Jan. 2, 1923.

F. M. PETERS ET AL.
COATING MECHANISM.
FILED FEB. 5, 1920.

1,440,624

5 SHEETS-SHEET 1

Fig. 1

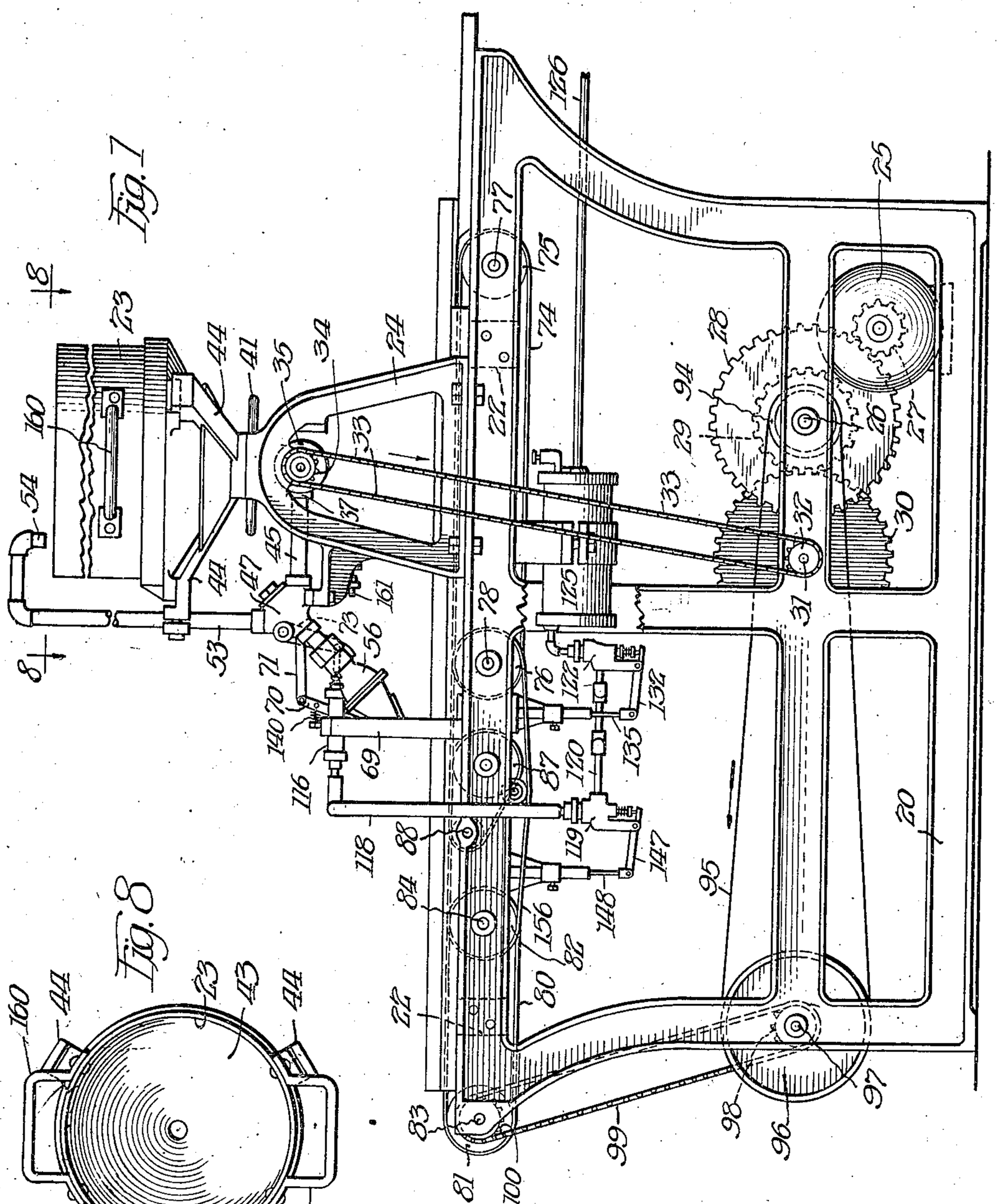

Fig. 8

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5 SHEETS-SHEET 2

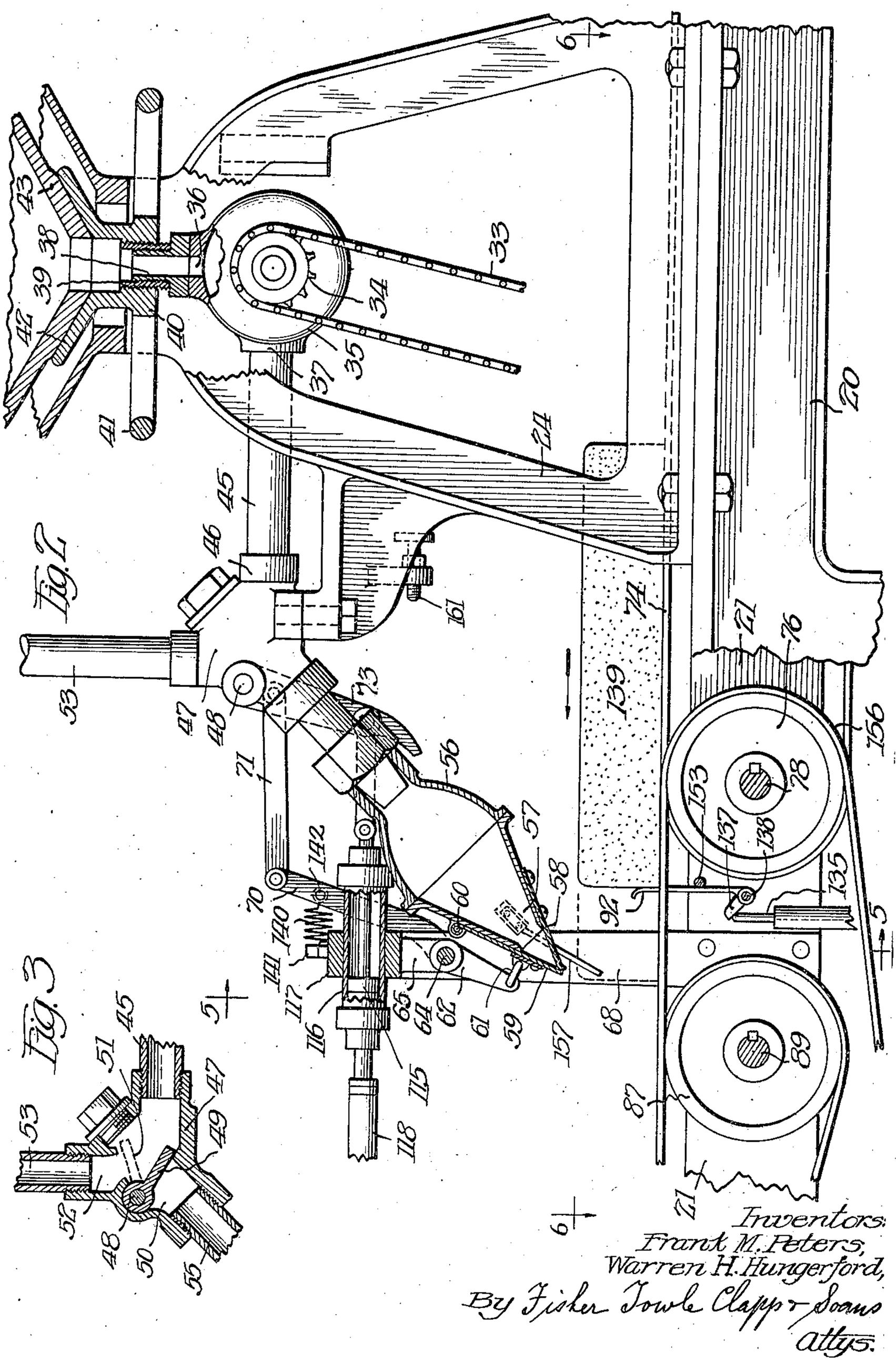

Fig. 2

Fig. 3

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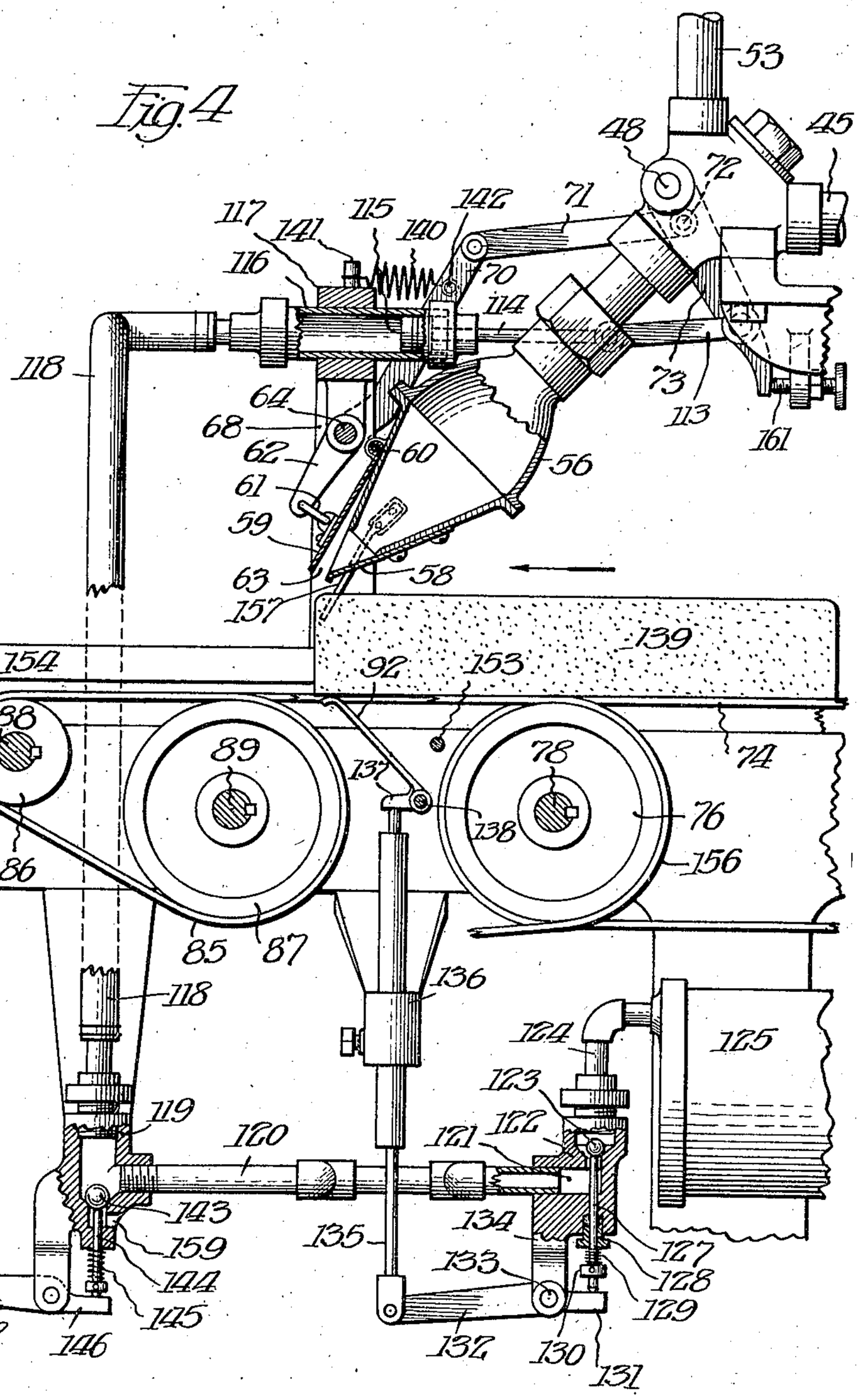
5 SHEETS-SHEET 3

Fig. 4



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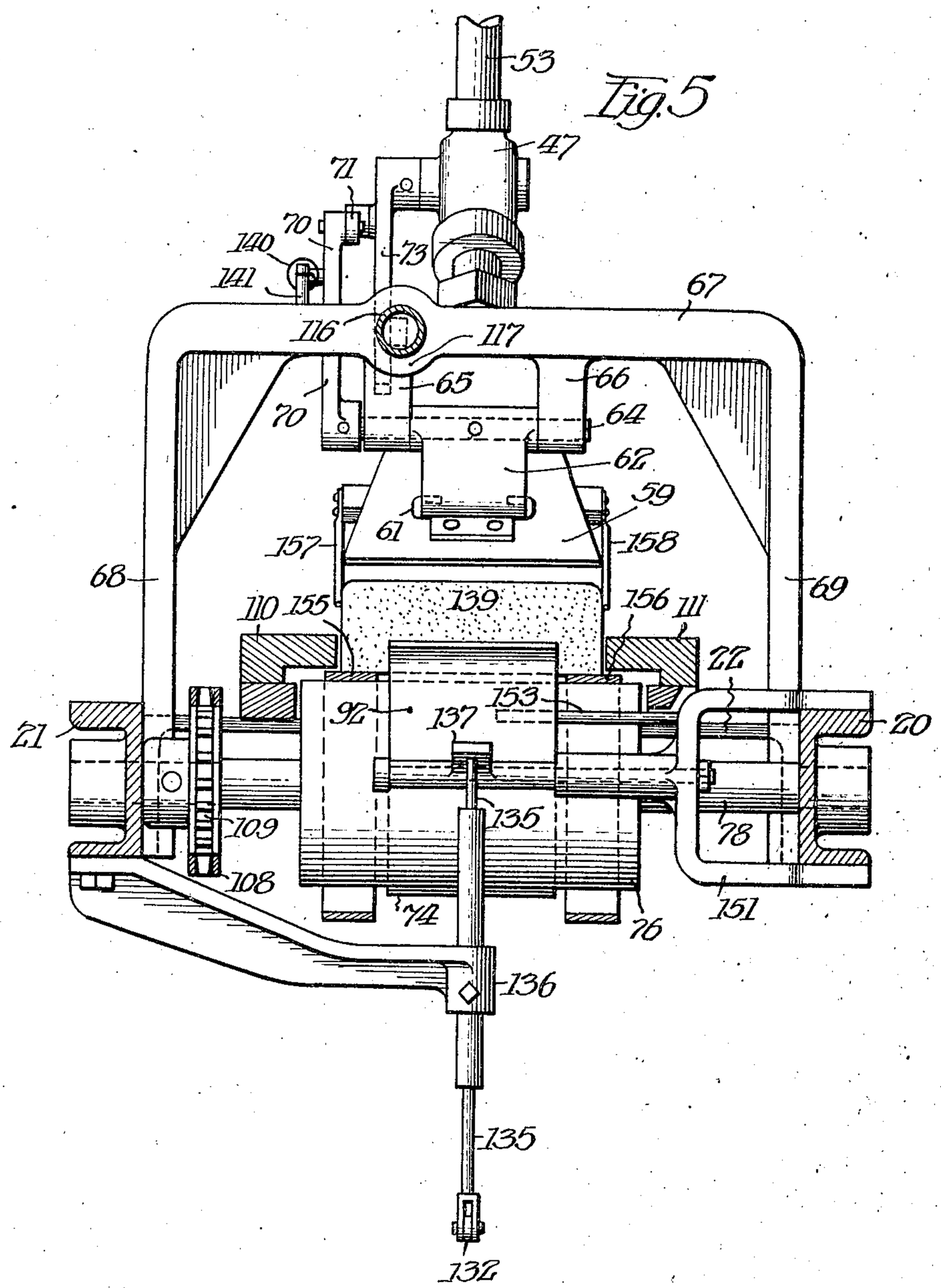
5 SHEETS-SHEET 4

Fig. 5



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5 SHEETS-SHEET 5

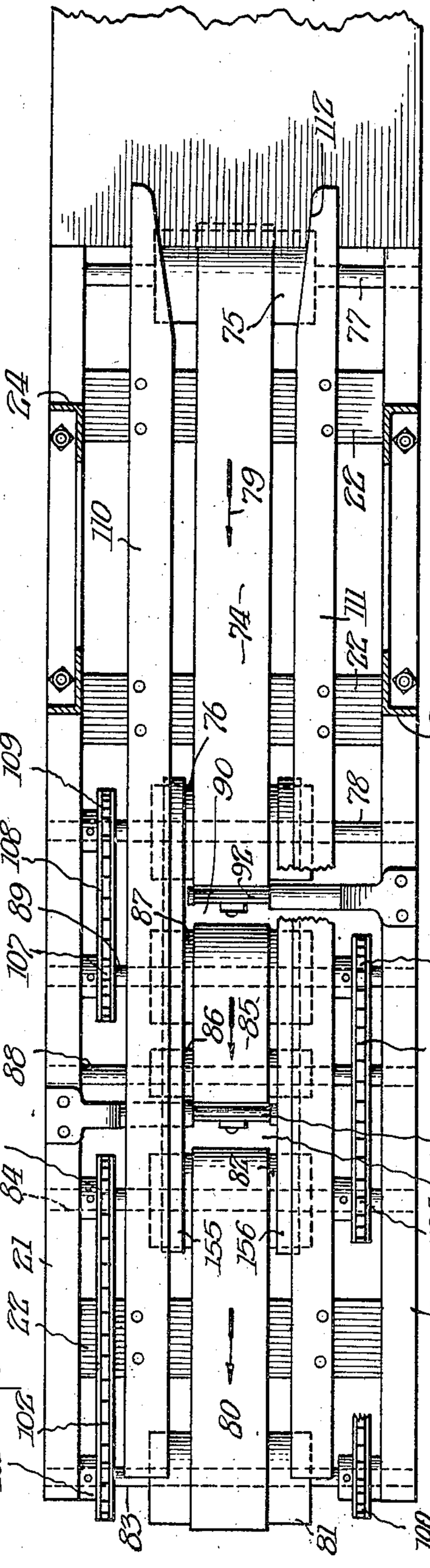

Fig. 6

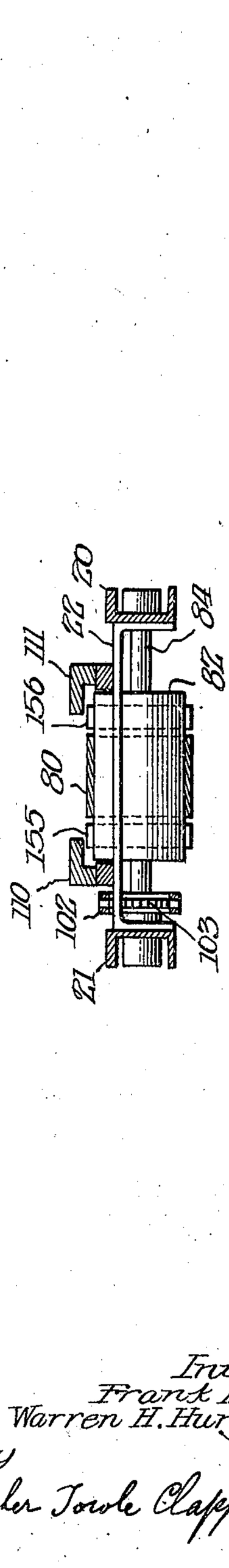

Fig. 7

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Patented Jan. 2, 1923. 1,440,624

UNITED STATES PATENT OFFICE.

FRANK M. PETERS AND WARREN H. HUNGERFORD, OF CHICAGO, ILLINOIS, ASSIGNORS TO PETERS MACHINERY COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

COATING MECHANISM.

Application filed February 5, 1920. Serial No. 356,541.

To all whom it may concern:

Be it known that we, FRANK M. PETERS and WARREN H. HUNGERFORD, both citizens of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Coating Mechanism, of which the following is a specification.

Our invention relates to improvements in coating mechanism and is of particular value in connection with the application of finishing coatings, such as icing to articles of food such as cakes.

The principal objects of the invention are to provide an improved apparatus of the character referred to by which the coating may be rapidly and economically applied; to provide an improved machine so organized, that there is substantially no waste of coating material due to dripping or leakage; to provide an apparatus so organized as to apply a uniform coating of the desired thickness, or impairment of the product due to the coating not being of sufficient thickness; to provide an improved arrangement whereby the coating may be applied substantially automatically without requiring skilled or expert attention to secure the best results; to provide a machine so organized, that the presence of the article itself will control the application of the coating; to provide a construction which will be sanitary and prevent contamination of either the article or the coating therefor; to provide a construction which will permit rapid cleaning and enable the supply of coating material to be conveniently and rapidly replenished; to provide simple and efficient means for insuring uniformity of the coating material and prevent coagulation thereof; and in general to provide an improved coating apparatus of the character referred to.

In the drawings which illustrate our invention as applied to a machine for icing bakery products, such as cakes, Fig. 1 is a side elevation of the machine; Fig. 2 is an enlargement of a portion of Fig. 1, certain parts being shown in section; Fig. 3 is a section of the valve mechanism which controls the flow of coating material; Fig. 4 is an enlargement of a portion of Fig. 1, the air valve mechanism being shown in section; Fig. 5 is a section taken on the line 5—5 of Fig. 2; Fig. 6 is a section taken on the line 6—6 of Fig. 2; Fig. 7 is a section taken on the line 7—7 of Fig. 6 and Fig. 8 is a section taken on the line 8—8 of Fig. 1.

Referring to Fig. 1, the frame of the machine is seen to consist of a pair of skeleton castings 20 and 21 which extend to the floor of the room, said side frames 20 and 21 being suitably connected together by transversely extending parts such as 22. The material supply tank 23 is supported at the upper end of a pair of A-shaped castings 24 bolted to the tops of the side frames.

The apparatus is driven by any suitable source of rotary power, such as an electric motor 25, which drives a shaft 26 through suitable reduction gears 27 and 28. The horizontal shaft 26 is journaled in the side frames of the machine and carries a spur gear 29 meshing with a larger gear 30 keyed to a shaft 31, also journaled in the frames of the machine. On the shaft 31 is keyed a sprocket wheel 32 which, by means of a chain 33, drives a sprocket wheel 34 keyed to the shaft of a rotary pump 35, said pump being of any suitable type and having an inlet opening 36 and a discharge 37. Said pump 35 is constantly rotated by the motor 25 as long as the machine is in operation and regardless of whether or not articles are actually being coated by the machine.

The inlet of the pump 35 is provided with a nipple 38, the exterior of which is threaded to receive an outer sleeve 39, said sleeve 39 also being threaded to fit the hub 40 of a hand wheel 41. The upper side of the hub 40 is extended upwardly and is flared out as shown at 42 to form a seat fitting the underside of the cone-shaped lower end 43 of the material supply tank 23. It will be understood that the surfaces of the cone-shaped flange 42 and the lower end of the tank are turned down to fit each other so that in effect a liquid proof detachable joint is provided between the tank and the inlet of the pump 35. Preferably, the entire weight of the material supply tank 23 is not normally supported on the flange 42 but

may be partly carried on a seat of three arms 44, constituting upper extensions of the A-shaped bracket members 24.

The outlet 37 of the pump 35 communicates by means of a delivery pipe 45, with the inlet 46 of the coating control valve 47, said valve being of a 3-way type as shown best in Fig. 3. The valve casing is arranged to accommodate a rotary valve stem or shaft 48 on which is keyed or otherwise suitably secured, a swinging gate member 49 which in non-coating position, occupies the position in full lines shown in Fig. 3, closing the coating discharge 50. While in coating position, it occupies the position shown in dotted lines at 51 in Fig. 3, opening the port 50 and restricting the by-pass opening 52 leading into the vertical by-pass pipe 53. The upper end of the vertical by-pass pipe 53 is fitted to discharge downwardly into the upper end of the coating supply tank 23 as shown at 54 in Fig. 1.

The coating discharge 50 of the coating control valve 47 is connected by means of a short pipe section 55 with a coating head or spout 56, the latter having an enlarged body terminating in a flat or fan-shaped nozzle 57. Said nozzle preferably is equipped with orifice plates 58 and 59, the latter being hinged to the upper side of the nozzle 57 as shown at 60, so that it may be moved to or from the stationary orifice plate 58 by means of a short link 61 connected to a control lever 62.

In the position shown in Fig. 2, the orifice between the orifice plates 58 and 59 is completely closed, there being no cake passing under the nozzle in the field of the coating mechanism.

In the position shown in Fig. 4, the control lever 62 has been oscillated slightly so as to lift the movable orifice plate 59 away from the stationary orifice plate 58, thereby permitting the coating material to flow out of the discharge orifice 63. The control lever or arm 62 (see also Fig. 5) is keyed or pinned to a rock shaft 64 journaled in stationary arms 65 and 66 depending from a transverse frame member 67 extending across the machine and carried by a pair of suitable brackets 68 and 69 suitably bolted or otherwise secured to the frame parts 20 and 21 of the machine. On the rear end of said rock shaft 64 there is keyed an upwardly directed arm 70 connected by means of a link 71 to an intermediate pin 72 in the length of an arm 73 keyed to the outer end of the valve stem or shaft 48, so that when the arm 73 is rocked, the nozzle and the coating supply valve will be simultaneously operated.

The cakes are fed into the machine horizontally, either by hand or automatically, and are received upon the upper stretch of a horizontally disposed endless belt 74, supported on a pair of drum pulleys 75 and 76 keyed to shafts 77 and 78 journaled in the side frames of the machine. The said belt 74 travels in the direction of the arrow 79, and is operated by means presently to be described.

The cakes are delivered from the machine by a constantly running endless belt 80 carried by drum pulleys 81 and 82, said pulleys being keyed to horizontal shafts 83 and 84 also journaled in the side frames of the machine. For a purpose which will hereinafter appear, there is provided a space between the ends of the belts 74 and 80 and in order to propel the cake while it occupies said space, we employ an intermediate conveyor belt section 85 supported on drums 86 and 87, keyed to shafts 88 and 89 also journaled in the side frames. As will be seen from inspection of Fig. 6, the belt 85 does not completely occupy the interval between the belts 74 and 80, spaces 90 and 91 being provided to admit certain actuating members 92 and 93, the functions of which will later be described.

The said belts 74, 85 and 80 all move in the direction of the arrow 79 and receive power in the first instance from the shaft 26 heretofore referred to. On said shaft 26 there is keyed a pulley 94 which drives through a belt 95 a pulley 96 keyed to a horizontal shaft 97 journaled in the side frames of the machine. To said shaft 97 there is keyed a sprocket wheel 98, which through a chain 99, drives a sprocket wheel 100 keyed to the shaft 83 previously referred to. On the other end of said shaft 83, there is keyed a sprocket wheel 101 which, by a chain 102, drives a sprocket wheel 103 keyed to the rear end of the shaft 84. On the front end of the said shaft 84 is a sprocket wheel 104 which, by means of a chain 105, drives a sprocket wheel 106 keyed to the front end of the shaft 89. On the rear end of the shaft 89 is keyed a sprocket wheel 107 which, through a chain 108, drives a sprocket wheel 109 keyed to the rear end of the shaft 78.

It will be obvious that by means of the class just described, all of the belts are operated in unison and continuously by the motor 25 when the machine is in operation. Hence, it will be understood that when a cake is received on the outer end of the belt 79, it will progress continuously and uniformly through the machine until it is finally delivered by the outer end of the delivery belt 80. In order to prevent the cakes from slewing or moving side-ways on the belts, suitable stationary guides 110 and 111 may be employed, the receiving ends of said guides being suitably flared as shown at 112.

In the construction shown, the coating apparatus is controlled by the presence or absence of the cake itself, so that the coating mechanism is rendered operative only where there is a cake passing through the

coating zone. Preferably, in order to prevent injury to the surface of the cake, the controlling parts actuated thereby, should require minimum power or effort for actuation. Hence, to accomplish the desired results as efficiently as possible, we prefer to use indirect control, i. e., a secondary source of power controlled by the cake actuated parts for moving the parts which actuate the coating control or valve mechanism. In the present instant, we select pneumatic power for this purpose. Accordingly, the lower end of the arm 73 is connected by means of a link 113 with the outer end of a rod 114 of a piston 115 reciprocable in an air cylinder 116. Said cylinder 116 is rigidly supported in an enlargement 117 of the transverse frame member 67, and is supplied with air under pressure through a conducting pipe 118 leading to a relief valve casing 119. The relief valve casing 119 is connected by means of a conducting pipe 120 to the discharge 121 of an admission valve casing 122. The admission valve, which is of the ball type, as shown at 123, is supplied through a suitable connecting pipe 124 leading from a reservoir or tank 125, which is supplied with air under pressure by a pipe 126 leading from any suitable source of compressed air. The ball 123 of the admission valve is actuated by a plunger 127, vertically movable through a stuffing box or gland 128. The plunger 127 is normally retracted by a small coil spring 129 interposed between the base of the gland 128 and a collar 130 pinned to the outer end of said plunger 127. The plunger is moved upwardly to shift the ball 123 and admit fluid into the cylinder 116 by the short arm 131 of an oscillating lever 132 pivoted on a pin 33, secured in a lug 134 depending from the casing of the admission valve 122. The longer arm 132 of said lever is linked to the lower end of an operating rod 135 vertically movable in a stationary bracket 136 and actuated by the short arm 137 of the bell crank member 92 previously referred to, which is pivoted on a stationary pin 138. The bell crank 92 is of such length and is so placed that the front end of the cake 139 will engage same as shown in Fig. 2 during the movement with the conveyor and rock said bell crank 92 into the position shown in Fig. 4, thereby lifting the ball 123 and admitting the fluid to the valve operating cylinder 116.

In order to prevent damage to the surface of the cake, all of the parts for operating the admission valve 122 are made capable of light and free movement, and in order to still further insure delicacy of operation, a second actuating member 93 previously referred to, is employed for taking the power off the cylinder 116 when the cake passes out of the coating field. It will be understood that the piston 115 of the valve actuating cylinder 116 moves the mechanism in a direction to open the coating supply valves against the action of a coil tension spring 140 connected between a small lug 141 and a pin 142 at an intermediate point in the length of the oscillating arm 70 which operates the nozzle gate 59. However, unless some means are provided for exhausting the air admitted to the cylinder by the admission valve, the piston 115 would remain in its outermost position indefinitely.

Accordingly, we employ a relief valve 143 also of the ball type and like the valve 123 actuated by a plunger 144, against the pressure of a spring 145 by the short arm 146 of a pivoted lever 147. The outer end of the lever 147 is linked at the lower end of a rod 148, the upper end of which is depressed by the short arm 149 of the bell crank 93 oscillatable on the stationary pivot 150. The bell crank pivots 138 and 150 are carried respectively in brackets 151 and 152 bolted to opposite sides of the frame and are limited in their retractive movement by means of stop pins 153 and 154 mounted respectively in said brackets 151 and 152. By reference to Fig. 5, it will be seen that the upper ends of the bell cranks 92 and 93 are made of plate-like form so as to engage a substantial portion of the area of the cake surface, and thereby prevent formation of grooves or furrows in the cake.

In view of the above description and details of the mechanism, little in the nature of explanation of the operation of the apparatus is required. It will be obvious that during the operation of the machine, the motor 25 is rotated continuously and through it the pump 35 and the conveyors 74, 85 and 80. When the cake is received by the conveyor 79, the front end thereof engages the bell crank 92 which moves into the position shown in Fig. 4 and depresses the operating rod 35, oscillates the lever 132, raises the plunger 127 and opens the ball valve 123, admitting pressure fluid to the cylinder 116. This cause the piston 115 to move outwardly and swing the valve actuating shaft 48 in a position to throw the gate 49 into the dotted line position 51 shown in Fig. 3. At the same time the movement of the piston causes a correspondingly reduced movement of the link 71 which opens the nozzle gate 59 through the agency of the levers 70 and 62 on the shaft 64. Hence, as soon as the piston is operated, the port 50 is opened and coating fluid from the pump 35 is conducted into the nozzle and through the nozzle orifice 63 upon the surface of the moving cake. It may be stated that while the cake is crossing the space between the belts 74 and 85 and the belts 85 and 80, it is supported at its edges on a pair of narrow side belts 155 and 156

around the drums 76 and 82, so that there is no tendency for the cake to tip or halt during its travel through the coating zone.

It is desirable that during the coating of the cake, means should be provided to prevent wavering of the ribbon of icing or slobbering from the side edges of the cake. This result is secured by means of a pair of trailers which extend from the edges of the nozzle and press lightly against the said side edges of the cake as it travels between same. Said trailers take the form of small wires as shown at 157 and 158, the upper ends of which are secured to the opposite sides of the nozzle casing. These wires constitute in effect guides for the jet of icing which thus flows onto the cake as an even, uniform stream or ribbon.

After the cake has traveled substantially through the coating zone, the rear edge of the cake passes beyond the front end of the bell crank 92 which flies back into position due to the action of the spring 128 on the admission valve plunger, the admission valve thus closing and preventing further supply of operating fluid to the cylinder 116. At the same time, the front end of the cake engages the bell crank 93 which opens the relief valve 143 and the pressure fluid which has been previously admitted to the cylinder 116, rushes out through the exhaust opening 159 permitting the spring 140 to retract the piston 115. It will be understood that the cakes, as they are fed to the machine, are spaced apart a sufficient distance so that the rear end of a coated cake disengages the bell crank 93 before the front edge of the next succeeding cake engages the admission valve bell crank 92.

It will be apparent that the retraction of the piston 115 closes the nozzle gate 59, preventing the nozzle from dripping or slobbering while the flow of coating fluid from the pump is diverted through the vertical by-pass 118 and returns to the tank 23 through the by-pass discharge 54.

It will be observed that the arrangement for supplying coating fluid is particularly efficient in the matter of uniformity and consistency of coating and in ability to clean the apparatus and replenish or change the character of the coating. The pump keeps the coating fluid constantly agitated and prevents the settling of the heavier ingredients. When it is desired to clean the apparatus, for instance if changing from a chocolate icing to a white sugar icing, a plug is inserted in the tank discharge opening. The tank 33 may then be lifted off by means of handles 160 and replaced by a tank containing water, either hot or cold as the case may be, the plug of which is then removed so as to permit the pump to circulate said water through the system for cleaning out the former coating fluid. Preferably, also a pan is placed under the nozzle and the coating supply valve is actuated by hand so as to effect a thorough cleaning out of the nozzle. When the apparatus has been thoroughly cleaned or washed out, the cleaning tank is removed and replaced by a tank containing a new supply of icing. It will be understood that before actually passing cakes through the apparatus, the nozzle is cleared of air or wash-water by again actuating the coating supply valve, so that the first cake which is to be coated with the new supply of icing, will receive a complete coat.

The thickness of coating is controlled by adjusting the stop 161 which determines the degree of restriction of the by-pass port 52.

In certain cases it may be found desirable to run through the machine a continuous series of cakes abutting each other in which case the valve would be actuated only at the beginning and end of the entire series.

The described details of construction and explanation are merely illustrative of one phase of our invention, the scope of which may readily be determined by reference to the appended claims, said claims being construed as broadly as possible consistent with the state of the art.

What we claim is:

1. In combination, a tank containing a supply of coating material of fluid consistency, a support for an article of food to be coated with said material, a conduit communicating with said tank and provided with an orifice for directing said material upon said article's surface, means for effecting a relative movement of the orifice and the article for successively coating different portions of the article's surface, and means for effecting uniform flow of the coating material, independently of pressure of the material in said tank, the arrangement including mechanism operable by said relative movement for controlling the flow of material through said orifice.

2. In combination, a tank containing a supply of material of fluid consistency, a conduit communicating with said tank provided with an orifice for directing the material upon the surface of an article of food to be coated therewith, a traveling support for moving said article past said orifice whereby different portions of the article's surface are successively coated, a pump in said conduit for controlling the supply of coating material, and mechanism actuated by the article in its movement for operating said pump mechanism.

3. In combination, a cake conveyor, a tank containing a supply of material of fluid consistency for coating said cake during its movement by said conveyor, a continuously running pump communicating with said tank and having a discharge conduit delivering into said tank, a conduit provided with

an orifice and connected with said discharge conduit for directing the coating material upon the surface of said cake during its movement, and valve mechanism for alternately interrupting the flow of material through the discharge delivery or the coating delivery.

4. In combination, a cake conveyor, a tank containing a supply of material of fluid consistency for coating said cake during its movement by said conveyor, a continuously running pump communicating with said tank and having a discharge conduit delivery into said tank, a conduit provided with an orifice and connected with said discharge conduit for directing the coating material upon the surface of said cake during its movement and valve mechanism for alternately interrupting the flow of material through the discharge delivery or the coating delivery, controlled by movement of the cake by said conveyor, whereby the material is conducted through said orifice only when the cake is in position to be coated.

5. In combinatiton, a cake conveyor, a tank containing a supply of material of fluid consistency for coating said cake during its movement by said conveyor, a continuously running pump communicating with said tank and having a discharge conduit delivering into said tank, a conduit provided with an orifice and connected with said discharge conduit for directing the coating material upon the surface of said cake during its movement, and valve mechanism for alternately interrupting the flow of material through the discharge delivery or the coating delivery, said valve mechanism being actuated by the cake itself.

6. In combination, a receptacle for containing a supply of material of fluid consistency, a conduit connected to said supply and provided with an orifice for directing the material upon the surface of an article of food to be coated therewith, a moving support for propelling said article past said orifice, valve mechanism associated with said conduit for controlling the supply of coating material, mechanism actuated by the movement of the support for controlling said valve mechanism and rendered effective to coat said article by the presence of an article on said support, the arrangement including a power means controlled by said last named mechanism and for operating said valve mechanism.

7. In combination, a receptacle for containing a supply of coating material of fluid consistency, means for directing said material on an article of food, a movable support for propelling said article past said directing means, valve mechanism for controlling the supply of coating material, a cylinder for operating said valve mechanism and means for controlling a supply of operating fluid for said cylinder, actuated by the support and controlled by the presence of an article on said support.

8. In combination, a receptacle for containing a supply of coating material of fluid consistency, means for directing said material on an article of food, a movable support for propelling said article past said directing means, valve mechanism for controlling the supply of coating material, a cylinder for operating said valve mechanism and means for controlling a supply of operating fluid for said cylinder, actuated by the support and controlled by the presence of an article on said support, the arrangement including independently actuated members for respectively starting and arresting the admission of coating material.

9. In combination, a support, a vertically movable seat on said support provided with a central discharge opening and a tank carried by said support and provided with a seat surrounding the discharge opening into said tank and adapted to fit said first seat.

10. In combination, a support, a flange member having threaded engagement with said support, its axis being vertical, a pump on said support, a tank carried by said support and having a discharge orifice surrounded by a sealing surface arranged to fit within said flange member, the flange member and the support being apertured to provide communication between the tank opening and the pump.

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