MACHINE FOR FILLING FABRIC CASINGS WITH FILLING MATERIALS BY MEANS OF A HELICAL CONVEYER AND AN AIR BLOWER AND A PLENUM TYPE CHAMBER
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FIG. 4

FIG. 5

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FIG. 8

FIG. 9

FIG. 10

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This invention relates to a combined apparatus for picking and stuffing or filling fibrous material or stock, such as cotton, kapok, hair, fiber-glass, or divided material such as rubber particles into porous or non-porous casings by means of a force feeding helical conveyor.

An object of this invention is to provide a combined picking and stuffing machine comprising a chamber for receiving materials to be processed, the receiving chamber having an opening in its floor, the opening being defined by a substantially semi-circular screen positioned below the floor of the receiving chamber, and to mount a helical conveyor preferably below the floor of the receiving chamber, the screen being substantially concentric with the conveyor, the receiving chamber having a shaft carrying a plurality of agitator arms above the floor level and designed to scan a large number of coating stationary picker teeth which keep the material in a loosely divided state, one agitator being preferably positioned in superposed relation with the helical conveyor. Also, to provide a plenum chamber around the conveyor screen, from which air is exhausted to positively initiate the feeding of the materials to the helical conveyor.

Another object of this invention is to provide air blowing means for placing the fibers in the receiving chamber in air-borne suspension in such a manner that the fibers are pneumatically conveyed toward the supply portion of the helical conveyor.

According to a preferred embodiment of my invention, the filling material is conveyed from a hopper to a force feed helical conveyor. The receiving chamber is provided with mechanical and pneumatic agitation means which operate to place the filling material in directed air-borne suspension.

The air suspended fibers within the receiving chamber are drawn into a pocket or opening formed by a curved screen which partially surrounds the supply end portion of the force feed helical conveyor where the processed material is fed into a nozzle in which an extension of the helical conveyor is rotatably mounted.

Pneumatic suction means is connected to the plenum chamber around the helical conveyor to remove the air from around the helical conveyor to positively initiate the feeding of the processed material through the extension portion or nozzle portion of the conveyor.

Another object of this invention is to provide actuating mechanism whereby the helical conveyor is reciprocated while rotated and so that the combined rotary and reciprocating motions act jointly on the filling material and function to provide non-compacted filling material portions in between the conveyor-fed portions of the filling material. Also to provide means causing the conveyor to rotate and reciprocate when moving in direction out of the nozzle, and only reciprocate when moving in direction into the nozzle, and in timed sequence.

With the above and other objects in view, the invention will be hereinafter more particularly described, and the combination and arrangement of parts will be shown in the accompanying drawings and pointed out in the claims which form part of this specification.

Reference will now be had to the drawings, wherein like numerals of reference designate corresponding parts throughout the several views, in which:

Figure 1 is a side elevation of the feeding and stuffing apparatus embodying the invention.

Figure 2 is a top plan view of the machine shown in Figure 1, with the cover removed.

Figure 3 is a cross-sectional view taken on line 3—3 in Figure 2, the conveyor not being cross-sectioned.

Figure 4 is a cross-sectional view taken on line 4—4 in Figure 1.

Figure 5 is a central cross-sectional view taken through the nozzle and showing a two-step arrangement of the helical force feeding spiral conveyor.

Figure 6 is a top plan view showing a modified arrangement of mechanism for driving the helical conveyor in a manner such that reciprocations or linear feeding motions are imparted to the conveyor simultaneously with the rotary motions.

Figure 7 is a side elevation of the modified rotary and linear drive mechanism shown in plan view in Figure 6.

Figure 8 is a top plan view showing another modified arrangement of mechanism for transmitting rotary and reciprocating motions to the conveyor when moving in one direction and only reciprocating motion in the other direction and in timed sequence.

Figure 9 is a front elevation of the mechanism shown in Figure 9.

Figure 10 is a front view of a modified nozzle and helical conveyor having keys longitudinally positioned inside the nozzle.

In the illustrated embodiment of the invention, the numeral 10 indicates an apparatus for feeding and stuffing fibrous or other materials into casings such as that used for cushions, stuffed
toys, dolls, etc., of which the casings may be porous or non-porous. The apparatus comprises a closed top rectangular chamber for receiving the filling materials. The chamber has two end walls, 12, 12'. The end wall 12 has a feed hopper 13 extending therefrom. The receiving chamber 11 has two side walls 14, 14'. In the receiving chamber 11, are stationary toothed bars 15 extending substantially the entire length of the chamber. Each bar 15 has a plurality of horizontally facing sharp pointed angular teeth 16, in spaced-apart relation. A further stationary toothed bar 15 is placed at the floor portion of the chamber 11 and has triangular upwardly facing picker teeth.

Mounted on a horizontally rotatable agitator shaft 20 in the receiving chamber 11 is a plurality of agitators 21. In practice, the rotatable agitators 21 coact with the stationary picker teeth 16 to set up a picking action on the filling material deposited in the chamber 11 through a door 22 secured by a hinge 23 to the chamber cover 24. Sizeable lumps of fibrous or other materials are thrown into the feed hopper 13 where the rotating agitator assembly with the teeth break and tear the stock into divided form which are passed against the stationary picker teeth. The materials are fed in divided pieces into an opening 25 which is positioned at the opposite or discharge end of the receiving chamber 11. It is to be noted that the filling materials may, if desired, be deposited into the receiving chamber 11 in comparatively large lumps which are unsuitable for insertion into the casings, etc. This requires that the coacting rotary agitators and stationary triangular toothed elements should be suitably spaced-apart from each other so as to break up the large lumps.

A pulley 26 is mounted on the agitator shaft 20 and is driven by a belt 27 mounted on a motor-pulley 28. A pulley 29 is mounted on a conveyor shaft 30 rotatably mounted in bearings 31 and 32 below the receiving chamber 11. The pulley 29 is of large diameter and is connected by a belt 33 to a motor pulley 34. The motor 36 is thus adapted to drive the shaft 30 at reduced speed.

Referring to Figures 1 to 3, it will be seen that the opening 25 is of rectangular form and is preferably cut in the lower wall 40 of the receiving chamber 11. Secured to the lower wall of the chamber 11 (Figure 3), is a plenum type chamber 41 of substantially rectangular form and having a flange 42 serving for securing the plenum chamber 41 to the wall 40 of the receiving chamber 11 by bolts 43.

The plenum chamber 41 has an opening 45 in alignment with the opening 25 in the receiving chamber 11. At the lower wall 45 of the plenum chamber 41 is a clean-out opening 46 which is suitably closed air tight by a cover 47.

A helical conveyor 49 is fixedly mounted on the shaft 30 by means of a hub 50 which fits on the shaft 30. The conveyor 49 is positioned horizontally and centrally within a screen 51. The conveyor 49 has a helical or screw type blade 51 of the same length as the opening 25. The conveyor 49 is formed at one end into a key 52 to which it is attached a step-down conveyor extension 54 rotatably mounted in a nozzle 55.

The screen 56 has perforations 57 and of semicircular form circumscribes substantially one-half the circumference of the conveyor 49 and is suitably attached by flange 58 and bolts 59 to the plenum chamber 41. The plenum chamber 41 has an outlet 60 to which is attached a suction conduit 61. The other end of the suction conduit 61 is attached to the suction inlet 62 of a blower 63.

The blower 63 comprises a casing 64 in which an impeller 65 is rotatably mounted and driven by a motor shaft 66. In the lower part of the side wall 71 is an outlet opening 68. Secured to the upper portion of the outlet opening 68 is a screen 69 which circumscribes the impeller 65 in concentric relation for about ninety degrees. Beyond the ninety degree portion, the screen 69 is in volute or spiral relation with the impeller. The screen 68 has perforations 70 for substantially one hundred and eighty degrees and without perforations for the remainder volute portion.

At the upper portion of the other upright side wall 72 is an outlet tube 73 to which is attached an air bleeding relief bag 74 of the vacuum cleaner type. The bag 74 serves to receive the exhaust air from the blower and entrap such particles as may have passed through the screen 69.

Attached to the outlet opening 68 is a delivery conduit 75 which extends upwardly and communicates with the receiving chamber 11 through an opening 76.

The conduit 75 serves for delivering the discharge from the blower into the receiving chamber to keep the materials in suspension in the receiving chamber.

It is preferable that the blower 63 be constantly operating so that there will always be available an air suction in the plenum chamber 41. It is to be noted that the receiving chamber may be covered and operate above atmospheric pressure or may be operated under atmospheric conditions.

In the lower portion of the suction conduit 61 is an apertured extension 83 providing an atmospheric air inlet. A valve 81 suitably mounted in the extension 83 is used to maintain pre-determined constant suction inside the plenum chamber 41. The valve 81 is held down by a tensioned coil spring 82. The upper end of the spring is secured in an aperture in the valve stem 83 and the lower end is secured in an aperture in a threaded member 84 in the lower face of the extension.

For manual pre-setting of a controlled flow or suction I use a hand set butterfly valve 85 which rotates on a pivot 86 in the suction conduit 61. A blast gate may be used for this purpose.

It is found desirable to provide mechanism 86 coating in the operation of the helical conveyor whereby the filling material fed thereby is less compacted. For this purpose, the drive shaft 30 (Figures 6 and 7) is divided into two sections 30' and 30''. The section 30'' is rotatable but not slidable and terminates at one end in a rectangular key 90.

The section 30'' is rotatable and slidable and terminates at the end adjacent the key 90 in a keyway 91 which is engageable with the key and slidable relative to the key.

The helical conveyor 49' is mounted in an elongated opening 92 which is longer than the conveyor 49 having a screen 56. The conveyor 49' being mounted in offset relation in the opening so as to leave a vacant space 93 through which the shaft section 30'' passes and in which non-compacted filling material is deposited by the feeding action of the air blower 63.

The shaft section 30'' is turned down at 94 to provide two collars 95, 95 which are spaced apart from each other to provide bearing surfaces for an eccentric 96 mounted on a shaft 97 which is rotatably mounted in a bearing 98.

A pulley 99 mounted on the shaft 97 is driven
by a belt on a motor pulley. It is to be noted that the speed of the motor may be made to provide any ratio of reciprocating motions to the rotary motions.

Rotation of the shaft causes the eccentric to impart reciprocatory motions to the shaft section while the shaft section is rotated by the shaft section. This arrangement of the shaft sections and eccentric causes the conveyor to be reciprocated simultaneously with its rotary motions, partially into and out of the nozzle.

It is to be noted that when the rate of motion of the reciprocations or linear feeding is equal to the thread lead of the helical conveyor, that this will cause non-compacted soft wads of filling material to be delivered between the compacted material normally fed by the conveyor through the nozzle.

Figures 8 and 9 show another modified arrangement of mechanism designed for transmitting rotary and reciprocating motions to the conveyor when moving in direction, out of nozzle, and only reciprocating motion in direction into the nozzle, and in timed sequence.

The mechanism comprises a drive section and a driven section. The drive section is rotatable but not slidable and terminates at one end in a conical female clutch member which is secured to the drive section by a pin. The section is rotatably mounted in a bearing which is supported on a plate.

The shaft section has a key on which a conical male clutch member is slidable mounted. The clutch member has a keyway in engagement with the key. The shaft section is rotatably mounted in a bearing and is interposed between the bearing and the clutch member. The coil spring urges the clutch member into engagement with the clutch member.

A collar spring is mounted in compression on the shaft section and is interposed between the bearing and the clutch member. The coil spring urges the clutch member into engagement with the clutch member.

An open face type disk conveyor is suitably secured to the shaft. A follower is slidable mounted in a bearing and has a forked end which carries a pin on which is mounted a roller which is in contact with the conveyor.

The other end of the follower carries a pin. A lever is fulcrummed on a pin and has a forked end which engages the pin. The other end of the lever is rotatably terminated in a circular end portion which contacts two bearing surfaces in a cutout portion of the member.

It is to be noted that the conveyor has a concave portion which the follower is caused to dwell or period of rest. Rotation of the shaft causes the eccentric to impart reciprocatory motions to the shaft section while the said shaft section is rotated by the shaft section. This arrangement of the shaft sections and eccentric causes the conveyor to be reciprocated simultaneously with its rotary motions.

The cam is rotated simultaneously with the rotation of the eccentric and this causes the follower to swing the lever and to move the male clutch member away from the female clutch member.

The cam has another concentric portion of smaller radius than the radius of the concentric portion. The concentric portions are connected by inwardly curved portions and outwardly curved portions.

Movement of the cam in a direction of the arrow (Figure 9) will cause the follower to suddenly move towards the lever and to disengage the clutch members and the concentric section causes the said parts to be held apart for a predetermined period during which time the eccentric causes reciprocation of the conveyor toward the discharge end of the nozzle while the conveyor does not rotate. This movement causes discharge of the filling material.

Further rotation of the shaft causes the eccentric to move the section and the conveyor to reciprocate in a reverse direction. Simultaneously, the follower suddenly moves toward the cam into a curved portion and this permits the loaded coil spring to actuate the male clutch member into engaging position, with the result that the drive shaft section causes rotation of the driven shaft section and of the conveyor while the follower is in contact with the cam surface. This simultaneous rotation and reciprocation of the conveyor takes place during the movement of the eccentric in a direction causing the conveyor to move away backwardly from the discharge end of the nozzle.

Figure 10 shows a modified nozzle having internal spouts or keys positioned longitudinally of the nozzle and serving to enhance the rate of travel of the filling material through the nozzle.

It is to be noted that the mechanisms shown in Figures 6 to 9 inclusive are for purpose of illustration and that equivalent mechanisms may be employed to carry out the functions or actions of this invention.

It is also to be noted that, as shown in Figures 2 and 5, the conveyor is in stepped form and used when the filling materials allow themselves to be compressed in order to accelerate the discharge through the nozzle. The conveyor shown in Figure 6 does not have any step or change in volume per unit length and is used where the filling material does not permit itself to be compressed, as it may be damaged by compression.

Operation of invention

In practice, it is found that the axis of the helical conveyor should be placed in line with the horizontal upper portion of the screen while the screen remains concentric with the conveyor. (Figure 3.)

As best shown in Figure 3, one of the agitators is in close proximity to the helical conveyor and sweeps the collected materials that tend to bridge above the conveyor at the opening, away from the said opening.

Air rushing through the filling material and through the perforations makes the filling material air-buoyant by positive pressure or by suction. The velocity of the air buoy the filling material and carries it in the air stream to the screen. The perforations in the screen prevent...
passage of the filling material but permit the air to pass through to the blower 63 or outside the machine 16.

In accordance with the patent statutes I have described and illustrated the preferred embodiments of my invention, but it will be understood that various changes and modifications can be made therein without departing from the spirit of the invention as defined by the appended claims.

I claim:

1. A processing and force feeding machine for filling casings, a closed receiving chamber having an opening in its lower wall, a helical force feed conveyor rotatably mounted below said opening, a perforated screen positioned at the lower portion of said conveyor and of a size to circumscribe substantially one-half the circumference of said conveyor, a plenum chamber around said perforated screen, an air blower, a conduit connecting said plenum chamber with the suction end of said air blower, and means for directing the discharge from said blower into said receiving chamber.

2. In a processing and forced feeding machine for filling casings of the character described, a receiving chamber having an opening in one of its walls, a helical force feed conveyor rotatably mounted in said opening, a perforated screen of a size to circumscribe the circumference of said conveyor, a plenum chamber around said perforated screen, an air blower, a conduit connecting said plenum chamber with the suction end of said air blower, and means for directing the discharge from said blower into said receiving chamber.

3. In a processing and force feeding machine for filling casings, a closed receiving chamber having an opening in one of its walls, toothed bars fixedly positioned lengthwise of said chamber with said teeth positioned diametrically, a rotary agitator means coaxing with said teeth to break up said filling materials, a helical force feed conveyor rotatably mounted in said opening, a nozzle, a conveyor extension mounted in said nozzle, a perforated screen of a size to circumscribe substantially one-half the circumference of said conveyor, a plenum chamber around said perforated screen, an air blower, and a conduit connecting said plenum chamber with the suction end of said air blower.

4. In a processing and force feeding machine for filling casings, a closed receiving chamber having an opening in one of its walls, toothed bars fixedly positioned lengthwise of said chamber and with said teeth positioned on opposite sides thereof, a rotary agitating means coaxing with said teeth to break up said filling materials, a helical force feed conveyor rotatably mounted in communication with said opening, a nozzle outside said chamber and in alignment with said helical conveyor, a conveyor extension mounted in said nozzle, a perforated screen of a size to circumscribe substantially one-half the circumference of said conveyor, a plenum chamber partially around said perforated screen, an air blower, a conduit connecting said plenum chamber with the suction end of said air blower, and means for directing the discharge from said air blower into said receiving chamber to maintain said materials under pressure in said receiving chamber while being processed and fed.

5. In a processing and force feeding machine for filling fabric casings, a closed receiving chamber having an opening in one of its walls, a hopper having a hinged cover, toothed bars fixedly mounted lengthwise of said chamber with said teeth positioned to face each other from opposite sides of said chamber, a rotary agitator cooperating with said teeth to break up said filling materials, a helical force feed conveyor rotatably mounted outside said chamber and in communication with said opening in said chamber, a nozzle outside said chamber and in alignment with said helical conveyor, a step-down conveyor extension mounted in said nozzle, a perforated screen of a size to circumscribe substantially one-half the circumference of said helical conveyor, a plenum chamber around said perforated screen, an air blower, and a delivery conduit for directing the discharge from said air blower into said receiving chamber to maintain said materials under pressure in said receiving chamber while being processed and fed through said nozzle.

6. In a processing and force feeding machine for filling fabric casings, a receiving chamber having an opening in one of its sides, a hopper having a cover, toothed picking bars fixedly mounted lengthwise of said chamber, a rotary agitator cooperating with said teeth to break up said filling materials, a helical force feed conveyor rotatably mounted in communication with said chamber, a nozzle outside said chamber and in alignment with said helical conveyor, a step-down conveyor extension mounted in said nozzle, a perforated screen of a size to circumscribe substantially one-half the circumference of said helical conveyor, a plenum chamber of a size to pass around said perforated screen, the alignment of said receiving chamber opening with said plenum chamber causing the material being processed to enter said helical conveyor in a direction perpendicular to the axis thereof, an air blower, a suction conduit connecting said plenum chamber with the suction end of said air blower, and a delivery conduit for directing the discharge from said air blower into said receiving chamber while said materials are processed and fed through said nozzle.

7. In a processing and force feeding machine for filling fabric casings, a receiving chamber having an opening in one of its sides, a hopper having a cover, toothed picking bars fixedly mounted lengthwise of said chamber, a rotary agitator cooperating with said teeth to break up said filling materials, a helical force feed conveyor rotatably mounted in communication with said
chamber, a nozzle outside said chamber and in alignment with said helical conveyor, a step-down conveyor extension mounted in said nozzle, a perforated screen of a size to circumscribe substantially one-half the circumference of said helical conveyor, a plenum type chamber of a size to pass around said perforated screen, the alignment of said receiving chamber opening with said plenum type chamber causing the material being processed to enter said helical conveyor in a direction perpendicular to the axis thereof, an air blower, a suction conduit connecting said plenum type chamber with the suction end of said air blower, a delivery conduit for directing the discharge from said air blower into said receiving chamber while said materials are processed and fed through said nozzle, and means causing said conveyor to reciprocate simultaneously with its rotary motions.

9. In a processing and force feeding machine for filling casings, a closed receiving chamber having an opening in one of its sides, a hopper having a cover, toothed picking bars fixedly mounted lengthwise of said chamber, rotary agitators coacting with said teeth to break up said filling materials, a helical force feed conveyor rotatably mounted in communication with said chamber, a nozzle outside said chamber and in alignment with said helical conveyor, a perforated screen of a size to partially circumscribe the circumference of said helical conveyor, a plenum type chamber of a size to pass around said perforated screen, the alignment of said receiving chamber opening with said plenum type chamber causing the material being processed to enter said helical conveyor in a direction substantially perpendicular to the axis thereof, an air blower, a suction conduit connecting said plenum type chamber with the suction end of said air blower, a delivery conduit for directing the discharge from said air blower into said receiving chamber, and means causing said conveyor to rotate and reciprocate when moving in direction out of said nozzle, and only reciprocating motion in direction into said nozzle, and in timed sequence.

10. In a processing and force feeding machine for filling casings, a receiving chamber having an opening in one of its sides, a hopper, toothed picking bars fixedly mounted in said chamber, rotary agitators coacting with said teeth to break up said filling materials, a helical conveyor rotatably mounted in communication with said chamber, a nozzle outside said chamber and in alignment with said helical conveyor, a perforated screen of a size to partially circumscribe said helical conveyor, a plenum type chamber of a size to pass around said perforated screen, the alignment of said receiving chamber opening with said plenum type chamber causing the material being processed to enter said helical conveyor in a direction substantially perpendicular to the axis thereof, an air blower, a suction conduit connecting said plenum chamber with the suction end of said air blower, and a conduit for the discharge from said air blower.

No references cited.