Sept. 29, 1931. W. SUMNER 1,825,559

APPARATUS FOR MANUFACTURING SMALL ARTICLES SUCH AS PILLS OR THE LIKE FROM PLASTIC MATERIAL

Filed Jan. 21, 1931 2 Sheets-Sheet 1

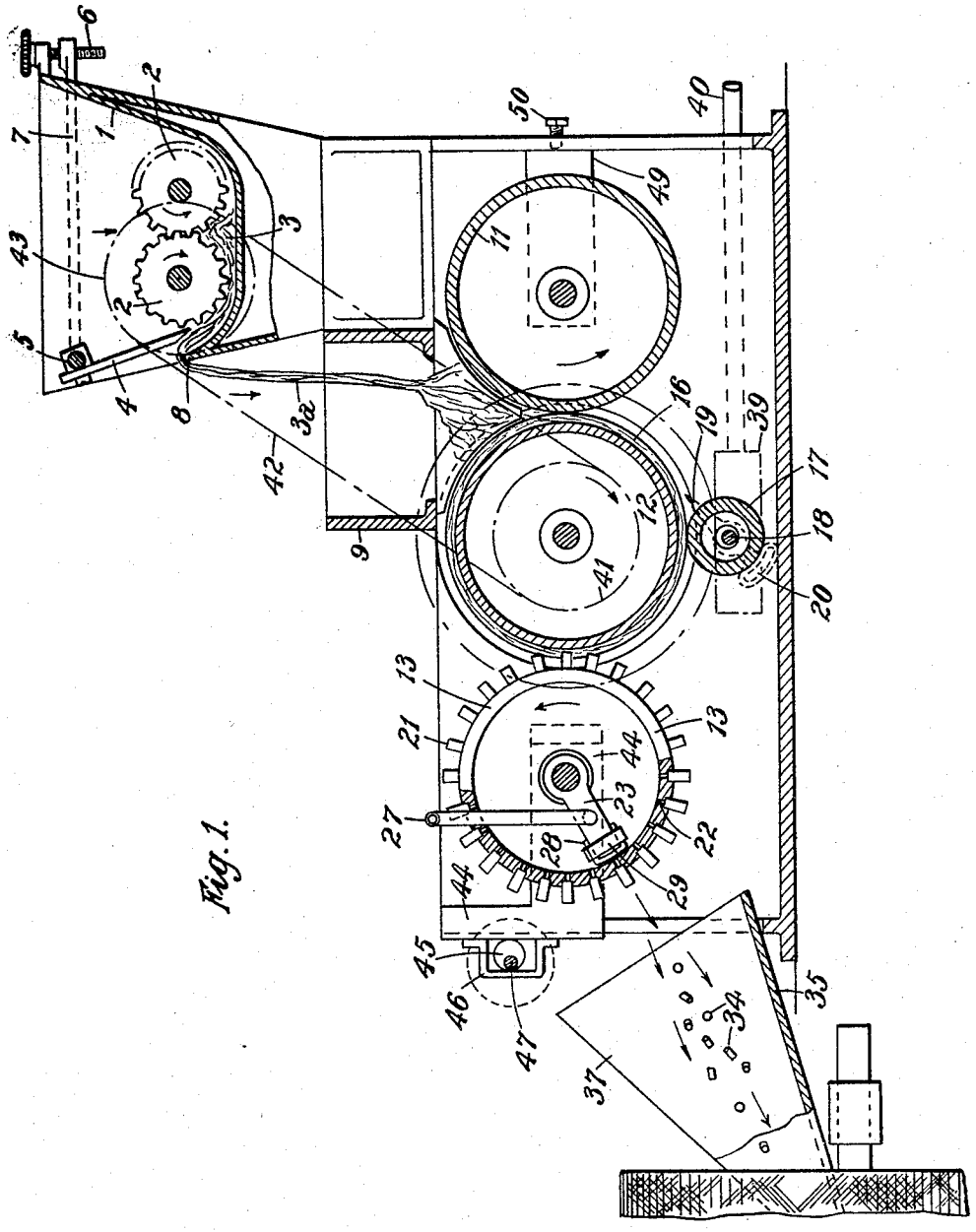


Fig. 1.

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Fig. 4.

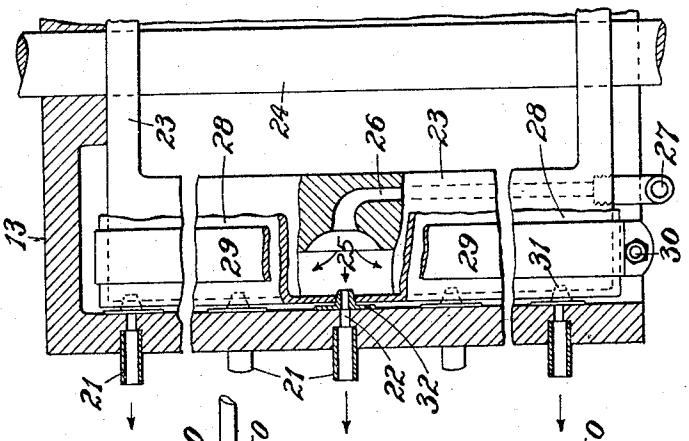


Fig. 5.

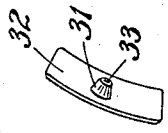


Fig. 2.

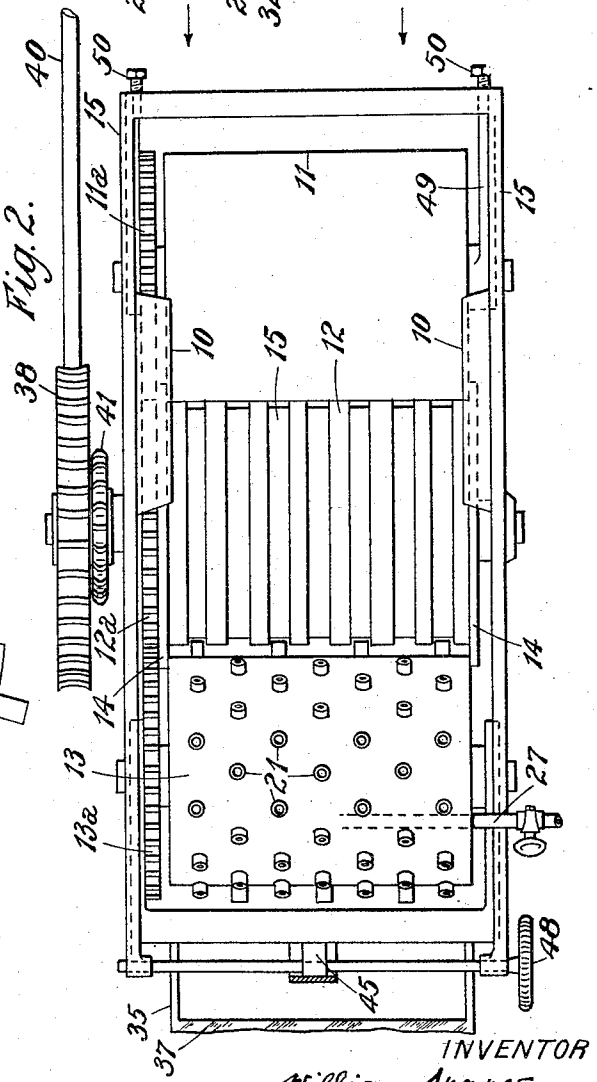
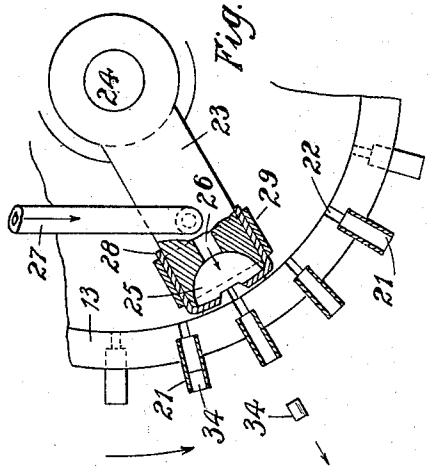


Fig. 3.



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UNITED STATES PATENT OFFICE

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APPARATUS FOR MANUFACTURING SMALL ARTICLES SUCH AS PILLS OR THE LIKE FROM PLASTIC MATERIAL

Application filed January 21, 1931, Serial No. 510,302, and in Great Britain January 31, 1930.

This invention relates to an improved apparatus by means of which small units or pellets may be made from a mass of plastic material the invention being particularly applicable for the manufacture of pills though it would also be suitable for making tablets, pastilles or similar commodities.

According to this invention the plastic mass from which the pills or the like are to be made is fed from a directing hopper or otherwise between two rollers which fashion the material into a ribbon or sheet which is carried round in contact with one of the rollers, a third roller or the like being provided with a series of somewhat radially disposed short tubes which are adapted to embed into the ribbon or sheet of material a certain proportion of which passes into the tubes. The perforated ribbon of material clings to its roller and is afterwards consolidated with some new material fed from the hopper so that the ribbon is being continually replenished as it is fed towards the tube roller. The tubes now filled with material are carried round and the material is blown by compressed air from the tubes into a collecting chamber or may be delivered, in the case of pills, into a rolling device of any suitable construction where the pellets are made globular. Means are provided for graduating the thickness of the ribbon of material before it passes between the tube roller and the ribbon roller and for ensuring that the material shall adhere to the ribbon roller in its passage through the machine.

Apparatus in accordance with this invention and suitable for use in pill making is illustrated in the accompanying drawings in which Fig. 1 is a sectional elevation of the machine, Fig. 2 being a plan. Fig. 3 is a fragmentary sectional detail in elevation of the tube roller and pellet ejecting mechanism and Fig. 4 is a fragmentary sectional plan. Fig. 5 is a perspective view of an air nozzle and sealing shoe.

In the construction illustrated in the drawings the plastic material is primarily fed into a hopper 1 in the base of which are located two intermeshing grooved rollers 2, which co-act in the manner of the well known type of pump to draw the material 3 down between the rollers, the base of the hopper being shaped closely to shroud the teeth of the right hand roller so that the material 3 travels towards the left. A knife blade 4, pivotally mounted at 5 and adjusted by a screw 6 engaging the end of an arm 7, deflects the material 3 which passes over a lip 8 in the hopper side, the ribbon 3*a* of material falling into a lower chamber 9 through the open bottom of which it passes into a lower hopper formed by side plates 10 and the upper converging surfaces of two rollers, a compression roller 11 and a ribbon roller 12, the direction of rotation of which is indicated by the arrows. By suitably regulating the screw 6 the knife edge of the blade 4 may be so adjusted as to skim the material 3 off the teeth of the left roller 2, thus permitting the feed rollers 2 to deliver a maximum output, and by varying the position of the blade 4 the amount of material so delivered may be graduated from such a maximum to any desired minimum, or, by adjusting the blade 4 so that it contacts with the lip 8 the delivery may be entirely shut off. Mounted between the side plates 15 of the apparatus are three rollers, a compression roller 11, a ribbon roller 12 and a tube roller 13. The ribbon roller is preferably provided with side radial flanges 14 between which the compression roller 11 closely fits, the distance of the compression roller from the ribbon roller being such that as the rollers rotate a ribbon of material of the requisite radial thickness is produced. Annular grooves 15 may be formed in the ribbon roller to ensure that the consolidated ribbon of plastic material 16 shall adhere to and be carried round by the ribbon roller. It is found that in the manufacture of pills the elasticity of the plastic material from which they are formed varies with the temperature and consequently at certain temperatures the ribbon 16 of rolled material would swell slightly after leaving the feed roller 11 and ribbon roller 12 and this variation of radial thickness of the ribbon would result in different quantities of material being taken by the tubes of the tube roller 13. To avoid this an

additional graduating roller 17 is mounted in such manner that it may be adjusted relatively to the ribbon roller, this graduating roller again fashioning the ribbon to exactly the required radial depth just before such ribbon passes between its roller 12 and the tube roller 13. For this purpose the graduating roller 17 is mounted eccentrically on its spindle 18, a pointer 19 working over a graduated scale being provided to enable the roller 17 to be set at any desired distance from the ribbon roller 12 the pointer having a setting arm slotted at 20, so that after adjustment the roller 17 may be locked in position by a screw.

The tube roller 13 is provided with a series of radially disposed short tubes 21 which, as the roller rotates, enter the ribbons of material in the grooves 15, a definite amount of material passing into each tube and being carried round to the opposite side of the tube roller where it is blown out. The base of each tube is set in the tube roller the cylindrical wall of which is perforated at 22 below each tube to form an air inlet, and fixedly positioned in the interior of the tube roller is a bracket 23, Fig. 3, engaging the tube roller spindle 24. This bracket extends radially towards the inner wall of the roller 13 and has in its outer face an open cavity 25 from which a duct 26 extends to the side of the bracket Fig. 4, where it is connected to a pipe 27 communicating with any suitable source of air pressure. The open mouth of the cavity 25 is covered by a wrapping of leather or the like flexible and tough material 28 which is secured on the bracket by a strap 29 bolted at 30. The outer face of the leather wrapping 28 forms a distensible membrane in which are a series of holes corresponding in number and position to the annular rows of tubes in the roller 13, and each hole in the flexible membrane 28 is engaged by the nozzle 31, of a shoe 32, Fig. 5. Each shoe 32 is of thin sheet metal ground accurately to fit the concave inner face of the tube roller and is adapted to form an air seal between such roller and the bracket, the air pressure from the pipe 27 entering the cavity 21 and distending the flexible leather wrapping 28, which in turn presses the shoe 32 closely against the concave face of the roller 13. The nozzles 31 are perforated at 33 and consequently as the roller rotates the apertures 22 of each transverse row of tubes will successively pass the row of nozzles 31 in the shoes, jets of compressed air being thus blown into the tubes in each row and expelling the pellets 34 therefrom, such pellets, as previously explained, having been taken up by the tubes from the ribbon of material and carried round. By reason of the flexibility of the leather 28 and shoes 32 an effective air seal is maintained preventing any lateral escape of compressed air between the shoe and the roller, and it is found that the pellets in the tubes are driven cleanly therefrom without excessive air pressure being necessary. The expelled pellets 34 are caught in a funnel 35 and delivered, preferably, into a rotating cylinder 36, of any desired length, to enable the pellets to dry slightly before passing into the final pill shaping machinery. The funnel 35 is preferably provided with a buffer or panel 37 of some flexible or textile material so that any deformation of the pellets likely to arise from their impact with a hard surface is avoided, the delivery of the pellets from the tube roller 13 being so directed that they impinge resiliently against the textile cover 37 and subsequently fall down the funnel into the drying tube 36.

The pellets expelled from the tubes 21 are in the form of short cylinders. These after passing along the drying tube 36 are then delivered to the usual "rounding" or globular shaping machines used in pill making and consisting of twin belt runs having a relative transverse as well as longitudinal movement between which the pellets are rolled and shaped to a spherical form.

The three rollers 11, 12 and 13 are coupled together by gear wheels 11*a*, 12*a*, and 13*a*, the centre roller 12 being driven by a worm wheel 38, worm 39 and shaft 40, from an electric motor or other source. The hopper rollers 2 are driven from a sprocket wheel 41 on the ribbon roller spindle and chain 42 passing over a corresponding sprocket 43 on the spindle of one of the feed rollers 2.

In order to provide for detachability of the tube roller 13 so that another roller may be fitted having tubes of different diameter to make pills or the like of a greater or less capacity, the spindle of the tube roller 13 is mounted in slides 44 guided in the side plates 15 of the machine, the slides being adjustable by a cam 45 housed within a strap bracket 46. The cam is rotated by its shaft 47 from a milled wheel 48. By this means the roller 13 and its gear wheel 13*a* may be moved to the left, clear of engagement, to permit of it being removed and another tube roller inserted. Similarly, the compression roller 11 is preferably mounted in slides 49 adjustable by screws 50 in the machine casing for the purpose of graduating the setting of the roller 11 relatively to the ribbon roller 12 in order to produce ribbons of material of various thicknesses. The annular grooves 15 in the rollers 12 are found to be somewhat necessary to the effective action of the apparatus inasmuch as the grooves cause the material after being fashioned into a ribbon to cling to and be carried round by the central roller 12 instead of being carried round with the roller 11.

Where a considerable output is required and in order to distribute the consumption of compressed air somewhat evenly throughout the rotation of the tube roller, the tubes

may be arranged helically on the surface of the tube roller one or more tubes then only opening to the compressed air supply in sequence. In the arrangement shown the tubes in each transverse row are staggered and the rows parallel to the roller spindle but, as mentioned, the tube rows may be arranged slightly helically.

Utilization of compressed air for the ejection of the formed pellets offers many advantages, as in addition to being more efficient than a plunger type of ejection, the plastic material not lending itself satisfactorily to such an operation, the expansion of the compressed air as it leaves the tube from which the pellet is being expelled sets up a considerable reduction of temperature and a chilling effect on the pellets, which enables the material of the pellet to be more satisfactorily rolled or shaped. Similarly should the atmospheric temperature be too low the air may be heated to compensate.

While the invention has been mainly described in reference to, and is particularly suitable for, the manufacture of pills it would be available generally in the manufacture of small tablets or the like from plastic material.

I claim:

1. Apparatus for manufacturing small units or pellets from a mass of plastic material comprising rollers for forming the material into a ribbon or sheet upon and completely surrounding one of said rollers, a series of tubes adapted to be embedded into the ribbon or sheet and take up small pellets of the material and means for expelling the pellets from the tubes by compressed air.

2. Apparatus for manufacturing small units or pellets from a mass of plastic material comprising a feed hopper having means for graduating the delivery of the material, rollers for forming the material into a ribbon or sheet upon and completely surrounding one of said rollers, a series of tubes adapted to be embedded into the ribbon or sheet and take up small pellets of the material and means for expelling the pellets from the tubes by compressed air.

3. Apparatus for manufacturing small units or pellets from a mass of plastic material comprising rollers for forming the material into a ribbon or sheet, one roller being annularly grooved, a series of tubes adapted to be embedded into the ribbon or sheet and take up small pellets of the material and means for expelling the pellets from the tubes by compressed air.

4. Apparatus for manufacturing small units or pellets from a mass of plastic material comprising rollers for forming the material into a ribbon or sheet, an adjustable graduating roller co-operating with one roller to fashion the ribbon or sheet to any desired thickness, a series of tubes adapted to be embedded into the ribbon or sheet and take up small pellets of the material and means for expelling the pellets from the tubes by compressed air.

5. Apparatus for manufacturing small units or pellets from a mass of plastic material comprising rollers for forming the material into a ribbon or sheet, an adjustable graduating roller eccentrically mounted and co-operating with one roller to fashion the ribbon or sheet to any desired thickness, a series of tubes adapted to be embedded into the ribbon or sheet and take up small pellets of the material and means for expelling the pellets from the tubes by compressed air.

6. Apparatus for manufacturing small units or pellets from a mass of plastic material comprising rollers for forming the material into a ribbon or sheet upon and completely surrounding one of said rollers, a series of tubes radially disposed in the wall of a roller and adapted to be embedded into the ribbon or sheet to take up small pellets of the material, and means for expelling the pellets from the tubes by compressed air.

7. Apparatus for manufacturing small units or pellets from a mass of plastic material comprising rollers for forming the material into a ribbon or sheet upon and completely surrounding one of said rollers, a series of tubes radially disposed in the wall of a roller and adapted to be embedded into the ribbon or sheet to take up small pellets of the material, perforations in the wall of the tube roller below each tube, and means for expelling the pellets from the tubes by compressed air.

8. Apparatus for manufacturing small units or pellets from a mass of plastic material comprising rollers for forming the material into a ribbon or sheet upon and completely surrounding one of said rollers, a series of tubes radially disposed in the wall of a roller and adapted to be embedded into the ribbon or sheet to take up small pellets of the material, perforations in the wall of the tube roller below each tube, a bracket fixedly positioned within the tube roller and forming a duct for leading compressed air to the tube roller perforations, and means for expelling the pellets from the tubes by compressed air.

9. Apparatus for manufacturing small units or pellets from a mass of plastic material comprising rollers for forming the material into a ribbon or sheet, a series of tubes radially disposed in the wall of a roller and adapted to be embedded into the ribbon or sheet to take up small pellets of the material, perforations in the wall of the tube roller below each tube, a bracket fixedly positioned within the tube roller and forming a duct for leading compressed air to the tube roller perforations, a perforated flexible membrane enclosing the end of the bracket near the tube

roller perforated sheet metal shoes disposed between the membrane and the inner wall of the tube roller, and means for expelling the pellets from the tubes by compressed air as the tube roller rotates past the bracket.

In testimony whereof I affix my signature.

WILLIAM SUMNER.