Jan. 6, 1953 J. P. VOLLER 2,624,443

WEIGHING AND FEED DEVICE HAVING VOLUME AND DRIBBLE FEED

Filed Feb. 2, 1948

3 Sheets-Sheet 1

FIG-1

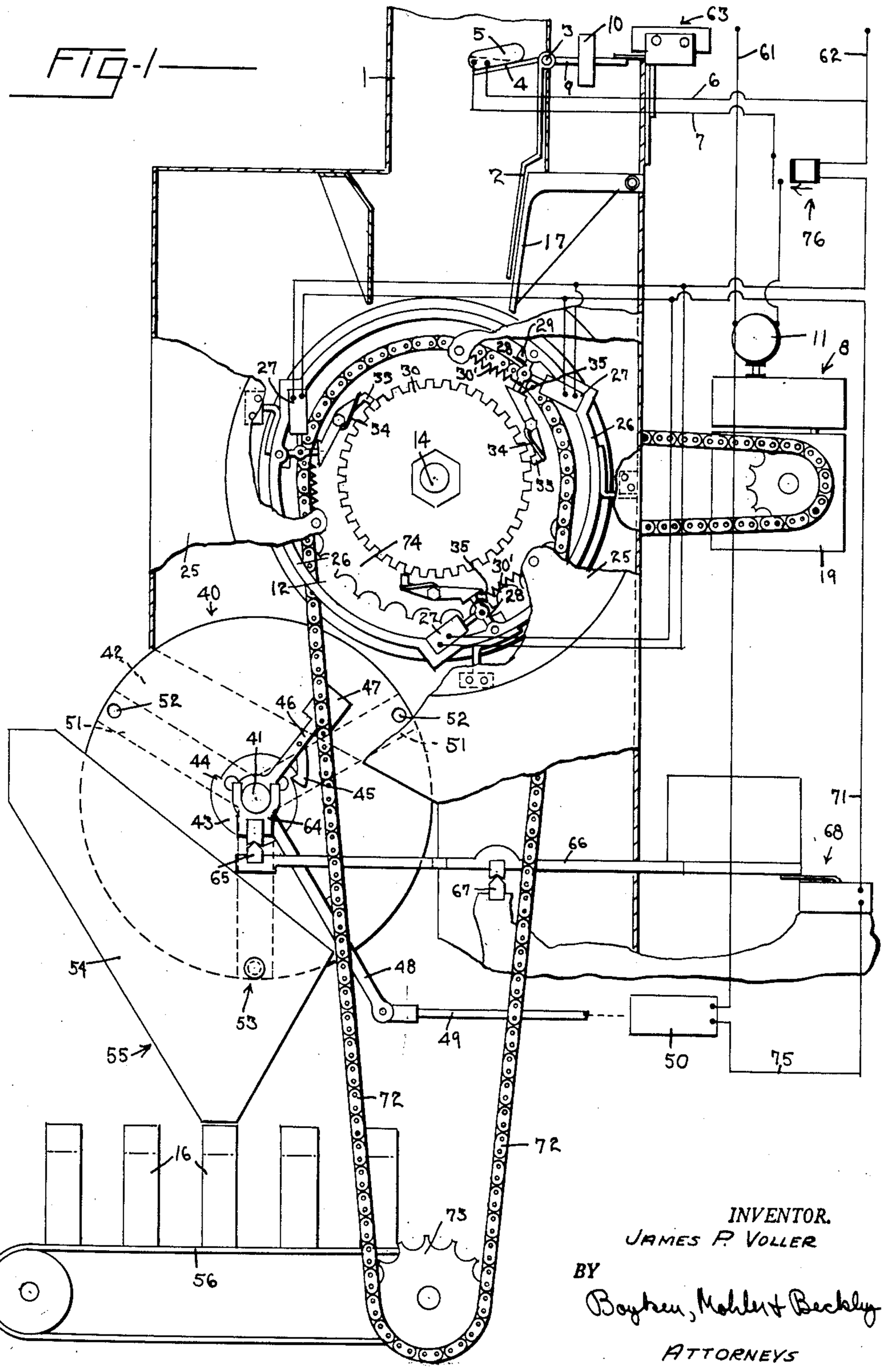

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Fig-3

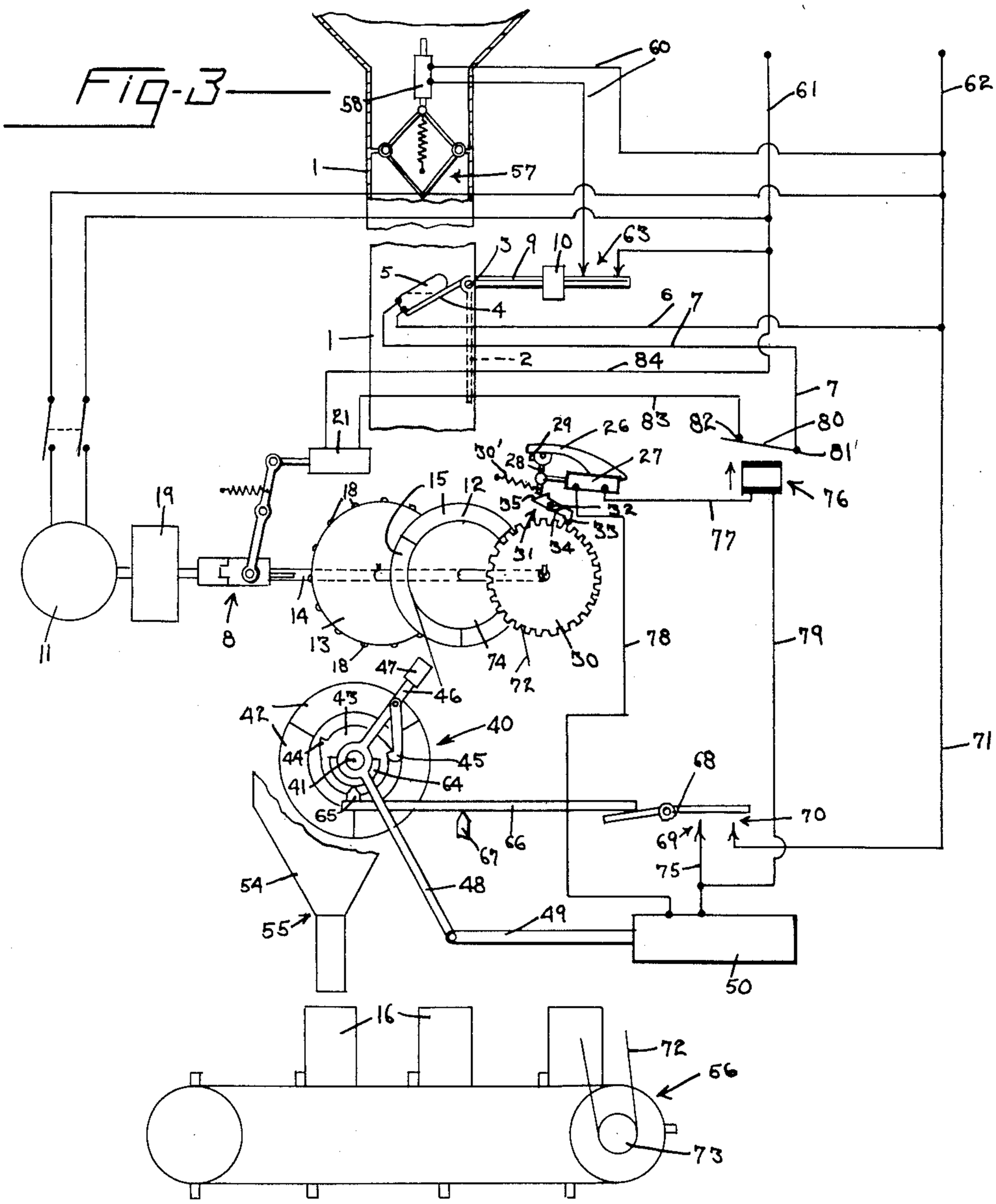

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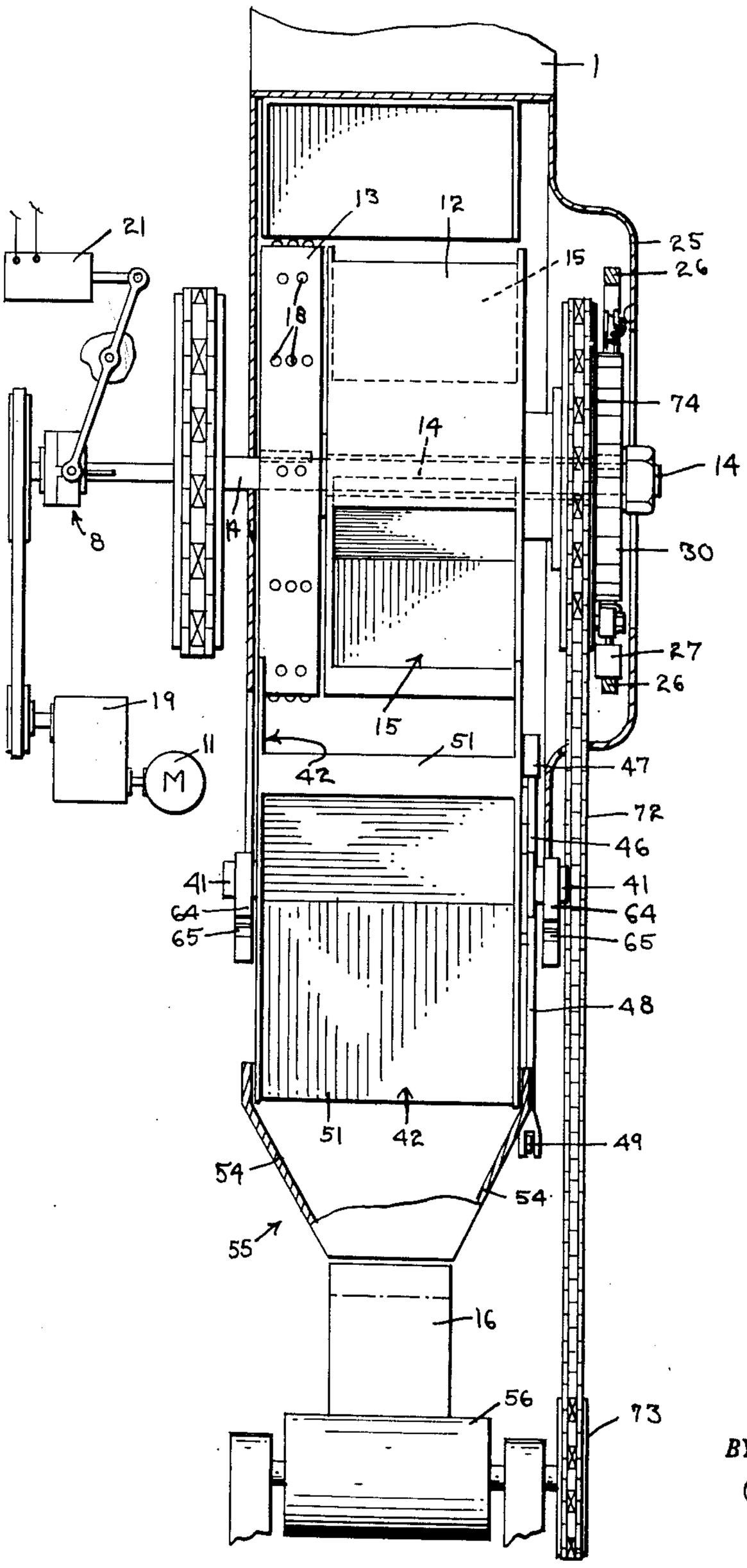
Fig. 2



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UNITED STATES PATENT OFFICE

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WEIGHING AND FEED DEVICE HAVING VOLUME AND DRIBBLE FEED

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Application February 2, 1948, Serial No. 5,823

1 Claim. (Cl. 198—39)

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This invention relates to a feed device for automatically feeding a predetermined weight of material into cartons or containers and has for its objects the provision of improved apparatus for quickly and accurately weighing batches of material and for successively discharging the weighed material into successively positioned containers, the steps of delivering the material for weighing, the weighing, the discharging of the weighed material and the positioning of the containers and removal of the filled containers being automatic.

While the present apparatus is found to be particularly suitable for accurate and rapid weighing of small discrete bodies of dried fruit, such as raisins, its application to other materials will be obvious.

In the filling of containers with raisins by methods and apparatus heretofore employed, it has been found that from about fifteen to twenty-five per cent of the cartons are of incorrect weight and when these cartons are underweight it has meant that they must be opened, more raisins inserted, and then resealed. If the weight is too great, the packer has the option of absorbing the loss and permitting the cartons to go out or opening the cartons and removing the excess raisins and then resealing the cartons.

Most methods heretofore suggested have contemplated a main feed and a dribble feed utilizing endless belt conveyors or the like in which one belt continuously discharges a relatively large volume of material per minute until about the right weight is reached, and then such belt stops and the dribble feed continues to discharge a lesser volume per minute until the weight hopper indicates that substantially the desired weight is in the hopper. Special movable discharge gates open and close for discharging the material and for restoring the hoppers that are used to holding position. While these devices have been found to be fairly satisfactory where relatively large particles of material are weighed, they have not been found suitable for such light small articles as raisins.

With the present invention it has been found that the weights are considerably more uniform and that only about from one per cent to five per cent of the cartons are of incorrect weight, thereby materially reducing the cost involved in packing where cartons must be opened and resealed or where the weight of material in the containers may be substantially higher than the desired weight but are nevertheless sold for no more than the minimum marked weight.

Other objects and advantages will be obvious from the detailed description and drawings.

In the drawings,

Fig. 1 is a part sectional, part elevational view through the apparatus with the electrical circuit

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and conventional electrical elements, such as an actuating motor, switches, solenoids, etc., being diagrammatically indicated. Also the container conveyor is semi-diagrammatically indicated.

Fig. 2 is a part sectional, part elevational view of the device of Fig. 1 as seen at right angles to the latter.

Fig. 3 is a schematic view of the electrical circuit and parts therein.

In detail, the raisins to be fed to the present device are delivered thereto through a vertical conduit 1 in which there is a downwardly swinging element 2 that is held down in the position shown in Fig. 1 as long as there is a head of raisins in the discharge end of the conduit. Pivot 3 of this element 2 may be rotatable with movement of the gate and is connected with a radially extending arm 4 carrying a conventional mercury switch 5 that is in an electrical circuit that includes a magnetic or electrically actuatable clutch 8 is a drive connection between the device and a motor 11.

The movement of the mercury switch 5 is simultaneous with the swinging of the element 2, and the arm has an extension 9 that is at the other side of pivot 3, which extension has a weight 10 thereon that constitutes gravity means for swinging the switch up for opening the circuit when no material is in the conduit.

Motor 11 is continuous in operation but may be stopped in the usual manner by a hand switch or in any other suitable and desired manner.

Assuming that material is in the conduit 1 and the clutch 8 is energized, the said material will be fed against the uppermost sides of a pair of rotary drum-like conveyors 12, 13 that are in coaxial side by side relation on a common shaft 14. The conveyor 12 is rotatable on shaft 14 but conveyor 13 is keyed to the shaft for rotation therewith.

The conveyor 12 may be termed the "volume" feed conveyor, while conveyor 13 may be called the "dribble feed" conveyor.

Volume feed conveyor 12 is formed with a plurality of radially outwardly opening pockets 15, each of which is adapted to hold say approximately 90% of the desired weight of raisins to be placed in containers 16 that are at the lower portion of the device.

From the above, it will be seen that when one of the pockets 15 is uppermost it will be filled with raisins, there being side walls 17 (Fig. 1) in downward extension of conduit 1 to direct the raisins into only the uppermost pocket in the volume feed conveyor.

Also raisins from the conduit and between walls 17 will be in engagement with the peripheral uppermost surface of the dribble feed conveyor 13. Said surface does not have pockets therein like conveyor 12, and the dribble feed conveyor is

quite thin or narrow relative to the width of the volume feed conveyor. Said peripheral surface of the dribble feed conveyor may have slight projections 18 thereon and the lower edge of the wall 17 in the direction of rotation of the conveyors (which is counterclockwise as seen in Fig. 1) will clear the peripheral surface of the dribble feed conveyor by only about the thickness of a raisin, which is about the degree the projections 18 extend from the surface of the dribble feed conveyor. Thus, upon rotation of conveyor 13 counterclockwise, only a few raisins in a thin layer of narrow width will be moved from between walls 17 for discharge.

A gear reduction box 19 may be connected with the motor 11 and the driven shaft of said box is connected with shaft 14 of the conveyors by said motor clutch 8. A solenoid 21 may be in said circuit 6, 7 as the electrical means for moving the actual clutch element.

Secured to stationary frame 25 of the device is an annular member 26 that is concentric with the conveyors 12, 13 and adjacent the end of conveyor 12 that is opposite conveyor 13.

This member 26 may carry several solenoids 27 thereon (only one being shown in the diagrammatic view Fig. 3), each of which solenoids is pivotally connected with a lever 28. These levers 28 are normally held against stops 29 by springs 30', in which position said levers extend substantially radially inwardly from member 26 to which they are pivoted at one of their ends. Stops 29 may also be formed integrally with member 26.

Keyed on shaft 14 at the same side of volume feed conveyor 12 as the member 26 is a gear 30.

Outwardly of gear 30 and pivotally secured to the axially facing side of conveyor 12 that is adjacent said gear are pawls 31. Each of these pawls 31 extends at opposite ends thereof past the pivot 32 that secures each pawl to conveyor 12. One end of each pawl is formed with a tooth 33 that is adapted to engage a tooth of the gear 30 when the tooth end of the pawl is swung toward the gear and each pawl tends to be yieldably swung on its pivot so said tooth will engage said gear teeth by a torsion spring 34 (Fig. 1).

The end of each pawl opposite tooth 33 has a cam surface 35 that is tangential to a circle concentric with the member 26 when the tooth on each pawl engages one of the teeth of gear 30. The path of travel of these cam surfaces, when the conveyor 12 is rotated counterclockwise as seen in Fig. 1, is such that the said surfaces will simultaneously strike the radially inwardly projecting ends of the levers 28 to swing said pawls toward the solenoids, thereby releasing teeth 33 from the teeth of gear 30 and also stopping rotation of conveyor 12 in a position in which one of its pockets 15 is in exactly the right position for filling with raisins. The solenoids are, of course, de-energized at the time the levers function as stop members for the conveyor 12.

Until the levers 28 are pulled by the solenoids 27 away from the pawls 31 and toward said solenoids (which frees the pawls and prevents their fouling by said levers when the springs 34 force teeth 33 into engagement with the teeth on gear 30) the conveyor 12 will remain stationary. However, the instant solenoids 27 are actuated, the teeth 33 will engage the teeth of the continuously rotating gear 30 and the conveyor will be rotated counterclockwise until the pawl surfaces 35 strike the outer ends of levers 28.

As shown in Fig. 1, there are three pockets in conveyor 12 and three solenoids and three pawls. As will later be explained, the conveyor 12 will make only one-third of a revolution each time the pawl teeth 33 engage gear 30. This one-third revolution is sufficient to move the previously filled pocket 15 to a position in which its contents will be emptied by gravity.

After the material in a pocket 15 is discharged, the dribble feed conveyor 13 will continue to revolve and to carry raisins to a discharge point located at substantially the same place as that of the pockets 15. This will continue until the motor clutch 8 is disengaged. However, when solenoid 21 or any other electrical means in a magnetic clutch for actuating the same is energized, the motor clutch will be disengaged and everything on shaft 14 will stop.

Below the discharge side of conveyors 12, 13 is a balanced hopper 40 that is supported on a rotatable shaft 41. This hopper 40 has three radially outwardly opening compartments 42 therein, and when any one of these is uppermost it is in exactly the right position to receive the raisins or material discharged from both of the conveyors 12, 13.

A ratchet wheel 43 is secured to the hopper 40, which wheel has three equally spaced teeth 44. One of these is adapted to be engaged by pawl 45 that is pivotally secured on a radially upwardly projecting arm 46 having a weight 47 at its upper end. Arm 46 is rotatable on shaft 41 and has a downward extension 48 that is pivotally secured at its lower end to one end of an extension 49 of a solenoid core in solenoid 50.

The hopper 40 itself has vertical circular ends 51, one of which may have three equally spaced recesses 52 therein for frictional engagement with a spring urged pin 53 (Fig. 1) carried by one of the sides 54 of a funnel-like chute 55 into the enlarged upper end of which the hopper is adapted to discharge its load.

When the pin 53 is in one of the recesses 52, the uppermost compartment 42 is in a position to receive all of the material discharged from conveyors 12, 13. However, upon actuation of solenoid 50, the extension 48 will be rotated on shaft 41 causing the arm 46 and pawl 45 to be rotated counterclockwise with the result that as soon as the weight of material in the uppermost compartment moves slightly in a counterclockwise direction gravity will cause its continued movement to discharge position in which the contents of said compartment will pass into the funnel chute 55, the lower end of which is in or directly over a carton 16 on conveyor 56, which carton will receive the full contents of the compartment.

The rotation of the hopper will stop, then the next recess in the end 51 comes to the spring urged pin 53. Arm 46 is automatically returned by influence of weight 47 when the solenoid 50 is de-energized.

In practice, a gate means 57 may be in the feed conduit 1 at a level above the element 2, which gate means may be connected in any suitable manner with electrical means, such as a solenoid 58 for closing the conduit as long as a predetermined amount of material is moving past said element 2.

This solenoid may be in a circuit 60 that is connected with the main lead in wires 61, 62. A switch 63 may be in said circuit 60 actuated by extension 9 of switch 5 for energizing said solenoid when the element 2 is in a closed position.

Thus an excessive head of material will not be in the lower end of the conduit, but only a head determined by the force applied by it on element 2. As soon as this force decreases a predetermined amount, and the arm 9 swings down, the switch 63 is broken and gate means 57 opens, but as soon as the switch 63 is closed, the gate 57 is closed.

The bearings 64 of balance hopper 40 may be supported on a knife edge 65 that is on the outer end of a balance arm 66 fulcrumed at 67. The other end of arm 66 may actuate a switch 68 for closing contacts 69, 70 in an electrical circuit, one wire 71 connecting contact 70 with the lead-in wire 62 with which wire 6 of switch 5 also connects.

When there is no weight in hopper 40, the switch 68 is open but when a predetermined weight is in said hopper (the uppermost compartment) the switch will break the circuit.

A sprocket chain 72 may connect sprocket 73 at one of the pulley shafts of conveyor 56 with a sprocket 74 connected with the gear conveyor 12. Thus upon each actuation of conveyor 12 the conveyor 56 will be advanced to bring an empty carton under the discharge funnel 55.

The contact 69 of switch 68 is connected by a wire 75 with one terminal of solenoid 50 and also with relay 76. Said relay is also connected by wire 77 with one of the terminals of each of the solenoids 27 that release pawls 31. The other terminals of solenoids 27 are connected by wires 78 with the other terminal of solenoid 50. Also a wire 79 connects the other terminal of relay 76 with wire 75 that extends from contact 69.

The armature or switch arm 80 of relay 76 has one contact 81 connected with wire 7 that extends to switch 5 while the other contact 82 is connected by a wire 83 with one terminal of solenoid 21 (motor clutch). The other terminal of solenoid 21 is connected by a wire 84 with lead in wire 61.

In the device as shown in the drawings, the teeth 33 of pawls 31 are held disengaged from the teeth of gear 30 by levers 28, the solenoids 27 being de-energized. Solenoid 50 is also de-energized. However, the motor clutch 8 (or its solenoid 21) is energized and switch 5 is closed, which means that material is being fed to the volume and dribble conveyors. The dribble conveyor is rotating and feeding raisins to the balance hopper 40 but the volume conveyor is stationary and cannot move until the solenoids 27 are energized.

To start the operation, this energizing of solenoids 27 may be done manually by closing switch 68 or the dribble feed conveyor may be permitted to fill the uppermost compartment in hopper 40 to the desired weight. Assuming the latter is the method used, as soon as the desired weight is in the hopper, the same will swing downwardly, whereupon switch 68 will be closed, thereby energizing relay 76 which will break the motor clutch circuit stopping the dribble feed conveyor and energizing solenoid 50, which will dump the hopper 40. Also the circuit to the solenoids 27 will be closed whereupon the pawls 31 will be released and teeth 33 will engage the teeth in gear 30.

Actuation of solenoid 50 will result in an empty compartment coming under the volume and dribble feed conveyors preparatory to receiving a fresh load.

As soon as the hopper 40 has discharged its load, the switch 68 will again be broken, thereby de-energizing relay 76 and solenoids 27, and at the same time closing the switch 80 in lines 83,

7 for energizing the motor clutch solenoid 21, whereupon both the volume and dribble feed conveyors will be actuated, but the volume conveyor will only revolve until the pawls 31 engage levers 28 when it will be stopped. However, this is sufficient to dump the contents of the uppermost recess 15 into the feed hopper and to position the next recess for receiving a new load.

In the meantime the dribble feed continues to feed material into the hopper until the desired weight is in the latter and then the above described cycle is repeated.

It is thought obvious that certain changes may be made in the device as described above without departing from the invention. It is to be understood, therefore, that the precise detailed description and drawings are not to be considered as limitations on the invention. They are merely intended to be illustrative of a preferred form.

I claim:

In a feed device, a first drum-like conveyor and a second drum-like conveyor coaxial therewith and closely alongside the former, the axial width of said first conveyor being substantially greater than the axial width of said second conveyor, said first conveyor having radially outwardly opening pockets therein for respectively receiving a predetermined weight of uniform discrete bodies when each pocket is directed upwardly and said second conveyor having a peripheral surface the uppermost side of which is adapted to carry a single layer of said bodies only, means for restricting said latter surface to so carrying said single layer for downward discharge of bodies therefrom by gravity upon rotation of said second conveyor, power means for rotating said conveyors, a balanced hopper below said conveyors positioned for receiving said bodies from each of said conveyors, means supporting said hopper for downward movement upon a predetermined weight being in said hopper, means actuated by said downward movement for rotating said first conveyor a fraction only of a revolution for each such movement to cause successive discharge of material from each pocket separately, separate means actuated by said downward movement for stopping rotation of said second conveyor, said separate means including a solenoid in an electrical circuit and a clutch actuated by said solenoid for disengaging the power means from said second conveyor, said means for rotating said first conveyor comprising a constantly rotating member coaxial with said conveyor, a movable element carried by said first conveyor and engageable with said rotating member for rotating said first conveyor, a solenoid operatively connected with said element for disconnecting the latter from said member after said fraction of a rotation of said first conveyor.

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