United States Patent

[11] 3,592,129

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[21] Appl. No. **722,832**
[22] Filed **Apr. 22, 1968**
[45] Patented **July 13, 1971**

[54] **MACHINE FOR PROCESSING POWDER OR PASTELIKE MATERIALS INTO A GRANULATE OR THE LIKE**
4 Claims, 5 Drawing Figs.

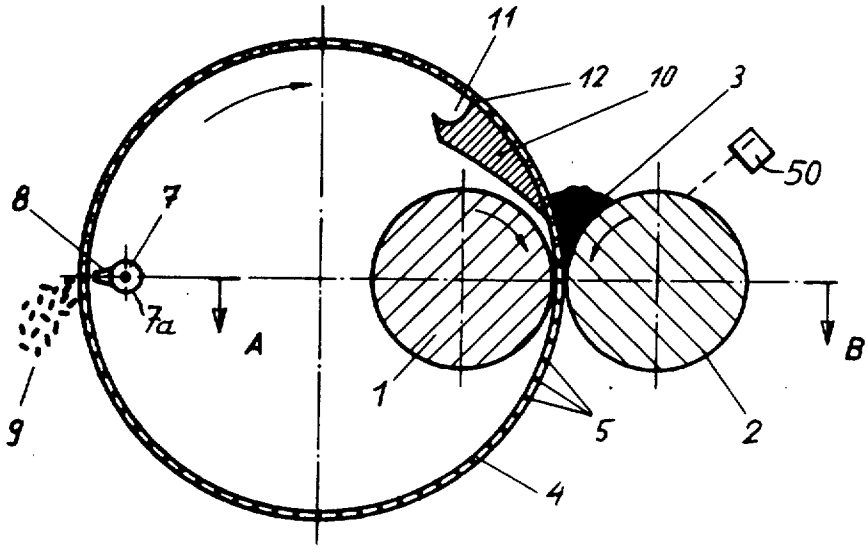
[52] **U.S. Cl.** **100/157**, 18/1, 25/76, 100/160, 100/176, 107/14
[51] **Int. Cl.** **B30b 3/04**
[50] **Field of Search** ..... 100/157, 160, 176; 18/1 B, 12 R, 12 A; 25/DIG.13, 76; 107/8.3, 8.35, 8.55, 11, 14.1, 14, 15.5, 54.65

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ABSTRACT: A machine for processing or working powdery or pastelike materials into a granulate at the wedge gap between two opposite rotating rollers. A forming ring member rotates between the rollers, and the forming means are arranged at such ring member.



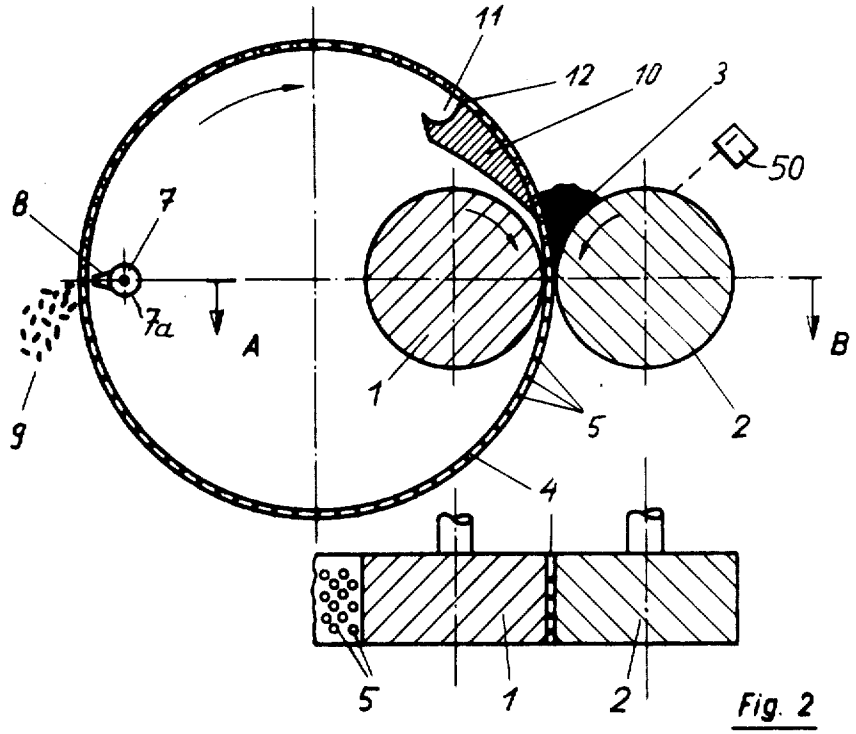


Fig. 1

Fig. 2

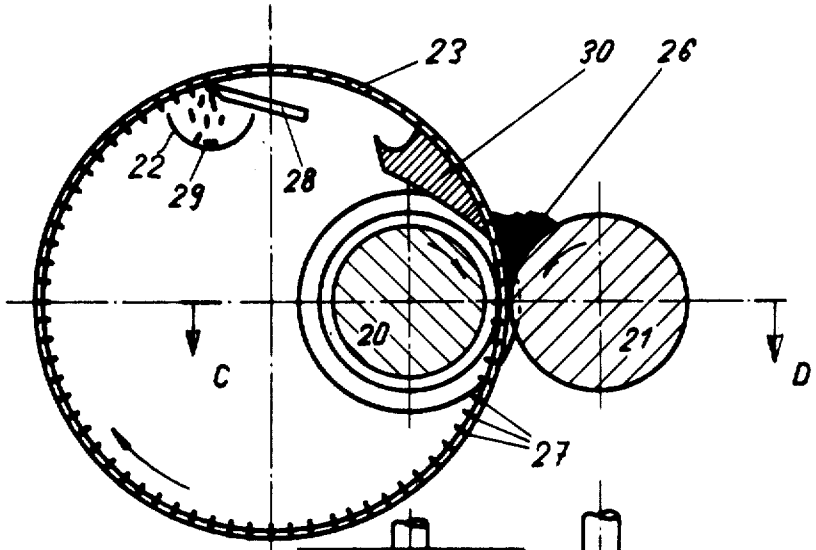


Fig. 3

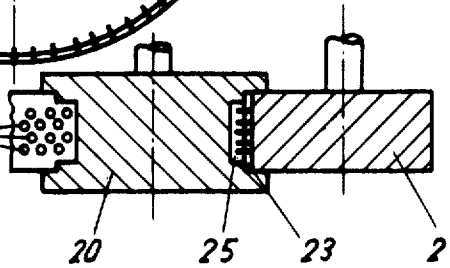


Fig. 4

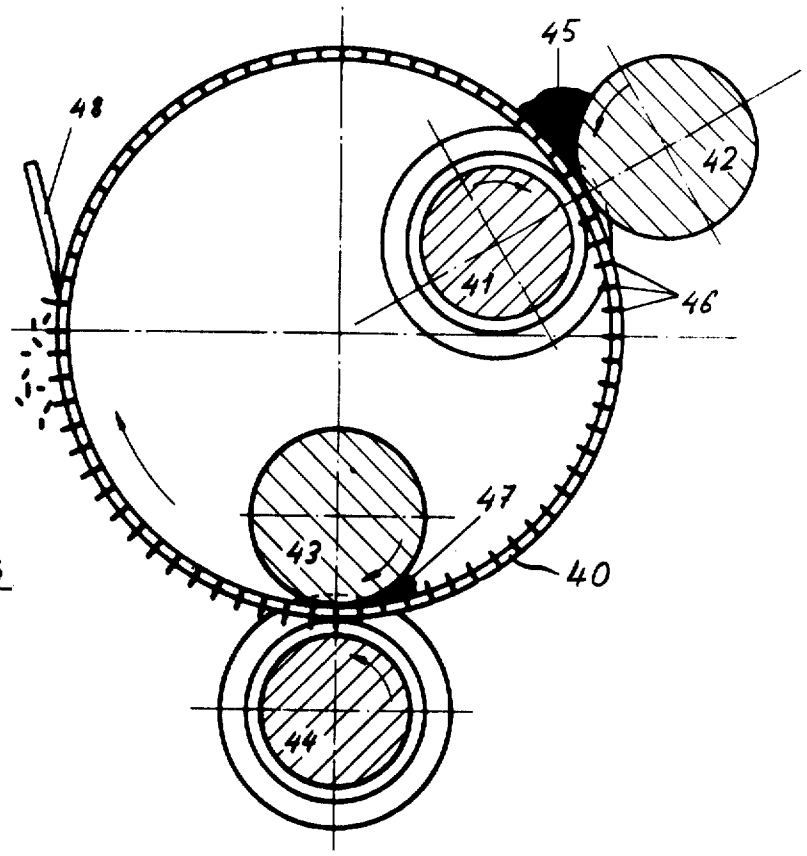


Fig. 5

MACHINE FOR PROCESSING POWDER OR PASTELIKE MATERIALS INTO A GRANULATE OR THE LIKE

BACKGROUND OF THE INVENTION

The present invention relates to an improved machine for the working or processing of powdery or pastelike materials into a granulate and, more specifically, is of the type wherein according to the invention the forming or molding means or the forming apertures are not provided at the roller members themselves, rather at a forming ring which travels or revolves between both of the roller members.

In the known prior art roller-granulation devices a pressure is exerted by the so-called wedge effect at the product between both of the oppositely rotating roller members. This pressure presses the product which is to be granulated through bores or into molds or forming means which are arranged at one or both roller members. These prior art physical constructions have the drawback that the grain size of the granulate is limited at its lower dimension to about 3 millimeters. Likewise, it is often difficult to obtain a uniform length of the granulate. If solid materials are processed, wherein the strength of the granulate is determined by thermal techniques, for instance by cooling or chemical processes, then an operationally reliable processing of the product is difficult to attain. On the one hand, a marked differentiation between the plastic and the solid zone is not possible, and, on the other hand, an insufficient residence time exists between both zones.

SUMMARY OF THE INVENTION

Accordingly, it is a primary object of the present invention to provide an improved machine for processing powdery or pastelike material into a granulate which effectively overcomes the aforementioned drawbacks of the prior art structures.

Still a further important object of the present invention resides in the provision of an improved machine for effectively and reliably working or processing powdery or pastelike material into a granulate in an economical and highly efficient manner.

Now, in order to implement these and still further objects of the invention, which will become more readily apparent as the description proceeds, the inventive machine is generally manifested by the features that the forming or moulding means or the forming apertures are arranged in an intermediate ring member which is disposed between the roller members.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be better understood, and objects other than those set forth above, will become apparent, when consideration is given to the following detailed description thereof. Such description makes reference to the annexed drawings, wherein:

FIG. 1 is a cross-sectional view through a first embodiment of inventive machine equipped with smooth roller members;

FIG. 2 is a longitudinal sectional view through the machine of FIG. 1, taken along the line A—B;

FIG. 3 is a cross-sectional view through a modified form of inventive machine equipped with hollow roller means;

FIG. 4 is a longitudinal sectional view of the machine shown in FIG. 3, taken along the line C—D thereof; and

FIG. 5 is a cross-sectional view through a further form of inventive machine equipped with two pairs of roller members, incorporating hollow roller means.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Describing now the drawings, in FIGS. 1 and 2 there is schematically illustrated a first embodiment of inventive machine equipped with a pair of smooth roller members 1 and 2. A forming ring member 4 travels or rotates between the roller members 1 and 2 at the wedge gap 3. This forming ring member 4 is either driven by the friction prevailing in the wedge gap 3 or by means of teeth which are provided at the roller member 1 which engage in lateral perforations of the forming ring member 4. The material which is deposited in the wedge gap 3 is pressed by virtue of the wedge gap effect into the forming apertures or holes 5 provided at the forming ring member 4. This revolving forming ring member 4 transports the thus formed molded or processed particles to the ejection device 7.

In the presently considered embodiment, this ejection device 7 comprises a compressed-air pipe or conduit 7*a*. The pronounced air jets which emanate through the nozzle means 8 eject or disburse the formed particles 9 out of the forming apertures 5. This principle of ejection of the material is generally employed for small granulate material in conjunction with appropriately suited apertured forming means. In the case of larger formed particles mechanical ejection devices are employed, the control of which takes place by means of the previously mentioned lateral perforations of the forming ring member. If the forming ring member is very elastic, then, the ejection of the formed particles can also occur by carrying out a pronounced deflection of the forming ring member by means of rollers or by a sudden jarring or jolting thereof. In order to prevent any premature dropping through of the powdery starting material in the wedge gap 3, the forming ring member 4 can be guided past a guide or slide shoe 10. The latter is provided with a trough 11 which simultaneously serves to collect any waste material which is scraped away from the inner wall of the forming ring member 4 by the edge 12 provided at this guide shoe 10.

The just described embodiment is particularly suitable for very small granulate, for instance having a diameter of 1 millimeter and a length of 1 millimeter, wherein the forming ring member is constructed to possess a thickness of only 1 millimeter. For larger briquetlike pieces the forming means can also be arranged at only one side, that is to say only at the outside of the forming ring member.

If with the aforedescribed mode of operation it is desired to produce individual formed particles or bodies in forming means which are closed at all sides, then in FIGS. 3 and 4 there is schematically illustrated an exemplary embodiment of a machine providing for continuous forming. For this case, a forming ring member 23 again rotates between the roller members 20 and 21. This forming ring member 23 is provided with nozzlelike constructed forming or molding apertures 24. The roller member 21 is constructed to be smooth and provides a pressure roller, whereas the roller member 20 is provided with a hollow compartment 25 beneath the forming apertures 24 of the forming ring member 23, so that the strandlike product 27 which is pressed out of the wedge gap 26 through the forming apertures 24 can freely escape. These strands of material or particles are cut into individual pieces 29 during further rotation of the forming ring 23 by means of the knife 28 and, in known manner, are transported away by means of a trough 22. For powdery materials where the danger exists that it will fall through the forming apertures 24 at the region of the wedge gap 26, there is once again provided the guide shoe 30.

FIG. 5 depicts a special embodiment of the invention in which there is undertaken a double forming of the material in order to improve its consolidation or compaction. In this instance, the forming ring member 40 travels between two pairs of rollers 41, 42 and 43, 44, where in one instance the inner roller 41 and in the other instance the outer roller 44 is constructed as a hollow roller, in other words provided with a hollow compartment in the manner previously explained during the discussion of the embodiment of FIGS. 3 and 4. The material which is deposited into the wedge gap 45, as described in connection with FIGS. 3 and 4, is initially pressed inwardly. The thus-formed strands 46 or the like are again engaged in the other wedge gap 47 and pressed towards the outside, where they are cut into individual pieces by the knife 48, as shown. With an appropriate size of the forming ring

member 40 it is possible to also provide further pairs of rollers in the manner previously considered.

The machine of the invention provides particular advantages during the processing or working of plastic materials which at the wedge gap, at elevated temperatures and in a molten plasticized condition, are pressed into the forming ring member, and whereby the roller members are heated. By cooling the forming ring member during its further revolving path of travel by means of blowing air or gas thereon, the formed particles or material are cooled and solidified to such an extent that they can be cut. The forming ring member after the cooling between the knife, also without the wedge gap, can be again heated up by hot air or by inductive means.

Furthermore, in order to improve the wedge gap effect oftentimes one roller member has imparted thereto a somewhat greater velocity and therefore an improved friction is achieved at the wedge gap. A similar effect can also be achieved for different materials in that, one roller member of the pair of rollers is tangentially or radially oscillated at the wedge gap, as such has been schematically depicted in FIG. 1 by the oscillating drive means 50.

The teachings of the invention can also be practiced with toothed rollers. In this case, then, the forming ring member is provided either externally or internally with appropriate counter teeth, and whereby the forming apertures are then provided at the base of the teeth.

Thus, while there has been shown and described present preferred embodiments of the invention, it is to be distinctly understood that the invention is not limited thereto but may be otherwise variously embodied and practiced within the scope of the following claims. Accordingly,

I claim:

1. A machine for processing powdery or pastelike materials into a granulate comprising a pair of oppositely rotating roller means defining therebetween a wedge gap at which the material is formed into a granulate, a ring member disposed to rotate between said pair of roller means, and forming means provided at said ring member, and wherein one of said roller means is provided with a hollow compartment and said rotating ring member bears against said one roller means, the other of said roller means serving to press the material through the wedge gap so that the product is pressed at one side by means of said other roller means into said ring member and at the opposite side of said ring member is ejected into said hollow compartment of said one roller means.

2. A machine for processing powdery or pastelike materials into a granulate as defined in claim 1, wherein said forming means define a plurality of forming apertures.

3. A machine for processing powdery or pastelike materials into a granulate as defined in claim 1, wherein said ring member is fixedly limited by said pair of roller means so that the length of the formed material particles is determined by the thickness of said ring member.

4. A machine for processing powdery or pastelike materials into a granulate as defined in claim 1, wherein a number of pairs of roller means are arranged behind one another at said ring member, whereby the material is subjected to at least one additional processing step.