

June 17, 1947.

W. A. GORDON

2,422,480

MEANS FOR TREATING RUBBER

Filed June 29, 1945

4 Sheets-Sheet 1

Fig. 1.

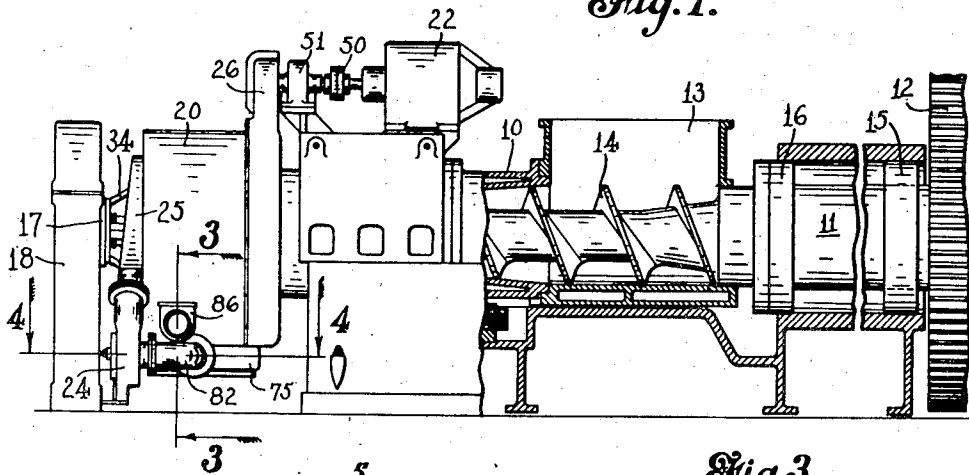


Fig. 2.

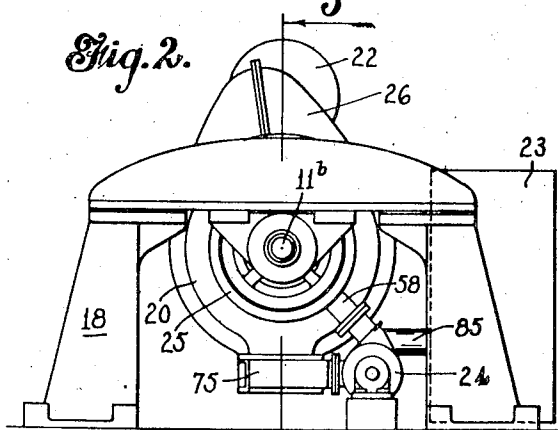


Fig. 3.

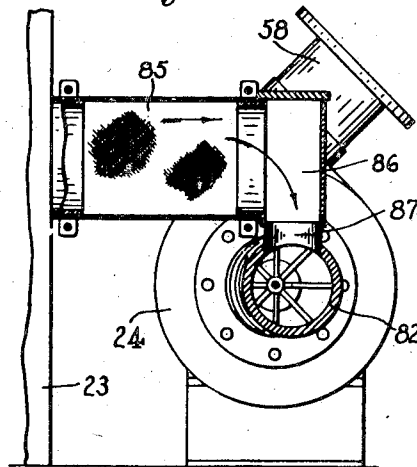
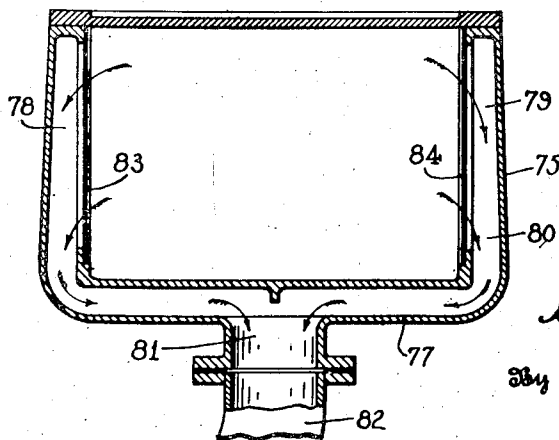


Fig. 4.



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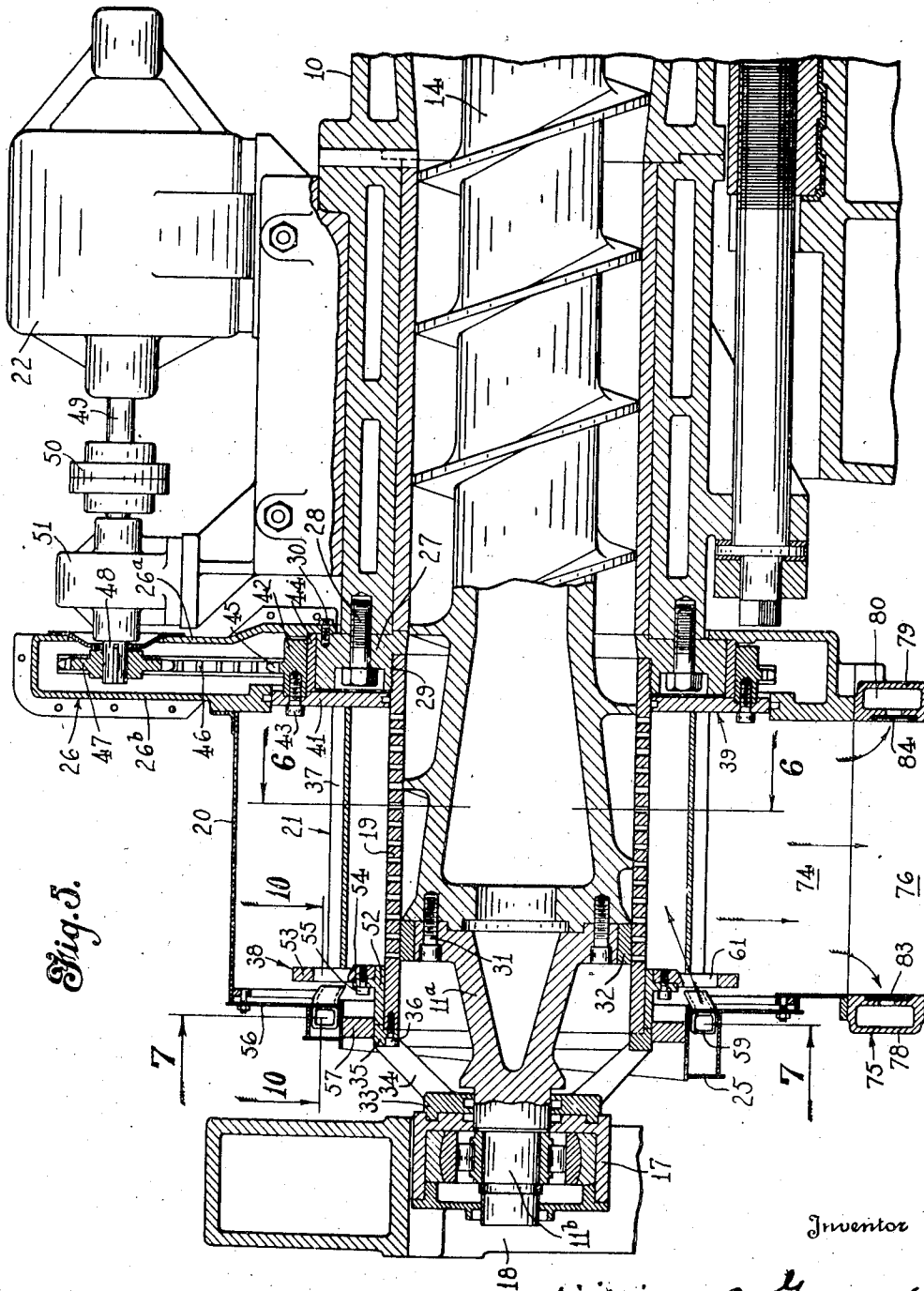
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4 Sheets-Sheet 2



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Fig. 6.

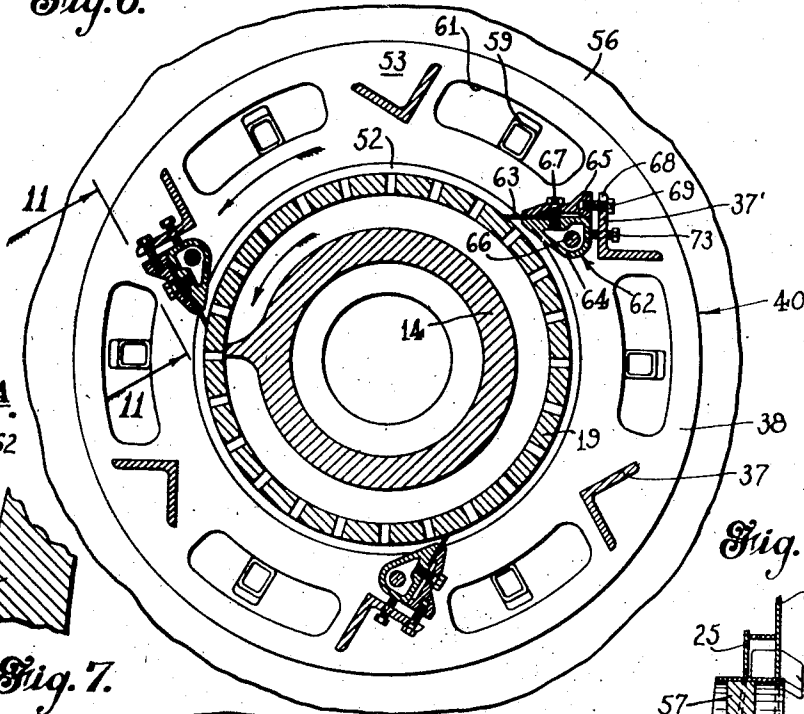


Fig. 6A.

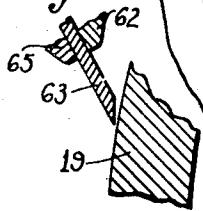


Fig. 7.

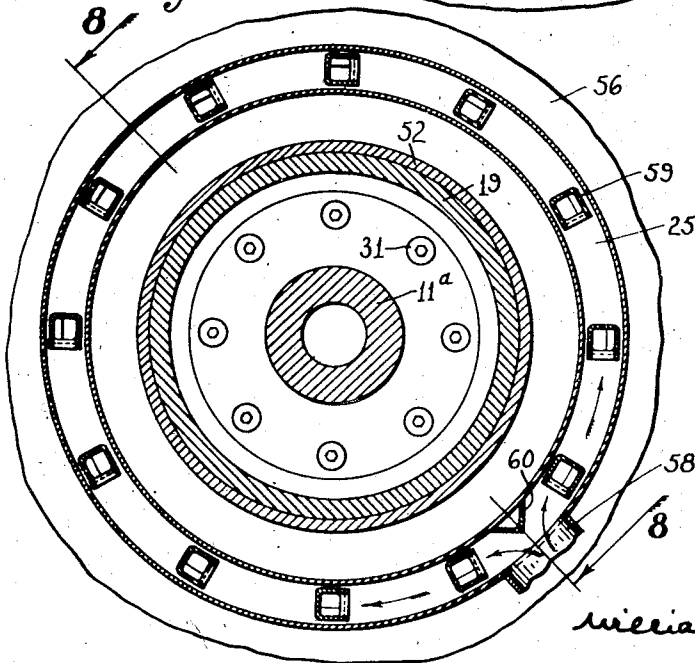
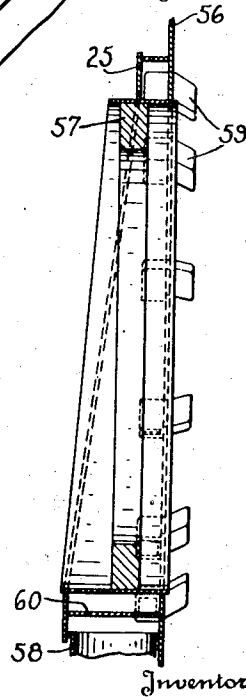


Fig. 8.



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Fig. 9.

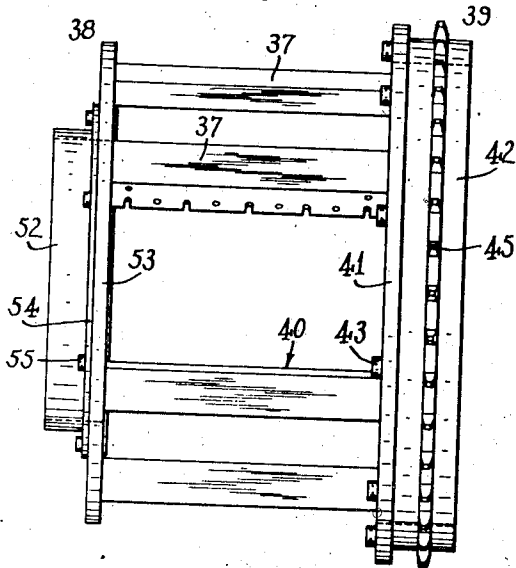


Fig. 10.

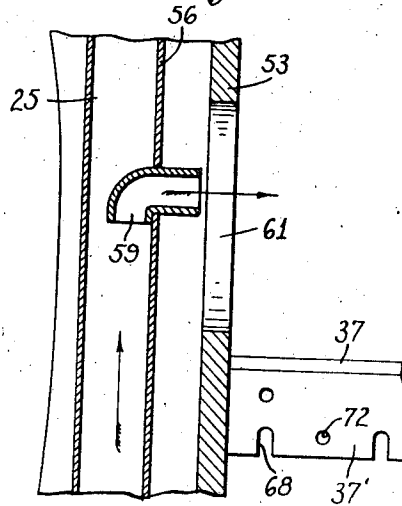


Fig. 11.

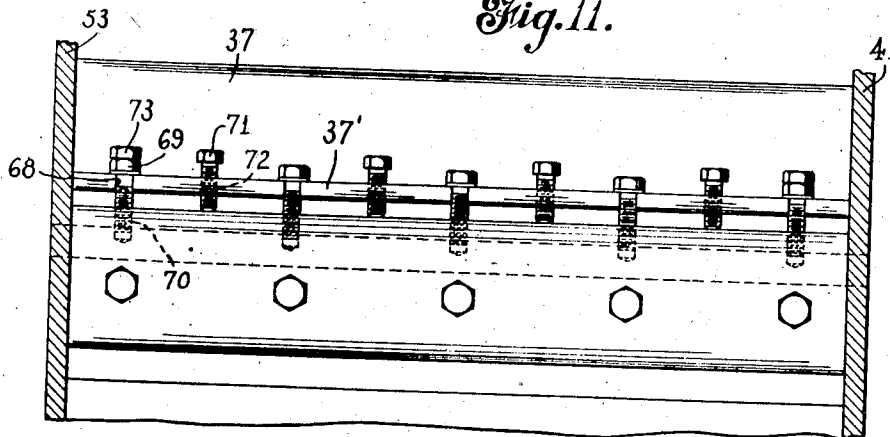
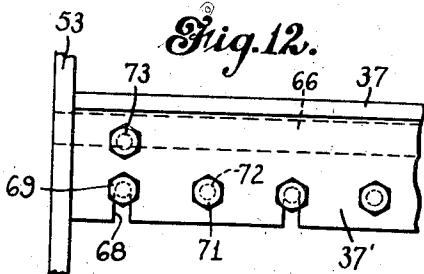


Fig. 12.



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UNITED STATES PATENT OFFICE

2,422,480

MEANS FOR TREATING RUBBER

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Application June 29, 1945, Serial No. 602,245

7 Claims. (Cl. 18—12)

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This invention relates to means for treating rubber, and has particular reference to pelletizing machines of the general type disclosed in my Patent No. 2,286,405, of June 18, 1942, and my Patent No. 2,370,952, of March 6, 1945.

In machines of this type the uncured plastic rubber is forced through peripheral perforations of a shell so as to emerge as strings or pencils, and these are cut off by revolving knives and are subjected to treatment while in the machine to overcome their tackiness, so that when discharged from the machine they will not stick together.

The present invention is concerned particularly with provisions for cutting off the strings or pencils, and provisions for treating the emerging strings and the pellets with a dusting powder to insure effective dusting before the pellets are discharged from the machine.

One object of the invention is to provide for very effective treatment of the rubber with the dusting powder so that the pellets will be thoroughly covered.

Another object is to provide improved means whereby the dusting powder employed in the machine is supplied, distributed and conserved.

Another object is to improve in general and in detail the structure of machines of this type where the cutting mechanism and the dusting mechanism are embodied in the same machine.

In the accompanying drawings:

Fig. 1 is a side elevation, partly in vertical section and partly broken away, of a machine embodying the invention, the external powder supply receptacle being omitted.

Fig. 2 is an end elevation of the machine looking toward the left-hand end of Fig. 1;

Fig. 3 is an enlarged section on line 3—3 of Fig. 1;

Fig. 4 is an enlarged section on line 4—4 of Fig. 1;

Fig. 5 is an enlarged section of a portion of the machine taken on line 5—5 of Fig. 2;

Figs. 6 and 7 are sections on lines 6—6 and 7—7, respectively, of Fig. 5;

Fig. 6A is an enlargement of a portion of Fig. 6;

Fig. 8 is a section on line 8—8 of Fig. 7;

Fig. 9 is an elevation of the knife-carrying cage, the knives themselves being omitted;

Fig. 10 is an enlarged section on line 10—10 of Fig. 5;

Fig. 11 is an enlarged section on line 11—11 of Fig. 6; and

Fig. 12 is a fragmentary view of certain parts shown in Fig. 11.

In its general features the machine selected for

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illustration comprises a casing provided with a feed hopper into which the mass of rubber to be treated is introduced, said casing being provided with a long shaft or rotor driven at one end from suitable gearing, and having through a considerable portion of its length a feed screw which picks up rubber in the hopper and forces it through the casing longitudinally. The rubber is discharged laterally by the end portion of the feed screw through small perforations in the periphery of a cylindrical shell, so that the rubber emerges from the shell in the form of strings or pencils, the latter being cut off by a revolving knife mechanism which, as the rubber issues from the perforations, cuts it into small pieces. These small pieces, during and after their formation and while they are dropping from the shell, are treated in a confined space within a supplemental casing by subjecting them on all sides to the action of tackiness-destroying material such as talc or other powder sprayed into the supplemental casing so that, upon discharge from the supplemental casing, the pellets inhibit adhesion and maintain their individuality without sticking or locking together.

In this particular case the rubber supplied to the hopper has been rendered sufficiently plastic by suitable treatment, and the screw previously referred to is primarily a forcing screw for forcing the rubber mass out of the shell in the form of strings or pencils. This, however, is only by way of example.

In the drawings, the casing of the machine is indicated generally at 10, the long shaft at 11, the large gear at one end at 12, the hopper or receiving chamber, which is intermediate the ends of the shaft, at 13, and the feed screw at 14. In the casing, shaft 11 has suitable bearings, such as shown at 15 and 16, and at the discharge end of the machine is an outboard bearing 17 for the end portion of the shaft which is made in a separate piece, indicated at 11^a. The outboard bearing 17 is provided upon a pedestal 18. The cylindrical perforated shell through which the rubber is forced by the end portion of the feed screw is indicated at 19, the same being enclosed within a supplemental casing 20 within which is mounted a rotary cutting mechanism, generally indicated at 21. The cutting mechanism 21 is rotated from a suitable external prime mover such as an electric motor 22 mounted on top of the casing 10.

The dusting powder is sprayed into the supplemental casing from the left-hand end of the latter (Fig. 5) so that the pellets being produced

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and dropping from the perforated shell are thoroughly covered with the powder. The supplemental casing 20 in this form has an open lower end through which the completed pellets are discharged.

The dusting powder to be used in the machine is supplied from a suitable external receptacle 23, which may be a vibratory receptacle from which the powder passes to a suitable fan or blower, such as the rotary blower 24, and from this blower the powder mixed with air is supplied under pressure to a ring-like chamber, generally indicated at 25, from which it is ejected through the medium of suitable nozzles into the supplemental casing.

Referring now to the details, it will be observed that the perforated shell 19 is mounted upon the left-hand end portion (Fig. 5) of casing 18, and that a frame member, indicated at 26, which supports the supplemental casing 20, is also mounted upon the left-hand end (Fig. 5) of the main casing. This is brought about in this particular case by mounting a ring member 27 upon the end portion of the main casing and supporting the perforated shell 19 and the frame member 26 upon this ring member. The ring member may be attached to the open end portion of the main casing by means such as bolts 28, and the ring member may, as shown, have a threaded socket 29 into which the right-hand end of shell 19 (Fig. 5) is screwed. The ring member 27 has an outstanding portion to which the frame member 26 is fastened at a number of points by means such as bolts 30. The frame member 26 is in the form of a shallow hollow housing extending above and below the main casing. It has parallel walls 26^a and 26^b, of which the first is fastened to the ring member by the bolts 30, and the second of which serves as a support for the peripheral wall of the supplemental casing 20. The wall 26^b, moreover, is provided at its inner part with an opening in which rotates a portion of the knife cage, as hereinafter described.

The feeding screw 14 extends into the perforated shell 19, and has its hollow body portion somewhat enlarged toward the left-hand end of the shell (Fig. 5), at the left-hand end of the body portion of the shaft or rotor. The separate shaft portion 11^a is attached by means of bolts 31, which bolts pass through a flange portion of shaft part 11^a. This flange portion is surrounded by a bearing ring 32 fixed to the rotor, fitting closely against the inner surface of the perforated shell. To provide for possible leakage of rubber between the ring 32 and the inner surface of the perforated shell, the shell is provided with certain extra perforations at the end, as will be noted from Fig. 5, these extra perforations being placed in a group beyond the regular perforations through which the rubber is forced. The shaft portion 11^a has a portion 11^b which is received in the outboard bearing 17. The bearing 17 has at the inner part a cap 33 formed on a spider 34 having a ring 35 attached to the perforated shell 19 by means such as bolts 36. In this manner the left-hand end (Fig. 5) of the perforated shell is effectively supported and centered.

The cutting mechanism 21, previously mentioned, includes in its structure a revolving knife cage, generally indicated at 40 (Fig. 9). This cage has suitable end members interconnected by connecting bars, and the right-hand end member (Fig. 9) has provisions whereby the cage can be driven from the motor 22. The left-hand end member is indicated at 38 and the right-hand one

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at 39. These end members are interconnected by bars 37, shown as angle bars.

The end member 39 includes in its structure a plate 41 attached to a ring member 42 by bolts 43. The ring member 42 is adapted to rotate upon a bearing sleeve 44 embracing the ring member 27, and the plate 41 is adapted to rotate with a radially outward edge thereof in approximate contact with plate 26^b and with a radially inward edge thereof in approximate contact with the shell 19. The member 42 above mentioned is provided at its outer periphery with teeth 45, thereby providing a sprocket engaged by a chain 46 driven by a sprocket 47 on a shaft 48 driven from shaft 49 of motor 22 through a suitable coupling 50 and a reduction gearing 51.

The frame 26 provides a housing in which a portion of one of the end members of the knife cage is disposed, and in which the driving provisions for the cage are disposed in part.

The left-hand end member 38 of the cage (Figs. 5 and 9) includes in its structure an annular member or collar 52 and a plate-like member 53. The annular member 52 is provided with a flange 54 to which the member 53 is attached by means such as bolts 55. The annular member 52 has a smooth inner surface in contact with a solid portion of the perforated shell 19, and at one side the annular member 52 is in contact with the ring 35, previously mentioned, in a manner to hold the knife cage in the proper longitudinal position with respect to the perforated shell as the cage rotates.

In this present form the supplemental casing has a peripheral wall of sheet metal, and it also has an end wall 56 of sheet metal. Against the exterior of the wall 56 is placed the ring-shaped chamber, previously mentioned, which chamber receives the dusting powder and supplies it to the interior of the supplemental casing. The ring-shaped chamber 25 is preferably supported in a suitable manner from the structure supporting the rotary feed shaft, as by means of a supporting ring 57 interposed between the spider 34 and the inner part of chamber 25.

The chamber 25 varies in width at different points in its periphery, the same being of maximum width at the lower part, where the same is joined to an inlet pipe 58 leading upwardly from the blower 24, and said chamber 25 being of minimum width at a point diametrically opposite the inlet. Within this chamber are a number of nozzles that are adapted to receive the dust coming from the blower and eject it into the dusting chamber provided by the casing 20. These nozzles may be of a suitable number, and each may be of angular formation, having an inlet mouth at one end and at the opposite end an outlet directed at an angle to the inlet, the inlet branches being located within the chamber 25 and the outlet branches, on the other hand, being disposed externally of said chamber.

In the form shown, there are twelve of these nozzles, the same being indicated at 59. However, I do not limit myself to any particular number. In the form shown, there are two groups of nozzles, said groups being at opposite sides, respectively, of a diametrical line such as the section line 8-8 of Fig. 7, all of the inlet mouths of each group being faced toward the inlet pipe. The inlet pipe supplies both groups, the arrangement preferably being substantially as shown in Fig. 7, where a baffle 60 is placed in front of the outlet of the inlet pipe so as to divide the powder into two equal streams, each stream supplying all

of the nozzles of one group. The nozzles can be of simple form, as shown in Fig. 10, and each can be readily fastened, as by welding, to the sheet metal wall 56 which constitutes one of the walls of the chamber 25, the ejecting portion of each nozzle being within the main dusting chamber.

The nozzles preferably have their ejecting ends directed at an angle to the axis of the perforated shell 19, as shown in Fig. 5, so that the dust is ejected toward the strings or pencils as they issue from the perforated shell. In order to permit the nozzles to have full action in dusting the emerging strings, the plate member 53 of the knife cage is suitably open or cut away. It may be cut away in the manner shown in order to provide windows which, as the knife cage rotates, will pass the nozzles and permit the streams of dust to move directly through the plate 53, as well as over it. In the form shown, six windows 61 are provided in plate 53, each window being comparatively wide compared to the outlet of one of the nozzles. Each nozzle will, therefore, direct powder through a window for an interval as the knife cage rotates, and then a solid portion of the cage will be presented opposite said nozzle, and then another window will be presented opposite the nozzle, and so on. In the form shown, the windows 61 are placed so as to alternate with the connecting angle bars 37 of the knife cage, there being six of these bars. Alternate bars 37 act as supports for knives or cutting devices, generally indicated at 62, there being in this embodiment three of these cutting devices.

The alternate bars supporting the cutting devices 62 have flanges 37' arranged for support and adjustment of a knife structure, which is preferably constructed in the following manner: A knife 63, adapted to cut off emerging rubber strings, is clamped in place in a knife holder comprising a body 64 and a cap 65. These parts are elongated and extend between the end members or heads of the knife cage, and the body 64 is mounted to swing on a longitudinal axis afforded by a longitudinal rod 66 fixed at its ends in the heads. The knife blade is clamped in place by a number of clamping screws 67 passing through the cap plate 65 and screwing into threaded sockets in the body 64. The flange 37', previously mentioned, is provided adjacent its free edge with notches 68 in which are engaged the threaded shanks of headed bolts 69, of which the threads engage threads in sockets 70 in the side of the cap 65.

By screwing in the bolts 69, the knife holder can be swung so as to move the cutting edge of the knife in a direction away from the surface of the shell. Alternating with the bolts 69 is a series of bolts 71 (Figs. 11 and 12) having threaded shanks screwing in and out in threaded sockets 72 of flange 37', and having ends abutting the side of the cap plate 65. The function of these bolts 71 is to swing the body in a direction to move the knife edge toward the shell. After the knife has been adjusted to the desired position, it is firmly set in the fixed adjusted position by means of bolts 73 (one at each end of the knife structure) which have threaded shanks engaging threaded sockets in the flange 37' and have ends engaging the body 64 at points slightly offset from the swinging axis of the body.

The knife is preferably held in a position in which the edge portion, which is beveled, has a very small clearance between it and the outer surface of the shell, it being unnecessary to have

contact between the knife and the shell (note Fig. 6A). The rotation of the knife cage causes the edges of the knives to impinge against the sides of the strings of rubber, and the latter are cut off in an effective manner. The plane of the knife blade may be at an angle of 50° or thereabouts with respect to the axis along which the string or pencil moves in issuing from the shell. The knife blades are comparatively thick and project only slightly from the holders and therefore the cutting edges are rigidly supported in their outwardly spaced positions.

The supplemental casing 20 is generally of round cross section, but at the lower part is extended to provide a short depending vertical discharge throat 74 presenting a downwardly leading discharge of rectangular cross section, and this discharge throat is continued downwardly to some extent by the provision of a housing 75 having a discharge opening 76 registering with the throat 74. (See Fig. 5.) In horizontal cross section the housing or manifold 75 has the shape shown in Fig. 4, the same having a body 77 extending lengthwise of the supplemental casing 20 at one side of the latter, and having branch portions 78 and 79. The body 77 and the branches 78 and 79 are hollow so as to provide a fork-shaped conduit 80. The body 77 has a flanged inlet 81 in communication with a conduit 82 which leads off from the blower 24 at the suction side of the latter, which is the right-hand side as viewed in Fig. 1. The conduit 80 is, therefore, subjected to suction while the blower or fan is in operation, and the branch portions 78 and 79 are provided at their inner sides with elongated screens 83 and 84. Through these screens the fine dust which has not been used in coating the pellets is enabled to pass, but the pellets are screened out. By having this dust go back to the blower, it can be kept in circulation and can pass again into the dusting chamber to be applied to the pellets. As a substantial part of the dusting powder, which is in a free state, is caught before it enters the discharge, and returned into the machine, there is a very noticeable saving of powder. Also the air in the vicinity of the machine is much cleaner than it would be otherwise, which is an important point.

The external receptacle for the dusting powder is usually placed alongside the machine in the manner indicated in Fig. 2. In Fig. 1 this receptacle is omitted for the sake of clearness. The receptacle has a lateral discharge tube 85 of flexible material connected to a fitting 86 communicating at 87 with a port in the side of the suction conduit 82, so that said conduit takes fresh powder into circulation as needed.

It is believed that the operation of the machine in creating strings of rubber and in subdividing the strings will be apparent from the previous description. The knife cage can be rotated at any desirable speed in respect to the stationary perforated shell, so as to cut the strings into pellets. The pellets, as cut off at the exits of the perforations in the shell, drop off of the shell and move downwardly in the dusting chamber and are ejected by gravity from the opening at the lower end of the chamber. In the form shown, the lower open end of the discharge throat is spaced upwardly somewhat from the floor of the room, and a conveyor, not shown, may be used for carrying away the pellets as they drop out, but other provisions may be made for disposing of the dropping pellets as the conditions may

require, the present showing being only by way of example.

The dusting powder being blown into the chamber from the left-hand end (Fig. 5) in the manner above described, the same has full access to the pellets as they issue from the shell, and as they drop off from the shell during cutting and after being cut. The dusting streams move toward and to the right-hand end of the cage (Fig. 5), and the dust moving into that region and not taken up by the pellets comes against the solid annular plate 41, which may have suitable sealing packing, not shown in detail, introduced between it and the adjacent fixed parts of the machine for the purpose of excluding powder, any excess of which should not pass to the bearing which supports that end of the cage. It is of advantage to have the cage rotated by a separate prime mover through a drive mechanism of the general type shown.

A substantial amount of powder should be used in dusting the pellets, taking care that all parts of the pellets are dusted, for it is very important that the discharged pellets do not cohere or adhere to extraneous surfaces. Where, as here, the perforated shell is preferably cylindrical, it is of advantage to inject a considerable body of dusting powder into the dusting chamber at one end of the latter, in such a manner that a more or less uniform cloud or suspension of powder may have full access to the region where the strings are issuing and are being cut off. It is also of advantage to have a plurality of streams coming in at the end of the chamber and directed at an angle to the shell so as to be inwardly converging, as previously described, and it is of advantage to have these streams supplied by nozzles, of which a plurality are used in connection with a distributing chamber, said chamber being provided with a ring-like series of nozzles, as above described.

It will be seen that the present invention provides improved means for cutting off the strings by reason of the fact that it is not required to maintain the knife edges in contact with the shell, and because, among other things, the knives can be very readily placed and held in the required operative positions. Three knives are shown in the present embodiment, but it will be understood that I do not limit myself to any particular number.

It will also be seen that the means for supplying the pellets with a tackiness-destroying coating is also improved to a notable degree.

It will be understood that while only one form of the improved machine is illustrated, the invention can take many different forms, and various modifications in the procedure and in the organization of the machine parts may be made without departing from the principles of the invention or the scope of the claims.

What I claim is:

1. In a rubber-treating machine, a rotor portion, a surrounding cylindrical shell having a multiplicity of peripheral perforations, means on the rotor for forcing rubber out of said perforations, a casing enclosing the shell into which the emerging rubber enters and having a body portion substantially concentric with the rotor and also having a substantially radial and downward extension below the rotor forming a discharge throat, means external to the casing and at one end thereof for supplying powder into the casing in a plurality of streams converging toward the periphery of the shell, and revolving cutting means in said casing for cutting off the rubber

emerging from said perforations, a blower for supplying powder-containing air under pressure to said supply means, and means in association with said discharge throat for recovering free powder associated with the discharging pellets and returning it to said blower.

2. In a rubber-treating machine, a rotor portion, a surrounding cylindrical shell having a multiplicity of peripheral perforations, means on the rotor for forcing rubber out of said perforations, a casing enclosing the shell into which the emerging rubber enters and having a body portion substantially concentric with the rotor and also having a substantially radial and downward extension below the rotor forming a discharge throat, means external to the casing and at one end thereof for supplying powder into the casing in a plurality of streams converging toward the periphery of the shell, and revolving cutting means in said casing for cutting off the rubber emerging from said perforations, a blower for supplying powder-containing air under pressure to said supply means, and means in association with said discharge throat for recovering free powder associated with the discharging pellets and returning it to said blower, said last-named means including a suction manifold.

3. In a rubber-treating machine, a rotor portion, a surrounding cylindrical shell having a multiplicity of peripheral perforations, means on the rotor for forcing rubber out of said perforations, a casing enclosing the shell into which the emerging rubber enters and having a body portion substantially concentric with the rotor and also having a substantially radial and downward extension below the rotor forming a discharge throat, means external to the casing and at one end thereof for supplying powder into the casing in a plurality of streams converging toward the periphery of the shell, and revolving cutting means in said casing for cutting off the rubber emerging from said perforations, a blower for supplying powder-containing air under pressure to said supply means, and means in association with said discharge throat for recovering free powder associated with the discharging pellets and returning it to said blower, said last-named means including a suction manifold, said manifold constituting a downward extension of said throat.

4. In a rubber-treating machine, a rotor portion, a surrounding shell having a multiplicity of perforations, means on the rotor for forcing rubber out of said perforations, rotary knife means disposed about the shell for cutting off the rubber, a casing in which the cutting action takes place, said casing having at the lower part a discharge throat, a plurality of nozzles for spraying dust-laden air into the casing, a blower for supplying dust-laden air to said nozzles under pressure, and a suction manifold and connections in association with the discharge throat for returning to the blower free dust accompanying the discharging rubber pieces.

5. In a machine such as described, a cylindrical shell having a multiplicity of peripheral perforations, a rotor portion in the shell having means for forcing the rubber out of said perforations, a cage disposed about the shell and having end heads and bars interconnecting said heads, means to rotate said cage, a rod interconnecting said end heads adjacent one of said bars, a knife holder mounted on said bar and comprising a body and a cap plate, a knife blade clamped between the body and cap plate, and means between

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the said bar and the knife holder whereby the holder is rigidly clamped so as to hold the edge of the knife blade at a predetermined outward spacing from the external surface of the shell.

6. In a machine such as described, a cylindrical shell having a multiplicity of peripheral perforations, a rotor portion in the shell having means for forcing rubber out of said perforations, a cage surrounding the shell and rotatable about the same and including a longitudinal bar disposed outwardly of the shell and a longitudinal rod adjacent said bar, a knife structure including a knife blade, a holding body and a holding cap, said body being mounted by means of said rod so that it can swing in and out relatively to the shell, and means in connection with the bar and knife holder whereby the knife blade is rigidly set in position with its edge at a predetermined outward spacing from the external surface of the shell.

7. In a machine such as described, a cylindrical shell having a multiplicity of peripheral perforations, a rotor portion in the shell having means for forcing rubber out of said perforations, a cage surrounding the shell and rotatable about the same and including a longitudinal bar disposed outwardly of the shell and a longitudinal rod ad-

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jacent said bar, a knife structure including a knife blade, a holding body and a holding cap, said body being mounted by means of said rod so that it can swing in and out relatively to the shell, and means in connection with the bar and knife holder whereby the knife blade is rigidly set in position with its edge at a predetermined outward spacing from the external surface of the shell, said last-named means including adjusting screw members mounted in the bar adapted to swing the knife holder outwardly, and other screw members mounted in the bar adapted to swing the knife holder inwardly.

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