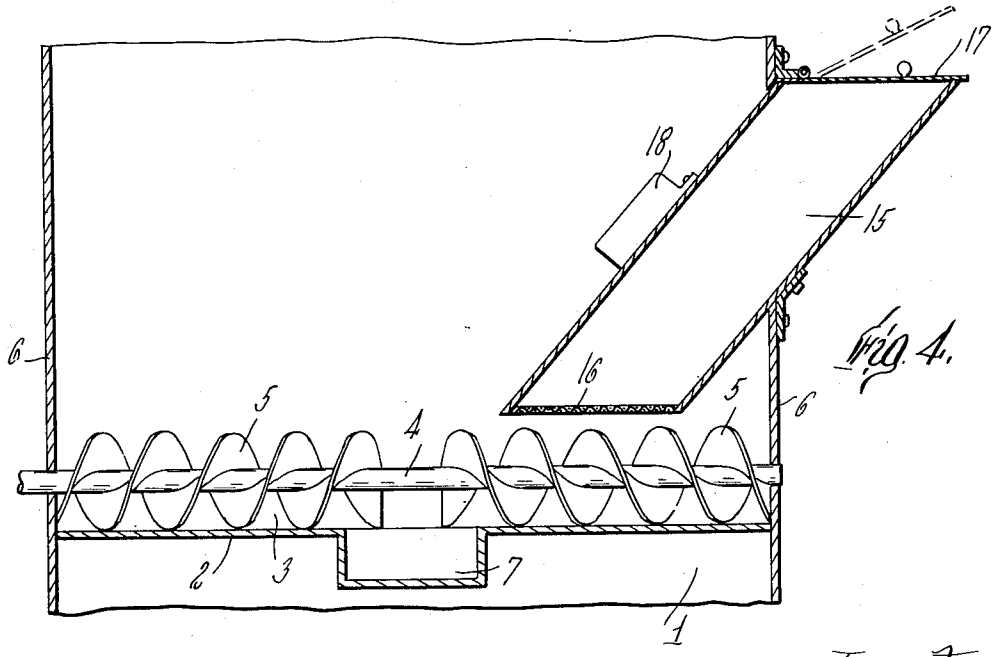

Fig. 4.

Inventor
Theodore Lindquist
by Wright Brown Quinby & Clay
Attys.

United States Patent Office 2,759,449 Patented Aug. 21, 1956

2,759,449

FLOCK APPLYING MACHINE

Theodore Lindquist, New York, N. Y.

Application October 5, 1954, Serial No. 460,352

5 Claims. (Cl. 118—51)

This invention relates to machines for applying flock to adhesive coated areas, the flock being oriented to the vertical to the surface area coated thereby, and has for an object to provide an automatic machine which may be adjusted to apply the precise desired amount of flock, the flock being oriented by an electrostatic field to which it is subjected for a sufficient length of time and under other conditions suitable to produce most satisfactory results.

In accordance with this invention, the flock is introduced into an air stream where it is moistened and it is then dispersed in a relatively quiescent gaseous atmosphere within a casing and out of the air stream where it is subjected to electrostatic orientation and deposited end-on against the adhesive coated portions of articles which are passed through that atmosphere. The density of the flock within the quiescent atmosphere may be adjusted manually by the operator by adjustment of the rate of supply of the flock to the machine so that it does not exceed the capability of the machine to deposit the flock against the adhesive surface. The casing is provided with a window through which the conditions therein may be viewed so that adjustment may be made as appears desirable.

For a complete understanding of this invention, reference may be had to the accompanying drawings in which

Figure 1 is a view partly in side elevation and partly broken away and in section of a machine embodying the invention.

Figures 2, 3 and 4 are detail sectional views, Figure 2 being to an enlarged scale, on the correspondingly numbered section lines of Figure 1.

Referring to the drawings, at **1** is indicated a casing having a hopper bottom at **2** leading to a central portion **3** extending thereacross in which is located a screw conveyor **4**. This screw conveyor has conveyor elements **5** oppositely disposed to convey material from the outer ends of the conveyor adjacent to the side walls **6** of the casing toward the central portion thereof where the material drops into a trough portion **7** as this conveyor is rotated. From this trough portion there extends a pipe **8** to a blower fan **9**. This blower fan has a discharge pipe **10** leading upward to the top of the machine where it enters a cyclone separator at **11**. The air from the cyclone separator is discharged through the pipe **12** into the breather bag **13** through which it escapes to the atmosphere but holds behind flock or other material in the air stream and prevents it from being discharged into the atmosphere of the room.

Flock is supplied to the conveyor **4** as from a supply hopper **15**, which as shown in Figure 4, extends through the front wall of the casing **1** and at whose lower end is positioned a screen **16** above one of the conveyor portions **5**. This supply hopper **15** is provided with a cover **17** which may be lifted as shown in dotted lines in Figure 4 to permit the supply of flock therein to be replenished. This hopper **15** has attached to one of its faces a vibrator **18** of any suitable description which sets up vibration in the hopper **15** and tends to feed flock down through the

screen **16** to the screw conveyor **4**. This vibrator may be of any suitable type, but as shown it is an electrically actuated vibrator of the type known as "Syntron."

Likewise the side walls of the hopper **2** may be provided with similar vibrators at **19** and all of these may be controlled by a single rheostat **20** placed in any convenient position, adjustment of this rheostat determining the amount of vibration and consequently the rate at which flock is fed from the supply hopper **15** into the casing in position to be engaged by the conveyor **4**.

During the passage of the flock from the lower portion of the container to the cyclone separator, it is suitably surface moistened as by a steam jet **25**.

The flock, after having been separated from the air current, drops onto a freely rotatable fan **26**, preferably a small amount of air current aiding gravity, this tending to rotate the fan **26** and distribute the flock discharged from the cyclone separator over a larger area. The vanes of the fan **26** are preferably easily bendable so as to adjust the spreading area of the flock. It discharges this flock in dispersed condition into an insulated ionizing chamber which may be "Lucite" or other transparent material, having its lower wall formed by a plurality of wires **29** spaced apart to permit the flock to pass therebetween. These wires may be, for example, of diameters from .024 to .003 inches and spaced, say, 1 inch apart.

Beneath the wires **29** is the upper substantially horizontal stretch of a belt conveyor **30** on which are supported articles, such as cards, having adhesive coated areas thereon and which are transported through the receptacle as the belt conveyor is moved, and as shown in Figure 1, from left to right. The upper stretch of this belt may be supported on a metal plate **31**. Forwardly of the receptacle **28** in the direction of travel of the belt there is mounted a conductive plate **35** at approximately the level of the wires **29**. This plate is supported by insulating supports **36**, and the plate and wires are electrostatically charged, preferably negatively, as from the lead **40** from an R. F. power supply which electrostatically charges the wires and plate 35 at, say, 40 kv. The plate **31** is charged in the opposite polarity from the other lead **41** from the power supply. The return stretch **42** of the conveyor belt preferably passes between a pair of rotary brushes **43** and **44** which act to brush off any loose flock which may have been deposited on the belt. As shown best in Figure 2, these brushes **43** and **44** are arranged in spiral formation and are rotated in a direction to move the loose flock from the central portion of the belt over to the margins thereof where it may be discharged and find its way down to the hopper walls **2** and eventually to the conveyor **4**.

Articles are fed into the casing **1** as by the conveyor belt **50** which moves them through a slot **51** in the casing wall and deposits them onto the top stretch of the conveyor belt **30** by which they are passed beneath the charged wires **29** and the plate **35** and above the oppositely charged plate **31**.

At the opposite end of the machine suitable means such as a conveyor **52** takes the coated articles and removes them therefrom.

In operation of the machine, flock is fed from the supply hopper **15** to the lower portion of the container where it is picked up by the air stream from the fan **9** and is transported into the cyclone separator, during which transportation it is suitably surface-moistened by the jet **25**. In the cyclone separator the flock is removed from the air current which continues on into the breather bag and is discharged therefrom to the atmosphere. The flock while in dispersed and moistened condition descends into the receptacle **28** and as it descends through the relatively quiescent atmosphere therein it becomes charged negatively from the charged wires **29**, between

which it passes into the influence of the positively charged plate 31. This causes the flock to become oriented and to be projected against the adhesively coated articles on the top stretch of the belt 30 and become embedded end-on in the adhesive coating thereon. Such flock as may not strike the adhesive-coated surfaces properly and remains unattached is further oriented and projected between the plates 35 and 31 and finds its way as far as possible into contact with the adhesive surfaces. Flock which even then does not become attached and remains loose within the container is removed from the belt by brushes 42 and 43 and falls from the side edge of the belt into the lower portion of the container where the vibration of the hopper bottoms 2 causes it to drop into the range of the conveyor 4 and be returned into circulation.

The rate of supply of the flock is regulated by the extent of vibration of the various vibrating elements and should be such that it forms a cloud in the ionizing receptacle 28 which can be seen through by the operator, the casing having a suitable transparent window 58 through which the interior may be viewed.

The conveyors are driven by any suitable means such as a motor 60 which may be operatively connected to the conveyor belt 30 and screw conveyor 4 as through a speed-reducing gear 61 and the driving belts 62, 63 and 64.

The belt conveyor 30 may be made of canvas, or, if desired, it may be made of woven material presenting orifices sufficiently large for the flock to pass therethrough.

From the foregoing description of an embodiment of the invention it should be evident to those skilled in the art that various changes and modifications may be made therein without departing from its spirit or scope.

I claim:

1. In combination, a casing, a substantially horizontal conveyor belt having an upper stretch and located in said casing for supporting on its upper stretch adhesive coated material, a conductor plate positioned beneath said stretch, means for producing a current of air containing flock, means for introducing moisture into said current to surface moisten the flock particles therein, spaced conductors in said casing above said stretch, means for separating said moistened flock from said air current and introducing such flock in dispersed condition into the atmosphere in said casing between said conductors, and means for subjecting said plate and conductors to electrostatic charges of opposite polarity whereby the flock passing between said conductors becomes charged in one polarity and said material in the opposite polarity, whereby said flock in said casing becomes oriented and is projected endwise against the coated material.

2. In combination, a casing having a hopper bottom, a screw conveyor extending laterally of said bottom and having oppositely directed impellers arranged to direct material toward one portion thereof, pneumatic means for drawing material from said one portion and having a pipe, a vortex separator located above said bottom and receiving the discharge from said pipe, means for introducing moisture into said pipe, a flock supply hopper arranged to deliver flock into said receptacle and to said screw conveyor, freely rotatable vanes within said casing positioned to receive the flock from said separator, a belt conveyor having an upper stretch for supporting and conveying adhesive coated material through said receptacle beneath said vanes, a conductor plate beneath said stretch, spaced conductors arranged above said stretch and positioned to receive flock from said vanes to pass between said conductors toward material on said stretch, and means for charging said plate and conductors in opposite polarity whereby the flock passing said conductors is charged to the same polarity as said conductors and is oriented and projected endwise against said material.

3. In combination, a casing having a hopper bottom, a screw conveyor extending laterally of said bottom and having oppositely directed impellers arranged to direct material toward one portion thereof, pneumatic means for drawing material from said one portion and having a pipe, a vortex separator located above said bottom and receiving the discharge from said pipe, means for introducing moisture into said pipe, a flock supply hopper arranged to deliver flock into said receptacle and to said screw conveyor, freely rotatable vanes within said casing positioned to receive the flock from said separator, a belt conveyor having an upper stretch for supporting and conveying adhesive coated material through said receptacle beneath said vanes, a conductor plate beneath said stretch, spaced conductors arranged above said stretch and positioned to receive flock from said vanes to pass between said conductors toward material on said stretch, means for charging said plate and conductors in opposite polarity whereby the flock passing said conductors is charged to the same polarity as said conductors and is oriented and projected endwise against said material, and a second conductor plate above said stretch and beyond said conductors in the direction of motion of said stretch and charged to the same polarity as said conductors.

4. In combination, a casing having a hopper bottom, a screw conveyor extending laterally of said bottom and having oppositely directed impellers arranged to direct material toward one portion therof, pneumatic means for drawing material from said one portion and having a pipe, a vortex separator located above said bottom and receiving the discharge from said pipe, means for introducing moisture into said pipe, a flock supply hopper arranged to deliver flock into said receptacle and to said screw conveyor, freely rotatable vanes within said casing positioned to receive the flock from said separator, a belt conveyor having an upper stretch for supporting and conveying adhesive coated material through said receptacle beneath said vanes, a conductor plate beneath said stretch, spaced conductors arranged above said stretch and positioned to receive flock from said vanes to pass between said conductors toward material on said stretch, means for charging said plate and conductors in opposite polarity whereby the flock passing said conductors is charged to the same polarity as said conductors and is oriented and projected endwise against said material, a second conductor plate above said stretch and beyond said conductors in the direction of motion of said stretch and charged to the same polarity as said conductors and means for vibrating said hopper bottom and hopper.

5. In combination, a casing having a hopper bottom, a screw conveyor extending laterally of said bottom and having oppositely directed impellers arranged to direct material toward one portion thereof, pneumatic means for drawing material from said one portion and having a pipe, a vortex separator located above said bottom and receiving the discharge from said pipe, means for introducing moisture into said pipe, a flock supply hopper arranged to deliver flock into said receptacle and to said screw conveyor, freely rotatable vanes within said casing positioned to receive the flock from said separator, a belt conveyor having an upper stretch for supporting and conveying adhesive coated material through said receptacle beneath said vanes, a conductor plate beneath said stretch, spaced conductors arranged above said stretch and positioned to receive flock from said vanes to pass between said conductors toward material on said stretch, means for charging said plate and conductors in opposite polarity whereby the flock passing said conductors is charged to the same polarity as said conductors and is oriented and projected endwise against said material, a second conductor plate above said stretch and beyond said conductors in the direction of motion of said stretch and charged to the same

polarity as said conductors, means for vibrating said hopper bottom and hopper, and means for removing free flock from said belt conveyor.

References Cited in the file of this patent

UNITED STATES PATENTS

2,109,205 Woodward ---------- Feb. 22, 1938
2,173,032 Wintermute ---------- Sept. 12, 1939
2,356,489 Amstuz ---------- Aug. 22, 1944
2,419,835 Hester ---------- Apr. 29, 1947