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4 Sheets-Sheet 1

2,498,100



BY *Smith & Tuck*

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Feb. 21, 1950

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FLUID OPERATED MATERIAL EJECTOR FOR
ROTARY CAN FILLING MACHINES

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4 Sheets-Sheet 2

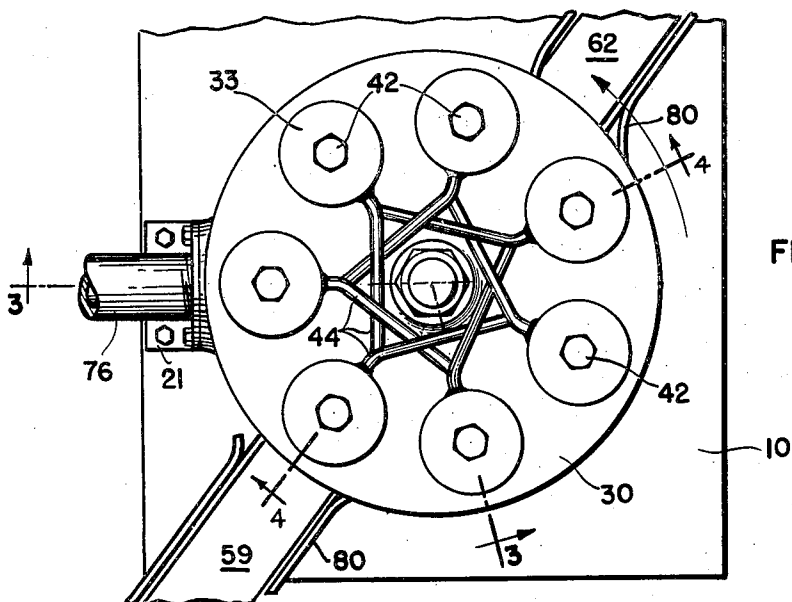


FIG. 2

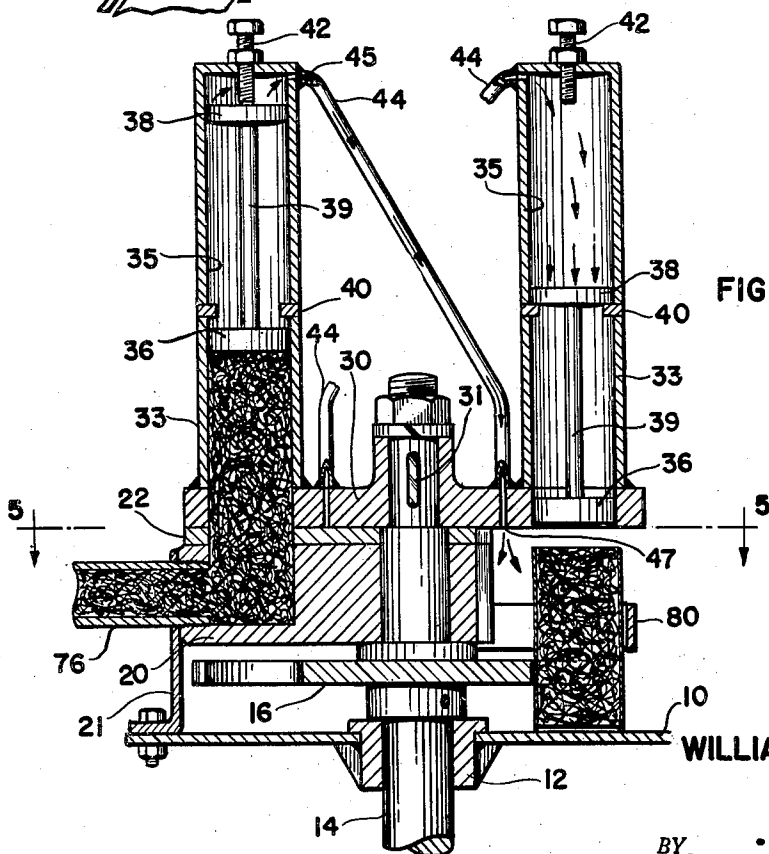


FIG. 3

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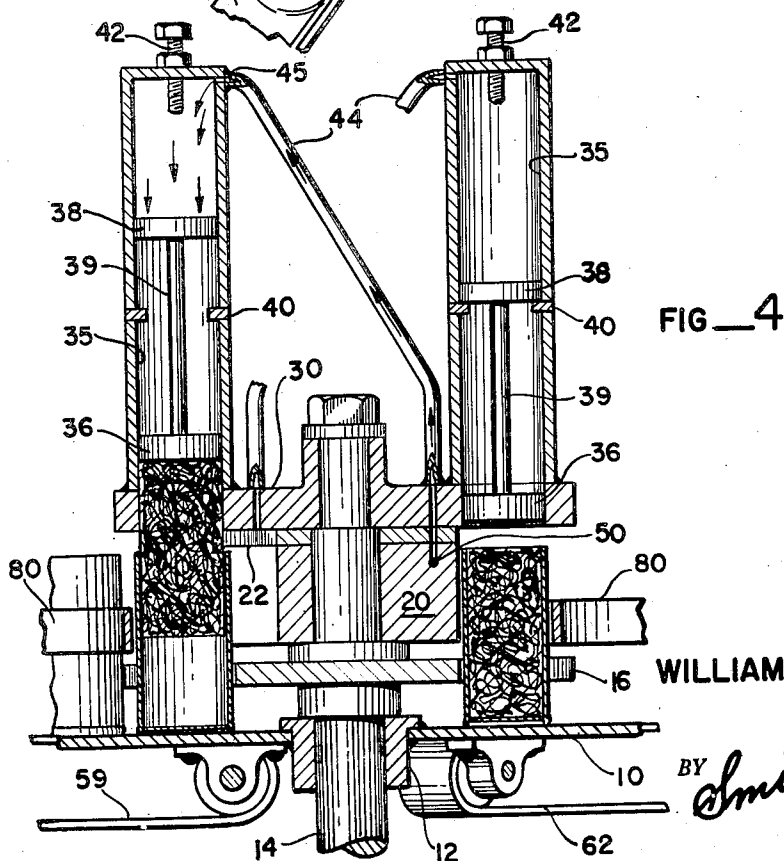
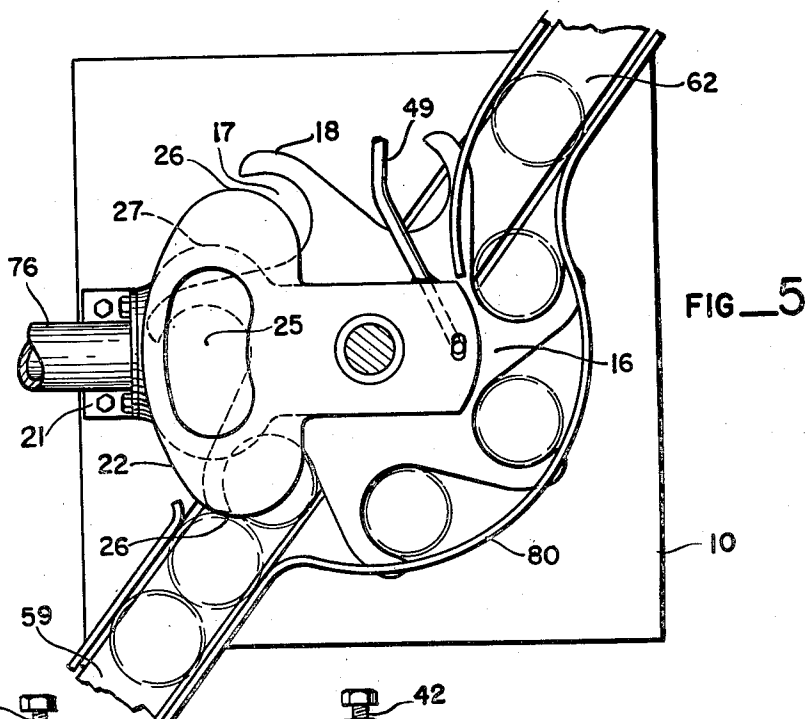
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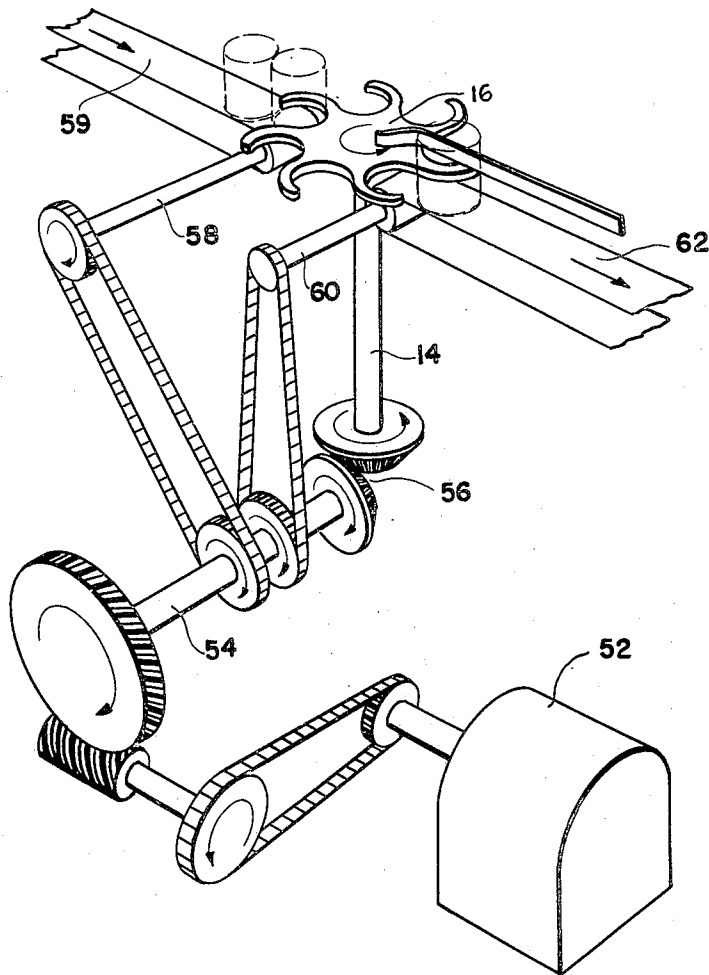


FIG. 6

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UNITED STATES PATENT OFFICE

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FLUID OPERATED MATERIAL EJECTOR FOR
ROTARY CAN FILLING MACHINES

William G. Tyrrell, Seattle, Wash.

Application March 1, 1948, Serial No. 12,361

4 Claims. (Cl. 226-97)

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My present invention relates to the art of fluid operated material ejector for rotary can filling machines of the type that are employed to fill cans with materials which are fluid under considerable pressure, but which are not liquid.

One use for which my can filling machine has proved very effective is the filling of tin cans with comminuted dog food, of the type combining meat products, cooked cereals, and the like. Other similar products are mincemeat, spaghetti and puree of vegetables.

There are several considerations involved in a can filling machine of this general type. On one hand, accurate measuring of the products placed in each can is essential, in that the cans are sold by the weight of the contents, which must be uniform.

A second requirement is that the cans will be filled without any loss or wastage which would, on one hand, tend to produce an actual waste of material but, more important, would tend by the accumulation of such materials to create an unsanitary condition, which cannot be countenanced in a food product especially.

A third, and very important requirement of such equipment is to provide a machine which will handle cans with speed, so that a large number of cans can be passed through the machine as part of a continuous process line, to the end that a large volume of the product can be handled without the necessity of employing large areas, which in so many metropolitan areas is expensive for rental or ownership.

My present equipment serves these essential requirements. The known prior art, while achieving the general end result of my equipment is usually characterized by complicated, involved structures, having a multiplicity of cams, followers, levers and actuating crank arms, all of which make the machine bulky, expensive in first cost, and noisy in operation. My equipment, on the other hand, is characterized by its simplicity of construction, its quietness of operation and its capacity for handling the filling operation at high speed.

The principal object of my present invention, therefore, is to provide a can filling machine capable of handling fluid materials, which accurately measures the amount of the food product under conditions which insure uniform measuring, and to then discharge this measured amount of material into the final sales container.

A further object of my present invention is to provide a can filling machine in which filling of the measuring chamber is against a dead

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weight augmented by an air dash-pot and in which air pressure is employed to produce the expelling of the measured food products in such a way that there is a minimum of mechanism and no complicated valving means which may become inoperative through extended use.

A further object of my invention is to provide a can filling machine in which the can supply means, the filling operation of the metering chamber, the movement of the cans through the machine, the filling of the cans, and finally movement of the cans away from the filling machine, are all accurately timed in proper sequence with each other so that high speed operation can be maintained.

A further object of my present invention is to provide a machine of the class described which is characterized by relatively simple structure, which will operate over long periods of time, with a minimum of maintenance and which is very economically produced as a manufactured article.

Further objects, advantages and capabilities will be apparent, it is believed, from the description and disclosure in the drawings, or may be comprehended or are inherent in the device.

In the drawings:

Fig. 1 is a side elevational view showing many of those parts which are essential for the filling operation of the cans following my principles.

Fig. 2 is a top plan view of the filling head of my machine.

Fig. 3 is a vertical, sectional view taken along the broken line 3-3 of Fig. 2.

Fig. 4 is a view similar to Fig. 3, but taken along the broken line 4-4 of Fig. 2 to show an advanced step in the filling operation over Fig. 3.

Fig. 5 is a top plan view of the filling mechanism, in part, with the upper cylinder assembly removed therefrom.

Fig. 6 is a diagrammatic perspective type of view showing the essential drive means for my filling machine that insures the in-step operation of the various parts.

Referring more particularly to the disclosure in the drawings, the numeral 10 designates generally the table upon which my machine is mounted. This I prefer to form with a metal top at least or, preferably, all metal supported by suitable legs to bring the can-carrying belt up to normal table height to admit of ready and convenient inspection of the cans as they enter and leave the filling machine.

Secured in table top 10 is a bearing 12 adapted to journal the revoluble shaft 14. Fixedly se-

cured to shaft 14 is the can-transporting toothed wheel 16. This wheel has a plurality of cut-out portions 17, which are of a size to properly engage the size of can the machine is to fill. In between cut-out portions 17 are the finger portions 18, which serve physically to engage the can and cause it to move about the desired path. It is to be noted, particularly in Fig. 5, that these fingers and the cut-out portions 17 form a natural and centering rest for the cans so as to insure their accurate placement in the various steps of my filling operation.

Disposed next above wheel 16 is the can filler handling block 20. This block is free-floating on shaft 14 and does not revolve with it, but rather is secured in place as by angle member 21, which is fixedly secured, as by bolting, to table top member 10. Disposed immediately above block 20, and secured to it in fixed relationship is the block covering plate 22. This plate conforms generally to the shape of block 20 but overlaps the same, as is probably best illustrated in Fig. 5. The amount of this overlap must be sufficient so that the distance from the edge of opening 25 to the outer edge 26 of plate 22 will be slightly more than the diameter of the can or carton to be filled. When this condition is maintained, the filling material which comes up through opening 25 will be stopped from flowing up into the can and then out over the outer edge 27 of block 20. The overlaps on each side of plate 22 are equal and for the same general reason.

Disposed above and resting on plate 22 is the piston head plate 30. This block is fixedly secured to shaft 14, as by key, 31, and revolves with shaft 14. Fixedly secured to head 30 is a plurality of cylinders 33. Throughout my drawings I have shown seven of these cylinders. This is not an essential requirement. However, normally, the greater the number of cylinders the higher the speed of operation which can be maintained with a given pressure on the filling material.

Each of the various cylinders 33 is similarly constructed. They consist of a cylindrical bore 35 in which is disposed, for reciprocation, piston 36. Above piston 36 is a second piston 38, and the two pistons are fixedly connected together by the piston rod 39. Disposed substantially midway in the cylindrical wall 35, are outstanding stop members 40. These members form the stop for piston 38 as it comes to the bottom of its travel in its discharging cycle. The working upper travel of the piston assembly, composed of pistons 36 and 38 and connecting rod 39, is achieved by the adjustable screw at 42, which may be positioned and locked by a conventional type of lock nut, and forms the adjustment by which the volume of each charge of the cylinder can be determined or varied.

At its upper end, cylinder 33 is provided with an air tube 44. This tube supplies air through port 45 above piston 38, the air being supplied under pressure during the discharge stroke and the same port and tube form a discharge passageway for the entrapped air as the piston is being driven upwardly in the filling operation. The lower end of tube 44 terminates on head 30 and is in communication with a discharge port or filling port, depending on the cycle, 47. As viewed in Fig. 3, air is being discharged out through port 47, whereas in Fig. 4, air is being supplied through tube 49 from a source of air under pressure into the air duct 50 formed within block 20, and thus air under pressure is supplied to piston 38. There

is one pipe 44 with its appropriate discharge and intake ports for each of the cylinders. This arrangement is apparent from the various views, especially that of Fig. 2.

It is very essential in any high-speed operation, as in filling cans, to have the various steps of the operation accurately timed with respect to each other. In my present machine, I achieve this by the power supply arrangement shown in Fig. 6, in which some form of motor is shown at 52. This drives, through suitable reduction gearing, the revolvable shaft 54. Shaft 54 drives three separate units. The first main drive is through the bevel gears at 56, up through the vertical shaft 14. This drives the can handling wheel 18. Also, suitably connected to shaft 54 is the can in-feed drive shaft 58 and the can out-feed drive shaft 60. As will be noted in Fig. 6, it is desirable that the out-speed belt 62 be driven at a higher speed than the in-feed belt 59. This is easily achieved by the arrangement shown.

The filling material for the cans is normally supplied either direct to the in-feed pipe 70, or through means of a hopper, as 72, which may be suitably charged, as by conveyors, or otherwise. The semi-fluid food is then taken through the impeller pump 74 where it is fed under considerable pressure through pipe 76, which in turn connects to opening 25 in block 20.

Method of operation

In operating my machine, after the motor 52 has been started, it is necessary to await the supply of cans to the machine by the in-feed belt 59. As soon as this supply is assured, pump 74 may be started. The filling material will then be forced through pipe 76 into block 20, and up and out of the same through opening 25. It will then pass successively into the various cylinders 33 as they are passed over opening 25 by the rotation of shaft 14. As soon as a cylinder is positioned, in part, over opening 25, the filling material rises in the cylinder, thus pressing upwardly the piston assembly, namely pistons 36 and 38. This will expel the entrapped air out through port 47, after the showing of Fig. 3. As soon as piston 38 meets the adjusting screw 42, further upward movement is arrested and a measured amount of filling material is now contained within cylinder 33. During the filling operation, the cylinder has been moving around shaft 14. This is one of the principal reasons for the elongated shape of opening 25. As the cylinder passes off of the extension of plate 22, it will be immediately over a can which has been accurately positioned by wheel 18. At this instant, however, there is no filling of the can due to the fact that there is no expelling force. This is accomplished by a further movement of the can and the cylinder which are naturally driven in step, both being driven by shaft 14. At a point, however, when port 47 comes in alignment with the pressure discharge port 50 of pipe 49, an inflow of air occurs after the showing of Fig. 4, and the piston assembly is pressed downwardly until the upper piston 38 meets the stop member 40. At this time, the entire charge of filling material has been expelled from the cylinder and deposited in the can. The filled can is now carried around on the pathway, guided in part by guide member 80, until the can is deposited on the out-feed belt 62, and is carried on for subsequent processing by other equipment. During this continued movement of wheel 16, shaft 14 has also carried the

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cylinder plate 30 around, so that port 47 is no longer obtaining air from port 50 and, consequently, the cylinder assembly with its associated pistons is moving around to a point where it will again repeat the cycle as described.

In order to obtain the requisite speed of handling, it has been found necessary to employ a plurality of pistons and cylinder assemblies 33 so that the cycle of operation just explained can be carried on successively, and in step, by the entire number of cylinders and, in this way, high speed operation can be achieved, without the unnecessary hazards that would result from endeavoring to make one cylinder assembly function, say seven times as fast, as good judgment and experience have indicated is a proper speed.

It is believed that it will be clearly apparent from the above description and the disclosure in the drawings that the invention comprehends a novel construction of a can filling machine.

Having thus described my invention, I claim:

1. A can-filling machine for filling cans with materials which are fluid under pressure, consisting of: a vertically disposed revolvable shaft; a toothed, can-transporting wheel secured to said shaft and adapted to revolve in a plane normal to said shaft; a fixed can filler handling block disposed above said wheel; a block covering plate, fixedly secured with respect to said block and overlapping it in the path of can travel; a piston head plate revolvably mounted on said shaft; an air supply and exhaust port in said head plate; a plurality of vertically disposed cylinders mounted on the upper surface of said head plate, concentric with said shaft; openings in said head plate for each cylinder; a cylinder air port at the top of said cylinder; an air tube connecting said cylinder port and said air port in said head plate, adapted to act alternately as an air supply and an air exhaust line; a piston disposed for reciprocation within said cylinder; a stop to limit the downward travel of said piston; an adjustable stop adapted to limit the upper travel of said piston and to provide a volume control of the filling materials delivered; a fixed air supply port in said handling block and said covering plate adapted for cyclic engagement with the air port in said head plate; means for supplying air under pressure to said fixed supply port; a filling material opening in said handling block; means for supplying filling material, under pressure, to said filling material opening; a can in-feed means; a can out-feed means; and a synchronous drive for said in-feed means, said vertical shaft and said out-feed means.

2. A can-filling machine for filling cans with materials which are fluid under pressure, consisting of: a vertically disposed revolvable shaft; a toothed, can-transporting wheel secured to said shaft and adapted to revolve in a plane normal to said shaft; a fixed can filler handling block having overhanging projections disposed above said wheel; a piston head plate revolvably mounted on said shaft; an air supply and exhaust port in said head plate; a plurality of vertically disposed cylinders, closed at their upper ends, mounted on the upper surface of said head plate, concentric with said shaft; openings in said head plate for each cylinder; an air port at the top of said cylinder; an air pipe connecting said port and a port in said head plate adapted to act alternately as an air supply and an air exhaust line; a piston disposed for reciprocation within said cylinder; means to limit the downward travel of said piston; an adjustable stop

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adapted to limit the upper travel of said piston and to provide a volume control of the filling materials delivered; a fixed air supply port in said handling block adapted for cyclic engagement with the air port in said head plate; means for supplying air under pressure to said fixed supply port; a filling material opening in said handling block; means for supplying filling material, under pressure, to said filling material opening; a can in-feed means; a can out-feed means; and a synchronous drive for said in-feed means, said vertical shaft and said out-feed means.

3. A can-filling machine for filling cans with materials which are fluid under pressure, consisting of: a revolvable shaft; can-transporting means driven by said shaft; a fixed can filler handling block disposed above said transporting means; a block covering plate, formed as part of said block and overlapping it in the path of can travel; a piston head plate revolvably mounted on said shaft; an air supply and exhaust port in said head plate; a plurality of cylinders closed at one end formed on said head plate, disposed concentric with said revolvable shaft; filling openings in each cylinder; an air port at the closed end of each cylinder; an air duct connecting said port and a port in said head plate adapted to act alternately as an air supply and an air exhaust line; a piston disposed for reciprocation within said cylinder; a stop to limit the discharge travel of said piston; an adjustable stop adapted to limit the filling travel of said piston and to provide a volume control of the filling materials delivered; an air supply port in said handling block adapted for cyclic engagement with the air port in said head plate; means for supplying air under pressure to said supply port; a filling material opening in said handling block adapted to co-act cyclically with the filling openings of said cylinders; means for supplying filling material, under pressure, to said filling material opening; a can in-feed means; a can out-feed means; and a synchronous drive for said in-feed means, said revolvable shaft and said out-feed means.

4. A can-filling machine for filling cans with materials which are fluid under pressure, consisting of: a vertically disposed revolvable shaft; a toothed, can-transporting wheel secured to said shaft and adapted to revolve in a plane normal to said shaft; a fixed can filler handling block disposed above said wheel; a block covering plate, fixedly secured with respect to said block and overlapping it in the path of can travel; a piston head plate revolvably mounted on said shaft; a fluid supply and exhaust port in said head plate; a plurality of vertically disposed cylinders mounted on the upper surface of said head plate, concentric with said shaft; openings in said head plate for each cylinder; an air port at the top of said cylinder; an air pipe connecting said port and a port in said head plate adapted to act alternately as an air supply and an air exhaust line; a divided-piston disposed for reciprocation within said cylinder having an upper piston portion and a lower piston portion and a piston rod adapted to join said portions and fix their spacing; a stop to limit the downward travel of said piston adapted to engage the upper piston portion; an adjustable stop adapted to limit the upper travel of said piston and to provide a volume control of the filling materials delivered; an air supply port in said handling block and said covering plate adapted for cyclic engagement with

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the air port in said head plate; means for supplying air under pressure to said supply port; a filling material opening in said handling block; means for supplying filling material, under pressure, to said filling material opening; a can in-feed means; a can out-feed means; and a synchronous drive for said in-feed means, said vertical shaft and said out-feed means.

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