May 30, 1944. R. R. NYDEGGER ET AL 2,349,829

APPARATUS

Filed Aug. 15, 1942 2 Sheets-Sheet 1

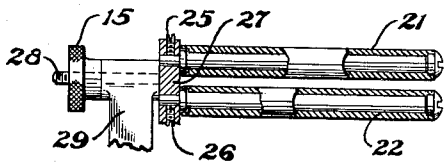
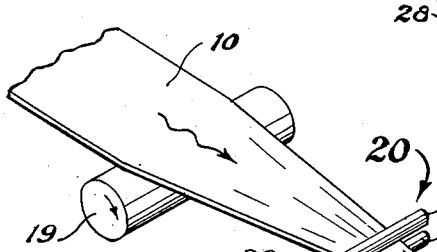


Fig. 3



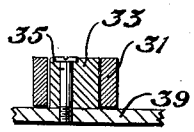


Fig. 5

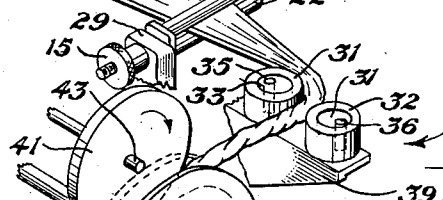
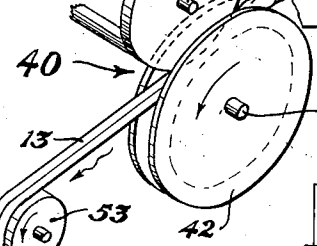
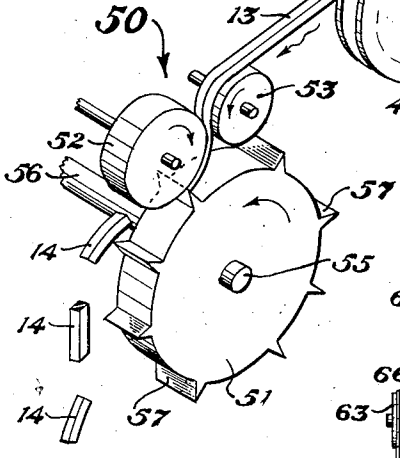


Fig. 1





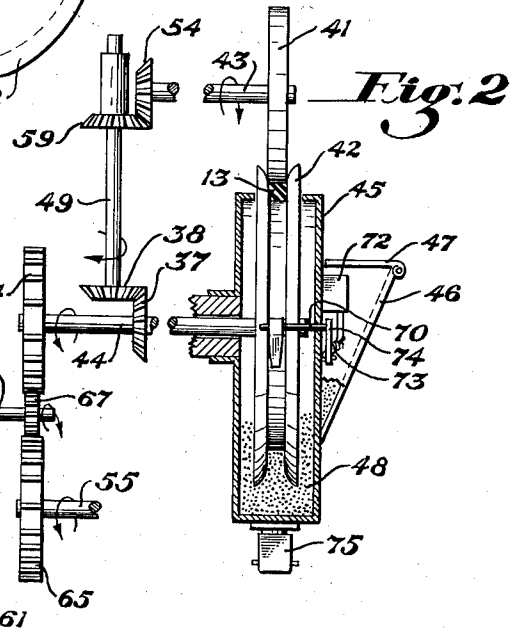


Fig. 2

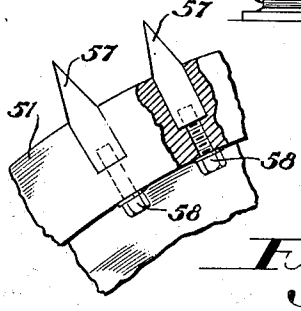


Fig. 4

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May 30, 1944. R. R. NYDEGGER ET AL 2,349,829

APPARATUS

Filed Aug. 15, 1942 2 Sheets-Sheet 2

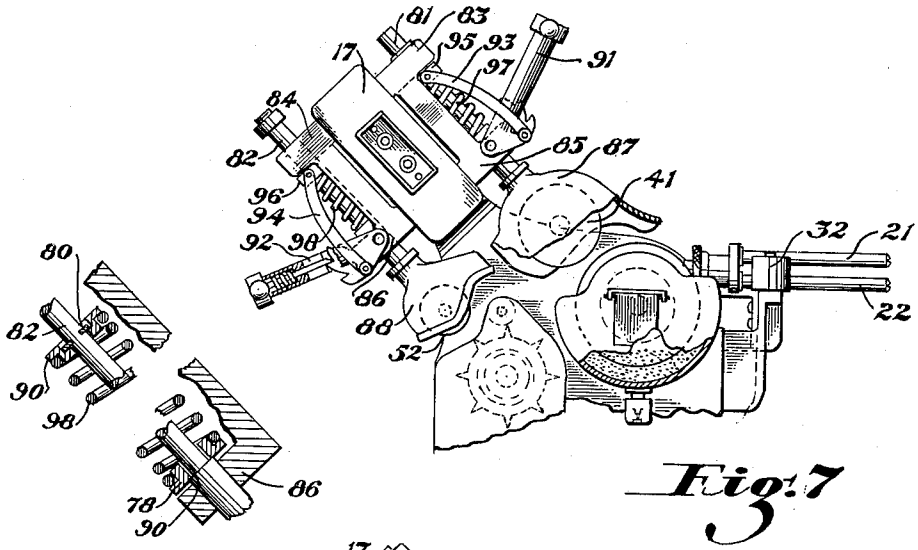


Fig. 7

Fig. 9

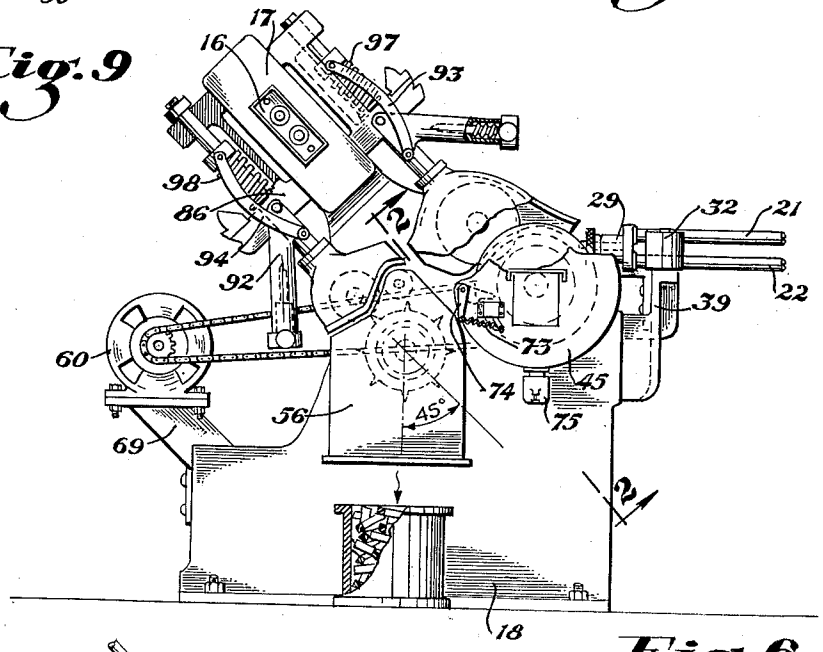


Fig. 6

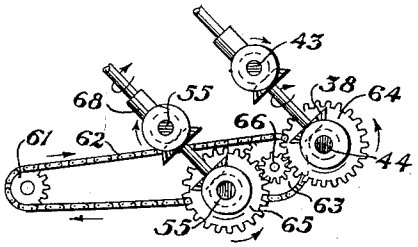


Fig. 8

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Patented May 30, 1944

2,349,829

UNITED STATES PATENT OFFICE

2,349,829

APPARATUS

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Application August 15, 1942, Serial No. 454,968

3 Claims. (Cl. 18—2)

This invention relates to neoprene (modified or unmodified polymeric 2-chloro-1:3-butadiene) and the like, especially to its preparation in a form that can be conveniently handled and transported. More particularly it appertains to means and ways for converting thin continuous diaphanous neoprene web to chips or small rope-like sections.

In current neoprene manufacturing practice, chloroprene (2-chloro-1:3-butadiene) is continuously polymerized, coagulated, washed and dried in the form of a thin web. The aforementioned web has various properties such as tackiness, frailness, bulkiness, etc., which made handling, packaging and shipping onerous.

The primary object of this invention was to convert neoprene webs into compact chunks which could be handled easily. Other objects were to produce neoprene in a form suitable for marketing, and to work thin sticky, neoprene sheeting into small non-tacky blocks. Still a further object was to design a compact apparatus for producing slug-like pieces of neoprene which could be directly fed to compounding mills and the like without further shredding or subdivision. A general advance in the art, and other objects which will appear hereinafter, are also contemplated.

It has now been found that drawing and rolling neoprene web (film, skin, tissue) into a loose rove or sliver, pressing the resultant into a dense rope and cutting the rope into short pieces in the manner described in detail hereinafter, gives a product satisfactory for transportation and acceptable by rubber article fabricators because of its suitability for use without further processing.

How the foregoing objects and related ends are accomplished will be apparent from the following exposition, in which are disclosed the principle and divers embodiments of the invention, including the best mode contemplated for carrying out the same. The written description is amplified by the accompanying drawings, in which:

Figure 1 is a fragmentary diagrammatic perspective view showing the course of the neoprene body through the apparatus of this invention;

Figure 2 is a fragmentary conventionalized end elevation view, partly in section, of the driving arrangement and the neoprene rope-forming rolls, together with associated housing parts and appurtenances;

Figure 3 is an elevation view, partly in section, of the idler finger gathering rolls over which the neoprene passes on its way to the vertical axis gathering rolls;

Figure 4 is a fragmentary elevation view, partly in section, of the cutting roll, showing the mode of securing the cutting wedges;

Figure 5 is a fragmentary sectional view of one of the gathering rolls and associated parts.

Figure 6 is a side elevation view, partly in section, with some parts omitted and some parts exaggerated in size for clearness, of the neoprene rope-forming and cutting machine of this invention;

Figure 7 is a fragmentary side elevation view, partly in section, similar to Figure 5, showing the male forming roll and roll for backing the neoprene rope during the cutting, in raised positions;

Figure 8 is a conventionalized elevation view of the gear trains and appurtenant driving means; and

Figure 9 is a fragmentary view, partly in section, showing the way in which the springs are secured to the upper roll supports.

The general operation of the machine will be clear from Figure 1, which shows a continuous thin wide diaphanous web of neoprene 10, approximately 0.025 centimeters thick and 1 meter (40 inches) wide, being discharged from the preceding apparatus over the idler supporting roll 19, and entering the roping machine of this invention through guiding mechanism 20 comprising upper and lower fingers 21 and 22, respectively. The gathering of the web into a sliver-like body begins as it leaves the roller 19, and continues, with the sides of the web forming an angle of about 40°, through the guide 20 to the gathering device 30, comprising rolls 31 and 32. Because of its tacky nature, there is no significant separation of folds in the web once they have been brought into contact.

The loosely rolled web leaving the gatherer 30 passes to a forming or molding device 40, comprising male and female rolls 41 and 42, respectively, which compress the neoprene into a firm continuous rope 13 of generally square cross-section about 1.25 centimeters on a side. The rope then travels to a cutter 50 comprising cutter roll 51, backing roll 52 and idler roll 53, where, without significant alteration in transverse dimensions, it is severed into short pieces usually about 12 to 15 centimeters long. The roll 42, rotating in powdered soapstone, chalk, or like lubricating agent 48 as shown in Figure 2, causes the neoprene to receive a dusting or coating of this material.

As a result of the operation just described, the tacky sheet 10 is converted to small compact non-tacky high-density chips 14, which are collected and packaged for sale without further treatment.

A motor 60, as shown in Figure 2, drives the positively driven rolls through sprocket 61, chain 62, sprocket 63 and shaft 66. The shaft 66 carries a spur gear 67 which meshes with and drives gears 64 and 65 carried on shafts 44 and 55, re-

spectively. The female forming roll 42 is keyed to the shaft 44, and the cutter roll 51 is keyed to the shaft 55.

Referring now to Figure 6, the numeral 18 indicates the frame of the machine which is bolted to the floor. The frame carries brackets or arms 29, 39 and 69 which respectively support the guide 20, the gatherer 30 and the motor 60. The frame supports a housing 45, which encloses the female roll 42 at the end of the shaft 44 to which said roll is keyed. It also supports a chute 56 which serves as a housing for the cutter roll 51. An angularly extending part of the frame 17 supports the mechanism for raising and lowering the forming roll 41 and backing roll 52 and provides a convenient location for the switch 16 for the motor 60.

In Figure 3, it will be seen that by means of integral collars 23 and 24 and set screws 25 and 26, the shafts for the fingers 21 and 22 are secured and positioned in a plate 27. Screws in the ends of the shafts cooperate with shoulders inside the tubular shells to keep the rolls rotating on their supports. Integral with the plate 27, is a pivot 28 journaled in the bracket 29 and threaded on one end to receive the knurled nut 15. The fingers 21 and 22 can be turned to any desired position about the pivot and there held by tightening this nut.

The gathering rolls 31 and 32, as shown in Figures 1 and 5, rotate about vertical stub shafts 33 and 34 which are, by means of bolts 35 and 36, secured to the bracket 39. The holes in the stub shafts for the said bolts are off center, whereby an adjustment of the distance between the rolls 31 and 32 can be secured.

As shown in Figures 2 and 6, the housing 45 about the roll 42 has affixed thereto an inclined hopper or chute 46 covered by hinged lid 47, through which the body of powdered soapstone 48 in the bottom of the housing 45 can be replenished. Pivoted in this housing and straddling the roll 42 is a small shaft 70. Inside the housing and secured in a fixed position on the shaft 70 is a tongue 71 which extends into the groove in the roll 42. A lever 74, fixed on the same shaft outside the housing, is connected to a snaplock switch 72 by means of a spring 73. In case the neoprene rope does not separate from the bed of the groove in the roll 42, and starts to wrap around this roll, it forces the tongue 71 outwardly from the axis of the roll, causing the shaft 70 to pivot in the housing 45. As a result, the lever 74, working through the spring 73, throws the switch 72, sounding an alarm and shutting off the motor 60, thereby attracting the attention of the operator and stopping the machine.

In order to prevent caking of the powdered soapstone out of contact with the roll 42, a vibrator 75 is bolted to the bottom of the housing 45. These vibrators are well known in the art, as evidenced by U. S. A. Patents 2,229,037; 2,180,189; 2,094,698; 1,847,083; 1,772,596 and 1,753,412, so that there is no need to burden this specification with details of their construction.

As will be clear from Figures 4 and 1, the cutting wedges 57 for the roll 51 are fitted into transverse grooves and held there by stud bolts 58 extending through radial holes in the wheel rim. The length of the chips cut by the roll 51 is regulated by the spacing of the wedges, for example by having a series of cutting rolls with differently spaced cutting edges or by removing some of the wedges from a single roll. The chute 56 guides the chips into a container, weighing pan, conveyor or the like, as desired.

During its passage through the machine pressure is applied to the neoprene by means of spring pressed upper rolls 41 and 52, as previously pointed out. These rolls are carried on shafts which slide in brackets on the arm 17. The roll 41 and its housing 87 are mounted on shaft 81 which slides in bracket arms 83 and 85. The roll 52 and the housing 88 mounted on shaft 82 move similarly when the shaft slides in bracket arms 84 and 86.

The outward portions of bracket arms 85 and 86 are formed into arcuate ratchet bars to receive handle controlled pawls operating in levers 91 and 92, respectively. These levers, fulcrumed on their corresponding brackets, are used for moving the rolls 41 and 52 into and out of contact with the neoprene rope. Curved connecting rods or bars 93 and 94 join these levers to collars 95 and 96 which, pressed upwardly by the springs 97 and 98, are limited in that movement by half-moon keys such as 80, positioned in grooves in the corresponding shafts. These shafts are stepped, having portions of different diameters forming shoulders such as that shown at 90 which abut collars such as 78. These collars serve to limit the expansion of the springs encircling the shafts.

When the levers 91 and 92 are in raised position, their pawls, by coacting with the corresponding ratchets, positively hold the rolls 41 and 52 out of contact with the rolls 42 and 51 so that the neoprene rope may be conveniently threaded through the forming and cutting devices in its normal locus of operation. Upon releasing the levers and pulling them into the position shown in Figure 6, the upper rolls being spring loaded are brought to bear on the neoprene rope and are held there by the pressure of the springs 97 and 98. It will be observed that the pivots in the ends of the connecting bars 93 and 94 are in lines which includes the lever-frame pivots, so that any enlargement of the rope which tends to force the backing rolls upwardly must operate against the aforementioned springs. This force, taking the cutter backing roll, for example, is exerted against the collar 78 by the shoulder 90, and any upward movement of the collar 78 tends to press the spring 98 against the collar 96 which is held in position by the curved bar 98 and the lever 92 pivoted on the bracket 86.

In order to provide for positively driving the rolls 41 and 52, the gearing arrangement shown in Figures 2 and 8 is utilized. The shaft 44, for example, carries a crown gear 37 which meshes with corresponding gear 38 on shaft 49. The shaft 43 also carries a crown gear 54 which is driven by the crown gear 59 slidably keyed on the shaft 49. A similar driving arrangement for the roll 52 comprises a slidably mounted crown gear 68.

It will be understood that the spring 98 is designed to force the roll 52 against the cutting wedges with sufficient pressure to cut the neoprene rope but not to damage the said wedges. An interference of approximately 0.005 inch with the cutting wedges has been found satisfactory.

The patent literature on the production of neoprene is abundant (see, for example, U. S. A. Patents 2,109,968, 2,161,481 and 2,187,146), and in the interest of brevity reference is made thereto for production details.

The equipment herein described can be operated with continuous neoprene webs either narrower or wider than one meter and thinner or

thicker than 0.025 centimeter. In one installation a sheet 108 inches wide and 0.02 inch thick has been satisfactorily converted to a corresponding rope. In most cases it has been found advantageous to maintain the angle of 40° for the approaching festooned sheet, but satisfactory gathering can be obtained with greater or lesser angles, for example, 20° to 60°.

Ordinarily the sheet is fed to the apparatus of the present invention at temperatures slightly above ordinary normal room temperature, but the device has been found to work satisfactorily at temperatures as high as 100° C. It works well at temperatures well below room temperatures also.

Other means of shaking the soapstone down in the dusting chamber, such as mechanical vibrators, may be employed if desired.

Thin sheets of other vulcanizable polymeric materials resembling unvulcanized rubber, such as for example, polymeric 1:3-butadiene, interpolymers of 1:3-butadiene and acrylic nitrile, interpolymers of 1:3-butadiene and styrene, natural rubbers, etc., may be handled on the present apparatus.

The method of gathering the sheet into a preformed strand for feeding to the forming rolls, is subject to considerable modification by alteration of the type of gathering fingers and gathering rolls. To produce an irregularly crinkled strand, one of the finger rolls is replaced by a smooth concave hollow roll of low curvature and approximately the same height, and the other discarded. A concentrically rolled strand can be produced by positioning the secondary gathering rolls so that the line of center of these two rolls is on the extension of a line drawn along the edge of the sheet as it is being forwarded prior to the time it passes over the idler roll 19, and by maintaining an angle of convergence of approximately 40°.

The rectangular shaped groove in the female forming roll and the flat edge of the male forming roll may be substituted by concave shaped edges so that a rope of circular or elliptical cross-section may be produced. Other geometrical cross-sections may be employed in special circumstances.

Many advantages of the present invention will be obvious to those skilled in this art. Particular attention is directed to the compactness of the apparatus and, as a consequence, its requiring a minimum of floor area. Furthermore the power consumption for the chip fabrication is markedly less than that necessary for conventional equipment such as extruders, mills, cutters, etc.; the present device operates automatically, requiring no attention after being started; threading of the machine is simple and a safe procedure, involving no hazard to the operator; there is no production of scrap after the machine is in operation, and any scrap produced in anterior portions of the process may be readily cut by hand feeding of the machine; and the product can be packaged economically with a minimum of space wastage in low cost containers such as drums, cartons, bags or bales.

The small unit size of the product leads to marked ease in handling during packaging and by the fabricator using the packaged product. The surface covering of the chunks eliminates coherence or adherence to each other and to the container, and this, together with the small size of the chunk, eliminates further sub-dividing operations when weight webs of material, for conjoining in fabricating operations, is carried out.

As many apparently widely different embodiments of this invention may be made without departing from the spirit and scope thereof, it is to be understood that this invention is not limited to the specific embodiments thereof except as defined in the appended claims.

We claim:

1. In an apparatus for making formed compacted elongated bodies from a continuous sheet of cohesive material, the combination comprising a pair of gathering rolls having their axes disposed in a plane intersecting the plane of said sheet, said gathering rolls being located with respect to each other so as to gather the sheet from its edges and compact the same when the sheet is drawn therebetween, a pair of finger members separated from each other to form an opening in the plane of said sheet for guiding the sheet into said gathering rolls in a predetermined plane, a forming roll grooved to form the compacted material into a predetermined cross-sectional shape, a compressing roll having a cylindrical peripheral portion shaped to revolve in the groove of said forming roll, said compressing roll being disposed with its peripheral portion in said groove so as to form a confined space therewith for compressing and shaping the gathered material, and means comprising driven shafts for driving the forming and compressing rolls in the same direction whereby the gathered material is drawn through said gathering rolls, a spring means for resiliently loading the driven compressing roll in the direction of said forming roll, driven means for severing said material into lengths after it has been compressed and formed, and means for driving said driven members.

2. The device in accordance with claim 1 in which the means for severing the formed compacted material comprises a wheel having cutting members projecting from the peripheral edge thereof, an idler roll disposed to receive the advancing formed material, a driven backing roll for advancing the formed material over said cutting members, said backing roll having a peripheral face formed to conform to the cutting edges of said cutting members and disposed to contact therewith when the cutting wheel rotates and means to adjust said driven backing roll to and from said idler and cutting wheel so that the formed material will be engaged on one side by said idler and said cutting members and on the other by said driven backing roll.

3. A device in accordance with claim 1 which comprises means for opening a power circuit supplying energy to said driving means, said means comprising a switch in the power circuit, a rocking shaft, a finger mounted on one end of the shaft normally disposed with its outer end in sliding contact with a peripheral portion of the groove in said forming roll, a lever mounted on the outer end of said rocking shaft, means operatively connected with said lever and switch normally disposed to permit the switch to remain in closed position and to open said switch when the outer end of said finger is displaced from said sliding contact with the forming roll.

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