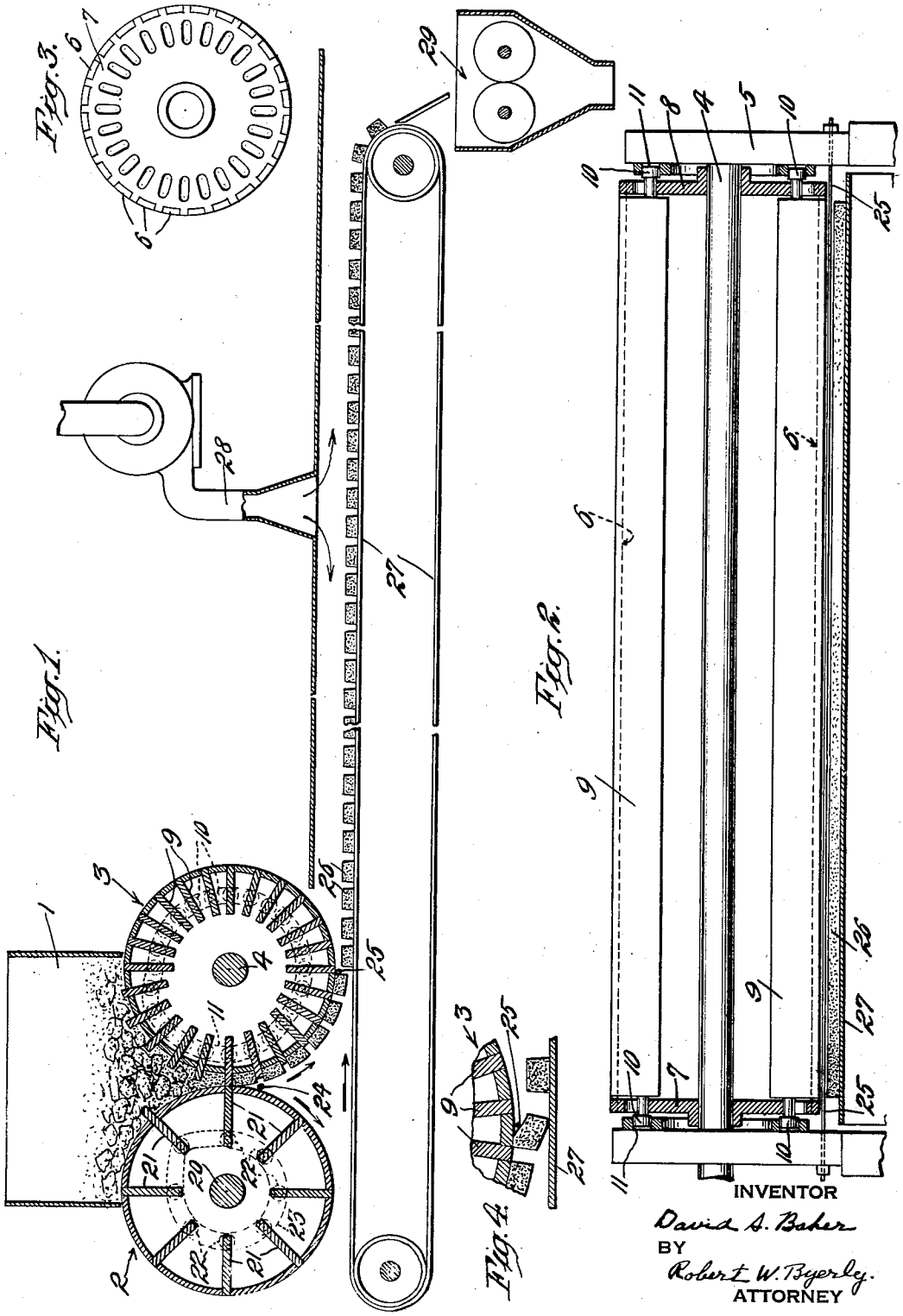
Sept. 21, 1937. D. S. BAKER 2,093,407

METHOD AND APPARATUS FOR TREATING PLASTIC MATERIAL

Filed Feb. 27, 1934 3 Sheets-Sheet 1



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Fig. 9

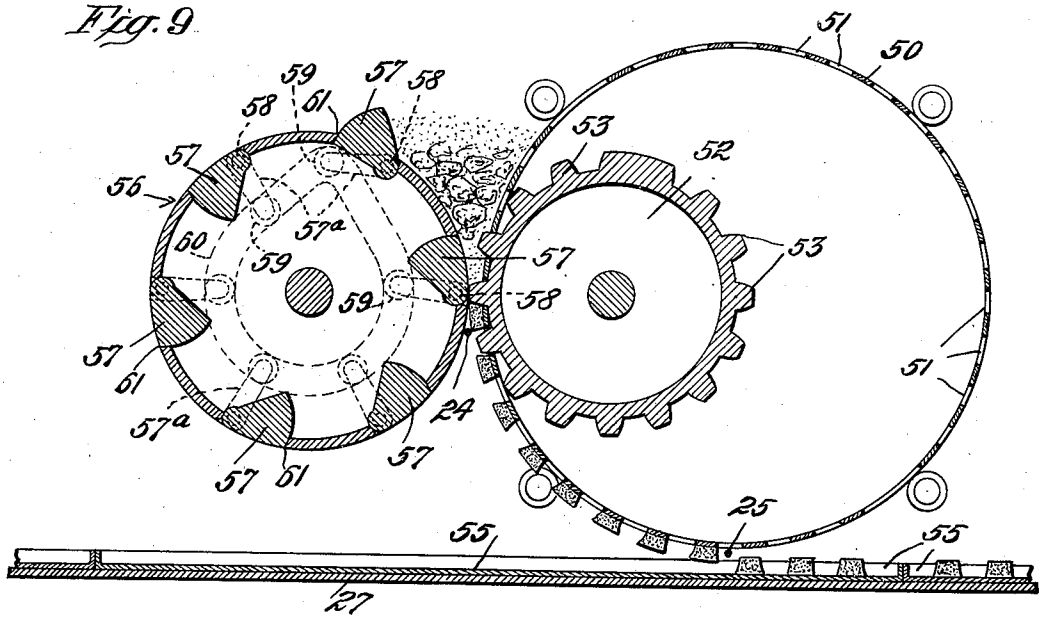
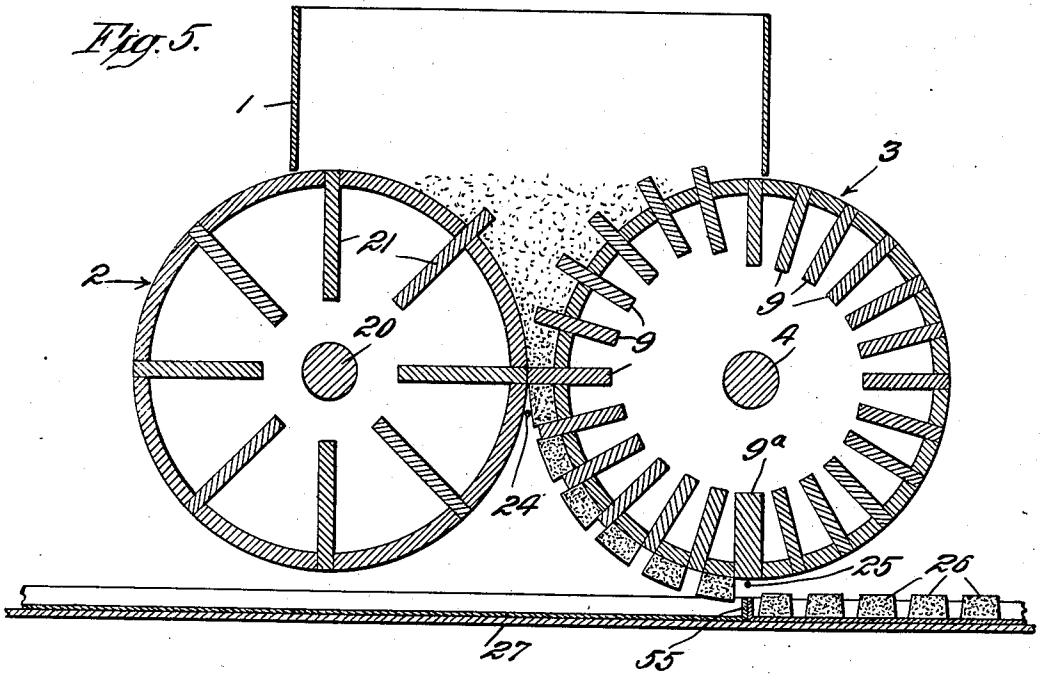


Fig. 5.



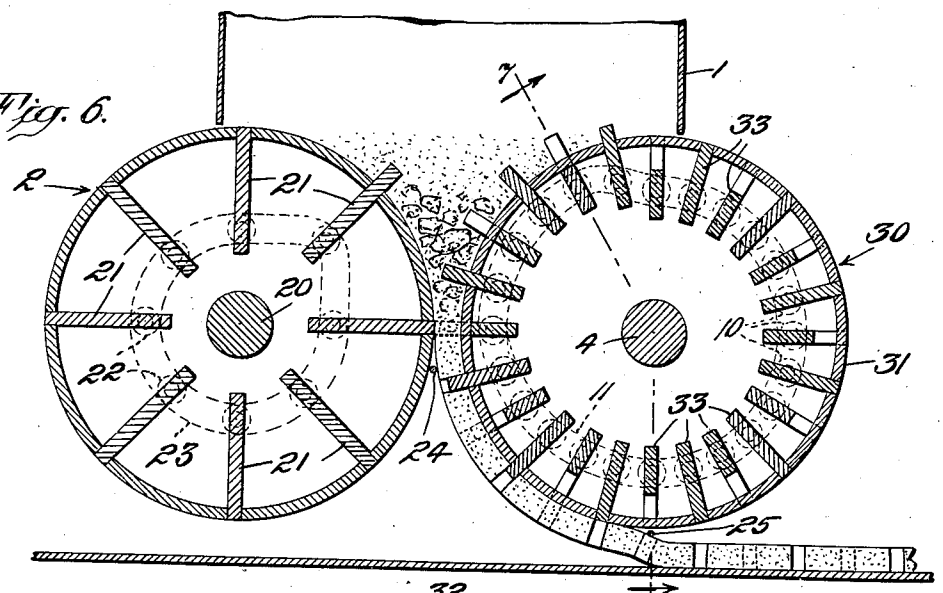
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Fig. 6.



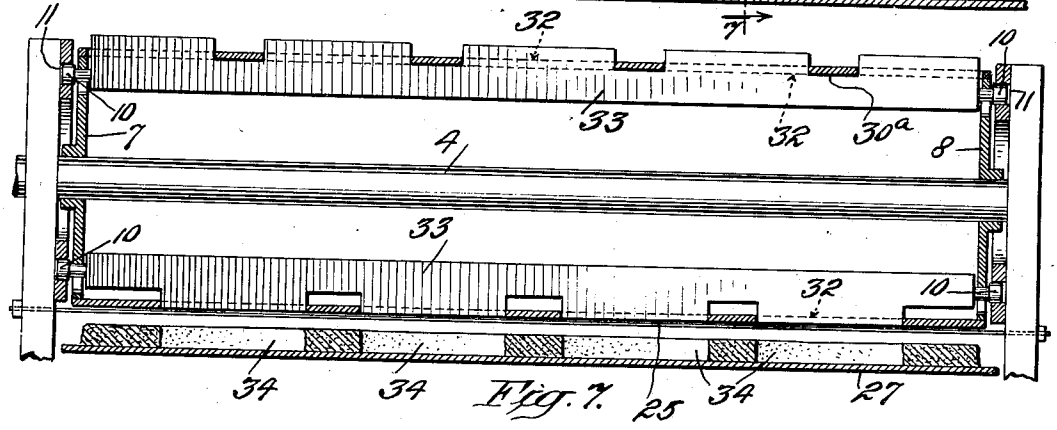


Fig. 7.

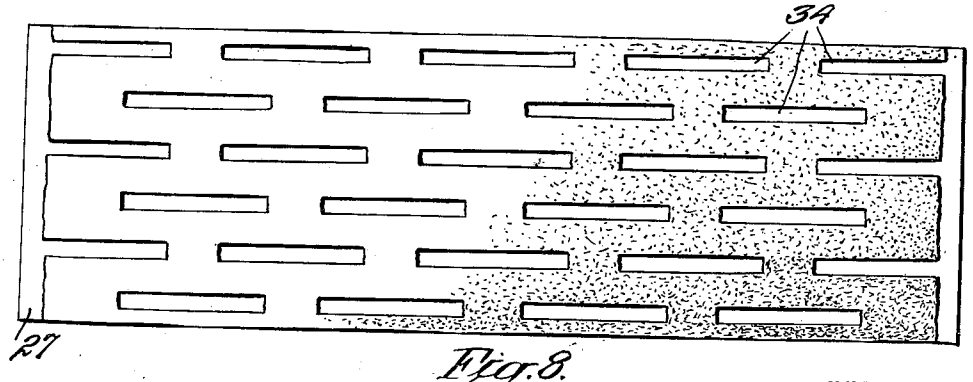


Fig. 8.

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UNITED STATES PATENT OFFICE

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METHOD AND APPARATUS FOR TREATING PLASTIC MATERIAL

David S. Baker, Greenwich, Conn.

Application February 27, 1934, Serial No. 713,117

22 Claims. (Cl. 25—76)

This invention relates to a method and apparatus for treating plastic material.

More particularly, the invention relates to a method and means for converting into uniform and measured form material which in some stage of its treatment is lumpy, wet, slimy, slippery, tacky, or otherwise constitutes a mass which is difficult, and in many cases disagreeable, to manipulate.

One of the several fields of use that are particularly contemplate for my invention is the preparation of paint pigments, such as lithopone, white lead, dry colors, insecticides, gypsum, etc., wherein a mass of wet, colored and highly adhesive material is produced in vats and presses and must be transformed into a dry and pulverized form. One of the chief difficulties encountered in treating such materials is their sticky or tacky nature which makes them tend to adhere to whatever comes in contact with them.

Heretofore lumps of such material have been shovelled into trays and an attempt made to level off the mass with hand paddles or trowels, and the trays thereafter placed in racks to dry. Because the hand-loaded trays did not contain a uniform amount of material, the time required for drying each tray was by no means uniform. The operations of hand loading the trays and drying have consumed an altogether disproportionate amount of time, and have limited the production of many plants to an amount far below the capacity of other departments.

Furthermore, the material near the edges of the trays dries much more rapidly than that at the center of the trays, thereby causing the material near the edges to become overbaked. This is a distinct disadvantage since many of the materials in the treatment of which I contemplate using my invention, such as dry colors for example, are definitely weakened and impaired by overbaking.

For a long time attempts have been made, particularly in the chemical industries, to develop a practical mechanical way of handling a mass of such material, and loading it uniformly into trays or other receving means for drying. It has been realized that by so dong, the drying time as well as the loading time would be enormously decreased, and the quality of the final dry product would be improved.

Attempts have been made to extrude such materials between cooperating rolls, and to separate it therefrom by means of scrapers. These attempts, however, have been failures because the material adheres to and builds up upon the scraper blade, and finally falls away in masses which are irregular in form and amount, and present the same problems as the material originally supplied to the device.

My invention overcomes the difficulties which have heretofore prevented the automatic handling of tacky plastic materials. My method of handling such materials involves, first, the molding of the material, second, the severing of the molded material from the surfaces against which it is molded, third, distributing the molded material in a uniform manner, fourth, subjecting the uniformly distributed molded material to a drying gas such as heated air, and, finally, pulverizing the dried molded material. I am, of course, aware that many sorts of plastic materials have been molded for various purposes, but, so far as I am aware, molding has not been included as a step in any process for putting material into pulverized form, nor has the step of severing a molded material from a molding surface been included in the known process of molding.

My invention includes also automatic apparatus for continuously carrying out this method of handling tacky plastic materials. The apparatus, in one practical embodiment, includes two endless molding surfaces and a receiving surface, all continuously moved in timed relation to one another, and means for severing the molded material from each of the molding surfaces. The molding surfaces are most conveniently formed as the surfaces of two adjacent cylinders rotated in opposite directions, while the receiving surface is horizontal and moves under the lowest point of one of the cylinders. The tacky material is supplied between the cylinders, and is molded between them at the point where their surfaces most closely approach each other. A severing means, such as a wire, is located close to one of the cylindrical surfaces just beyond this point to sever the molded material, or the greater part of it, from this cylinder and to allow it to travel along on the surface of the other cylinder to which it adheres. A second severing means, such as a wire, is located adjacent to the surface of this cylinder at or near the lowest point of this surface to sever the molded material, or the greater part of it, from this cylinder and to permit it to fall without change of form upon the receiving surface which is moving under this cylinder at substantially the same speed as that of the peripheral surface of the molded material on the cylinder.

An important feature of the invention consists in providing means for forming air spaces

in the molded material to facilitate its drying. These spaces most desirably, although not necessarily, extend completely across the molded material so that the molded material is given the form of a series of separate, spaced, long, narrow bars. The means for forming these air spaces is a series of vanes or mold sides which are automatically projected from one of the cylindrical mold surfaces while the material is being molded against this surface, and are withdrawn within this surface before the molded material on the surface reaches the severing wire by means of which it is separated from this surface.

Other features and advantages of the invention will be pointed out in connection with dedetailed descriptions of a number of forms of practical apparatus embodying the invention, which are shown in the accompanying drawings in which:

Fig. 1 is a diagrammatic side elevation, partly in section showing one form of apparatus embodying my invention;

Fig. 2 is a front elevation of the mold member shown in Fig. 1, partly in section;

Fig. 3 is an end view on the line 3—3 of Fig. 2;

Fig. 4 is a detailed view showing the removal of the molded bars from the member shown in Fig. 1;

Fig. 5 is a vertical section of the modified apparatus adapted to load the molded bars into trays;

Fig. 6 is a vertical section showing another embodiment of the invention;

Fig. 7 is a vertical section taken on the line 7—7 of Fig. 6;

Fig. 8 is a top plan view of a portion of the formed material after leaving the device illustrated in Figs. 6 and 7;

Fig. 9 is a vertical section showing a further modification of the invention.

The apparatus shown in Figs. 1 to 4 includes two cylinders 2, 3, and a traveling platform 27. By a common driving means not shown in the drawings, the cylinder 2 is continuously rotated in a clockwise direction, the cylinder 3 in an anticlockwise direction, and the platform 27 is continuously moved towards the right. The adjacent upper quadrants of the two cylinders are enclosed by a hopper 1, to which the tacky material is supplied. The shafts 20 and 4 of the two cylinders are supported on fixed standards, of which those for the shaft 4 are shown at 5 in Fig. 2. A severing wire 25 is stretched between the standards 5 so as to lie close to the periphery of the cylinder 3 near the lowest point of this cylinder. A severing wire 24 is similarly stretched between the standards 5 for the shaft 20 so as to lie close to the surface of the cylinder 2 just below the point at which the two cylinders are closest to each other.

The periphery of the cylinder 3 is formed by a number of cross-members 6 which rest in seats 7 provided therefor on the ends 8 of the cylinder 3. Within the periphery of the cylinder 3 are a number of vanes 9 of substantially the width of the spaces between the cross-members 6. Each of the vanes 9 has a cam roller 10 mounted in a cam race 11, which is so formed that each vane is projected beyond the periphery of the cylinder 3 shortly after it enters the hopper 1, and is retracted into the space provided between two of the cross-members 6 shortly before it reaches the lowermost point of the cylinder 3, so that it may pass under the severing wire 25. When the vanes 9 are projected beyond the periphery of the cylinder 3, they constitute with the periphery of the cylinder 3 a number of long, narrow, three-sided molds.

The cylinder 2 is also provided with movable vanes 21 whose function is to force the material in the hopper into the molds carried by the cylinder 3. The vanes 21 have cam rollers 22 mounted in a cam race 23, which is formed to project each vane beyond the surface of the cylinder 2 shortly after it enters the hopper 1, and to retract it just before it reaches the point at which the two cylinders are closest to each other so that it may pass under the severing wire 24.

The vanes 21 are spaced far enough apart to prevent any lumps in the material supplied to the hopper from bridging across between them. The space between the vanes 9 may be less, and is preferably about equal to the height of the vanes when projected and very much less than the length of the cylinders.

In the operation of the apparatus described, the vanes 21 of the cylinder 2 engage the material in the hopper and forcibly introduce it into the three-sided molds formed by the vanes 9 and the periphery of the cylinder 3. When each mold reaches the point at which the cylinders are closest together, the peripheral surface of the cylinder 2 closes the top of the mold and molds the outer surface of the material in it. At this point, the material in the mold, because of its tacky nature, adheres to all four sides of the mold. The material in the mold is then brought in contact with the severing wire 24, which severs it, or the greater part of it, from the surfaces of the cylinder 2. Some small part of the material may pass under the wire and travel around on the surface of the cylinder 2 by which it is returned to the hopper.

As each part of molded material, after being severed from the surface of the cylinder 2, travels down on the surface of the cylinder 3, it is freed from the mold sides or vanes 9 by the retraction of these sides within the periphery of the cylinder 3. Because of the tackiness of the material, each molded bar continues to adhere to the peripheral surface of the cylinder 3 after the retraction of the mold sides adjacent to it until it encounters the severing wire 25, which severs the inner surface of the bar from the peripheral surface of the cylinder 3 and permits it to drop on the traveling platform 27. A small part of the material of each bar may pass under the wire 25 and continue to adhere to the surface of the cylinder 3, in which case it is returned to the hopper by this surface.

As the traveling platform is at only a short distance below the lowest point of the cylinder 3, the bars are received on the platform without material change of form. The platform is most desirably driven at a speed equal to the peripheral speed of the outer surface of the molded bars on the cylinder 3, so that the speed of movement of the bars and the spacing between them is the same on the platform as on the cylinder.

The modified apparatus shown in Fig. 5 provides for loading the tacky material into a series of separate trays. This figure shows abutting trays 55 carried by the moving platform 27 under the cylinder 3. To avoid depositing any of the molded bars on the abutting ends of the trays 55, the cylinder 3 is provided with a vane 9a, which has a width slightly greater than the width of the abutting ends of the two trays, so that an extra space is provided between the two bars

which are molded on opposite sides of this vane. In order to secure a registering of the vane **9a** with the abutting ends of the trays, the movements of the platform **27** and the cylinder **23** are so related that during one revolution of the cylinder **3** the platform moves a distance equal to the length of one tray. To attain this relation and, at the same time, make the rate of movement of the platform equal to the rate of movement of the molded bars on the cylinder, each tray is of a length equal to the circumference of the cylinder measured along the outer surfaces of the molded bars. The trays may, however, be made of a length equal to any aliquot part of the circumference of the cylinder and a plurality of wide vanes like the vane **9a** may be provided in equally spaced positions around the cylinder.

In Figs. 6, 7, and 8, a modification of my invention is shown adapted to form the material into a continuous strip or mat having a number of air spaces evenly distributed therein. To accomplish this result, a forming member **30** is used which is provided with a continuous or unitary periphery **31** perforated by a number of openings **32** which may be formed by a simple stamping operation, and the openings **2** are uniformly spaced apart and staggered with respect to one another. Vane members **33** are provided which are adapted to project through the spaces **32** provided in the periphery **31** of the forming member **30**. The movement of the vanes may be controlled by cams mounted in a cam race as fully described in connection with the vanes on the member **3** of Figs. 1 and 5.

As illustrated in Fig. 6, the material is positively pressed onto the forming member **30** by any suitable means such as the member **2** fully described in connection with Figs. 1 and 5, while the ends of the vane members **32** are projecting through the apertures **31**, and are molded around said projecting ends. The ends of the vanes are then withdrawn, leaving the material perforated with a uniform pattern of air spaces **34**, as illustrated in Fig. 8.

The continuous strip or mat of material is separated from the forming roll by the wire **25** which is positioned adjacent the lower surface of the roller and extends longitudinally thereacross, as illustrated in Fig. 5.

In Fig. 9 another form of forming device is illustrated comprising an outer cylindrical member **50** having a number of apertures **51** evenly spaced around its periphery, and an internal rotary member **52** having a number of projections **53** thereon adapted to register successively with the apertures **51**. The size and position of the member **52** with respect to the member **50** is such that the projections **53** will extend through the apertures **51** while the material is being fed to the forming member, and, after the forming operation, will be withdrawn within the periphery of the member **50** before the formed material approaches the wire **25** stretched longitudinally across and adjacent to the member **50** by which the formed material is cut off onto the trays **55**, as illustrated, or onto any other suitable means.

In conjunction with the member **50**, the feeding member **56** is shown having modified vanes **57** pivoted thereon by the pivots **58**. The members **57** are controlled by the arms **57a**, each having a cam roller **59** mounted in a cam race **60** by which said members **57** are caused to project through apertures **61** during a portion of each rotation of the member **50**, and are withdrawn so that the outer ends of said members **57** will be flush with the surface of the member **50** during the remaining portion of each rotation of said member. It will be noted that the free ends of the members **57** are arcuate in form, all points of the arc being an equal distance from the pivot **58**. This structure has the advantage of permitting the members **57** to entirely fill the apertures **61**, regardless of the position of the members **57**, thereby preventing the material from entering the member **56** through the apertures **61**.

In the modifications illustrated, the severing means is shown as a wire of circular cross-section. In practice, I have found a steel piano wire a most satisfactory severing means. The expression "wire" as used herein, however, should not be understood as limited to wire of any particular size or cross-sectional shape, as any form of wire or small bar not having a sufficiently extended surface to cause the tacky material to build up as it does on a scraper may be used as the severing means and is, for this purpose, equivalent to the round wire illustrated.

What I claim is:

1. Apparatus for handling dyes, colors, intermediates and the like material, comprising a rotated cylinder, a traveling platform passing under said cylinder and moving in the same direction and at substantially the same speed at the lowest point of the periphery of the cylinder, means for molding the plastic material against the peripheral surface of said cylinder at a distance from its lowest point, and a wire adjacent to the peripheral surface of said cylinder near its lowest point for diverting the molded material from the surface of the cylinder to the platform.

2. Apparatus for handling dyes, colors, intermediates and the like material, comprising two adjacent cylinders rotated in opposite directions to mold the said material between them at their closest point, and two wires, one located adjacent the peripheral surface of one of said cylinders just below the point where said cylinders approach closest together, and the other adjacent the peripheral surface of the second cylinder at the point of discharge of the molded material.

3. Apparatus for handling paint and paint pigment material, comprising two oppositely rotated adjacent cylinders, a hopper for the plastic material enclosing the upper adjacent quadrants of said cylinders so that said material is molded between said cylinders at their closest point, a moving platform extending under one of the cylinders, a wire extending adjacent to the surface of the second cylinder just below the closest point of the cylinders to sever the molded material therefrom, and a wire extending adjacent to the surface of the first cylinder near its lowest point to sever the molded material therefrom and direct it upon said platform.

4. In apparatus for handling tacky plastic material, the combination of a rotary cylinder, means for supplying the material to a part of the peripheral surface of said cylinder, a wire extending adjacent to another part of the peripheral surface of said cylinder to sever the molded material therefrom, longitudinal vanes projectable through the surface of said cylinder, and means for projecting each vane when it reaches the part of the surface to which the material is supplied and for retracting it before it reaches the wire.

5. Apparatus for handling tacky plastic material, comprising adjacent feeding and molding cylinders rotated in opposite directions, a hopper

for the material enclosing the adjacent upper quadrants of the cylinders, a severing wire extending adjacent to the surface of the feeding cylinder just below the closest point of the cylinders, a second severing wire extending adjacent to the surface of the molding cylinder near the lowest point thereof, a series of longitudinal mold-forming vanes projecting from the surface of the molding cylinder within the hopper, a series of feeding vanes projecting from the surface of the feeding cylinder within the hopper, means for retracting each feeding vane before it reaches the first severing wire, and means for retracting each molding vane before it reaches the second severing wire.

6. Apparatus for preparing tacky plastic material for pulverizing, comprising two cooperating members, said members together having four molding surfaces, means for withdrawing two of said molding surfaces, and wires brought between said material and each of said two remaining surfaces respectively to separate the molded material therefrom.

7. In an apparatus for preparing plastic material to be pulverized, a member having three molding surfaces, a second member positioned at a predetermined distance from said first member and having a fourth molding surface, means for withdrawing three of said surfaces, and a wire adjacent said fourth surface for separating the material from said fourth surface.

8. In an apparatus for preparing plastic material to be pulverized, a member having three molding surfaces, a second member positioned at a predetermined distance from said first member and having a fourth molding surface, a wire for separating the material from said fourth molding surface, means for withdrawing two of the molding surfaces on said first member, and a second wire for separating the material from the third molding surface of said first member.

9. In an apparatus for preparing plastic material to be pulverized, a member having three molding surfaces, a second member positioned at a predetermined distance from said first member having a fourth molding surface, and means on said second member for directing material between the three molding surfaces on said first member.

10. In an apparatus for preparing plastic material to be pulverized, a long three-sided mold with open ends and a member adapted to press material into said three-sided mold and thereafter to mold the fourth surface of the material in said three-sided mold, and means for separating the material from both said mold and said member.

11. Apparatus for loading tacky plastic material, comprising a series of adjacent trays, means for continuously moving said series of trays, a rotary cylinder above said trays having a circumference equal to an integral multiple of the length of a tray, means for molding the material against said cylinder, means for separating the molded material from said cylinder and diverting it into the trays, and vanes on said cylinder spaced around its periphery at distances equal to the length of one tray to form spaces in the molded material registering with the abutting ends of the trays as the cylinder rotates.

12. Apparatus for transforming plastic material into a continuous mat of predetermined depth and width, comprising a forming member having a number of projections thereon arranged in staggered relation, means for supplying material to said member around said projections, means for withdrawing said projections leaving air spaces in the material, and means for separating the continuous mat of material from said forming surface without modifying the form of said mat or of the air spaces formed therein by the withdrawal of the said projections.

13. Apparatus for transforming plastic material into a continuous mat of predetermined depth and width, comprising a rotary cylindrical member having a number of projections arranged in staggered relation around its periphery, means for withdrawing said projections within the periphery of said member, means for pressing material on to said member, a wire for diverting material from said pressing means on to said member, and a second wire for separating the continuous mat of uniform material from said member.

14. Apparatus for transforming plastic material into a continuous mat of predetermined depth and width, comprising a rotary cylindrical member having a number of projections arranged in staggered relation around its periphery, means for withdrawing said projections within the periphery of said member, a second rotary, cylindrical member positioned at a predetermined distance from said first member, and means on said second member for pressing material on to said first member, means for withdrawing said pressing means while the projections on said first member are still extended, a wire for diverting material from said second member to said first member, and a second wire for separating the continuous mat of uniform material from said first member.

15. Apparatus for preparing plastic material for pulverizing, comprising an outer rotary drum having a number of spaced openings therein, an internal member having a number of projections thereon adapted to register successively with the spaced openings in said drum and to project therethrough during part of each rotation of said rotary member, means for supplying material to said drum while the projections on said inner member are projecting through the openings provided therefor, and a wire for cutting said material from said drum when the projections on said internal member are not projecting beyond the surface of said drum.

16. Apparatus for preparing plastic material for pulverizing, comprising a mold, and means for directing said material into the mold comprising a rotatable cylinder having openings in its periphery and members pivoted adjacent said openings and adapted to substantially close said openings at all times although projecting beyond the periphery of the cylinder during a portion of each rotation of the cylinder.

17. Apparatus for preparing plastic material for pulverizing, comprising a mold, a member having openings in its periphery, means pivotally mounted in said openings for directing material into said mold, and means for moving said pivoted means on their pivots to project and withdraw said mold directing means in advance of the point of closest approach between said cylinder and said mold.

18. The method of transforming a mass of wet dye, color, and the like into pulverized form, which comprises molding the material against a surface, interposing a wire between the molded material and said surface, and moving the wire and surface relatively to separate the molded material from said surface, and distributing it uniformly, exposing the molded material to a

drying gas, and pulverizing the dry molded material.

19. The method of transforming dyes, color, intermediates, and the like from the wet tacky state in which they are received from the filter press into pulverizing form, which comprises molding the material into elongated plastic bars evenly spaced apart, delivering them onto a receiving means and drying without substantially changing their form.

20. In apparatus for handling dyes, colors, intermediates and the like, the combination of a material receiving surface, means for pressing material on to said surface, means for molding the material on said surface into a number of substantially equal units, and separating means adapted to be interposed between said molded units and said surface, and means for moving said separating means and said surface relatively to one another.

21. The method of transferring a mass of wet dye, color, and other filtered plastic materials to pulverizable form which comprises molding the material against a surface into a number of units, interposing severing means between said units and said surface and moving said means and said surface relatively to one another, delivering the separated material onto a receiving means and drying the separated material.

22. The method of transforming a mass of wet dye, color and the like to pulverizing form, which comprises molding the material in the form of elongated parallel plastic bars, distributing the bars onto receiving means and subjecting the bars to a drying gas.

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