Nov. 29, 1960 A. MARZOCCHI ET AL 2,961,821

APPARATUS FOR MANUFACTURING BONDED FIBROUS GLASS SLIVERS

Filed Dec. 7, 1956

2 Sheets-Sheet 1

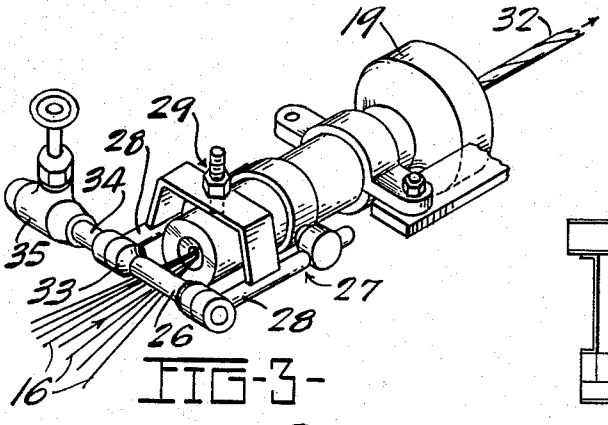


FIG-3-

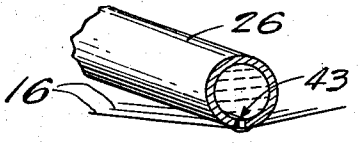


FIG-3-A-

FIG-1-

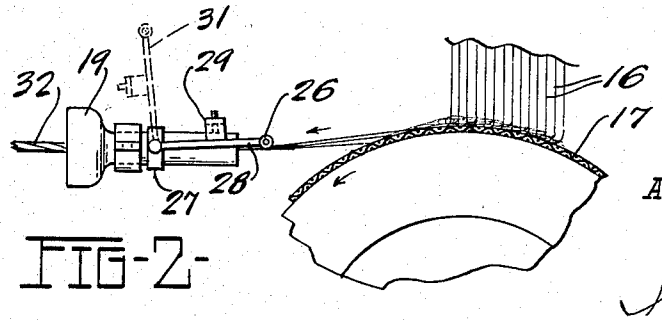


FIG-2-

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2 Sheets-Sheet 2

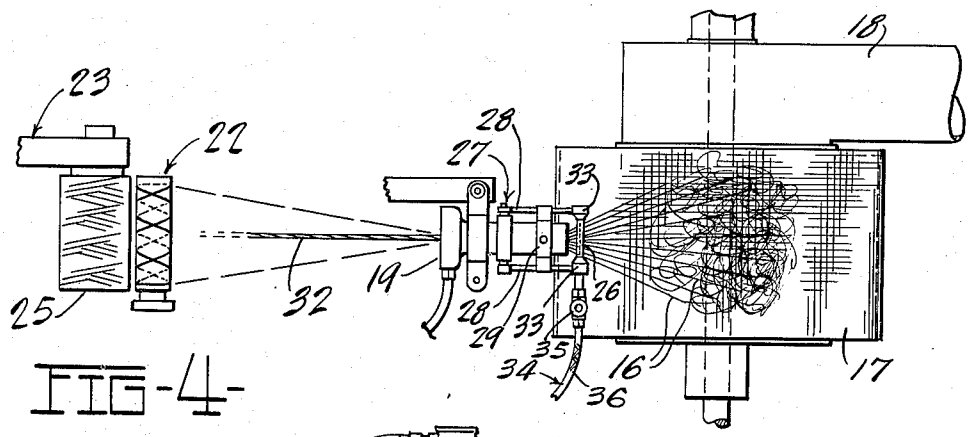


FIG-4-

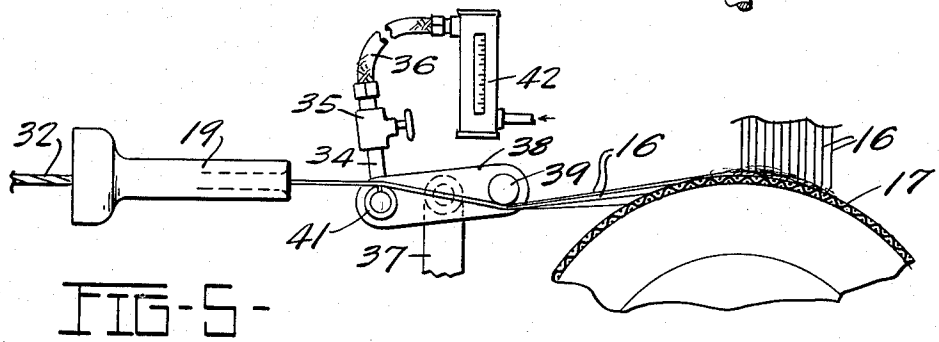


FIG-5-

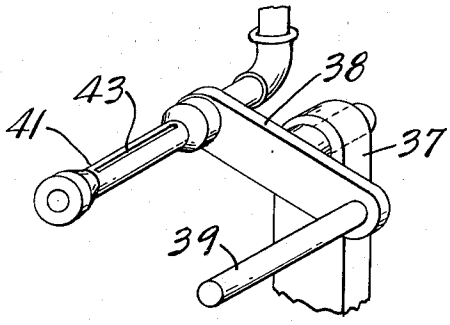


FIG-6-

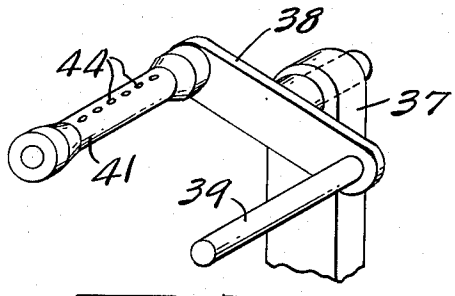


FIG-7-

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United States Patent Office 2,961,821
Patented Nov. 29, 1960

2,961,821

APPARATUS FOR MANUFACTURING BONDED FIBROUS GLASS SLIVERS

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Filed Dec. 7, 1956, Ser. No. 626,990

3 Claims. (Cl. 57—35)

This invention relates to staple textile products and more particularly to the stabilization of processes of manufacturing staple products and to the application of treating mateials to staple fibers such as glass fibers as they are formed.

It is an object of this invention to provide improved staple products.

It is a further object to provide an improved process for applying treating materials upon fibrous glass staple fibers as they are being formed.

It is also an object to avoid waste of binder as it is applied and at the same time to improve the uniformity of staple sliver, roving, and yarns produced therefrom.

It is also an object to provide an uninterrupted process for the production of sliver.

The objects are attained by blowing staple fibers onto a collecting surface and applying a treating material to the fibers as they are drafted from the collecting surface under added tension and formed into a staple sliver.

The invention will be best understood by reference to the drawings wherein:

Figure 1 is a side elevational view of apparatus for producing staple;

Figure 2 is an enlarged elevational view of the collecting surface for the fibers and the apparatus for applying treating materials and tension to the fibers as they are formed into a sliver, parts being in section;

Figure 3 is a perspective view of the air turbine and apparatus for applying the treating materials and tension to the fibers;

Figure 3A is a view of an applicator tube showing the slot through which the treating composition flows as it is applied to the fibers;

Figure 4 is a plan view of the fiber collecting apparatus and the sliver winding apparatus;

Figure 5 is an enlarged elevational view of another form of the apparatus used for applying treating compositions and tension to the fibers;

Figure 6 is an enlarged perspective view of the treating composition applicator or tension device; and

Figure 7 is a perspective view of another form of a treating composition applicator and tension device.

Various compositions can be applied to the fibers using the process and apparatus of this invention. These treating compositions act as a binder and also as a protective film or coating for the fibers during their use. Great improvement in binder coating efficiency has been achieved by the use of the apparatus of this invention. In addition the apparatus which will be described provides a stable, more easily operated process which runs continuously to provide a very uniform product.

In Fig. 1 the apparatus includes a marble hopper 11, a glass melter 12 and associated with the glass melter, a marble feeding device 13. Marble chute 14 interconnects the marble hopper 11 and glass melter 12. The glass melter comprises a platinum wall chamber within which the marbles are melted. The glass flows downwardly through an air blower which has skirts 15, 15. Glass streams are attenuated into fibers 16, 16 of staple length by the action of the air being directed downwardly through the skirts 15.

Disposed below marble melter 12 is a collecting drum 17 provided with an exhaust duct 18 adapted for moving air through the surface of the perforated collecting drum 17. Adjacent to collecting drum 17 is air turbine 19 and the product packaging apparatus 21 which comprises a winder traverse 22, sometimes referred to as a Reese roll, and a four spindle winder 23. The four spindle winder 23 is rotatable upon its axis 24 so that any one of the four tubes 25, 25 can be put into the winding position immediately adjacent to winder traverse 22. The treating compositions to be applied to the fibers are wiped onto the fibers as they pass below applicator tube 26 which is mounted on a supporting arm assembly 27 secured to the air turbine 19.

The air turbine and applicator tube assembly is better shown in Figure 2. Assembly 27 includes a means for swinging the applicator tube 26 into and out of operating position. Applicator tube 26 is mounted upon supporting arms 28 which are provided with an adjustable yoke 29 for properly positioning the applicator tube with respect to the fibers being drawn from collecting drum 17. The retracted position 31 removes the applicator tube 26 from the path of the fibers as they are drawn through the air turbine 19, see Figure 2. The fibers as they are removed from collecting drum 17 pass over the applicator tube where they pick up the treating composition. The fibers are then passed through the air turbine where the loose ends are wrapped into the fibrous glass product so that an integral sliver 32 is formed.

Air turbine 19 and applicator tube assembly 27 are also shown in the perspective view, Figure 3. It will be noted that applicator tube 26 has a tapered sleeve 33 at each end of the tube, see Figure 4. Inlet line 34 has a valve 35 for controlling the flow of treating composition to the applicator tube 26. A flexible line 36 connects the valve with the supply of treating composition, not shown. Applicator tubes are shown in larger scale in Figures 3A, 6 and 7 with either a slot 43 or holes 44 for applying liquid to the staple fibers.

In Figure 4 is shown a top view of the apparatus. Fibers 16 are collected upon collecting drum 17 in a rather wide pattern and are then drafted off by the action of winder traverse 22 in conjunction with the tube 25 on four spindle winder 23. As the fibers proceed they are drawn over the applicator tube 26 where they pick up the treating composition. The fibers are then brought together and the loose ends wrapped into the sliver as the fibers pass through air turbine 19. The sliver 32 from the air turbine rides within the yankee screw slot of the winding traverse 22. The applicator tube 26 acts not only as an applicator but also as a tensioning device for the fibers which are being formed. It has been found highly desirable to have the fibers drafted from the collecting drum under some tension. This tension seems to provide a more uniform product and to make it possible to maintain a continuous process relatively free of breakouts and the like.

Another form of applicator is shown in Figure 5 where the assembly comprises a supporting arm 37, cross arm 38, tension bar 39, and applicator tube 41. Applicator tube 41 is connected through inlet line 34, valve 35, and flexible line 36 with a rotameter 42 which is an indicator showing the flow rate. Applicator tube 41 has a dual function in that it acts also as a tensioning bar.

In Figures 6 and 7 are shown two embodiments of applicator tubes. The applicator tube may be provided with a slot 43 through which the treating composition is exuded or a multiplicity of holes 44 may be provided for the metering of the treating composition. Other arrangements may be used, for instance, a series of slots may be arranged in the applicator tube, if it is desirable.

In each of these double arm assemblies shown in Figures 5, 6 and 7, the applicator tube not only applies the treating composition but also applies added tension to the fibers passing over the bar. A porous member of graphite, metal or other suitable porous materials may be used as the applicator and tensioning member.

In operating this apparatus, current is supplied to the melter to form molten glass of the marbles or cullet. Molten glass is allowed to flow from the melter and air passing through the skirts 15, 15 attenuates the molten glass into long staple fibers. The melter is provided with orifices through which the molten glass flows in the form of streams. The fibers pass downwardly to the collecting drum and air is evacuated from the perforated collecting drum through exhaust duct 18. The fibers collect in the form of a web which is pulled from the collecting drum by the winding apparatus. The fibers pass through the air turbine which is rotated rapidly by compressed air. The smooth inner cylinder of the air turbine rotates quite rapidly to wrap in the loose ends of the fibers with the result that an integral sliver is formed. The sliver is brought up over the winder traverse roll and around the tube positioned on the spindle of the winder which is adjacent the winder traverse. A package of sliver is collected on tube 25 and after a package of suitable size has been collected, the collecting mechanism is rotated so that a new tube on another one of the spindles is put into winding position. The winder traverse is rotated by suitable drive means and the tube 25 which is in contact with the winder traverse turns as a result of its contact with the winder traverse.

Various treating compositions can be applied with the apparatus of this invention. For instance, various binders are applied to give the desired final physical properties in the product. One size which has been used for producing bonded staple comprises the following ingredients in the indicated weight percent:

	Percent
Alkyd resin (Archer Daniels Aroplaz 1400)	10
Antistatic agent (Konrite A)	1
Emulsifier (Triton X–100)	0.5
Humectant (Tween 81–Sorbitan mono-oleate)	0.5
Water	88

Another size which is used for bonding a staple sliver comprises the following materials expressed in weight percent:

	Percent
Alkyd resin (Archer Daniels Aroplaz 1400)	50
Antistatic oil (Konrite A)	3
Benzoyl peroxide (Lucidol)	1
Styrene monomer	9
Stoddard solvent	37

The binders may be either water or solvent base compositions as illustrated. Various resins such as the alkyd resins have been used successfully including those known as Paraplex P–13, P–43, P–47, P–433, and others, Admoline, Polylite 8000, 8001, Epon resin 828, and others. A medium oil alkyd supplied by Glidden and known as 614A may be used with propylene glycol as the solvent.

The size composition is applied to provide a heat polymerizing, bonding film for the fibers in the staple sliver. After the size is polymerized the fibers are locked into an integral, flexible unit. The alkyd resin used is believed to be a reaction product of soya bean oil and phthalic acid. Various other resins or oils may be used including linseed oil, tung oil, various alkyd resins, polyester resins, epoxy resins, polyurethanes and the like. Thermoplastic resins including those of styrene, vinyl chloride, vinylidene chloride and the like may also be used in these compositions. The resin applied may be foamed after being applied.

Although applicators having only one or two bars have been shown, it is possible to use more than two bars for applying the tension prior to or simultaneous with the application of the treating composition to the fibers being formed into a sliver. The tensioning is even more important when operating staple-forming apparatus at high speeds. It is preferred to reduce the number of bars for applying tension to the fibers to a minimum. It has been found that at present forming speeds, a single applicator tube which acts both as the tensioning member and as the applicator is satisfactory. Such apparatus is shown in the preferred embodiment in the drawings.

The fibers being removed from the collecting drum may be either passed over or under the tensioning bar or the applicator tube. In the preferred embodiment shown in Figures 1, 2, 3 and 4, the fibers pass below the applicator tube and the slot for emission of the treating composition is on the underside of this applicator tube. This is in contrast to the apparatus shown in Figures 5, 6 and 7, where the fibers are passed over the top of the applicator tube and the holes or slots for emission of the treating composition are in the top side of the applicator tube. Two, three, four or more tensioning bars may preceed the applicator tube if it is desired to increase the tension upon the fibers being formed into a sliver. The methods and apparatus may be used to apply treating compositions to continuous fibers which are formed by attenuation with pulling wheels or collet winders as known in the art.

Various modifications may be made within the spirit and scope of the following claims.

We claim:

1. Apparatus for forming an integral sliver from an advancing web of staple fibers comprising a rotatable, hollow cylinder within a housing suitable for the passage of the web of staple fibers therethrough, means for rotating said cylinder within said housing, a hollow tensioning bar attached to said housing upon hinged supports, said tensioning bar being positionable near one end of said rotatable, hollow cylinder to engage fibers passing through said hollow cylinder, said tensioning bar being provided with openings through which a treating composition is metered, means for supplying a treating composition to said tensioning bar, and a means for advancing said web of staple fibers through said rotatable hollow cylinder.

2. Apparatus for producing a bonded staple fiber sliver from an advancing web of staple fibers comprising roll-up means for advancing a web of fibers and packaging a sliver, an air-driven turbine comprising a rotatable, hollow cylinder journalled within a housing, said hollow cylinder having a tapered inlet opening, associated with said air driven turbine an applicator tube assembly comprising a clamp secured to the housing of the air turbine adjacent the inlet opening of said hollow cylinder, a pair of pivoted arms extending from said clamp and joined at their ends by an applicator tube, said applicator tube having an inlet pipe attached thereto and a slotted outlet opening for applying binder to fibers passing thereover, said pair of arms being joined together by a yoke having an adjusting means for positioning the slotted outlet opening with respect to the tapered inlet opening of the hollow cylinder.

3. In apparatus for production of bonded staple sliver which includes a collecting drum for forming a web of fibers and a roll-up device for advancing the web of fibers and collecting a sliver formed thereof, a turbine comprising a rotatable, hollow cylinder journalled within a housing, said hollow cylinder having an inlet and an outlet opening through which the web of fibers passes, associated with said turbine an applicator tube assembly comprising a bracket secured to the housing of the turbine, a pair of pivoted arms extending from said bracket and joined at their ends by applicator tube means positionable before said inlet opening of said hollow cylinder to apply tension to fibers passing into the hollow cylinder, said applicator tube means comprising a tube having an

inlet pipe attached thereto and a slotted opening for applying binder to fibers passing thereover.

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