Jan. 2, 1951 E. J. ROTH 2,536,662

DOUGHNUT SUGARING MACHINE

Filed July 17, 1946 3 Sheets-Sheet 1

Fig. 1.

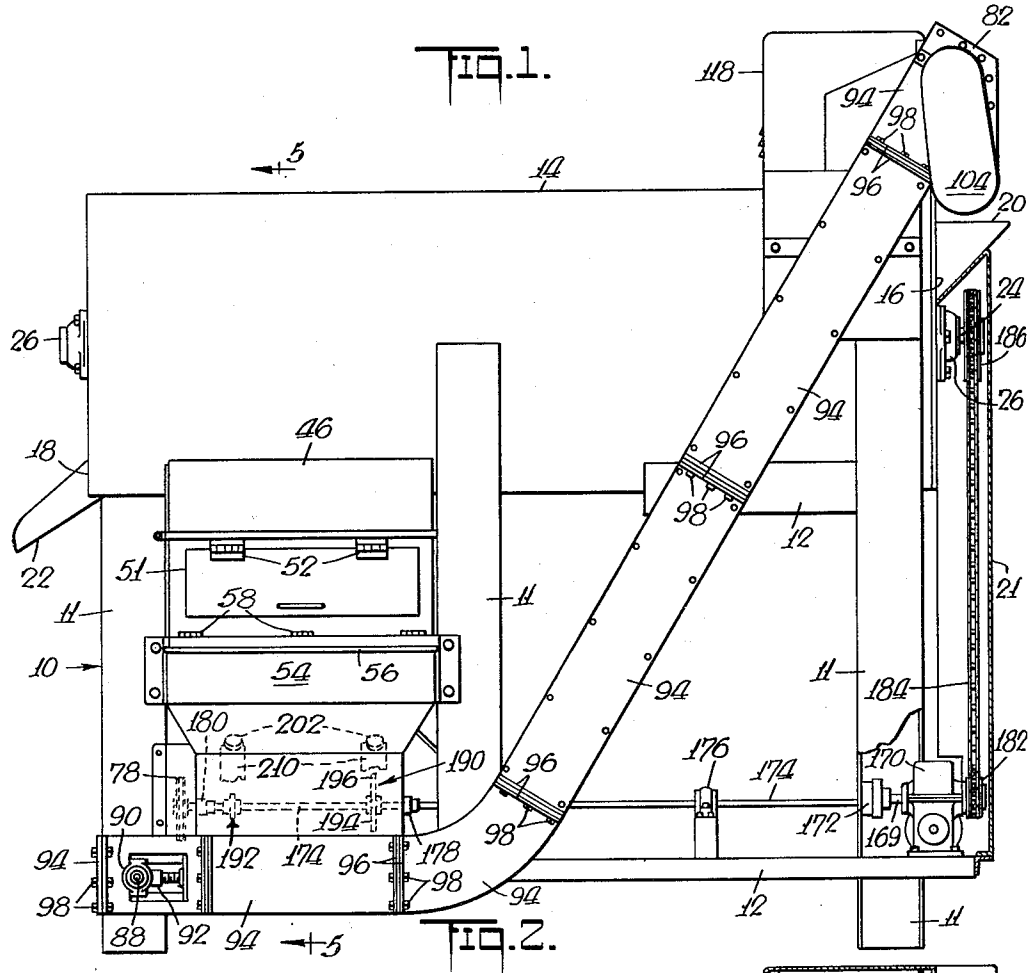
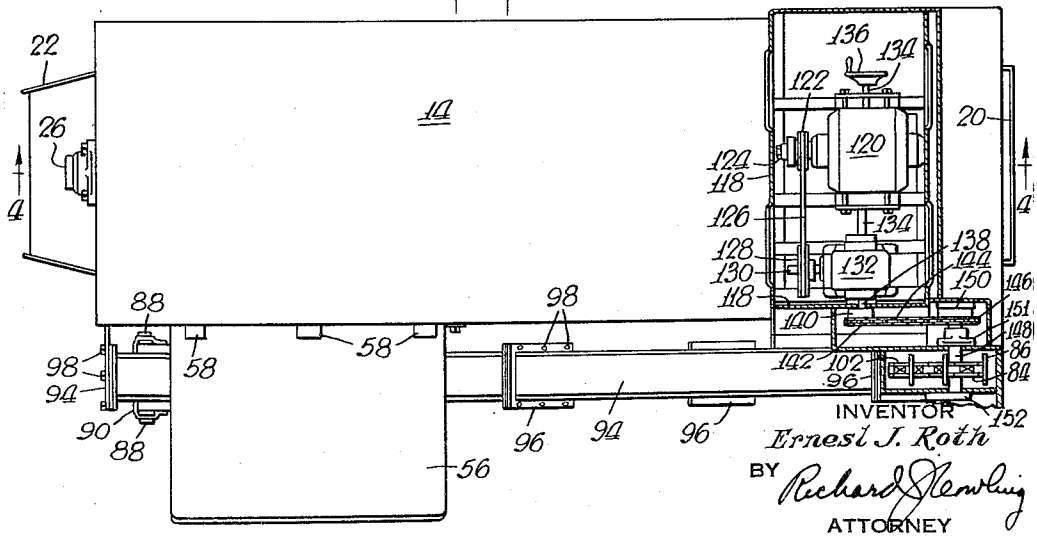


Fig. 2.



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DOUGHNUT SUGARING MACHINE

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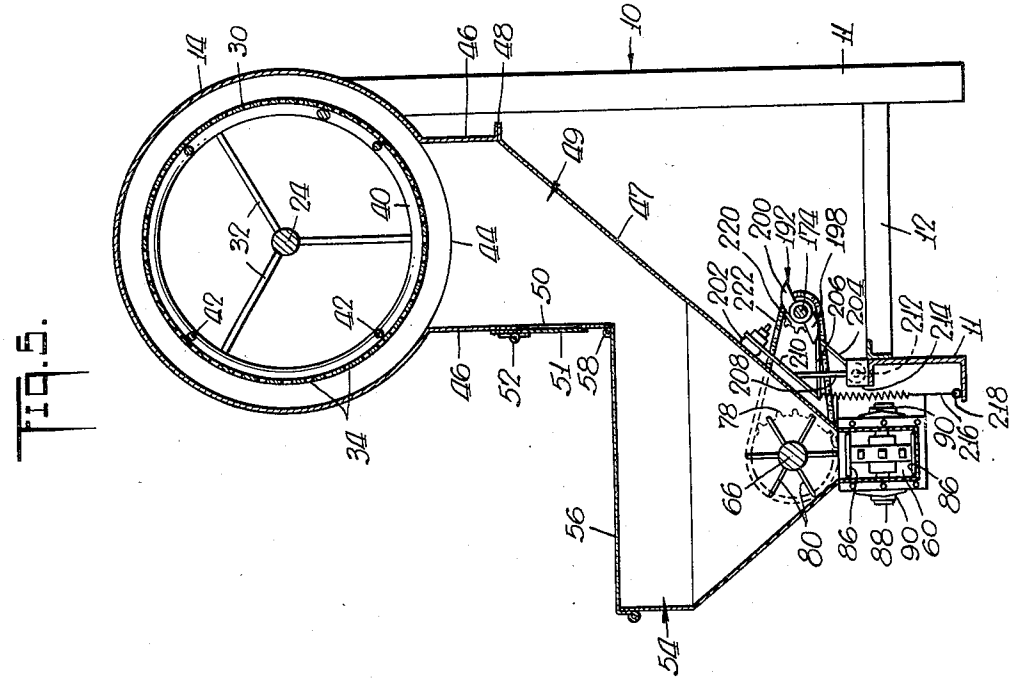


FIG. 5.

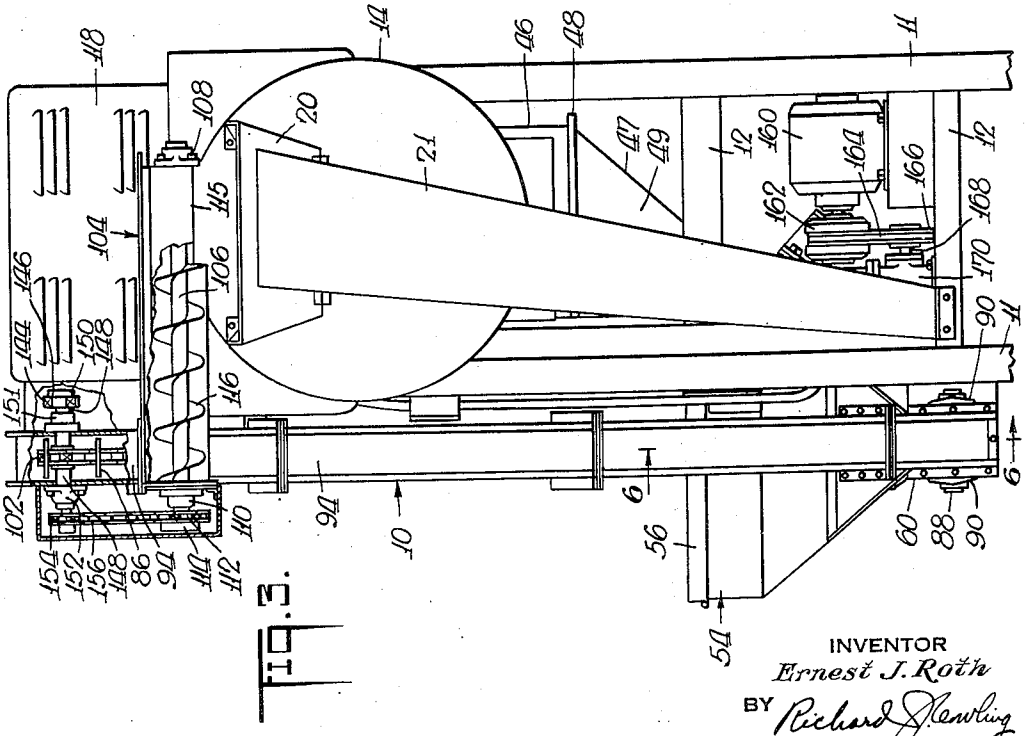


FIG. 6.

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DOUGHNUT SUGARING MACHINE

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Fig. 4.

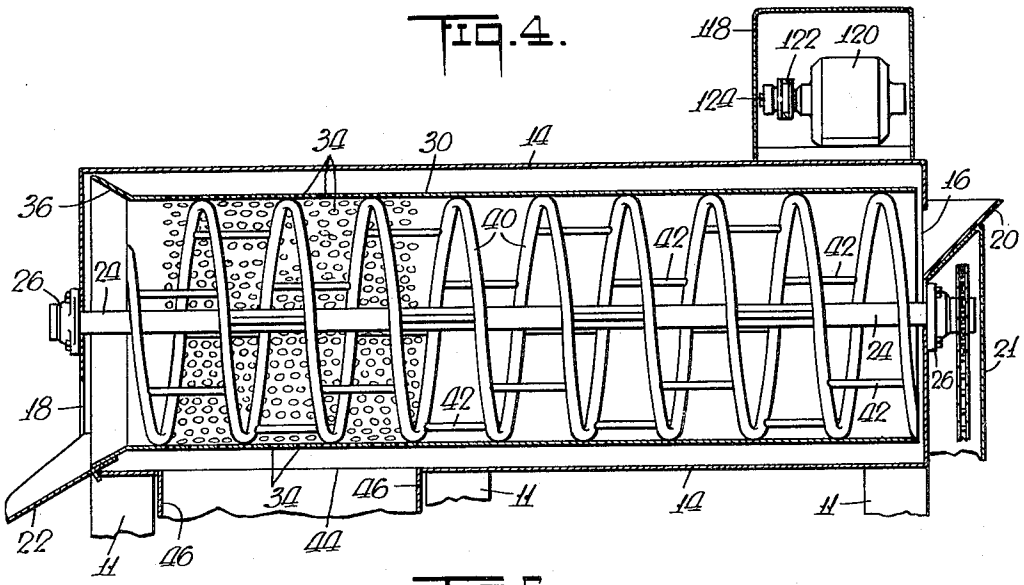


Fig. 6.

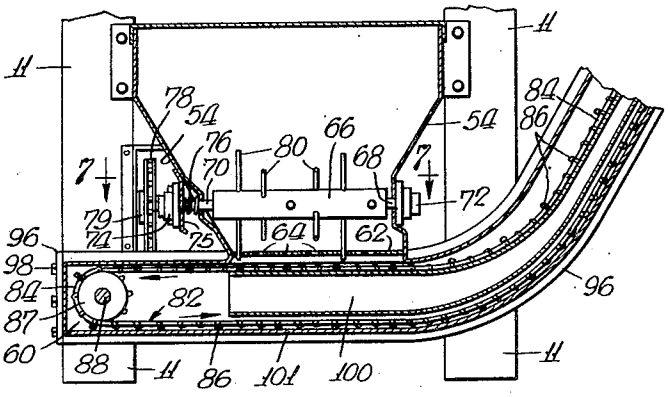
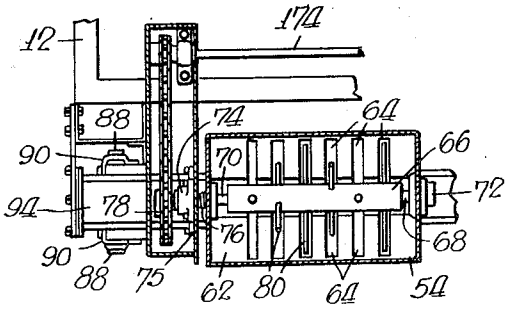


Fig. 7.



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2,536,662

DOUGHNUT SUGARING MACHINE

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Application July 17, 1946, Serial No. 684,321

5 Claims. (Cl. 91—7)

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The present invention relates generally to apparatus for coating articles with pulverized or granular materials, and, while it is applicable to many other uses, it is more specifically concerned with the coating or dusting of bakery products, such as cakes, crullers, cookies, doughnuts and the like, with dry powdery sugar or materials having similar physical characteristics.

An object of the present invention is to provide a simple, inexpensive and economical apparatus for applying a uniform coating to articles of the character described in a rapid, efficient, economical and continuous manner without danger of damaging said articles, applying an incomplete or non-uniform coating thereto, or wasting said coating material.

A further object of the invention is the provision of simple, inexpensive and efficient apparatus which permits the safe and efficient handling of large numbers of such products simultaneously and continuously, and which is capable of uniformly controlling the amount of coating or dusting material contacting the bakery products.

Another object of the invention is to provide means for positively tumbling said articles in an efficient and non-injurious manner to cause an application of said coating material to all exterior surfaces of said products during each tumbling operation in an efficient and uniform manner.

A further object of the invention is the provision of suitable means for continuously feeding the coating or dusting material from a reserve reservoir or hopper to the tumbling drum in a uniform and efficient manner, and for removing the unused or excess coating or dusting material therefrom.

Another object of the invention is to provide a coating apparatus of the character described having all of its moving parts suitably enclosed so as to eliminate the danger of accidents and the like and to protect the apparatus and its edible contents from dust, dirt, etc.

A further object of the invention is the provision of novel means for insuring uniform delivery of the coating or dusting material from a combination reserve reservoir and collecting bin to a rotatable coating drum in a fine powdery stream.

Various other and further objects and advantages of the invention, which result in simplicity, economy and efficiency, will be apparent from the following detailed description, wherein a preferred form of embodiment of the invention is shown, reference being had for illustrative purposes to the accompanying drawings, forming a part hereof, in which:

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Figure 1 is a side elevational view of an apparatus constructed in accordance with the invention, with a part being in section in order to show the lower drive mechanism for operating the rotating inner drum, vibrator and lump breaker mechanism;

Figure 2 is a top plan view of the apparatus shown in Figure 1, with the housing for the upper drive mechanism being in section in order to illustrate the driving mechanism for the elevator for conveying the coating or dusting material from its reserve reservoir to the top of the apparatus and the cooperating lateral feed screw conveyor for delivering said material into the rotating coating or dusting drum;

Figure 3 is a rear elevational view of the apparatus shown in Figure 1, with the upper driving mechanism, including the lateral screw feed conveyor being shown partly in section;

Figure 4 is a fragmentary longitudinal sectional view of the apparatus shown in Figure 2, the same being taken substantially along the line 4—4 thereof, looking in the direction of the arrows, and illustrating the detailed construction of the inner and outer drums;

Figure 5 is a cross-sectional view of the apparatus shown in Figure 1, the same having been taken substantially along the line 5—5 thereof, looking in the direction of the arrows, and illustrating the details of the collecting bin and reserve reservoir, and the driving mechanism for the lump breaker and vibrator;

Figure 6 is a fragmentary sectional view of the apparatus shown in Figure 3, the same having been taken substantially along the line 6—6 thereof, looking in the direction of the arrows, and illustrating the details of construction of the reserve reservoir, its lump breaker and its delivery elevator; and

Figure 7 is a fragmentary sectional view taken substantially along the line 7—7 of Figure 6, showing in greater detail the features of the lump breaking mechanism of the reserve reservoir.

Referring now to the drawings, and particularly to Figure 1 thereof, there is shown a box-like supporting structure 10 consisting of a plurality of legs 11 suitably connected and braced intermediate their ends by horizontal cross-bars 12. A stationary outer cylindrically-shaped drum 14 is fixedly secured on the tops of the legs 11, having an inlet or receiving opening 16 at one end and an outlet or discharge opening 18 at the opposite end. A sloping open-top receiving chute

20 is mounted on the outside of the drum 14 adjacent the inlet or receiving opening 16, and is suitably braced by a supporting bracket 21. A similar discharge chute 22 is mounted adjacent the outlet or discharge opening 18. Suitable conveyors (not shown) are employed for conveying articles to be coated to the inlet or receiving chute 20 and to receive and carry away the coated articles discharged by the outlet or discharge chute 22. A rotatable shaft 24 is mounted axially of the drum 14 in suitable bearing blocks 26 secured to the outer sides of the respective ends thereof.

A rotatable inner drum 30 is mounted fixedly on the shaft 24 by means of a series of longitudinally spaced spiders 32, one of which is shown in Figure 5. The inner drum 30 is of a solid construction adjacent the inlet or article receiving end, and a section thereof adjacent its discharge or delivery end is perforated, as indicated at 34, to provide means for gravitationally discharging any excess or unused granular coating material (not shown) therefrom. The discharge end of the inner rotatable drum 30 is provided with an outwardly flaring flange 36 (see Figure 4) to provide a suitable discharge connection with the discharge chute 22 mounted on the outer side of the discharge end of the outer drum 14. Means in the form of a fixed spiral tubular rod or vane 40 is mounted concentrically within the inner rotating drum 30, and is spot-welded or otherwise securely connected to said drum 30 at suitably spaced intervals. The several adjacent convolutions of the vane 40 are connected longitudinally and circumferentially at suitable spaced intervals by relatively short brace rods 42, which are securely welded thereto. The spiral vane 40 causes the articles deposited in the inner drum 30 at the inlet end 16 to be fed longitudinally therethrough and to be discharged therefrom through the discharge outlet 18 when the inner drum 30 is rotated, and the circumferentially spaced longitudinal brace rods 42 cause the articles to be tumbled over and over again in their passage through said revolving inner drum 30.

An opening 44 is formed in the bottom of the outer drum 14 below the perforations 34 of the inner drum 30, and, by turning down the metal of the outer drum 14 adjacent said opening, vertical depending flanges 46 are formed about said opening 44 to provide a suitable delivery chute, as best shown in Figure 5. A suitable sloping member 47 is welded to the bottom of the depending flanges of the chute 46, as indicated at 48, to form a sloping bin or gravity collecting means 49 for receiving the unused coating material discharged from the rotating inner drum 30 through its perforations 34. An opening 50 is cut in one side of the chute 46, which is closed by means of a trap door 51 swingably mounted on hinges 52. The door 51 permits inspection and cleaning of the collecting bin 49. A reserve reservoir 54 is mounted adjacent the base of the collecting bin 49, having one side integrally formed with the sloping bottom 47 thereof, and is provided with a top cover member 56 swingably mounted on hinges 58 to permit inspection, filling and cleaning out of the same.

It will be noted that the collecting bin 49 and reserve reservoir 54 have a common discharge trough 60 in the bottom thereof. The top of said discharge trough 60 is provided with a closure plate 62, having a series of transversely extending longitudinally spaced slots 64 therethrough (see Figures 6 and 7). A shaft 66 is mounted through the sides of the reservoir 54 in alignment with and directly above the trough 60. The shaft 66 has reduced end bearing sections 68 and 70, which extend through the sides of the reservoir 54. The bearing section 68 is suitably journalled in a bearing block 72 mounted on the outside of the reservoir 54. The reduced bearing section 70 is journalled in a bearing block 74 mounted on a fixed depending vertical bracket 75 welded to the outside of the opposite side of the reservoir 54. A spring 76 is mounted on the bearing section 70 between the outside of the reservoir 54 and the bracket 75, which serves to hold the shaft 66 in a fixed position longitudinally. The bearing section 70 projects entirely through the bearing block 74 and has a sprocket wheel 78 keyed to its outer end for driving the same. A second bearing block 79 is mounted on the supporting leg 12 for receiving the projecting end of the bearing section 70 of the shaft 66. The enlarged central section of the shaft 66 carries a series of fixed circumferentially spaced radial fingers 80 arranged in rows longitudinally thereof, which are of sufficient length to project a short distance through the slots 64 of the plate 62. The spring 76 prevents end play in the shaft 66 and maintains the fingers 80 in proper operating alignment with their respective slots 64 of the top closure plate 62 for the trough 60.

An endless conveyor or elevator 82 operates in the trough 80, and consists of a chain of substantially square-shaped interlocking links 84 having transversely spaced cross-bars 86 welded thereto at longitudinally spaced intervals. The conveyor or elevator 82 extends over an idler sprocket wheel 87, which is best shown in Figure 6. The idler sprocket wheel 87 is keyed to a shaft 88 extending transversely of the trough 60 adjacent its outer end. The shaft 88 is mounted in bearing blocks 90 secured to the sides of the trough 60. A conventional screw take-up or adjustment is provided for the shaft 88, as indicated at 92 (see Figure 1), and affords suitable means for varying the tension on the chain 84. The conveyor or elevator 82 extends from the lower end of the trough 60 to the upper opposite end of the apparatus, as best shown in Figure 1, and is enclosed throughout its entire length by a removable sectional housing 94, which confines the dry powdery coating material therein and also serves to keep out dirt, dust, etc. The sections of the housing 94 are each provided with radial end flanges 96, which are secured together by bolts 98. An internal tubular guideway or spacer 100, which is best shown in Figure 6, is mounted in the trough 60 and within the housing 94 between the inner sides of the endless conveyor or elevator chain 84. The spacer 100 serves to maintain the chain 84 in its proper alignment in making the turn where there is a normal tendency for it to sag or run out of alignment. The upper end of the elevator 82 operates over a suitable driving sprocket wheel 102.

A trough 104 extends laterally of the supporting structure 10 immediately below the upper or discharge end of the elevator 82 to the receiving chute 20 of the drum 14. A shaft 106 is mounted axially of the trough 104, and is journalled in suitable bearing blocks 108 and 110 mounted on the opposite ends thereof. The shaft 106 projects through and beyond the bearing block 110, and has a driving sprocket wheel 112 mounted thereon, the outer free end of the shaft 106, projecting beyond the driving sprocket wheel 112, is journalled in a suitable bearing block 114. The section of the shaft 106 operating within the

trough 104 is provided with a fixed spiral feed screw vane 116, which, when the shaft 106 is rotated, serves to feed or convey the pulverent coating material deposited in the outer receiving end thereof by the conveyor or elevator 82 into the open chute 20, through a suitable discharge opening 115 in its bottom, in a uniform endless stream, whereupon it gravitates into the rotating inner drum 30 through its receiving opening 16.

Referring now to Figures 2 and 3 of the drawings, a single drive mechanism, which is mounted on top of the drum 14 adjacent its receiving end, is employed to operate the conveyor or elevator 82 and the lateral feed screw 116 for moving the coating material from the reserve reservoir 54 to the receiving chute 20 in a uniform endless stream. This driving mechanism is enclosed in a suitable conventional housing 118, and consists of a constant speed electric motor 120, having an adjustable variable speed pulley 122 of conventional construction mounted on the projecting end of its drive shaft 124. The variable speed pulley 122 drives a belt 126 connected with a driving pulley 128 fixedly mounted on a drive shaft 130 of a conventional reduction gear 132. The motor 120 is slidably mounted on the supporting structure 10, and is adjustable toward and away from its reduction gear 132 by means of a shaft 134, which in turn is manually operable through a suitable hand wheel 136. By turning the hand wheel 136 in one direction, the motor 120 is moved away from its reduction gear 132, and, by turning the hand wheel 136 in its opposite direction, the motor 120 is moved toward its reduction gear 132. Such movements obviously will increase or decrease the tension on the drive belt 126. When the tension is increased on the belt 126, the variable speed pulley 122 tends to spread and allow the belt to ride lower therein and over a smaller circumference, and, when the tension is reduced on the driving belt 126, it tends to ride higher and over a larger circumference in the variable speed pulley 122. Such means for varying the speed of the reduction gear drive 132 is of a conventional construction, and since it forms no part of this invention no further details are believed essential.

The drive shaft 138 of the reduction gear 132 extends at right angles to its driven shaft 130, and passes through the end of the housing 118 and through a bearing block mounted on the outer end thereof, as indicated at 140. A fixed sprocket wheel 142 is keyed to the outer projecting end of the shaft 138, which drives a chain 144. The chain 144 in turn drives a sprocket wheel 146 keyed to a shaft 148 journalled in suitable bearing blocks 150, 151 and 152. It will be noted that the sprocket wheel 102, which drives the conveyor or elevator 82, is also keyed to the shaft 138 between the bearing blocks 151 and 152 (see Figure 2). Referring now to Figure 3, it will also be noted that the shaft 148 projects through and beyond the bearing block 152 and carries another sprocket wheel 154 keyed thereto. The sprocket wheel 154 drives a chain 156, which, in turn, drives the sprocket wheel 112, driving the shaft 106 operating the lateral feed screw 116.

Referring now to Figures 1, 3 and 5, there is shown a second or lower driving mechanism for operating the rotating drum, the lump breaking mechanism and the vibrating mechanism. This second driving mechanism consists of a conventional electric motor 160, having a conventional variable speed pulley 162 mounted fixedly on the projecting end of its drive shaft. A belt 164 operating over the variable speed pulley 162 drives a pulley 166 keyed to the shaft 168 of a conventional reduction gear 170. The tension on the belt 164 operating over the variable speed pulley 162 permits the regulation of the speed of the reduction gear 170, and hence its reduced driving speed. The mechanism for varying the tension of the belt 164 is not shown, but it is identical to that described for varying the speed of the upper driving mechanism hereinbefore set forth.

One end of the drive shaft 169 of the reduction gear 170 is connected through a suitable conventional flexible coupling shown diagrammatically at 172 with a line shaft 174 running longitudinally of the supporting structure 10. The line shaft 174 is suitably journalled at spaced intervals in conventional bearing blocks 176, 178 and 180. The opposite end of the drive shaft 169 of the reduction gear 170 has a sprocket wheel 182 keyed thereto, driving a chain 184, which, in turn, drives a sprocket wheel 186 keyed to the projecting end of the shaft 24, which rotates the inner revolving drum 30.

Spaced on the line shaft 174 immediately opposite the collecting bin 49 and its integrally formed reserve reservoir 54 are a pair of rotating cams 190 and 192. Each cam has a pair of cam conformations positioned at an angle of one hundred and eighty degrees of one another. It will be noted that the cam conformations 194 and 196 of the cam 190 are mounted on the line shaft 174 at an angle of ninety degrees from the cam conformations 198 and 200 of the cam 192. A vibrator head 202, which is usually made of rubber or some other suitable material, is provided for each of the rotating cams 190 and 192. Each vibrator head 202 is mounted on the upper end of a suitable pivotal bracket, which consists of a series of interlocking levers 204, 206, 208 and 210. The levers 204 and 208 are fixedly mounted on a shaft 212 journalled in bearing blocks 214 secured to the supporting structure 10. A spring 216 connects the joined ends of each of the levers 206 and 208, and has its other end secured to the upright 11 at a point spaced therebelow, as indicated at 218. The springs 216 tend to maintain each of the vibrator heads 202 against the sloping common side or bottom of the collecting bin 49 and reserve reservoir 54. As the cams 190 and 192 rotate with the line shaft 174, their respective cam conformations 194 and 196 and 198 and 200 strike the inwardly projecting joined ends of the levers 204 and 206, causing the bracket to pivot on its shaft 212 away from the bottom 47 of the reserve reservoir and against the tension of the springs 216. When the cam conformations 194, 196, 198 and 200 each pass beyond the joined ends 204 and 206 of the bracket, the springs 216 tend to draw it back to its normal position, causing the vibrator head 202 to strike the bottom 47 with considerable force, thereby vibrating the same and causing the coating material to flow freely down and onto the top of the slotted plate 62. With the cams 190 and 192 having their respective cam conformations 194 and 196 and 198 and 200 mounted at ninety degrees to each other, it will be obvious that one of them is always striking the bottom plate 47 at every quarter turn of the line shaft 174, causing substantially continuous vibrations while the apparatus is being operated. Any lumpy formations of coating material falling onto the top of the plate 62 will be unable to pass through the slots 64 therein. The rotating radial fingers 80 mounted on the shaft 66 will break up such lump

formations so that the coating material thereof will pass through said slots 64.

The end of the line shaft 174 has a sprocket wheel 220 keyed thereto, which in turn drives a chain 222 that operates over the sprocket wheel 78 keyed to the shaft 66. Thus, it will be obvious that when the line shaft 174 is operating, the sprocket wheel 220 through the chain 222 will cause the sprocket wheel 78 to revolve, thereby turning the shaft 66 and causing the fingers 80 to revolve thereabout, passing in and out of the slots 64 of the plate 62.

In the operation of the apparatus, it will be assumed that the lower motor 160 has been started, driving its reduction gearing 170, which in turn causes the line shaft 174 to rotate. Rotation of the line shaft 174 causes the sprocket wheel 182 to rotate, which through the chain 184 causes the sprocket wheel 186 keyed to the shaft 24 to rotate the inner drum 30. Rotation of the line shaft 174 also drives the sprocket wheel 220, which through the chain 222 drives the sprocket wheel 78 keyed to the shaft 66, which, in turn, rotates the fixedly mounted fingers 80. The cams 190 and 192, being directly mounted on the line shaft 174 rotate with it, causing their respective vibrator heads 202 to be put into striking operation against the bottom plate 47. Thus, it will be readily apparent that the motor 160 and reduction gear 170 drive only the rotating drum 30, the rotating fingers 80 and operate the vibrator heads 202.

The upper driving mechanism may now be started, which causes the motor 120 to drive the reduction gear 132, which in turn drives the sprocket wheel 142. Rotation of the sprocket wheel 142 operates the chain 144, which, in turn, drives the sprocket wheel 146 and jack shaft 148. Rotation of the jack shaft 148 drives the sprocket wheel 102, which, in turn, drives the elevator chain 84. Rotation of the jack shaft 148 also drives the sprocket wheel 154, chain 156 and sprocket wheel 112 (see Figure 3), the latter driving the shaft 110 having the spiral feed screw vanes 116 mounted thereon.

With both of the driving mechanisms in operation, it is now assumed that a quantity of coating material, such as dusting sugar, is deposited in the reserve reservoir 54 through its open door 56. The coating material will flow by gravity down onto the top of the plate 62, and some of it will pass through the open slots 64 therein. The revolving fingers 80 operating in the bottom section of the reservoir 54 will cause a continuous and substantially even flow of coating material through the slots 64. The material in passing through the slots 64 will fall into the trough 60 and onto the top of the tubular spacer or guideway 100. The cross-bars 86 of the elevator 82 will cause the coating material to be swept off the end of the guideway 100, whereupon it will fall down to the bottom of the trough 60 onto the top surface of the plate 101. The cross-bars 86 after passing around the sprocket wheel 87 will again pick up the coating material and push it along the surface of the plate 101 to the top of the elevator 82, whereupon it is deposited in the open end of the lateral feed trough 104. When the coating material is deposited in the feed trough 104, the spiral vanes 116 of the shaft 108 will force it to be moved therealong until it is discharged by gravity through its bottom discharge opening 115 into the open top of the chute 20. The coating material falling into the chute 20 gravitates into the revolving drum 30. The spiral vanes 40 cause the coating material to be moved toward the discharge end thereof as the drum 30 is rotated, and the longitudinal brace rods 42 tend to cause the doughnuts to tumble within the drum 30 and the coating material to be carried upwardly until gravity causes it to fall down on top of the doughnuts in the form of a light spray. The excess coating material, which is that which does not adhere to the surface of the doughnuts, will pass through the apertures 34 in the rotating drum 30 as it approaches the discharge end. The coating material passing out of the revolving drum 30 through its apertures 34 will gravitate through the chute 44 onto the sloping bottom 47, whereupon it is delivered to the reserve reservoir 54 for making another circuit of the apparatus. It will thus be observed that the coating material is kept in a uniform circulating stream, from the reserve reservoir 54 to the revolving drum 30 and back again, and that a large volume of coating material may be deposited in the apparatus without disturbing the quality of the coating operation or requiring constant watching to determine if there is enough coating material to properly dust the continuous and endless stream of articles passing therethrough.

Although I have only described and illustrated in detail one form which the invention may assume, it will be apparent to those skilled in the art that the invention is not so limited, but that various modifications may be made therein without departing from the spirit thereof or from the scope of the appended claims.

What I claim is:

1. In apparatus of the character described, a rotatable drum having article inlet and discharge openings at opposite ends thereof and internally mounted vanes for moving articles therethrough when said drum is rotated, means for rotating said drum, said drum having a perforate section adjacent its discharge end for permitting the unused coating material to be discharged therefrom, means for collecting said unused coating material discharged from said drum, a reserve reservoir associated with said collecting means, hammer means for vibrating said reservoir, rotary cam means for causing said hammer means to strike said reserve reservoir to vibrate the same to insure a uniform free flow of coating material therefrom, means for driving said rotary cam means, and means for conveying said material flowing from said reserve reservoir to the inlet end of said drum in a uniform stream.

2. In apparatus of the character described, a rotatable drum having article inlet and discharge openings at opposite ends thereof and internally mounted vanes for moving articles therethrough when said drum is rotated, means for rotating said drum, said drum having a perforate section adjacent its discharge end for permitting the unused coating material discharged from said drum, a reserve reservoir associated with said collecting means, a plurality of hammers for vibrating said reserve reservoir and said collecting means, rotary cam means for causing said hammers to strike said reserve reservoir and said collecting means to cause the same to vibrate to insure a uniform free flow of coating material therefrom, means for driving said rotary cam means, rotary means for breaking up any lump formations of said coating material in said reserve reservoir, and means for conveying said coating material flowing from said reserve res-

ervoir to the inlet end of said drum in a uniform stream.

3. In apparatus of the character described, a rotatable drum having article inlet and discharge openings at opposite ends thereof and internally mounted vanes for moving articles therethrough when said drum is rotated, said drum having a perforate section adjacent its discharge end for permitting the unused coating material to be discharged therefrom, means for collecting said unused coating material discharged from said drum, a reserve reservoir associated with said collecting means, means including a plurality of hammers adapted to intermittently strike the sides of said reserve reservoir to cause the same to vibrate to insure a uniform free flow of coating material therefrom, means including a plurality of spaced rotary fingers for breaking up any lump formations of said coating material in said reserve reservoir, means for operating said drum, vibrator and lump breaker, and means for conveying said coating material flowing from said reserve reservoir to the inlet end of said drum in a uniform stream.

4. In apparatus of the character described, a rotatable drum having article inlet and discharge openings at opposite ends thereof and internally mounted vanes for moving articles therethrough when said drum is rotated, said drum having a perforate section adjacent its discharge end for permitting the unused coating material to be discharged therefrom, means for gravitationally collecting said unused coating material discharged from said drum, a reserve reservoir associated with said collecting means, means including a plurality of hammers adapted to successively strike the sides of said reserve reservoir and collecting means to cause the same to vibrate to insure uniform free flow of coating material therefrom, rotary means including a series of spaced fingers of different sizes for breaking up any lump formations of said coating material in said reserve reservoir, means for operating said drum, vibrator and lump breaker, means for conveying said coating material flowing from said reserve reservoir to the inlet end of said drum in a uniform stream, and means for operating said coating material conveying means.

5. In apparatus of the character described, a rotatable drum having article inlet and discharge openings at opposite ends thereof and internally mounted vanes for moving articles therethrough when said drum is rotated, said drum having a perforate section adjacent its discharge end for permitting the unused coating material to be discharged therefrom, means for gravitationally collecting said unused coating material discharged from said drum, a reserve reservoir associated with said collecting means, means including a plurality of cam operated hammers adapted to strike the sides of said reserve reservoir to vibrate the same to insure a uniform free flow of coating material therefrom, means including a plurality of spaced rotary fingers of different lengths for breaking up any lump formations of said coating material in said reserve reservoir and collecting means, means for operating said drum, vibrator and lump breaker, means for conveying said coating material flowing from said reserve reservoir to the inlet end of said drum in a uniform stream, said means including an elevator for lifting said coating material from said reservoir to the top of said apparatus and a screw feed conveyor for delivering said coating material from said elevator into said inlet opening of said rotating drum in a uniform stream, and means for driving said elevator and screw conveyor.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
945,355	Wild et al.	Jan. 4, 1910
1,012,877	Mahan	Dec. 26, 1911
1,391,604	Baumgard	Sept. 20, 1921
1,482,473	Lord et al.	Feb. 5, 1924
1,739,642	Light	Dec. 17, 1929
1,819,557	Hunter	Aug. 18, 1931