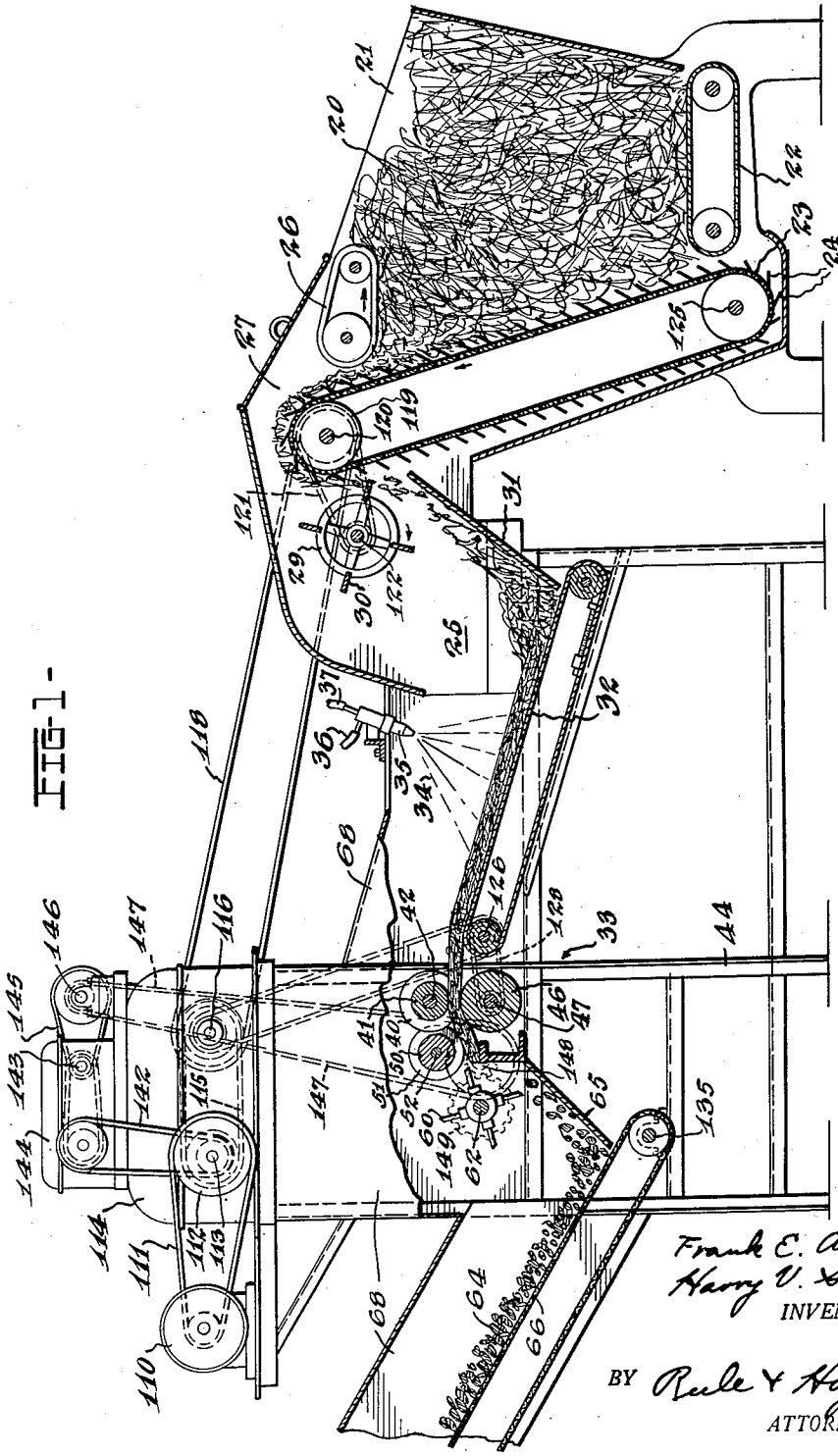
Oct. 29, 1940. F. E. ALLEN ET AL 2,219,285

APPARATUS AND METHOD FOR NODULATING FIBERS

Filed March 7, 1936 8 Sheets-Sheet 1

FIG-1-



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APPARATUS AND METHOD FOR NODULATING FIBERS

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FIG-2-

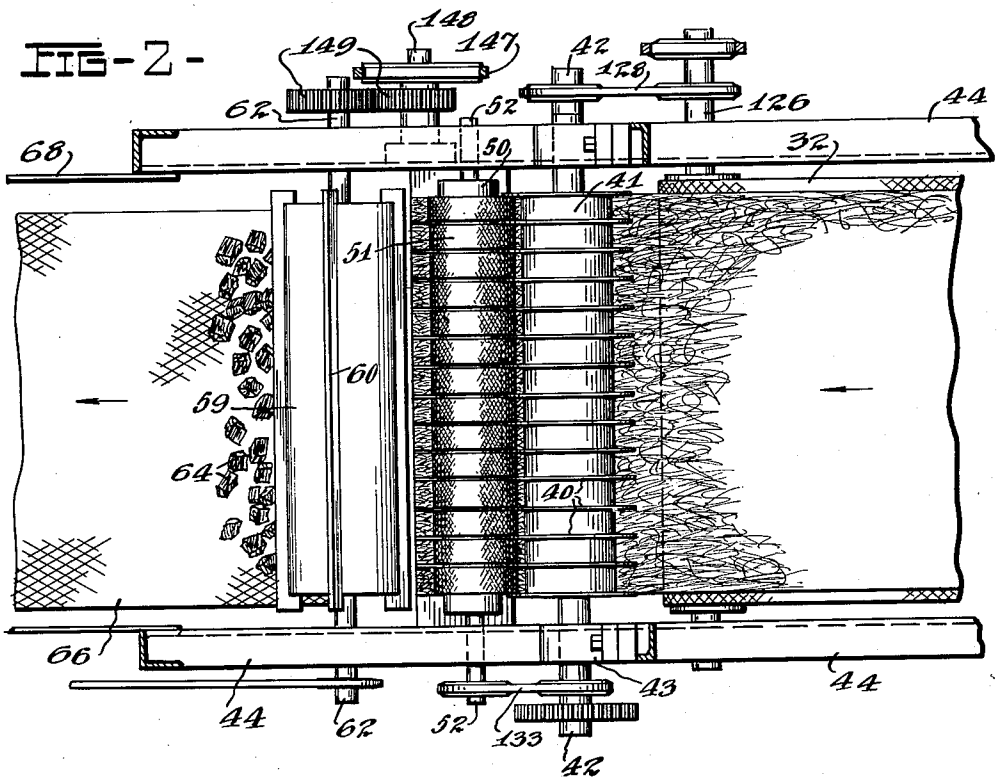
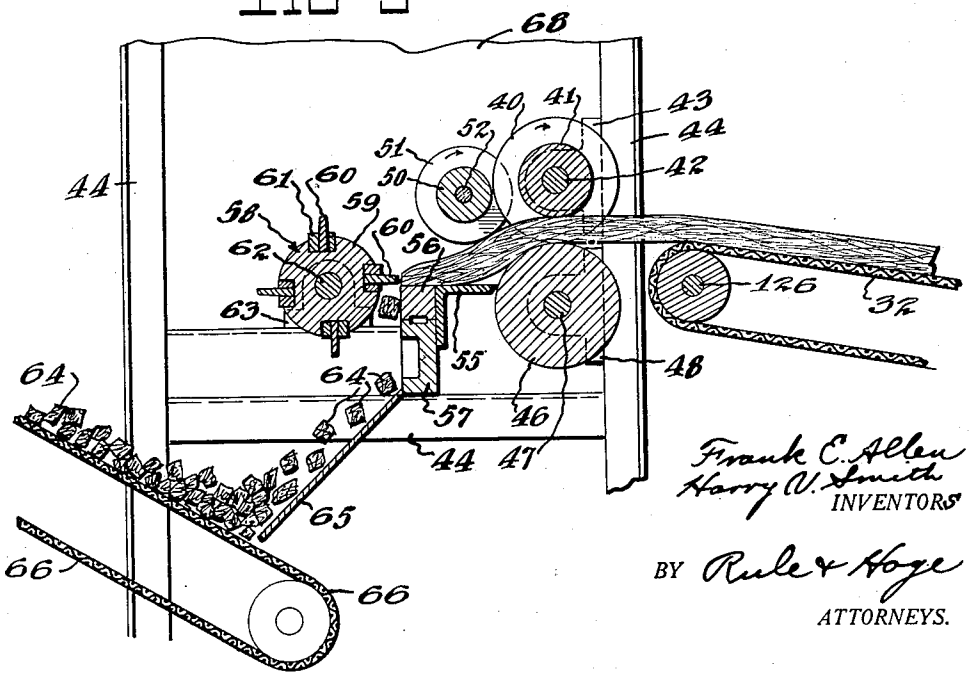


FIG-3-



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APPARATUS AND METHOD FOR NODULATING FIBERS

Filed March 7, 1936 8 Sheets-Sheet 3

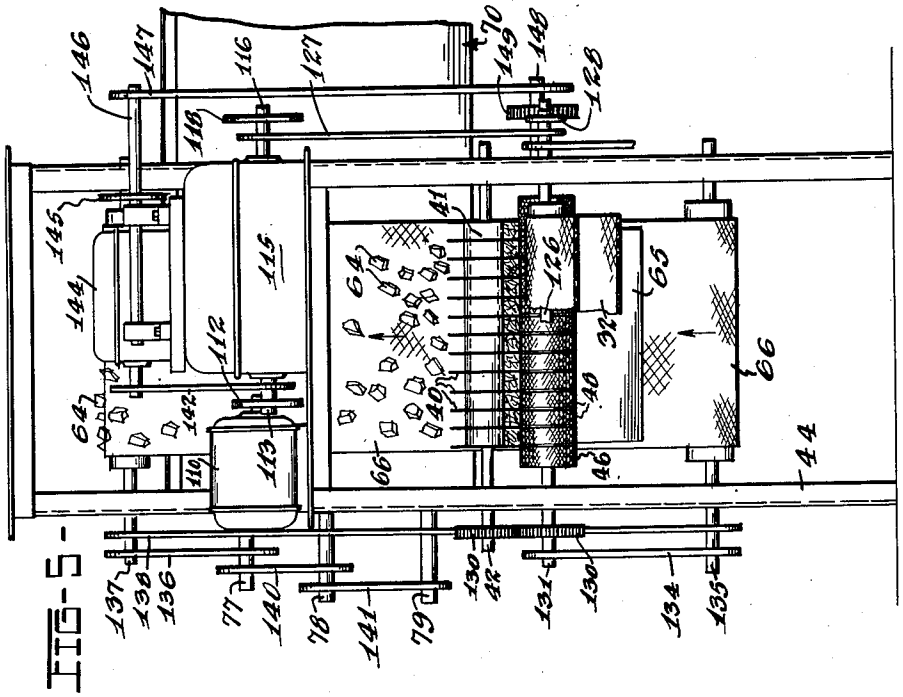


FIG-5-

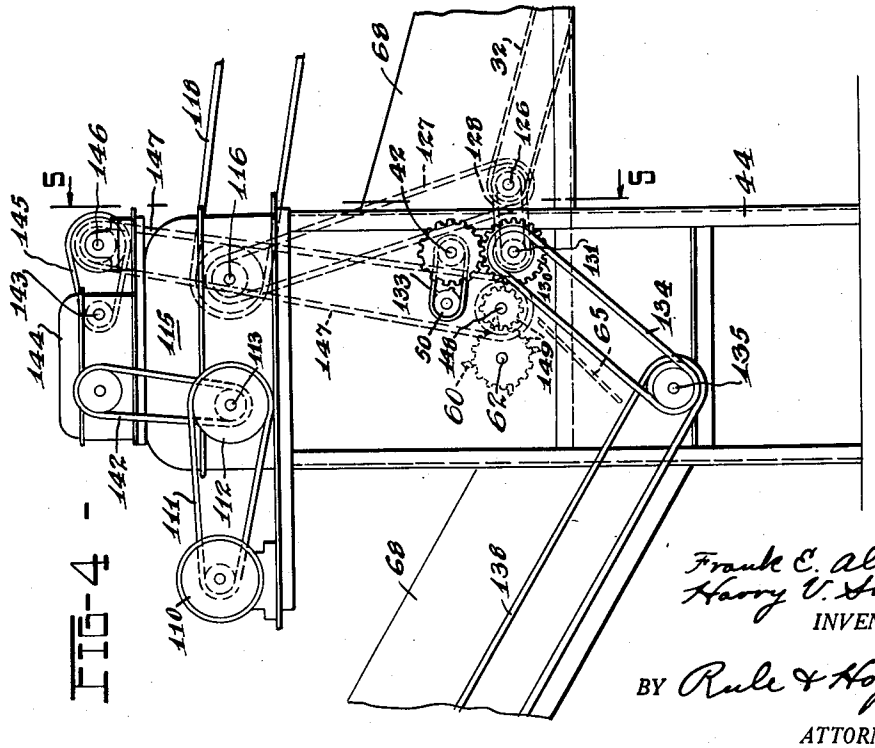


FIG-4-

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APPARATUS AND METHOD FOR NODULATING FIBERS

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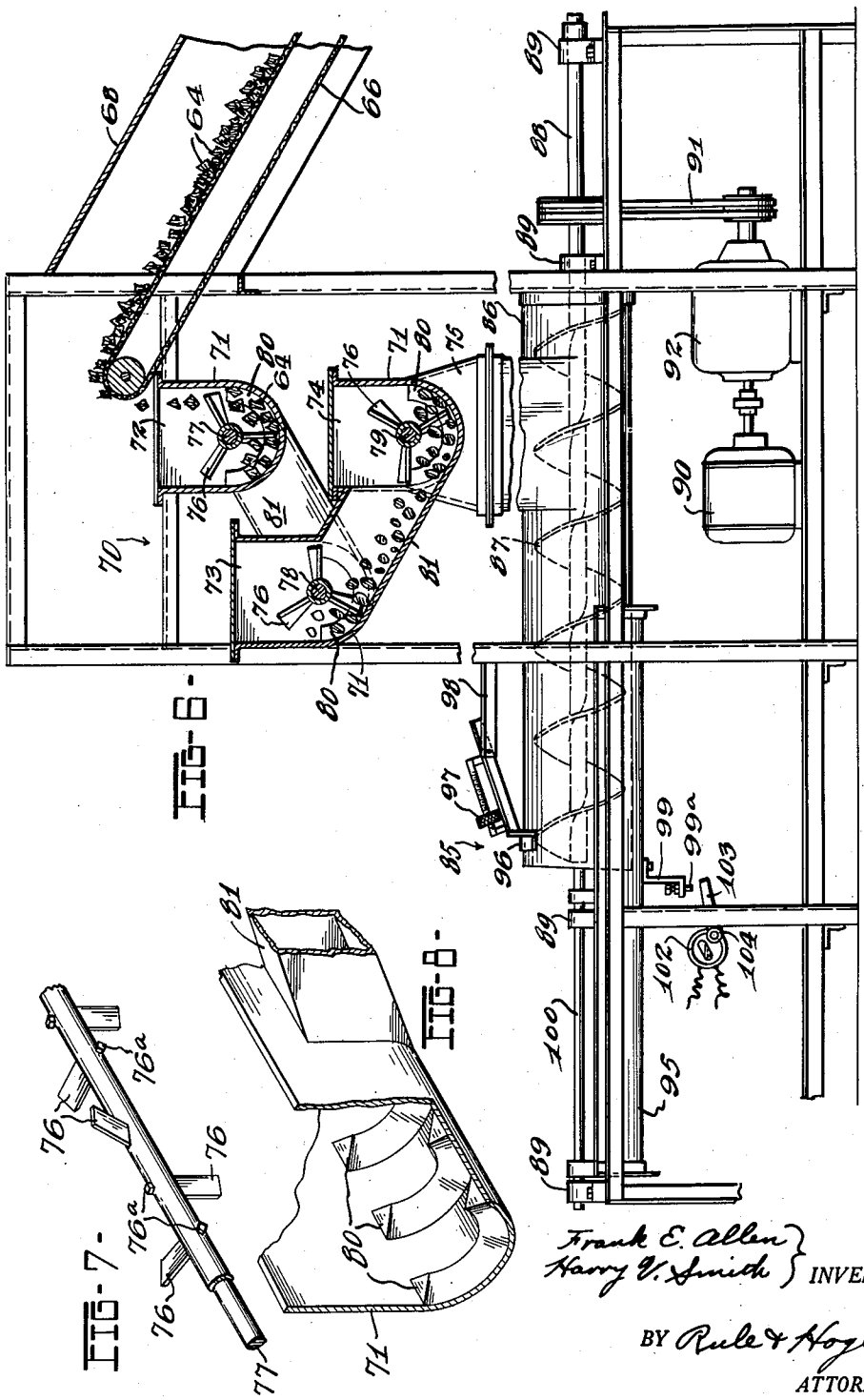


FIG-6-

FIG-8-

FIG-7-

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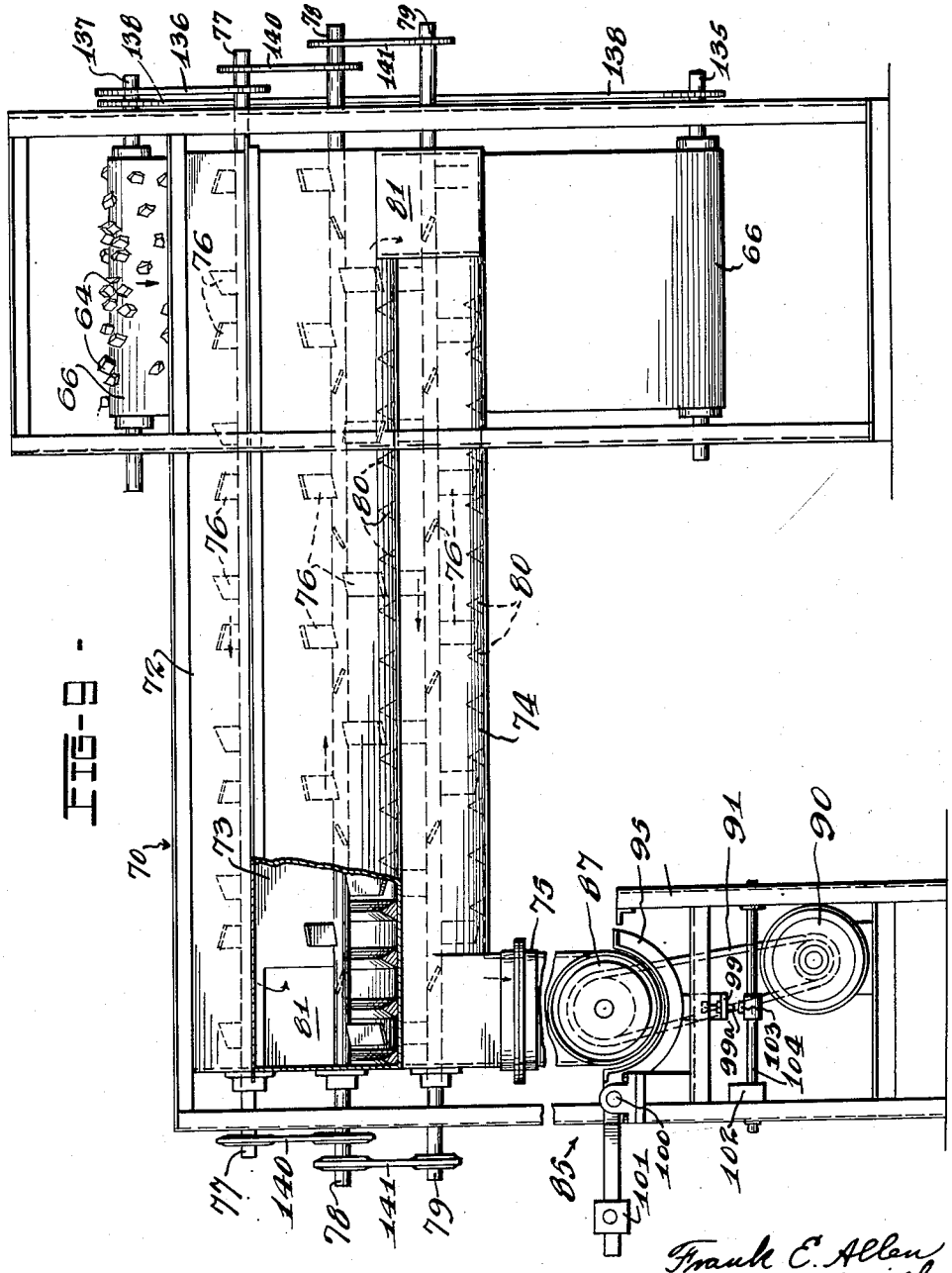
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APPARATUS AND METHOD FOR NODULATING FIBERS

Filed March 7, 1936 8 Sheets-Sheet 5

FIG-9



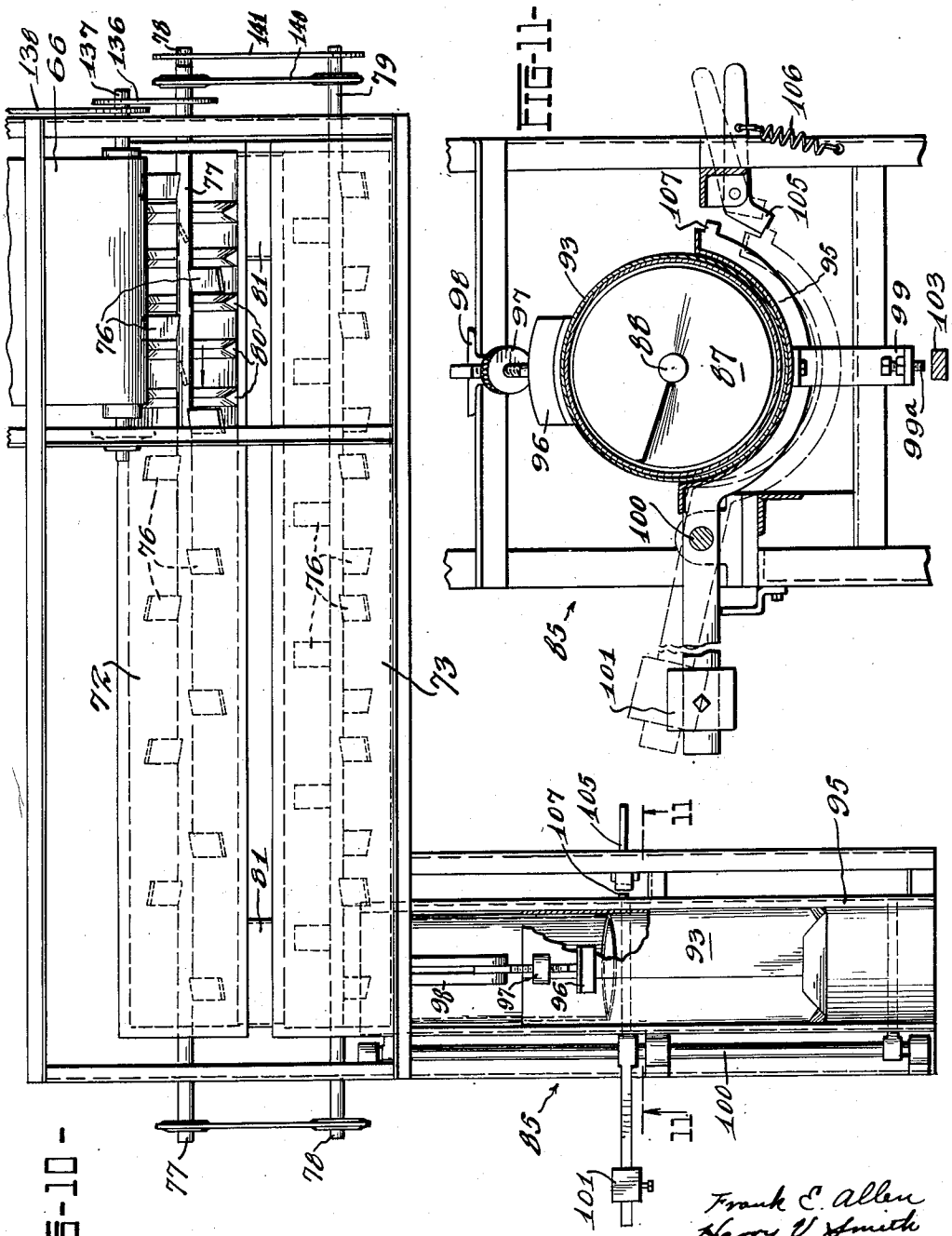
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APPARATUS AND METHOD FOR NODULATING FIBERS

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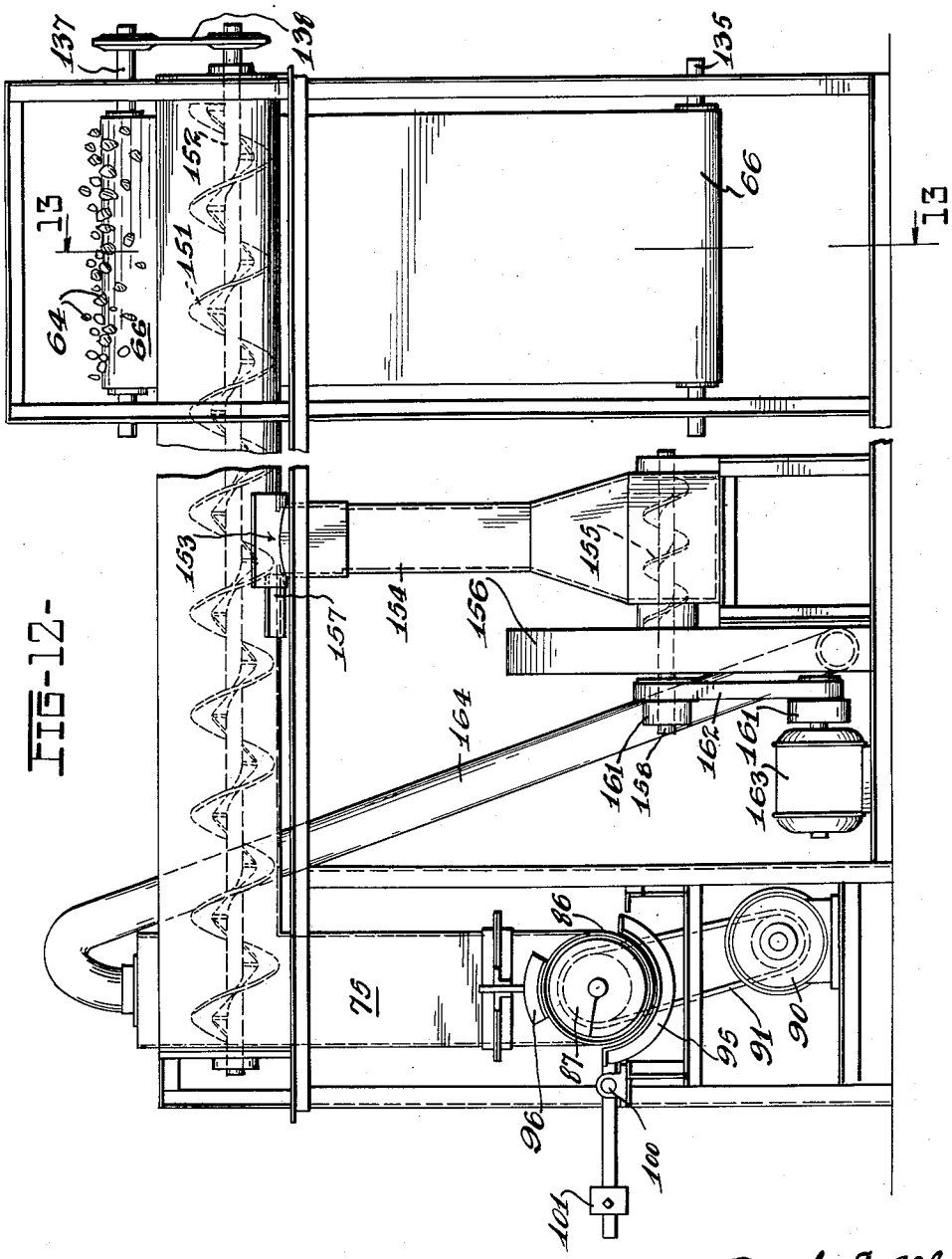
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APPARATUS AND METHOD FOR NODULATING FIBERS

Filed March 7, 1936 8 Sheets-Sheet 7

FIG-12-



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APPARATUS AND METHOD FOR NODULATING FIBERS

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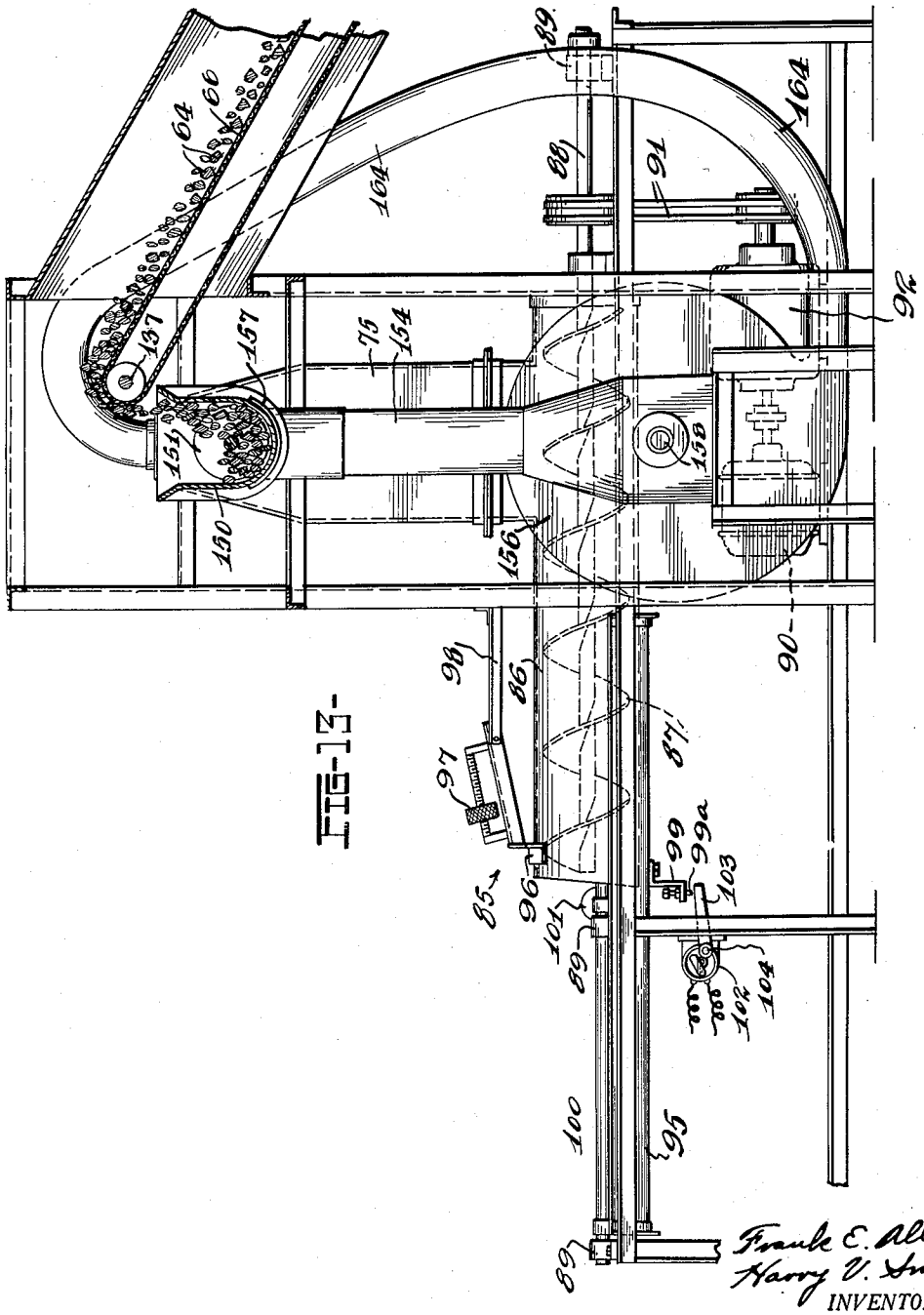


FIG-13-

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Patented Oct. 29, 1940 2,219,285

UNITED STATES PATENT OFFICE

2,219,285

APPARATUS AND METHOD FOR NODULATING FIBERS

Frank E. Allen, Columbus, and Harry V. Smith, Newark, Ohio, assignors, by mesne assignments, to Owens-Corning Fiberglas Corporation, a corporation of Delaware

Application March 7, 1936, Serial No. 67,736

22 Claims. (Cl. 154—28)

The present invention relates to a method and apparatus for forming individual masses of fibrous material and causing said masses to be formed into nodules. The nodules may be used for insulating purposes and are adapted to be poured or blown into insulating spaces or cavities that are not readily accessible for the introduction of fibrous insulation in the usual matted, fabricated or bulk forms.

It is an object of the present invention to provide an apparatus for forming individual nodules of fibrous material, such as long, fine fibers of glass wool or the like. The nodules of glass wool fibers should be rolled sufficiently tight so that they may be blown into a relatively narrow or irregular cavity having rough side walls or obstructions therein such as may be found between the walls and joists of an ordinary building or house. While it is advantageous to nodulate the individual tufts or masses of fibers sufficiently to prevent undue fuzziness and mutual affinity between the nodules so that it will be possible to blow them through an air tube or the like and permit them to pack themselves uniformly throughout a cavity, it is also desirable to keep the density of the nodules to a minimum. Regulation of the density is an important feature. If the nodules have been rolled too tightly so that the density is greater than necessary, there will be considerable waste of fibrous material since increased density will give practically no greater insulating effect and, as a matter of fact, may actually give less insulation. In addition, the added weight caused by increased density is a disadvantage since the ceiling, walls or other place in which the material has been installed, will be required to carry the added load and, in addition, the material, before being installed, will require increased handling charges. Besides these disadvantages, if the density is too high, the inherent weight of the material itself, particularly when inserted in a tall cavity such as found in the walls of a building, will pack down the fibers or nodules underneath so that the density in the bottom nodules is further increased by this packing effect. Further, such packing or settling may take place after an installation is completed, resulting in air pockets or empty spaces, thus impairing the insulating efficiency. A density ranging from about 1 to 4½ and preferably about 3 lbs, per cubic ft. has been found desirable for insulation comprising nodules made of fine glass fibers. If the nodules are originally rolled correctly, it will be possible to pack them in a bag or the like at a relatively great density, for example, 8 or 9 lbs. per cubic ft., without permanently affecting their normal density so that when they are unpacked again and blown into a cavity, they will spread out and reassume their original low density. In the manufacture of glass wool nodules, it was frequently found that, after producing nodules having the correct amount of density for optimum heat insulation, the nodules could not be blown into or individually inserted into a cavity. The individual nodules, due to a fuzziness and other objectionable features, clung together and adhered to the side walls, particularly when the latter were rough or irregular, and it was impossible to obtain a uniform distribution of nodules throughout the cavity. An object of the present invention is to overcome these difficulties, and to this end the invention provides nodules having a light density and which at the same time are free from excessive fuzziness so that they may be inserted uniformly in a cavity without undue mutual adherence.

It is a further object of the present invention to provide a method and apparatus for producing nodules of siliceous fibers, particularly glass wool fibers, the original stock of fibers being in the form of bats, loose wool, bulk wool, individual fibers, or the like.

It is a still further object of the present invention to condition the siliceous fibers by means of suitable liquids, gases or solid material so that their inherent mutual friction may be properly regulated to produce nodules having the proper degree of fuzziness, density and felting, permitting them to be blown uniformly throughout a cavity with maximum lightness and insulating quality.

It is also within the contemplation of the present invention to provide a method and apparatus for producing complete packages of fibrous nodules from siliceous fibers in bulk or loose wool.

Other objects and advantages of the present invention will become apparent from the following description taken in conjunction with the drawings, in which:

Fig. 1 is an elevational cross-section side view of the first portion of our nodulating machine, showing the apparatus for conditioning the fibers and dividing them into individual chunks or cubes ready for nodulating:

Fig. 2 is a top plan view of the cubing device of our nodulator;

Fig. 3 is an elevational cross-section side view of the portion shown in Fig. 2;

Fig. 4 is an elevational side view illustrating

the driving means for the nodulating apparatus;

Fig. 5 is a front elevational section view taken along the lines 5—5 of Fig. 4;

Fig. 6 is a side elevational cross-section view of the latter portion of our device used for nodulating the individual cubes and means for packing the same into bags;

Fig. 7 is a fragmentary perspective view of the agitator or beater blades;

Fig. 8 is a fragmentary perspective view of the trough in which the beater blades rotate;

Fig. 9 is a rear elevational view shown partly in section of the agitator and bag packing device;

Fig. 10 is a plan view of the apparatus shown in Fig. 9;

Fig. 11 is an elevation view of the bag filling device taken through the section 11—11 of Fig. 10;

Fig. 12 is a rear elevational view of a modification of the agitator; and

Fig. 13 is a side elevational view of the same taken at the line 13—13 on Fig. 12.

Referring to Fig. 1, the siliceous fibrous material 20 in bulk form or in the form of loose wool or wool rolled in bundles, whether pre-felted or not, is fed into a hopper 21. A belt 22 at the bottom of the hopper feeds the fibrous material to the picker belt 23 and insures a complete feeding of all the fibrous material, including the last remaining portions in the hopper 21. The picker belt 23, which is provided with a plurality of spikes or pointed needles 24, picks an even mat from the mass in the hopper as it advances, and passes it over to a chamber 25 where the fibers may be conditioned. As the picker belt 23 conveys the fibrous material upward, a short belt 26 or the like prevents the wool from clogging the outlet 27 and prevents unduly large masses of the fibrous material from being carried over into the conditioning chamber 25. The fibrous material in the hopper is given a rolling action by the belts 23, 22 and 26, which agitate the fibers and release any slugs which may be present in the material. The slugs fall through openings in the belt 22 or drop over the end thereof where they may be collected and removed.

In order to remove the fibrous material from the picker belt 23 as it emerges from the hopper 21, a stripper 29 comprising a plurality of blades 30 of leather, rubber or the like, has been provided. The thin mats of fibrous material which are wiped off by the paddles 30 drop down a chute 31 into the conditioning chamber 25 where they are laid onto the conveyor belt 32, which feeds the fibrous material into the cubing device 33. As the material advances along the conveyor belt 32, it is put into a proper condition for cubing and nodulating by application of various substances which have been found to be advantageous or necessary, more fully described hereinafter. A spray 34 of these substances may be administered to the advancing fibrous material by means of a spray gun 35 or the like, which is fed by an inlet conduit 36 and air pressure means 37 for producing a fine, uniform spray.

The cubing device 33 will now be described. By referring to Figs. 1, 2, 3 and 5, it can be seen that a plurality of slitter disks 40, mounted about ½ inch apart, are mounted upon a drum 41 or the like on the shaft 42. A bearing block 43 holding the shaft 42 may be mounted on the framework 44 of the machine, preferably with a yielding engagement so that the slitter disks 40 are held by a constant yielding pressure against the slitter roll 46. This slitter roll is mounted on a shaft 47 which receives its support from the bearing block 48, also mounted on the framework 44. The slitter roll 46, as can be seen from Fig. 5, is provided with a series of peripheral grooves 48, spaced apart at intervals along the axis of the roll, each groove 48 being aligned with and engaging a slitter disk 40. The slitter roll 46, between the grooves 48, is preferably knurled or otherwise roughened so as to facilitate the passing of fibrous material through the slitter roll and disks. The slitter disks 40 and the roll 46 are preferably made of a hard alloy steel to resist abrasion of the siliceous fibrous materials and to increase their life. As the slitter disks gradually become worn and the grooves 48 deepen, the uniform yielding engagement of the slitter disks permits a uniform and constant pressure of all the disks 40 upon the slitter roll 46. As the wool is passed between the slitter disks and the roll, it is crushed or cut so that the fibrous mass emerges from the slitter as continuous individual strips, each strip having a square cross-section.

In order to wipe or strip the wool from the slitter disks 40, as the fibrous material emerges from the slitting action, a stripper roll 50, having a series of strippers 51, is provided, the strippers 51 extending radially and passing interjacent between and in register with the slitter disks 40, there being a small clearance between the adjacent strippers 51 and disks 40. The peripheries of these strippers 51 are preferably knurled so that a greater pulling action may be obtained against the fibrous material and the slitter disks 40 may be kept continually clean and free from accumulating masses of material. The stripper roll 50 is mounted on a shaft 52, which is held in a bearing support on the frame 44.

On the under-side of the emerging fibrous material and serving to wipe the same from the slitter roll 46, is an angle support 55, upon which is mounted the stationary knife 56 (see Fig. 3). Bolts or the like may be provided to demountably secure the stationary knife or cutter block 56 to the support 55 and also to a casting 57 which is mounted on the frame 44. Mounted in front of the stationary knife 56 is a rotary chopper 58 comprising a chuck 59, and a plurality of axially mounted blades 60 which are secured to the chuck by means of wedges 61 and set screws or the like. The chuck 59 is keyed to a shaft 62, rotating freely in a bearing block 63, which secures its support from the frame 44. The rotary chopper 58 is adjustable so that the blades 60 may be made to align themselves accurately with the stationary knife 56. As the blades successively pass by the stationary knife 56, uniform cubes 64 of fibrous material are cleanly and completely sheared from the advancing strips of material. The cubes 64 drop down to the chute 65 from which they are delivered to a conveyor belt 66 of a chain or apron variety. The entire apparatus comprising the stripper 29, conveyor belt 32, the cubing apparatus 33, and the conveyor belt 66, is more or less completely housed in housing 68 to maintain equilibrium heat and moisture conditions within the apparatus, confine the fibrous material to its proper chamber and to render the machine safe for workmen.

Referring more particularly to Figs. 6 and 10, the conveyor belt 66 advances the cubes 64 upwardly and discharges them into the intake end of an agitator apparatus 70. This apparatus comprises a plurality of troughs 71, their length and number depending upon the speed and ca-

pacity of the machine. The cubes 64 are discharged into one end of the upper trough 72 and are advanced horizontally along the trough to the far end where they drop into the second trough 73. From here they are advanced back along the trough to its outlet end, where they fall into the inlet end of the succeeding trough 74. The cubes are further acted upon and moved until they are discharged into a hopper 75. Within each trough are a series of revolving beater blades 76 mounted on shafts 77, 78 and 79 in the first, second and third troughs, respectively. As can be seen from Fig. 7, the beater blades 76 are fastened to the shafts 77, 78 and 79 by means of bolts 76a, forming an adjustable mounting. The beaters 76 are preferably inclined at an angle, whereby the cubes 64 are continually advanced axially along the trough and are rolled against strips 80 to form nodules. Chutes 81 are provided at the extremities of the troughs 72 and 73 to pass the nodules from the discharge end of one trough to the inlet end of the succeeding trough.

In regard to the beater blades 76, some of the blades are inclined for the purpose of feeding the material forward but it is important that this forward feeding be slow enough to maintain the beater troughs 71 well filled and permit the beater blades to act effectively in conjunction with the strips 80. If all the beater blades were inclined in a direction to give a forward impulse to the material, the latter might be fed along in too thin a stream. Accordingly, some of the beater blades may be inclined for forward feeding and some, for example, every third beater blade, might be inclined in the reverse direction. The beater blades are adjustable, however, by means of the bolts 76a, permitting any desired adjustment, depending upon the particular desired conditions. It may be found advantageous in some cases to limit the number of strips 80 and, as a matter of fact, successful results have been obtained under certain conditions by removing them entirely. It is preferable not to roll or pack the nodules too firmly or tightly which would result in their density being increased excessively and also the fibers might be reduced thereby to a more or less powdered condition, particularly if the fibers are of a brittle substance.

As the material, now in the form of nodules, discharges at the outlet end of the trough 74, it is ready to be packed and for this purpose an automatic bag filling device 85 has been provided. Between the discharge end of the trough 74 and the bag filling device is a relatively large hopper 75 in which the nodules are temporarily stored during the intervals that the bag filling device 85 is stopped. This prevents the material from being unduly packed or held back within the agitator apparatus 70. Holding back the nodules in the agitator would tend to break up the nodules and reduce the fibers to a more or less powdered condition.

At the lower end of the hopper 75 the material drops into a feed tube 86, which is part of the packing device 85. Within the tube is a flight conveyor 87 fixedly mounted on the shaft 88, which rotates in and is supported by the bearings 89. The flight conveyor 87 is driven by a motor 90, which has driving connection with the shaft 88 through belting 91 and gearing within a gear reduction box 92. The flight conveyor 87 delivers the nodules to the outlet end of the tube 86 over which a paper bag 93 (Figs. 10 and 11) may be fitted. The bag 93 rests on a trough-shaped support 95 (see also Fig. 6) and is held telescoped over the tube 86 by means of a friction brake 96. The brake is adjustable by means of the poise 97, pivoted to the bracket 98. As the nodules are fed into the bag 93 by the flight conveyor 87, they are packed with a certain amount of pressure determined by the tension of the brake 96, which permits the bag to slip outward under a predetermined tension as the material is packed therein. The compactness and density of the nodules in the bag 93 are determined by the adjustment of the poise 97.

The trough 95 is pivotally mounted on the arm 100 (see Fig. 11) and balanced by the counterweight 101 which may be adjustably positioned. On the opposite side of the trough 95 is a protuberance 107 which engages a latch 105. This latch 105 is mounted on the frame of the machine and is held in its normal position by a spring 106. Depending from the trough 95 (see Fig. 6) is a finger 99 having an adjustable setscrew 99a fixed thereto for engaging a switch 102 which is electrically connected to the motor 90. The switch 102, which may be of the well-known mercury type, comprises a lever 103 pivoted to the bracket 104 on the frame of the machine.

When the bag 93 has received a predetermined weight of material, determined by the adjustment of the counterweight 101, the trough 95 drops down and trips the switch 102 which stops the motor 90 and the conveyor 87. As the trough 95 lowers, the protuberance 107 strikes against the latch 105, distending spring 106, and thereby locks the trough in its lowered position. The bag 93 is then removed by hand and replaced by an empty one to be ready for the next filling operation. After the new empty bag has been placed in position over the trough 95, the latch 105 is released by hand to permit the weight 101 to raise the trough for the subsequent filling operation. The finger 99 also disengages contact with the switch arm 103, thereby closing the electrical circuit through the switch 102 to restart the motor 90.

The system and apparatus for driving the machine will now be described. Referring to Figs. 1, 4 and 5, a motor 110 supplies motivating power for the entire machine with the exception of the bag filling device. The motor 110 is directly connected by a belt 111 to a pulley 112 which is keyed to a shaft 113, the shaft 113 delivering power into the housing 114 in which an automatic variable speed drive, such as a Reeves drive 115, is located. The Reeves drive 115 forms an adjustable mechanical drive connection with the shaft 116, to feed power to the picker belt 23, the slitter mechanism and the conveyor belt 32. The power to the picker belt is transmitted through the power belt 118, the pulley 119 and shaft 120 from where it is transmitted to the picker belt 23. The stripper 29 also receives its power from the shaft 120, the connection being made by means of the power belt 121 and the shaft 122 to which the stripper 29 is keyed. The belt 26 likewise receives its power from the shaft 120 by suitable belt arrangement (not shown). The belt 22 at the bottom of the hopper receives its power through suitable mechanical connection (not shown) to the lower shaft 125 of the picker belt 23.

Reference being had to Fig. 4, a drive belt 127, which is connected to the Reeves drive 115, drives the slitter roll 46 and the conveyor belt 32. The slitter roll 46 is connected to the shaft 126 by the drive belt 128. It will also be noted

from Fig. 4 that the slitter disk shaft 42 is geared by means of the spur gears 130 to the slitter roll shaft 131. Thus, the slitter disks 40 have a positive movement against the roll 46. The stripper roll 50 is driven from the slitter shaft 42 through the belt 133. The lower shaft 135 of the conveyor belt 66 is driven by the drive belt 134 which is connected to a pulley on the slitter roll shaft 131.

Referring to Fig. 9, it will be noted that the conveyor belt 66 and the agitator apparatus 70 both receive their power from and are driven by the lower shaft 135, the power being transmitted through the belt 138 and the upper shaft 137. The three beater shafts, 77, 78 and 79, are interconnected by a pulley system, including belts 136, 140 and 141. It can be seen, therefore, that the agitator apparatus 70, the conveyor belts 66 and 32, the picker belt 23, the stripper 29, and the slitter mechanism, are all interconnected, driven from, and regulated simultaneously by the same Reeves drive 115.

The rotary chopper 58, on the other hand, as illustrated in Figs. 1, 4, and 5, is regulated independently by a variable speed drive such as the small Reeves drive 144, surmounting the Reeves drive 115. A drive belt 142 delivers power to the small Reeves drive 144 from the shaft 113, this shaft 113 being powered directly from the motor 110 as brought out hereinabove. The chain of mechanical connections for delivering power to the rotary chopper 58 from the small Reeves drive 144, includes shaft 143, belt 145, jack shaft 146. drive belt 147, shaft 148, and spur gears 149. By means of this arrangement, the relative speeds of the rotary chopper and the slitter mechanism may be varied to produce predetermined sized chunks or cubes 64 in accordance with the particular requirements.

As a modification of the agitator mechanism 70, reference may be had to Figs. 12 and 13 in which the belt 66 delivering the cubes 64 to a trough 150 is identical with that heretofore described. The cubes 64 are conveyed horizontally and partially rolled within the trough 150 by a flight conveyor 151. The trough 150 is extended over to the hopper 75 into which the rolled cubes may be directly discharged. At a point midway between the ends of the trough 150 and at the bottom thereof, is an opening 153 which leads into a chute 154. A slide gate 157 is provided for the opening 153 to permit the material to be selectively discharged through the chute 154 or conveyed the full length of the trough 150 into the hopper 75. When the slide gate 157 is open, as shown in Fig. 12, the material drops directly into the chute 154, and when the slide gate 157 is closed the fibrous material is conveyed through the entire length of the trough to the hopper 75. At the lower portion of the chute 154, a screw conveyor 155 feeds the material into the central portion of a blower 156. Both the screw conveyor 155 and the blower 156 are mounted on the shaft 158 and are driven through the selective speed pulleys 161 and the belt 162 by the motor 163. The blower 156 throws the material outwardly to its periphery, and through the hose 164 into the top of the hopper 75. As the material is blown and projected through the hose 164, it receives a rolling action along the side walls of the hose so that, by the time the material is delivered to the top of the hopper 75, it has been rolled with the correct amount of density and tightness. The remainder of the mechanism, including the bag filling device, may be identical with that hereinbefore described. The type and nature of the particular nodules manufactured can be varied in several ways. For example, if the length of the hose 164 is increased, it is possible to roll the nodules more tightly and densely and if the relative machine speeds of the rotary chopper 58 and the slitter disks 40 are varied, it is possible to regulate the size of the chunks or cubes which form the nodules.

The operation of the machine may be reviewed briefly by referring first to Fig. 1. Fibrous material is fed into the hopper 21 in which it is given a rolling action to free itself from any included slugs, etc. A picker belt 23 tears off small tufts of the material and conveys it over to the chute 31 from which it falls onto the conveyor belt 32 in the conditioning chamber 25. A rotary stripper 29 strips the tufts of material from the needles 24 of the picker belt 23. As the fibrous material travels up the conveyor belt 32, it is subjected to a spray 34, which puts the material in a condition suitable for nodulating. The conveyor belt 32 delivers the material to the slitter roll 46 and the slitter disks 40, between which the material is slit into a series of continuous strips having a width of about ½ inch. These strips are fed into a rotary chopper 58 which cuts it to the desired length and delivers the material in the form of chunks or cubes to the conveyor belt 66, the length of the chunks being regulated by the Reeves drive 144. Reference being had now to Fig. 6, the conveyer belt 66 delivers the material into an agitator comprising a series of troughs 71, each trough having beater blades rotating therein, which thoroughly agitates the chunks or cubes to form nodules and advances the material consecutively through the individual troughs to deliver it to the hopper 75 from where it is fed to the bag packing device 85.

More particularly in regard to the method and purpose of conditioning the fibers in the chamber 25, it has heretofore been very difficult to produce nodules which were uniformly packed, felted and free from external fuzziness and which could be blown properly and distributed uniformly throughout a cavity. It was found, however, that by adding to the fibers a chemically reactive material capable of etching the surface, their roughness and surface friction increased, which enabled a mat of fibrous material to have increased mass integrity. If, for example, moisture is added to the fibrous material containing an alkali metal oxide ingredient before being divided into chunks, tight, well-felted nodules, which are free from fuzz and do not reduce to dust when blown, can be produced without increasing the density. In other words, the addition of moisture in correct amounts makes possible the production of a low density mass of nodules which may be uniformly and efficiently blown or otherwise inserted in a cavity. It is desirable to maintain a close control of the moisture content, it having been found advantageous to maintain the moisture content at approximately .75% to 1.5%, although, of course, this range may vary in accordance with particular requirements. The moisture tends to etch the surface of the fibers and increases their mutual friction and surface cohesion. The partial etching of the surface of the fibers is due to the accelerated leaching out of caustic soda. This is done to a degree, however, which is not detrimental to the strength of the fibers or nodules. Thus, the loose ends

which would ordinarily project outwardly from the nodules, may be turned back and felted within the nodule to prevent fuzziness. The moisture may be added either in the hopper 21 or, as shown in Fig. 1, in the conditioning chamber 25. Although it is preferably added in the form of a spray, it may be applied in vapor or steam form and permitted to condense on the surface.

Although the present invention has been illustrated and described in connection with specific embodiments, variations and modifications may be made within the spirit and scope of the appended claims.

We claim:

1. A method for forming nodules of siliceous fibrous material which comprises establishing a supply body of fibrous material, advancing from said supply body a continuous mat of said material, dividing the material in said mat into a mass of individual chunks, and then rolling said individual chunks in mass form into nodules.

2. A method for forming nodules of siliceous fibrous material which comprises establishing a supply body of fibrous material, advancing from said supply body a continuous mat of said material, dividing said mat of material longitudinally into a plurality of continuous strips, cutting said strips at regular intervals to produce individual chunks, and then rolling said individual chunks in mass form into nodules.

3. A method for forming nodules of siliceous fibrous material containing an alkali metal oxide ingredient which comprises establishing a supply body of fibrous material, applying a thin coating of water to said material in small amounts adapted to accelerate leaching of the alkali to the surface of said material, advancing from said supply body a continuous mat of said material, dividing the material in said mat into individual chunks, and rolling said individual chunks into nodules.

4. A method of forming nodules of siliceous fibrous material containing an alkali metal oxide ingredient which comprises establishing a supply body of fibrous material, applying a thin coating of water to said material in small amounts adapted to accelerate leaching of the alkali to the surface of said material, advancing from said supply body a continuous mat of said material, dividing said mat of material into a plurality of continuous strips, cutting said strips at regular intervals to produce individual chunks, and rolling said individual chunks into nodules.

5. The method of treating siliceous fibrous material containing an alkali metal oxide ingredient to form nodules, which comprises applying a thin coating of water to said material in small amounts adapted to accelerate leaching of the alkali to the surface of said material, dividing said material into chunks, and then rolling said chunks into nodules.

6. The method of treating siliceous fibrous material containing an alkali metal oxide ingredient to form nodules, which comprises applying moisture to said material in small amounts adapted to accelerate leaching of the alkali to the surface of said material, dividing said material into chunks, and then rolling said chunks into nodules.

7. The method of treating siliceous fibrous material containing an alkali metal oxide ingredient to form nodules, which comprises maintaining the moisure content of said material from about .75% to 1.5% by weight, dividing said material into chunks, and then rolling said chunks into nodules.

8. The method of conditioning fibrous glass material containing an alkali metal oxide ingredient prior to rolling it into nodules, which includes the step of maintaining the moisture content from about .75% to 1.5% by weight.

9. The method of producing nodules from a supply body of long, fine, glass fibers, which comprises advancing a mat of said fibers from said supply body, dividing said mat into a mass of individual chunks, and then rolling said individual chunks in mass form to produce nodules.

10. The method of producing nodules from a supply body of long, fine, glass fibers, which comprises advancing a mat of said fibers from said supply body, dividing said mat into individual chunks, and subjecting said chunks to a beating and rolling action to produce nodules.

11. The method of producing nodules from a supply body of long, fine, glass fibers, which comprises advancing a mat of said fibers from said supply body, dividing said mat into individual chunks, subjecting said chunks to a beating and rolling action to produce nodules having a density of about 1½ to 5 lbs. per cubic ft. and being sufficiently free from fuzziness to permit a group of said nodules to be blown into a cavity.

12. An apparatus for producing nodules of a siliceous fibrous material, which comprises means for continually feeding said material from a supply body of said material, means for cutting said material into chunks, and means including beater blades for rolling said individual chunks in mass form into nodules.

13. An apparatus for producing nodules of a siliceous fibrous material, which comprises means for continually feeding said material from a supply body of said material, means for slitting said material into long strips, means for cutting said strips at regular intervals to produce individual chunks, and means including beater blades for rolling said individual chunks into nodules.

14. Apparatus for producing nodules of glass wool fibers, which comprises a feeding mechanism for feeding said fibers in the form of a loose mat; means for applying a liquid in predetermined amounts to said fibers; means for dividing said mat into chunks; and means for rolling said chunks into nodules, the said rolling means including a trough, rotary beater blades within said trough, and stationary strips mounted in said trough, said chunks being rolled between said beater blades and said strips.

15. Apparatus for producing nodules of glass wool fibers, which comprises a feeding mechanism for feeding said fibers in the form of a loose mat; means for applying a liquid in predetermined amounts to said fibers; slitter disks for cutting said mat into longitudinal strips; a knife transversely disposed to said strips for cutting said strips into individual chunks; and means for rolling said chunks into nodules, the said rolling means including a trough, rotary beater blades within said trough, and stationary strips mounted in said trough, said chunks being rolled between said beater blades and said strips.

16. Apparatus for producing nodules of glass wool fibers, which comprises a feeding mechanism for feeding said fibers in the form of a loose mat; means for applying a liquid in predetermined amounts to said fibers; slitter disks for cutting said mat into longitudinal strips; a knife transversely disposed to said strips for cutting said strips into individual chunks; driving mechanism for individually driving said disks and said knife; means for adjusting the relative

speeds of said disks and said knife to regulate the size of said chunks; and means for rolling said chunks into nodules, the said rolling means including a trough, rotary beater blades within said trough, and stationary strips mounted in said trough, said chunks being rolled between said beater blades and said strips.

17. Apparatus for producing nodules of glass wool fibers, which comprises a feeding mechanism for feeding said fibers in the form of a loose mat; means for applying a liquid in predetermined amounts to said fibers; means for dividing said mat into chunks; and means for rolling said chunks into nodules; the said rolling means including a blower and a tube issuing from said blower, the said chunks being delivered into the central portion of said blower and being thrown out through said tube in which they are given a rolling action.

18. Apparatus for producing nodules of glass wool fibers, which comprises a feeding mechanism for feeding said fibers in the form of a loose mat; means for applying a liquid in predetermined amounts to said fibers; means for dividing said mat into chunks; and means for rolling said chunks into nodules; the said rolling means including a flight conveyor, and a housing for said conveyor.

19. Apparatus for producing nodules of glass wool fibers, which comprises a feeding mechanism for feeding said fibers in the form of a loose mat; means for applying a liquid in predetermined amounts to said fibers; means for dividing said mat into chunks; and means for rolling said chunks into nodules; the said rolling means including a flight conveyor, a housing for said conveyor, a blower and a tube issuing from said blower, the said chunks being delivered by said flight conveyor into the central portion of said blower and being thrown out of said blower through said tube and receiving a rolling action in said tube.

20. In combination, a feeder for delivering a loose mat of glass fibers, means for dividing said mat into individual chunks, means for rolling said chunks into nodules, said dividing means including a series of slitter disks, a slitter roll engaging said disks for cutting said mat into longitudinal strips, and a rotary chopper for cutting said strips into individual chunks.

21. The method of conditioning a mat of inorganic fibrous material, which includes the step of applying a substance to the surface of said fibers capable of attacking and etching the surface of said fibers, said substance being water in amounts from about .75% to about 1.5%.

22. The method of conditioning a mass of inorganic fibrous material to increase its mass integrity, which includes the step of etching the surface of said fibrous material, the said etching taking place by the presence of a substance capable of chemically attacking the surface of said fibrous material, said substance being water in amounts from about .75% to about 1.5%.

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