

June 18, 1957

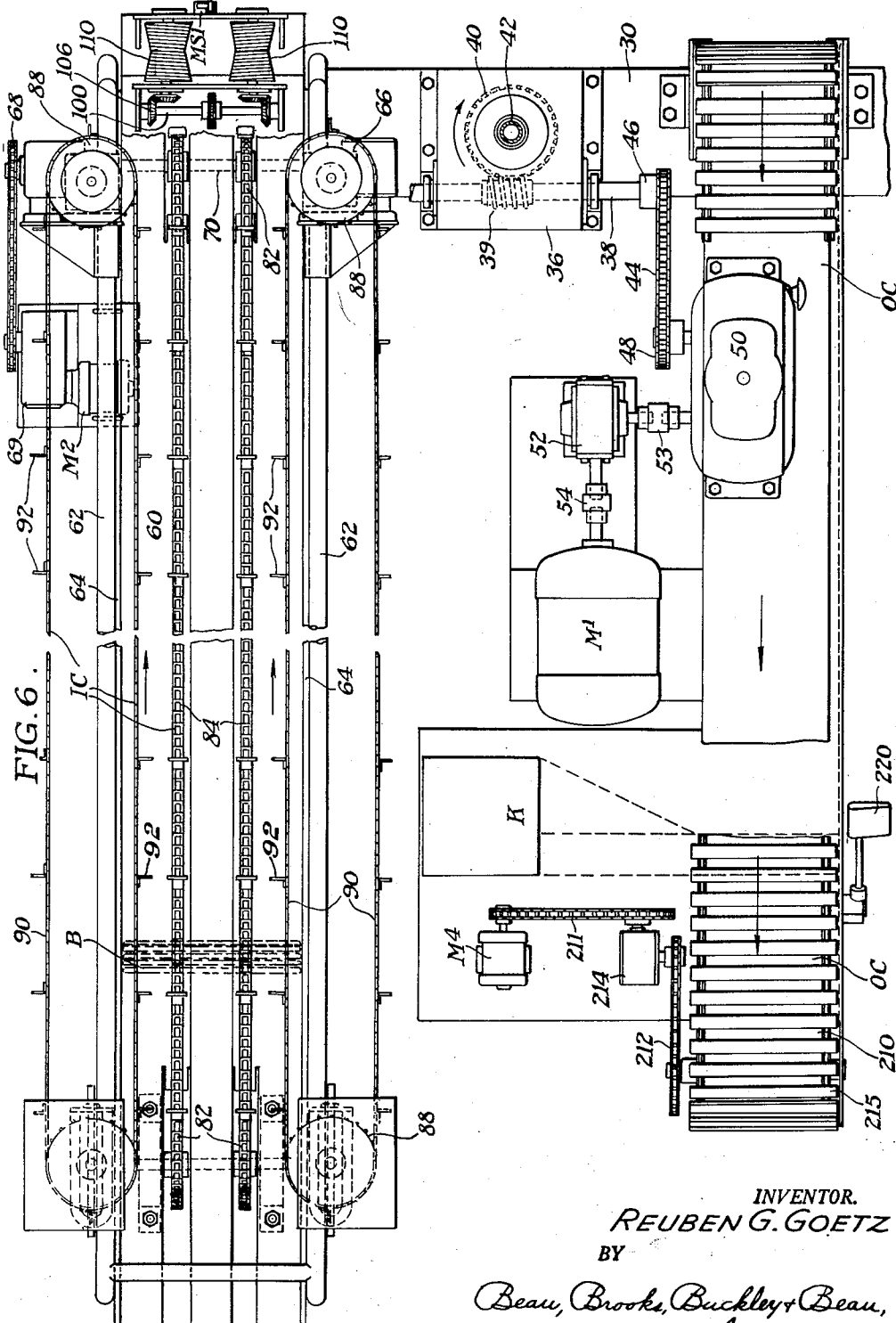
R. G. GOETZ

2,796,089

PACKAGING MACHINE

Filed Nov. 4, 1952

11 Sheets-Sheet 3



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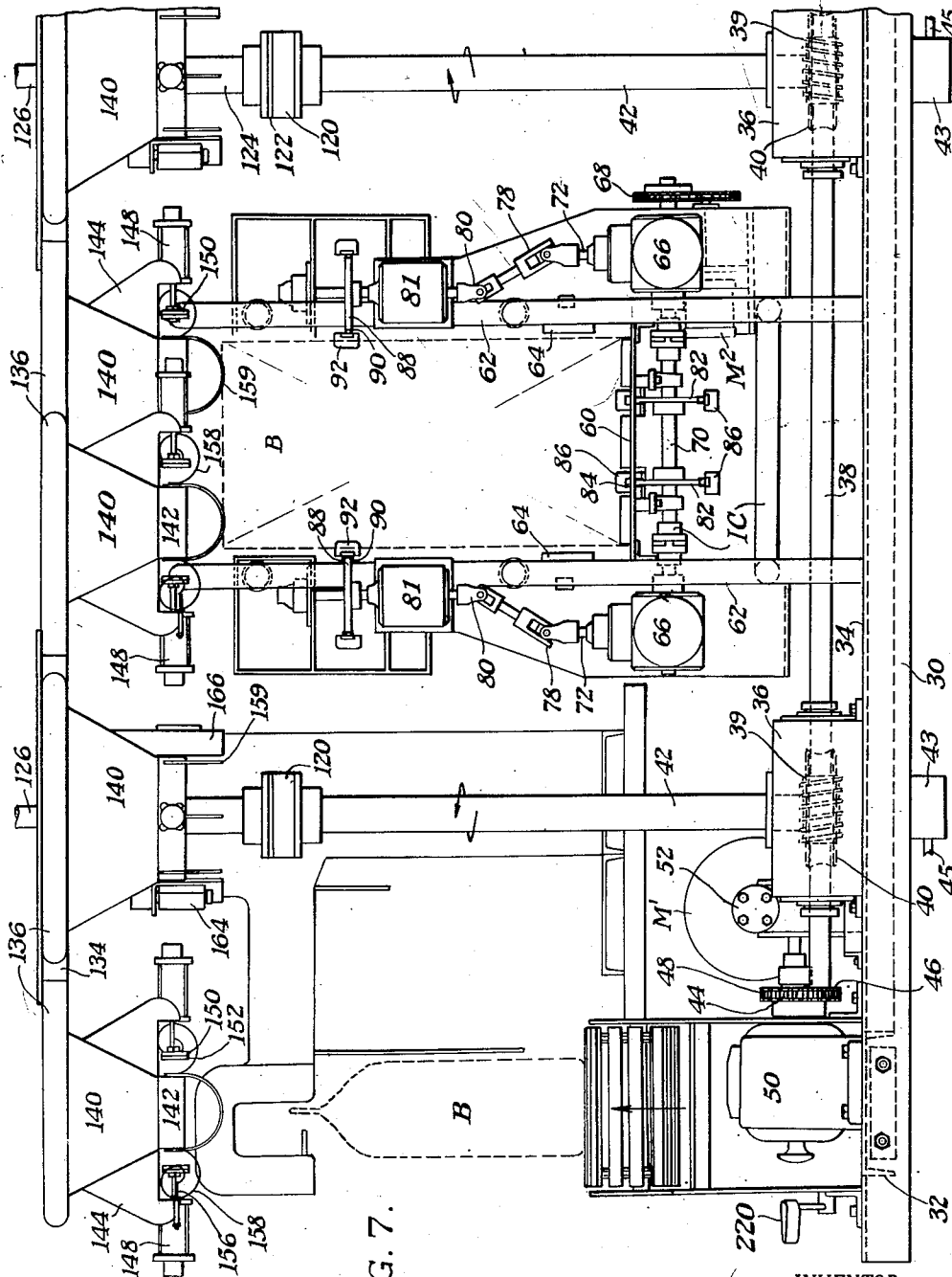
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11 Sheets-Sheet 5

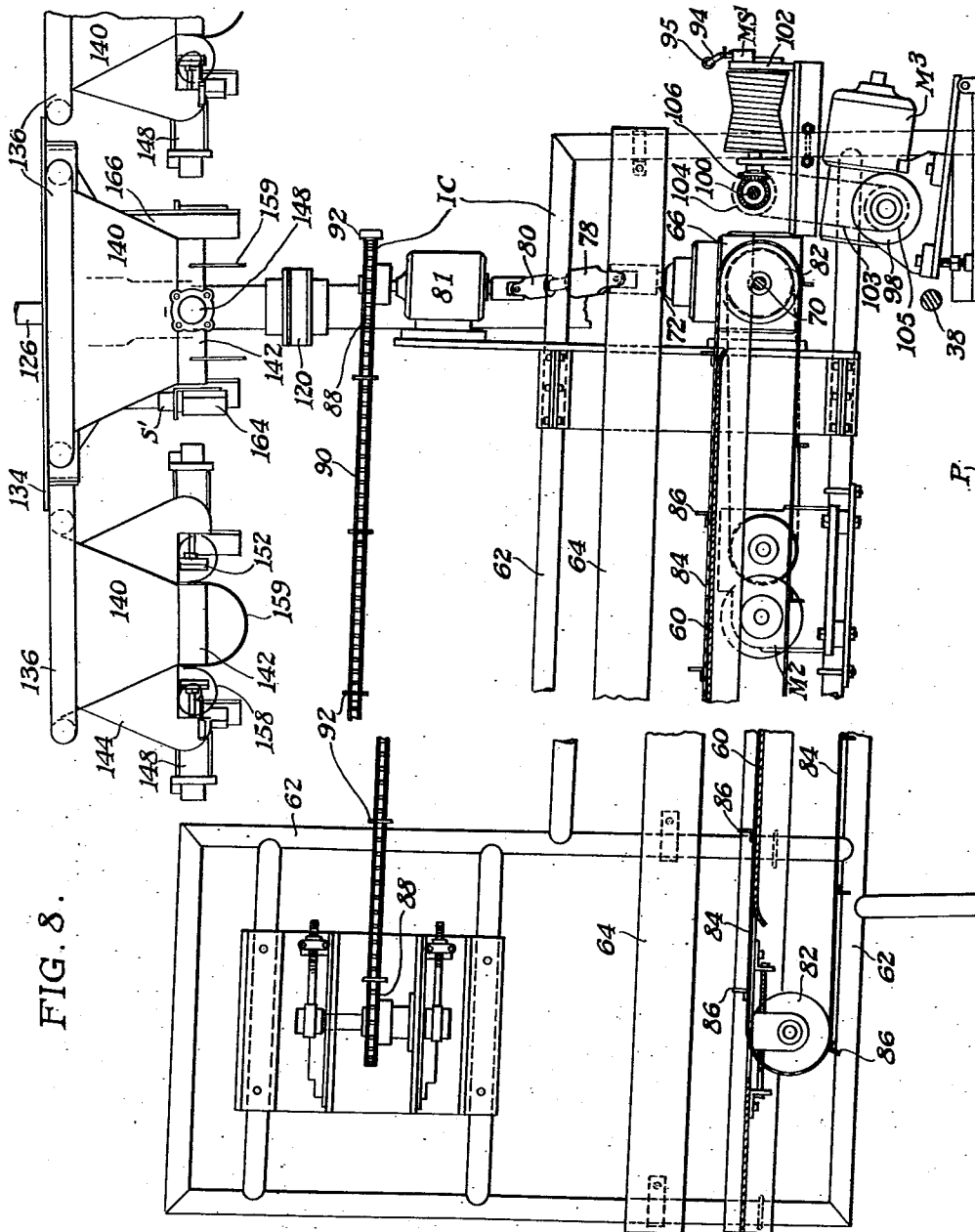


FIG. 8.

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FIG. 9

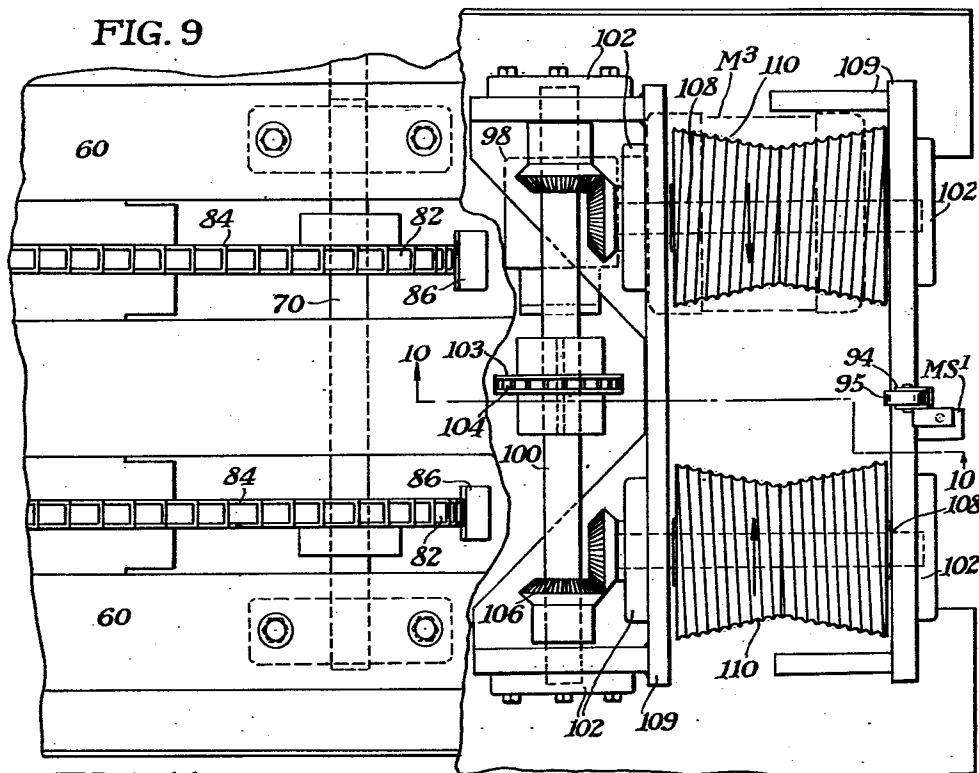


FIG. 11

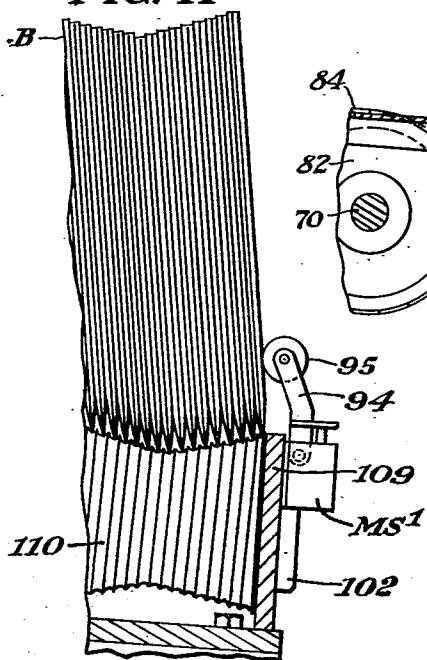
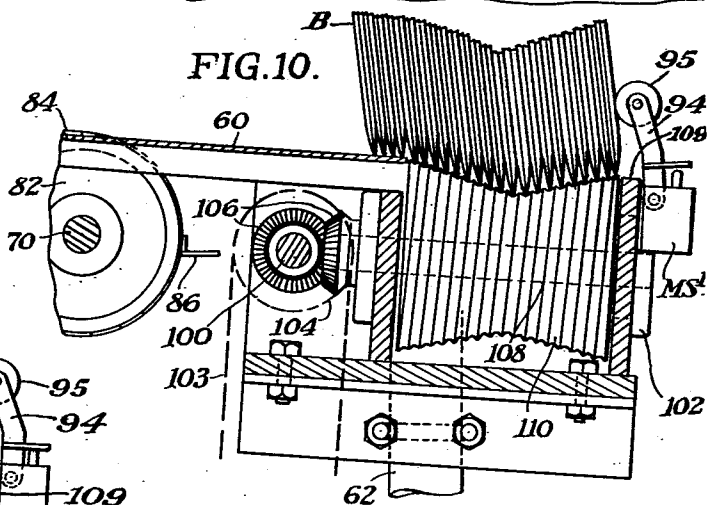


FIG. 10



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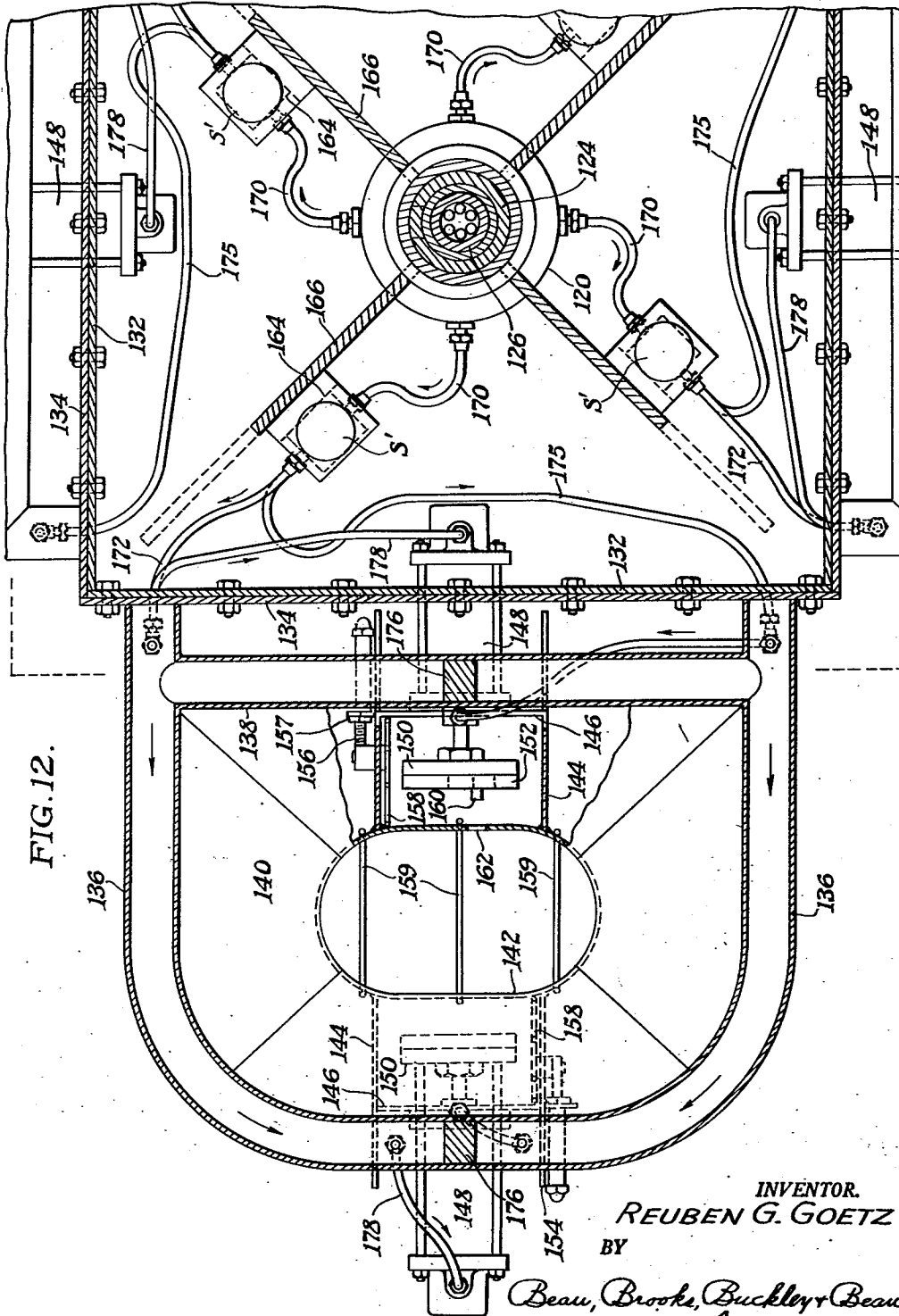
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FIG. 12.



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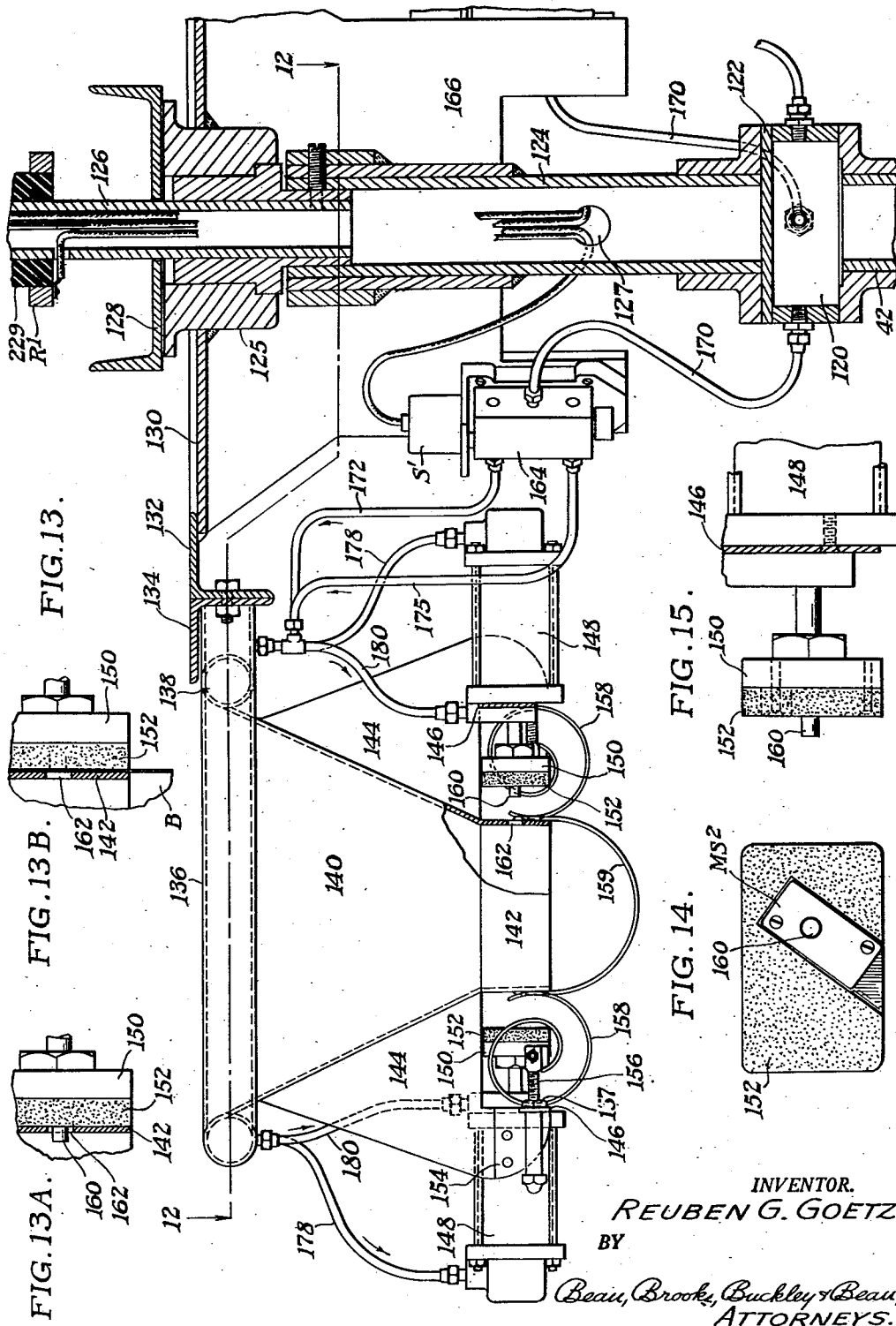
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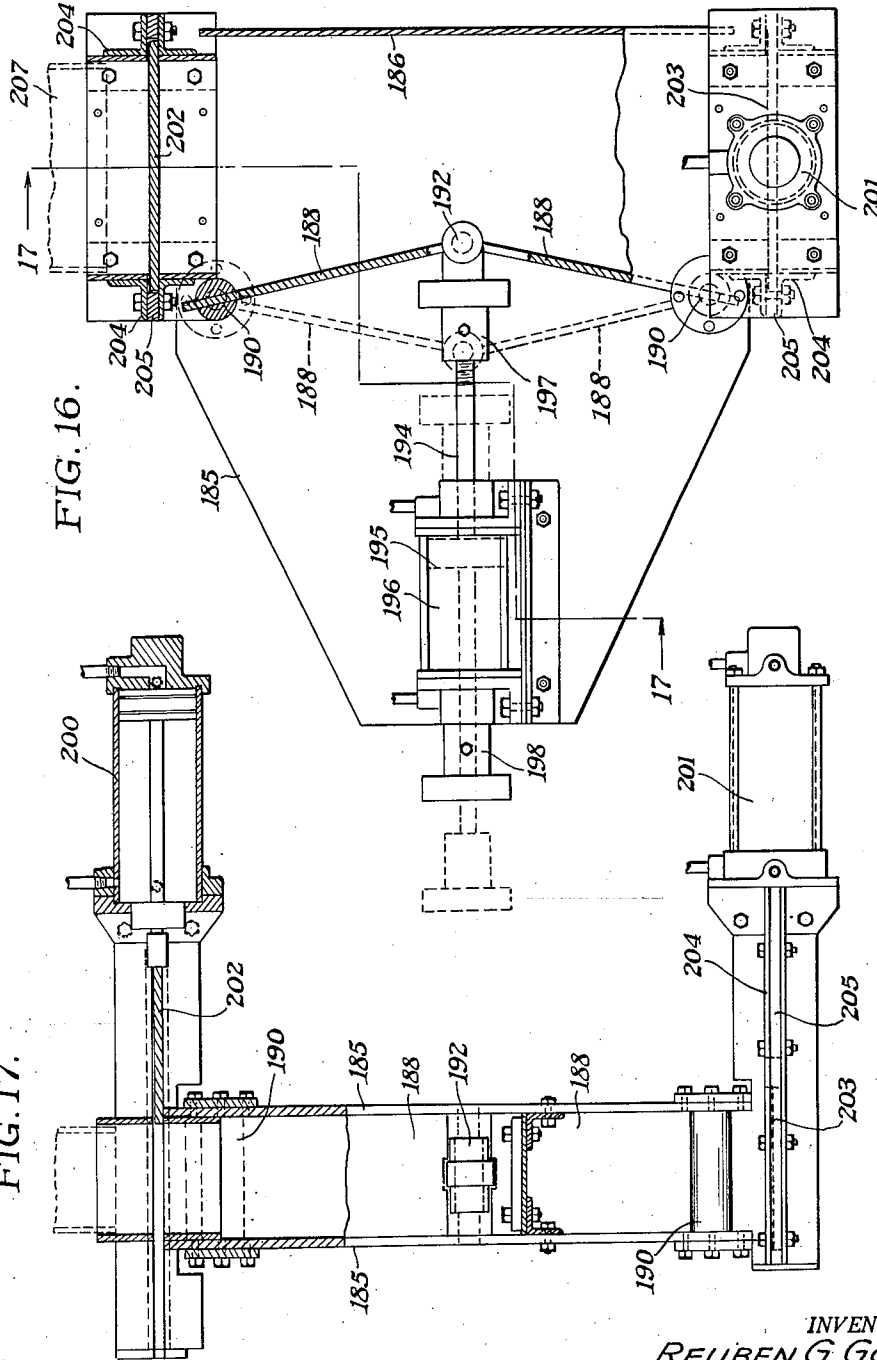


FIG. 17.

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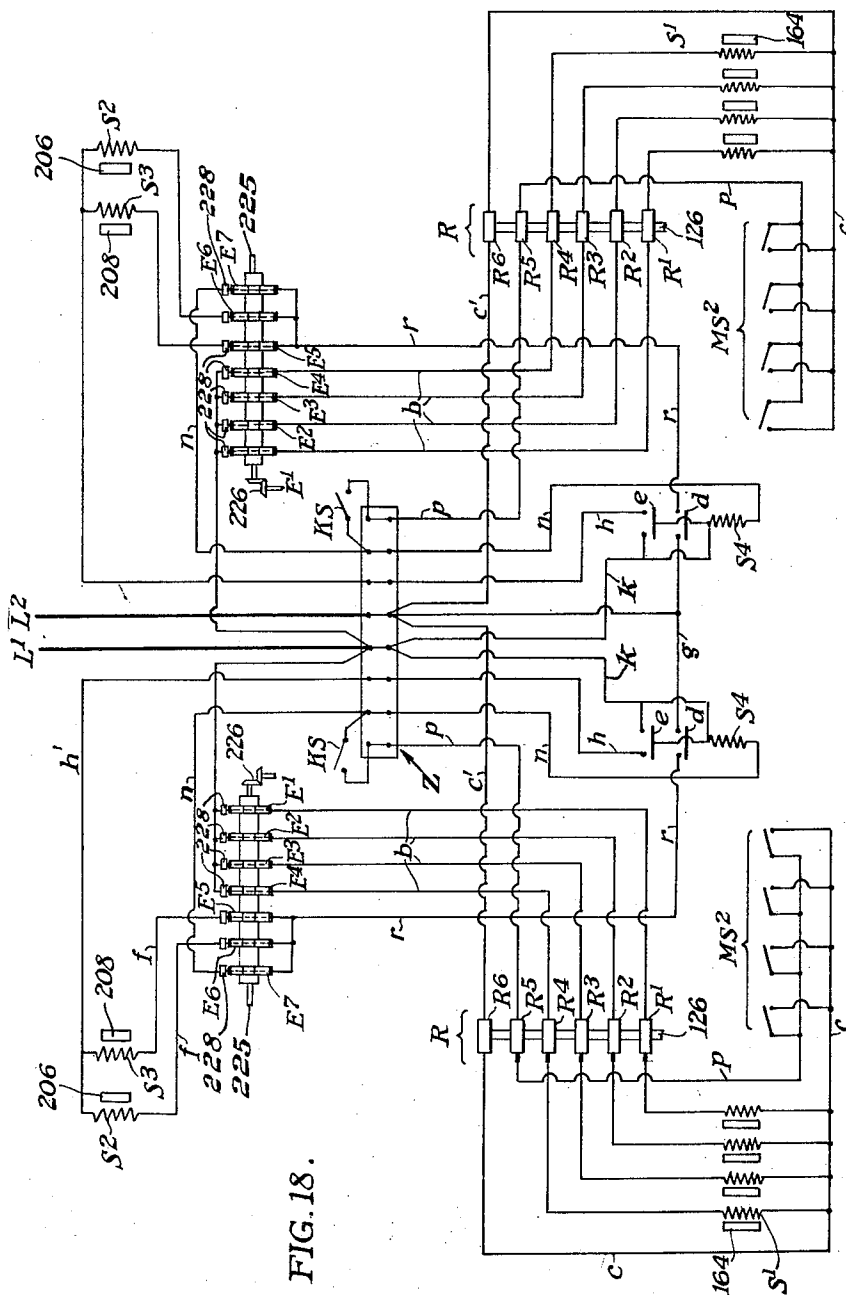


FIG. 18.

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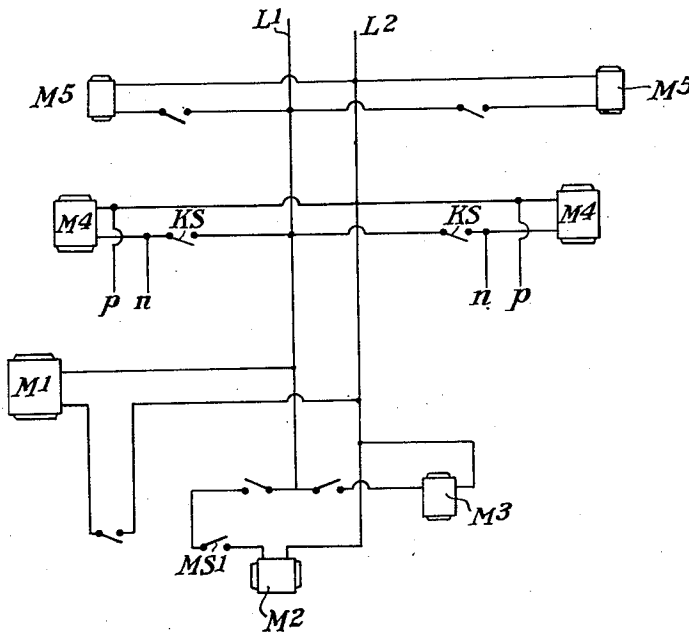
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FIG. 19.



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PACKAGING MACHINE

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Application November 4, 1952, Serial No. 313,661

16 Claims. (Cl. 141—151)

This invention relates to bag filling machines, and particularly to automatically operating power-driven mechanisms whereby predetermined quantities or weights of dry granular material, such as sugar, salt, sand, grain or the like may be accurately measured and deposited in bags, rapidly and automatically, so that each bag will be filled with exactly the same quantity or weight of material. Generally stated, the invention contemplates an improved filling station arrangement wherein empty bags are introduced to the filling station in the form of a constantly progressing stack, and the bags are manually mounted by an attendant in filling position upon spouts carried by constantly rotating turrets. As each bag comes into registry with a stationary dispensing hopper the latter discharges an accurately measured load of material into the bag chute, and the bag is then conveyed to suitable closing and sealing devices and finally discharged from the machine to a take-away conveyor.

A principal object of the invention is to provide a machine to fulfill the above-outlined requirements in which the operative components are so compactly designed and coordinated as to provide a machine of greatly increased capacity for its size, and which is of such simple and rugged and otherwise improved design and construction that it will be positive and reliable in operation and will require a minimum of maintenance attention. Another object is to provide a machine as aforesaid which is so nearly automatic that only minimum manual attendance by relatively unskilled labor is necessary. A further object is to provide in such a machine a measuring device which is so accurate as to load the bags uniformly while operating at a high output rate. Another object is to provide a machine as aforesaid which operates to avoid spillage or waste of material being handled. A still further object is to provide in a machine as aforesaid an improved paper bag supply mechanism including means for automatically separating each leading bag from the supply stack for presentation to the machine attendant, thereby facilitating handling and opening of the upper ends of the bags by the attendant for placement on the loading spouts. Other objects and advantages of the invention will appear in the specification hereinafter. The novel features and combinations of components are cited in the claims at the end hereof.

More specifically, the invention contemplates a loading machine comprising a plurality of loading units in the form of rotating turrets associated with a single empty bag feeder and arranged to be served by a single attendant; the machine parts being mechanically actuated and electrically controlled so that the empty bags are continuously transported to a point within convenient reach of the attendant for mounting thereof upon a plurality of loading spouts while the machine is in constant motion. For example, as shown in the drawing, a supply of empty bags in stacked form is carried from the rear to the front of the machine on a conveyor; the bags being disposed in an upright position while moving forward, and the con-

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veyor carrying the bags being automatically controlled so that as bags are removed from the front end of the supply stack the conveyor starts and stops to feed the bags to the attendant with step-by-step progress, as empty bags are required.

In the accompanying drawing, which illustrates by way of one example a machine of the invention, the bag supply conveyor is located at the center of the machine between two vertical filling units or "turrets." Each of these turrets has at its upper end a plurality of radially disposed funnels terminating in spouts having fluid-pressure operated gripping devices for holding bags in filling positions thereon. The turrets are rotated continuously in opposite directions so that in the case of each turret the funnels thereof pass successively under a measuring or dispensing hopper which alternately gravity-discharges an accurately measured load of material and refills from a supply bin located above the machine in proper sequence, automatically in accordance with rotation of the turret. The filled bags are subsequently closed, sealed, and deposited on output conveyors travelling away from the machine, and as they pass off the ends of these conveyors, they drop onto a take-away belt or other suitable transport mechanism. In the machine design shown, a single attendant may serve both turrets and conveniently handle as many as twenty to thirty 100 lb. bags per minute.

Electrical control mechanisms time and synchronize the actions of the apparatus and its various mechanical components, and include safeguards to prevent material from being discharged from the measuring hoppers unless bags are in position to receive it. Some of the details of the machine are novel in themselves, and others are novel in their relation to one another, or in combination with other elements. The organization of all the parts and the complete operation of the machine and its sequences may be fully understood by reference to the drawings accompanying this specification, in which

Fig. 1 is a top plan of a complete machine of the invention;

Fig. 2 is a front elevation thereof;

Fig. 3 is an elevation, partly in section on line 3—3 of Fig. 2;

Fig. 3A is a detail section on line 3A—3A of Fig. 2;

Fig. 4 is a front elevation of a distributing unit for the electrical controls;

Fig. 5 is an end view of Fig. 4;

Fig. 6 is a top plan of the empty bag conveyor, with the drive mechanism of the machine, and one output conveyor;

Fig. 7 is a front elevation of the parts shown in Fig. 6, some details being omitted;

Fig. 8 is a side elevation of the empty bag conveyor;

Fig. 9 is an enlarged top plan of the discharge end of the conveyor shown in Fig. 8;

Fig. 10 is a section on line 10—10 of Fig. 9;

Fig. 11 is an enlarged detail of certain parts in Fig. 10;

Fig. 12 is an enlarged top plan of one receiving chute and its associated parts;

Fig. 13 is a side elevation of Fig. 12, the line 12—12 thereon indicating the plane on which Fig. 12 is shown partly broken away and in section;

Figs. 13A and 13B are details of the bag grippers in two different positions, as associated with a bag;

Figs. 14 and 15 are other views of the grippers and a switch;

Fig. 16 is an elevation, partly in section, of the measuring dispenser;

Fig. 17 is a section and elevation along line 17—17 of Fig. 16;

Fig. 18 is a schematic diagram of the electrical elements and controls; and

Fig. 19 is an electrical diagram of the motor wiring system.

The machine as a whole will first be briefly described in its broad aspects, and each principal group of operating units will then be described in detail. Referring first to Fig. 2, it will be seen that spaced a suitable distance above the floor F the machine as a whole is built upon a platform P which is made up of structural steel shapes and plates, such as channels 30, 32, and a flat upper plate surface 34. Spaced apart a suitable distance on platform P are two bearing housings 36—36 through which extends a horizontal power shaft 38. This shaft operates through worm gear systems 40—40 to drive a pair of vertical tubular shafts 42—42 in opposite directions; the one at the left of Fig. 2 rotating clockwise, as viewed from above, and the one at the right rotating counterclockwise.

Each of the vertical shafts 42—42 carries four receiving funnels which pass in turn under the measuring dispensers as the shafts 42—42 rotate, as will be explained in more detail hereinafter. Empty bags are fed from the rear towards the front of the machine, and are picked up by an attendant and hung upon the funnel spouts, while the shafts 42 rotate continuously. As fast as they are filled, the bags are released automatically and fall upon rearwardly-moving output conveyors extending alongside the machine; the bags being dropped on the right and left conveyors alternately. The shafts 42—42 in the machine illustrated by the drawing rotate approximately $3\frac{1}{2}$ R. P. M. resulting in a total output of 28 bags per minute.

Empty bag feeding mechanism

As shown, for example, in Figs. 1, 6, 7 and 8, the empty bag input feeding mechanism comprises generally a conveyor designated IC on the drawing. As shown in Fig. 1, this input conveyor extends from a position rearwardly of the machine into a position centrally of the two rotating turrets, so that bundles of empty paper bags in upright standing position may be racked upon the conveyor by a loading attendant at the rear of the machine, while the conveyor operates automatically to bring the bags forwardly to the front end of the conveyor and within convenient reach of the filling attendant who stands upon the platform between the two rotating turret units. Thus, the bags are presented to the attendant in open end up attitude.

To effect this operation, the conveyor is shown in the drawing as comprising a bag stack guideway consisting of a flat base plate 60 from which extends a tubular framework 62 supporting opposite side plates 64—64 running horizontally at opposite sides of the guideway. Thus, the stacked bags may slide while in upright standing attitude through the guideway as they are moved from the rear end toward the front end of the input conveyor. The power supply mechanism for the input conveyor includes a gear box 66 disposed at each side of the front end of the conveyor; the gear boxes 66—66 being interconnected by a cross shaft 70 that is driven by a motor M² through means of a chain 68 and a gear box 69. Drive shafts 72—72 extend upwardly from the gear boxes 66—66, and in turn connect through flexible couplings 78—80 to bearing boxes 81—81. The cross shaft 70 carries suitably spaced sprockets 82—82 about which train drag conveyor chains 84—84 which are fitted at intervals therealong with laterally extending lugs 86. The chains 84—84 extend the length of the bottom plate 60; the bottom plate 60 being grooved to receive the chains 84 while disposing the lugs 86 to extend upwardly therefrom to engage between the bags which are stacked within the guideway so as to move the stack of bags forwardly as power is applied to the conveyor drive mechanism.

Shafts extending through the bearing boxes 81—81 are arranged to drive sprockets 88—88 around which train endless drag conveyor chains 90—90 running along opposite sides of the guideway. The chains 90 are fitted

with outwardly extending lugs 92 at suitably spaced intervals therealong, and the conveyor chain mechanisms are so disposed that the lugs are caused to project inwardly of the guideway structure so as to engage between adjacent bags of the stacked supply of empty bags when placed therein, thus assisting in moving the stack of empty bags forwardly in the guideway as the conveyor drive mechanism operates.

Between the cross shaft 70 and the front end of the base plate 60 is disposed a second cross shaft 100 which is supported in bearings 102—102 (Fig. 9) and driven by a motor M³ (Fig. 8) through a chain 103, sprockets 104—105, and bevel gears 106; the motor M³ having suitable speed reducing means 98. A pair of forwardly extending shafts 108—108 are supported in bearing plates 109, and carry bag supporting spools 110—110 which are driven in accordance with the gear arrangement shown in Figs. 8 and 9 to rotate in opposite directions and continuously as long as motor M³ is energized. Motor M³ is controlled by a switch (Fig. 19) convenient to the attendant. The spools 110—110 are of tapering reduced diameter toward their mid-portions and are provided with helical grooves or threads throughout their peripheral surfaces; the threads of the spools being of opposite hands.

A spring switch designated MS¹ (Figs. 9—10) is fixed to the front plate 109 and its upwardly projecting actuator arm 94 carries a roller 95 for contact with the front end of the feed stack B. Whenever the conveyor motion tends to exceed the required bag feeding speed the pressure of the moving bags accumulates and operates the switch MS¹ to open the circuit through motor M² driving the chains 84—90, thereby causing the conveyor to stop. Then, as the attendant removes bags from the front end of the conveyor the pressure against the switch arm relaxes and the conveyor runs again, thus maintaining a constant supply of bags at the filling station. As the bags are pushed off the slide plate 60 (Fig. 10) and move along the spools 110—110 they tend first to drop down into the valleys of the spools, and then as their bottom edges are led forwardly by the threads on the front ends of the spools (Figs. 10—11) they are forced to rise up again relative to the bags immediately following, because of the then increasing diameters of the spools at their forward ends. This action of the spools operates to break the positional lock between adjacent bags of each stack which tends to exist due to the adhesive nature of the printing ink and paper sizing materials which are applied to the bags during their manufacture.

Thus, whereas normally the paper bags of the reservoir stack tend to cling to one another in such manner as to resist and make difficult their separation and individual handling, in the case of the present invention each bag, as it approaches the end position in the feed stack, is vertically shifted relative to its neighbors and is thereby unlocked, and is finally thrust up to an elevation above its successors with its open end up and may be grasped with improved facility by the attendant and easily removed from the feed stack. As shown in Figs. 10—11, the lower edges of the bags are pulled forwardly by the spool threads to cause the bags to lean slightly rearwardly. Thus, the bags do not tend to topple forwardly out upon the working platform.

Receiving chutes and bag grippers

Referring now to Figs. 2, 3A, 12 and 13, it will be seen that the tubular columns 42—42 extend through the bottoms and tops of their respective housings 36, and inasmuch as the tubular columns and their appurtenances are of identical construction, the following description will cover both turret units. As shown in Fig. 3A, a packing gland 43 is mounted upon the lower end of the tube 42 to permit the tube to rotate while admitting compressed air into the interior of the tube from a supply line 45. A ball thrust bearing 47 is provided to support the weight of tube 42 and parts carried thereby, and a

suitable stuffing box 49 is set in the top wall of the housing 36 to seal the exit of the shaft 42 while similar stuffing boxes are provided where the shaft 38 passes through the ends of the housing 36.

Near the upper end of the tube 42, it is enlarged to form a chamber as illustrated at 120, and a top closure plate 122 (Fig. 13) is disposed therein to prevent air from passing into the upper extension portion 124 of the shaft 42. A reduced upper end portion 126 of the tube 42 extends still further upward, and is guided and supported in a structural member 128 that may be part of the machine frame or of the building containing the machine. A hub or head structure 125 is carried by the upper end of the column extension 124 and in turn carries a square plate 130. To the margins of plate 130 is attached a square frame of angle iron 132, and an outer frame 134 surrounds the frame 132 and is detachably secured thereto (Figs. 12-13). A square frame is provided in this instance because the present design utilizes four receiving chutes, but it is to be understood that a greater or lesser number may be employed, as circumstances dictate, and that the plate and frames would then be in conformation to the selected number. The frame 134 constitutes a support and attachment for the material receiving funnels, and inasmuch as all four of the funnels are identical, a description of one will suffice.

A bent tube frame 136, reinforced by a cross tube 138, is welded to the outer face of the angle frame 134 (Figs. 12-13) and a hopper-like chute or funnel 140 of sheet metal is welded to the inner periphery of the tube frame 136 to depend therefrom as shown in Fig. 13. The lower end 142 of the funnel is constructed to such form and size that the bags to be loaded may be easily slipped up over the funnel collar 142. On opposite sides of the funnel are radially extending brackets 144, each with a cross web 146. Air cylinders 148 are mounted on these webs; the piston rods of the cylinders extending through the webs toward the chute and terminating in connections to the bag grippers previously mentioned. Each gripper consists of a sturdy metal plate 150 (Figs. 13, 14, 15) faced with a resilient pad 152 of rubber or other suitable friction-surfaced material. When a bag is slipped over the funnel collar 142 and air under pressure is admitted to the outer ends of the cylinders 148, the grippers are thereby forced against the collar 142 and will thus hold a bag securely in suspended relation thereon, even when the bag is loaded. The cylinders 148 are double-acting, so that when air is admitted to their inner ends the pistons will return and restore the grippers to their free positions to release the bag.

Means are provided to hold an empty bag in place on the collar 142 before the grippers operate. For this purpose a fixture 154 with a threaded rod 156 extending inwardly is attached to each bracket 144. Helical springs 158 are attached to the ends of the rods 156 and are arranged to bear resiliently against the outer surface of the collar 142. The tensions of the springs 158 may be regulated by adjustment of a nut 157 on the rod 156. The attendant, stationed between the tubular columns 42 and in front of the empty bag feed conveyor 60, picks off the first bag from the advancing stack and lifts it up and slips it over the collar 142 of the funnel; the springs 158 acting automatically to frictionally retain it. As these springs are on opposite sides of the brackets 144, the bag will thus be evenly supported. Placements of the bags in loading position are further facilitated by semi-circular bent wire guides 159, rigidly attached to and depending from the lower edge of collar 142.

In the inner face of the collar 142 is an aperture 162, which is sized to admit the plunger or actuating button 160 of a spring switch designated MS². One such switch is fixed in a recessed portion of the rubber pad 152 of one gripper element of each unit. When a bag is slipped in place on the collar 142 it will repress the spring controlled plunger 160 of the switch MS², so that the latter

will be caused to control the material discharge mechanisms to permit the measuring dispenser (which will be described hereinafter) to discharge a load of material into the funnel 140 and thus into the bag. However, if no bag is on the collar 142 the plunger 160 will freely enter the opening 162 and the switch MS² will then be spring-actuated to keep open the electrical circuit which governs the operation of the dispenser.

The air cylinders 148 are controlled through solenoid-actuated multi-port valves 164, mounted on vertical brackets 166 attached to and radiating from the upper portion 124 of the tubular column 42. Any suitable commercially obtainable valve may be used for this purpose, and as shown in the drawing a solenoid S' is included therewith to cooperate with a spring to provide reciprocal control of the valve piston, as is well known in the art. The cylinders 148 are connected at each end to a source of compressed air from within the column 42 through flexible conduits. One such conduit 170 conducts air from the column chamber 120 to the center of each valve cylinder 164 and conduits 172 connect the upper ends of the valves to the U-tubes 136. The latter are each divided into two compartments by partitions 176-176 (Fig. 12), and it will be seen that the conduits 172 are arranged to admit air to only one-half of each tube 136, while conduits 175 from the opposite ends of the valves 164 carry air to the other side of each tube 136. From the left side of tube 136 conduits 178 are arranged to deliver air to the outer ends of the cylinders 148. Companion conduits 180 are arranged to deliver air from the right side of tube 136 to the inner ends of the cylinders 148. The valves 164 are arranged to be solenoid-actuated by an electrical control system (to be described hereinafter) in such manner that only after a funnel 140 has moved a safe distance past the attendant placing the empty bags thereon will the pistons of the cylinders 148 on the unit be then actuated to cause the grippers 150-152 to engage against the collar of the bag upon the chute. Then, subsequent to filling of the bag the valve 164 is reversed by de-energization of the solenoid S', and air is then admitted through the conduits 175 and 180 to the inner ends of the cylinders to cause the grippers to move apart and release the bag. It will be noted that the tubes 136 serve a dual purpose in that they support the funnels 140 and cylinders 148 and their accessories, and also conduct air from the supply conduits 172, 175 to the conduits 178, 180 that lead to the cylinders 148.

Measuring dispensers for material

Two measuring dispensers are provided, one for each turret unit, and are generally designated D in the drawings. Figs. 2, 16, and 17 show the details of the construction of these units which are identical. Supports for the dispensers may conveniently comprise parts of the building in which the machine is housed, and therefore are not shown. Each dispenser is so located that its center of gravity-discharge will be directly above the orbit described by the centers of the funnels 140 of the respective turret unit as it revolves upon its column 42.

Each dispenser is shown as comprising a pair of side plates 185-185 disposed in parallel relation and spaced apart a distance in accordance with the planned capacity of the dispenser. One end plate 186 is welded to the side plates 185-185 while the side wall of the dispenser opposite the plate 186 is constructed to be in the form of a toggle, each half of which comprises a plate 188 pivoted at its outer end as indicated at 190 to the fixed wall structure and at its inner end to a common center pin 192. The piston rod 194 of an air cylinder 196 is connected to the toggle pivot 192; the piston in the cylinder 196 being indicated at 195. The rod 194 is provided with a stop member 197 at its inner end and another stop member 198 at its outer end; these stop members being movable on the rod as may be required to limit the travel of the piston 195 for increasing or decreasing the capacity of the dispenser as will now be explained. When the plates

188—188 are positioned as shown in full lines in Fig. 16 the dispenser will obviously hold less of a given material than it will when the plates are in the dotted line position. To control the positions of the plates compressed air (or oil under pressure) is introduced under manual control to one side or the other of piston 195 to hold the piston rod in either extended or retracted position as limited by stops 197 or 198 bearing against either end of the cylinder. The volumetric capacity of the dispenser is thus readily adjustable whenever it is desired to change the amount of material the dispenser is required to deliver.

Piston-cylinder units 200—201 for control of slide gates 202, 203, respectively are mounted at the upper and lower ends respectively of the dispenser wall structure, whereby the gates are separately movable thereby to either open position as shown at the top of Fig. 17 or to closed position as shown at the bottom of the view. These gates are guided by and run between angle plates 204; fillers 205 being provided to close the spaces at the sides of the gates and to assure necessary clearance. Compressed air is supplied to the ends of cylinders 200—201 alternately under control of multi-port valves 206, 208 (Fig. 2) which may be similar in design and operation to valves 164. These valves may be fixed upon any conveniently available stationary part of the machine, such as on the casing shown at the top of Fig. 2, and are controlled electrically and automatically by a master controller device (to be later described) and operated by solenoids S² and S³, respectively, so that they will in turn operate to cause actuation of the gates 202 and 203 in proper sequence.

As previously stated, the turrets carrying the funnels 142 rotate continuously and not intermittently; it is therefore obvious that the release of the material to be discharged from the dispensers into the bags must be accurately timed. Because the linear speed of the funnels along their orbits is about 9 inches per second, it is also apparent that the lower gate 203 must open and close within a fraction of a second as each funnel 140 passes under it. It is also apparent that in order to obtain accurately measured charges of material, both gates must never be open at the same time. Therefore, the operation control devices of the machine are so arranged that the upper gate 202 is normally open to permit the dispenser to fill from the supply bin as indicated at 207 (Fig. 2). Then, as a receiving funnel approaches loading position the upper gate closes just before the lower gate opens. Thus, the dispenser gravity-discharges an accurately measured amount of material into the bag suspended under the hopper. The lower gate then closes and the upper gate opens again to receive a new supply from the bin 207. This dispenser gate control arrangement has been found to be particularly efficacious for the purpose because optimum use is made of the available time increments. Then too, while the turret is rotating between successive dispenser discharge positions the lower gate is closed while the upper gate is open, thus providing opportunity for the material in the dispenser hopper to settle (assisted by the vibration concomitant to operation of the machine) into fully and therefore accurately loaded condition each time.

Output conveyors

Referring now to Figs. 6 and 7, an output conveyor as designated generally by reference character OC, is located at each side of the machine to extend away from each loading turret. These conveyors are identical and may be of any desired type such as are obtainable commercially as self contained units. The conveyors therefore are not considered, per se, as novel elements of this invention, but the manner in which they are controlled by the electrical system of the invention is considered an indispensable feature, as will be fully described in connection with the electrical diagram portions of the drawing herein.

Each conveyor OC includes an endless belt 210, the longitudinal center of which is tangent to the orbit of the centers of the funnels 140 as they pass around the

outer arc of their travel. In the drawings the belts 210 are shown as being provided with slats 215 to assure positive and quick pickup of the filled bags as they are deposited thereon. Adjacent each conveyor OC is also provided a bag-closing or sealing machine designated generally at K in the drawing; which in the case of paper bags may be of any suitable type, stitching or gluing or sewing machine. Or, if the bags are to be heat-sealed, a suitable machine for that purpose will be used. Each belt 210 is driven by a motor M⁴ as through suitable chains 211 and 212, and a reducing gear unit 214.

An attendant is stationed at each conveyor OC in front of the closing apparatus, and his duty is to partially draw together the open tops of the filled bags as they approach him after being released by the grippers 150 and dropped onto the conveyor OC. A foot treadle control 220 is provided for normally starting motor M⁵ which drives the closing apparatus. However, a safety over-control arrangement is provided between the first movement of the treadle 220 and the operation of solenoids S² and S³ which actuate the valves 206 and 208 controlling cylinders 200 and 201. This control interconnection is to prevent double operation of the dispensers inadvertently, which might otherwise occur under some conditions, and will be more fully explained later in connection with the description of Fig. 18 of the drawing. Thus, filled and sealed bags are carried to the rear of the belts 210—210 and fall thereupon onto a transversely travelling belt TB (driven to run constantly by any suitable means not shown), which delivers them as to a car loader or a waiting vehicle, or to a stock piling operation, or the like.

It should be noted in Fig. 1 that the two turret units of the machine are arranged and geared together through shaft 38 so that the U-tubes 136 cannot interfere with each other, but in effect intermesh and thereby afford clearances between alternate funnels. Also, this arrangement makes certain that the loaded bags dropping off the rear ends of the conveyors OC—OC will be uniformly spaced along the belt TB and not in overlapping or in tangled relation with each other. For the same reason it is desirable to have both conveyors OC—OC run at equal linear speeds; and this may be readily accomplished by having at least one side of the drive mechanism adjustable, as by the use of a variable speed transmission device.

Electrical system

Figs. 18—19 show in schematic form the electrical control system of the machine. Figs. 2, 3, 4, 5, 12, 13 show the mechanical elements associated with the electrical diagrams.

At their upper ends the extension portions 126 of the columns 42 engage the drive shafts 225 of cam drums E—E through means of bevel gears 226. Also, the column extensions 126 carry groups of electrical contact or "slip" rings as indicated at R, and at the same time function as conduits for wires that lead from slip rings R to the corresponding solenoids S' and switches MS². As shown in Figs. 4—5, each cam drum E carries a series of cams E' to E⁷ inclusive, each of which has four lobes or "bumps" 227 (Fig. 5) spaced 90 degrees apart (to correspond to the number of funnels per turret in the present instance). The lobes are of such lengths circumferentially of the cams as to give the required circuit closing action as will be explained hereinafter. Thus, each time the shaft 225 rotates approximately 90 degrees a lobe 227 will act to close a switch as shown at 228 (Fig. 5). The slip rings on each column are designated R' to R⁶ and are insulated therefrom as indicated at 229 (Figs. 4, 13) and wires from the solenoids S' and the switches MS² are led through openings 127 in the column structure and electrically connected to the rings as shown in Fig. 13. The cams E are also conveniently carried on an insulating core piece 230 that is fixed on shaft 225. The switches 228 may of course be of any suitable spring-return type.

Referring now to Fig. 18, the main power leads are designated L¹ and L² as in any conventional power sup-

ply, such as to provide a 110 volt 60 cycle A. C. circuit; and these leads are conveniently run to a distributor panel Z from which wires branch to various elements of the apparatus. The wirings for both halves of the machine are identical as shown in right and left relation in Fig. 18, and therefore only one side of the diagram will be described in detail as follows.

The control circuits are arranged so that when any one of the switches 228 is closed by its cam E, current from line L' will flow through a wire *b* from the switch and thence through the corresponding ring R and solenoids S¹; thence through wire *c* and ring R⁶ and then back to the return line L². The energized solenoids S¹ then actuates its air valve 164 to close the bag grippers on that one unit; and thus if a bag has been mounted on the collar 142 of the corresponding funnel, the bag will be grasped and held in position ready for filling. Then after shafts 126 and 225 have rotated a few degrees further the solenoids S³ and S² that operate the gates 203, 202 of the dispensers D will be energized by closing of the switches 228 controlled by the cams E⁵ and E⁶; but only if switch KS is in closed position. This switch is the one previously referred to that is closed by depression of the treadle 220. Switch MS² is also in this circuit, and is closable by the movement of the grippers 150 but only if a bag is already in position to receive material. If both of these switches are closed current will flow from L' through wire *k*, solenoid S⁴, wire *n*, switch KS, wire *p*, ring R⁵, MS², wire *c*, ring R⁶, and then through wire *c'* to L². The solenoid S⁴ is thus energized and acts as a holding coil to retain a pair of contacts *d* and *e*, in closed condition. The solenoids S³ and S² are then energized (S³ operating first) in quick succession due to the synchronized action of the cam switches at E⁵ and E⁶ as controlled by the corresponding cams on shaft 225; the material in the dispenser being thus released when S³ operates, and being immediately followed by refilling of the dispenser from the bin 207.

Thus, a previously measured quantity of material falls into the suspended bag B, within a fraction of a second. However, it will be noted that both switches KS and MS² must be closed or else the bag will be dropped without being filled when cams E⁷ to E⁴ complete their action. The circuit thus referred to will include: L', wire *k*, contact *e*, wires *h* and *h'*, solenoids S² and S³, wires *f* and *f'*, E⁵ and E⁶, wire *r*, contact *d*, and wire *g* to L². The holding circuit through S⁴, wire *n*, cam E⁷, wire *r*, contact *d*, and wire *g* to L² is necessary to prevent a repeat operation of the gates 202, 203, which might otherwise occur if the attendant at the output conveyor OC inadvertently "jiggles" the treadle 220, thus opening and closing switch KS more than once.

The circuits associated with and controlling the motors for the machine are shown in Fig. 19, and are believed to require but little explanation. It will be seen that each motor is connected across the main leads L' and L²; motors M¹, M³ and M⁵ each having a switch in one lead, and being located at points most convenient to the machine attendants. Motors M⁴ have switches KS in their circuits and the function of these has been described. Motor M² has the spring switches MS¹ in its circuit (this is the switch operated by the first bag in the stack), in addition to a manual control switch; so that, as previously described, the input conveyor IC stops when the foremost bag presses in contact against the roller 95.

From the foregoing description it will be apparent that safe and certain operation of all the component units and elements of the machine is assured, and that the entire operation occurs in proper sequence automatically and rapidly, with a minimum of operator attention and with very little manual labor being required in connection with its use.

What is claimed is:

1. A bag filling machine having two bag carrying turrets driven to rotate in opposite directions in synchronism, each turret comprising in combination a vertical column

supporting a plurality of funnels arranged in orbital relation thereon and having discharge collars, fluid operated devices adapted to alternately hold filled bags on said collars and to release the bags therefrom; a material dispenser positionally associated with each of said turrets and comprising a material bin having inlet and outlet gates and adapted to discharge material through said outlet gates into said funnels when in position beneath said dispenser; fluid operated devices for opening and closing said gates; means including valves for supplying fluid under pressure to said fluid operated devices; solenoids arranged to actuate said valves, control switch means for said solenoids, and a cam device synchronized with rotation of said turrets and the positions of said funnels and controlling said switch means whereby said solenoids are energized and deenergized in accordance with the positions of said funnels.

2. A bag filling machine having two bag carrying units driven to rotate in opposite directions and mechanically interconnected, each unit comprising in combination, a central vertical tubular support and a plurality of funnels arranged in orbital relation on said tubular support, said funnels having collars sized to permit an open bag to be slip-fitted thereon to surround each collar, fluid-operated clamps to alternately hold filled bags on the collars and to release the bags therefrom; a material dispenser positioned above the path of each group of funnels and having inlet and outlet gates, fluid pressure-operated devices connected with said gates to open and close the latter, a fluid pressure supply connection to the interior of said tubular support so that said support constitutes a fluid pressure reservoir, control valves actuated by solenoids and having fluid-conducting connections with said support and with said fluid-operated clamps and devices, and means including a multiple cam device rotating in synchronism with rotation of said units and arranged to control distribution of electrical energy to said solenoids in timed relation with the rotation of said supports and said funnels, whereby the bags are filled and discharged from the machine automatically.

3. A bag filling machine comprising in combination, a pair of oppositely rotating bag-holding turrets each having a plurality of funnels with discharge spouts thereon adapted to receive empty bags thereon and to direct material into the bags, a material dispenser located above the path of each set of funnels and adapted to discharge material into the funnels as the latter pass beneath said dispensers, means including fluid pressure-operated clamp devices and fluid control valves therefor adapted to hold filled bags on said spouts and to cause material to be gravity-discharged into and out of said dispensers, solenoids arranged to actuate said valves, and means including a cam device synchronized to rotate with the rotation of the turrets and adapted to control distribution of electrical energy to said solenoids, whereby the bags may be filled and discharged automatically.

4. A bag filling machine having a plurality of rotatable bag-carrying units, each unit comprising in combination, a plurality of bag holding funnels adapted to receive gravity-discharged material, a material dispenser positioned above the path of each set of funnels as the latter rotate with said units, fluid pressure operated devices on said funnels adapted to alternately hold and release said bags in filling position, fluid-operated devices on the dispensers to operate gates thereon and to thereby dispense pre-measured quantities of material into the funnels, valves controlling admission of fluid as required to said fluid operated devices, and means adapted to operate said valves including a master cam controller device rotatable in synchronism with the units and adapted to control said valve operating means in timed relation whereby bags on said funnels are filled and dropped from said funnels coincident with rotation of the units.

5. A bag filling machine comprising in combination, oppositely rotating carriers, each carrier supporting a plurality of chutes adapted to suspend open bags thereon, ma-

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which the spools are disposed in side-by-side relation to support opposite edges of the bags and are driven to rotate in opposite directions and are provided with opposite hand screw threads at their peripheral surfaces.

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