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J. E. ROBERTS
EXTRUDING MACHINE

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2 Sheets-Sheet 2

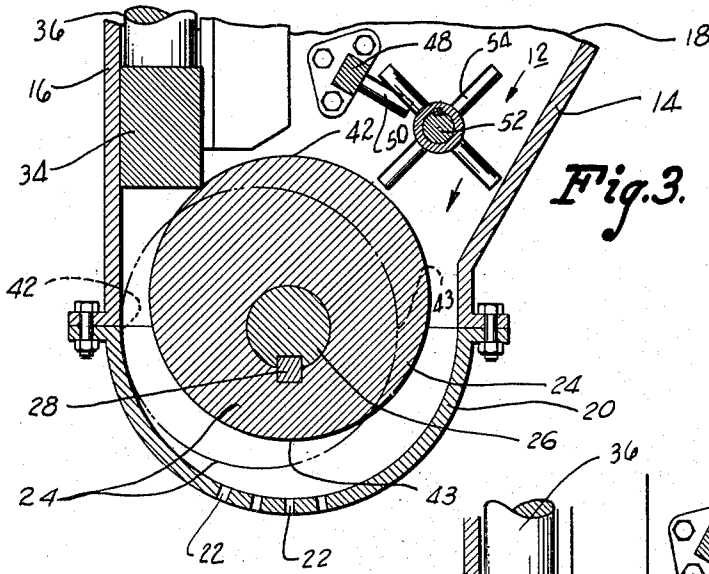


Fig. 3.

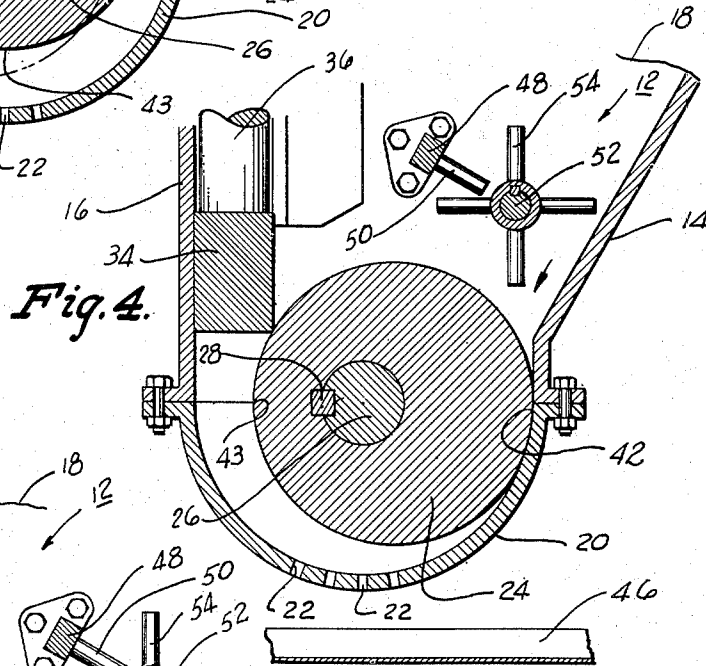


Fig. 4.

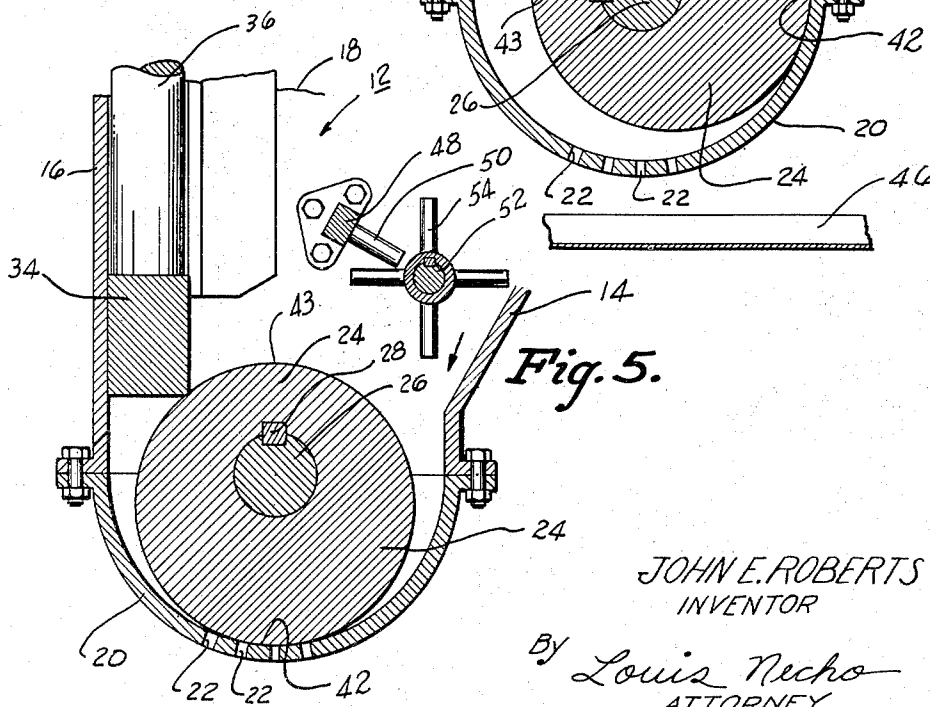


Fig. 5.

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EXTRUDING MACHINE

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6 Claims. (Cl. 18—12)

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My invention relates to an extruding machine of the type used for forming viscous or plastic material into predetermined shapes having predetermined dimensions preparatory to drying or other processing of such materials.

One object of the invention is to produce an improved drying machine.

In the art of extruding materials of the character described, it is necessary to avoid over compression of the material so as not to disturb its homogeneity. For example, in some instances, if the material is subjected to pressure exceeding a critical point, the liquid content of the material may be squeezed out. In other cases the over-compression of the material will result in building up resistance which will retard or altogether prevent passage of the material through the prescribed orifices. In still other materials over compression may otherwise adversely affect the texture, consistency or other characteristics of the material.

It is therefore a further object of the invention to produce an improved extruding machine by means of which various viscous materials may be extruded in a continuous manner and without any adverse effects on the consistency or other characteristics of such materials.

These and other objects are attained by my invention as set forth in the following specification and illustrated in the accompanying drawings in which

Fig. 1 is a side elevational view of an extruding machine embodying the invention.

Fig. 2 is a section on line 2—2 on Fig. 1.

Figs. 3, 4 and 5 are enlarged, fragmentary sections, looking in the direction of line X—X on Fig. 2, illustrating the manner of operation of the extruding machine.

The machine illustrated is supported on a pedestal or other suitable frame work 10 and includes a hopper 12 for receiving the material to be extruded. The hopper includes front and rear walls 14 and 16, side walls 18 and a substantially semi cylindrical bottom wall 20 having perforations 22 therein. The machine also includes a roll 24 which is excentrically mounted on a shaft 26 to which it is keyed as at 28. The shaft rotates in bearings carried by the side walls 18 of the hopper and is driven by a belt 30 engaging a pulley 32 carried by one end of the shaft. The belt 30 is driven by any source of power, not shown.

Coacting with the roll 24 is an elongated plunger 34 which is of the same length as the roll and which is carried by the piston 36 of an air cylinder 38 supplied with compressed air from a tank or the like 40. The plunger is preferably

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square or rectangular in cross section, so that the front edge thereof, which has following contact with the surface of the roll, acts as a wiper and so that the outer vertical face of the plunger slides vertically against the inner face of the rear wall 16 of the hopper as clearly shown in the drawings.

The apparatus thus far described operates as follows the roll 24 is caused to rotate at the desired speed and the material to be extruded is fed to the hopper above the roll. Due to the excentric mounting of the roll, the peripheral portion 42 thereof which is farthest from the center of the shaft 26 will have a wiping contact with successive portions of the interior of the semi-cylindrical bottom wall 20. For example, when the roll 24 is in the dotted line position of Fig. 3, the portion 42 of the roll has a wiping contact with the rear wall of the hopper and the opposite portion 43 which is nearest the center of the drive shaft 26 will be at maximum distance from the front wall of the hopper. This permits the material to be extruded to move, in the direction of the arrow in Fig. 3, into the lower portion of the hopper. As the roll rotates in clockwise direction, past the solid line position of Fig. 3 to the position of Fig. 4, the portion 42 of the roll comes into wiping contact with the front wall of the hopper. By this means the flow of material into the round bottom of the hopper is cut off and the movement of the roll, from the position of Fig. 4 to the position of Fig. 5, spreads the material which has entered into the lower portion of the hopper into a relatively thin film which is easily extruded through the holes 22 as the roll moves past the bottom wall 20 of the hopper. As the roll moves from the position of Fig. 5, its periphery moves progressively further away from the front wall of the hopper until maximum distance is reached in the position of Fig. 3. In other words the movement of the roll relative to the front wall of the hopper is such as to simulate the action of a valve which prevents entry of material into the lower portion of the hopper until the material which had previously entered has been extruded. It will be noted that the plunger 34, under action of compressed air, or other yielding, hydraulic or mechanical means, has a following contact with the rear wall 16 of the hopper and with the periphery of the roller. This prevents the material which is in the space below the roll, as shown in Fig. 4 from escaping between the roll and the rear wall 16 of the hopper before the roll has reached the position of Fig. 5 and has forced the material through the holes 22. The following plunger 34 thus provides the necessary pressure component to effect the extrusion of the material. In order to prevent

over compression of the material, the plunger is subjected to adjustable yielding pressure such as that produced by compressed air, by hydraulic cylinders or by mechanical springs. This permits adjustment according to the characteristics of different materials and permits the plunger to yield and allow the escape of material between it and the roll, if for any reason, pressure, beyond a predetermined value, should develop between the roll and the lower portion of the hopper.

The manner in which the roll coats with the front wall of the hopper to spread the material into a relatively thin film before the material is extruded, results from its excentric mounting on its axis of rotation and is an important feature of the invention because, when the material is thus spread thin, it can be forced through the openings 22 with much less pressure than would be required if the material to be extruded was in the nature of a relatively thick lump or layer interposed between a pressure exerting member and a perforated member. If the material is not spread thin, it will take increased pressure to force it through the perforated bottom of the well and this increased pressure expresses some of the liquid content of the material. The loss of liquid from the material hardens it and for all practical purposes it becomes impossible to extrude the material. In addition, the loss of liquid damages the texture of the material. Also, the wiping contact between the front edge of the plunger 34 and the periphery of the roller prevents accumulation of the material on the roll by scraping such material as may tend to adhere to the roll and forcing it back into the space below the roll shown in Fig. 3.

It will be seen from the foregoing that by the apparatus described, viscous or plastic materials are extruded in a substantially continuous manner, by first being formed into a relatively thin film and then forced through the desired holes under controlled, and therefore optimum pressure.

If desired, a belt or other conveyor 46 may be placed below the hopper for receiving the extruded material and conveying it to a drying chamber, or to other processing apparatus, not shown.

In certain cases it may be desirable to provide means for agitating or kneading the material as well as for assisting in the feeding of the material to the lower portion of the hopper. To this end, I provide a stationary rod 48 carried by the side walls of the hopper and having spaced fingers 50, and a shaft 52 journaled in the side walls of the hopper and having fingers 54 which interleave with the fingers 50. The shaft 52 may be rotated by a belt 56 which derives power from the shaft 26 and which engages a pulley 58 on one end of the shaft 52. The rotary movement of the fingers 54 through the material fed into the hopper, in cooperation with the fixed fingers 50 produces a kneading action and serves to force the material downwardly between the front wall of the hopper and the roller when the latter is spaced from said front wall during movement of the roller from the position of Fig. 5, through the positions of Fig. 3 and to the position of Fig. 4.

What I claim is:

1. An extruding machine including a wall defining a rounded well, at least a portion of the bottom of said well being perforate, an excentric roll mounted for rotation within said well, means for rotating said roll, the axis of rotation of said

roll being so located relative to the curvature of the well and the diameter of said roll relative to the diameter of said well being such that the peripheral portion of the roll nearest its axis of rotation will always be spaced from the interior of the well to permit introduction into the well of the material to be extruded, and so that the peripheral portion of the roll farthest from its axis of rotation will have a wiping contact with successive portions of the interior of the well to spread the material in the well into a relatively thin film and to extrude the material through the perforate portion of the bottom of said well, a hopper above said well, and a plunger mounted for sliding movement against a wall of said hopper and having the edges thereof in constant contact with said roll to prevent escape of material between the roll and the hopper wall.

2. The structure recited in claim 1 and means for applying predetermined yielding pressure on said plunger to prevent escape of the material being extruded, past the plunger, as long as the pressure on said material is less than said yielding pressure.

3. An extruding machine including a wall structure defining a well having its top open and having its lower portion rounded, at least a portion of the bottom of said well being perforated, an excentric roll mounted for rotation within said well, and means for rotating said roll, the axis of rotation of said roll being so located relative to the curvature of said well, and the diameter of said roll relative to the diameter of the rounded portion of the well being such that the peripheral portion of the roll nearest its axis of rotation will always be spaced from the interior of the well to provide room for receiving the material to be extruded, and so that the peripheral portion of the roll farthest from its axis of rotation will have wiping contact with the bottom of the well to extrude the material through the perforate portion of the bottom of the well.

4. The structure recited in claim 3 together with a plunger movable toward and away from the axis of rotation of the roll and having constant contact with the roll and with the juxtaposed wall of the well.

5. The structure recited in claim 4 together with means for forcing the material to be extruded into the lower portion of the well between the peripheral portion of the roll which is nearest its axis of rotation and the opposite wall of the well.

6. The structure recited in claim 3 together with means for intermittently forcing the material to be extruded into the lower portion of the said well between the peripheral portion of the roll which is nearest its axis of rotation and a wall of said well.

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