May 13, 1941. J. F. HYDE ET AL 2,241,405

APPARATUS FOR GATHERING FIBERS

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Fig. 1

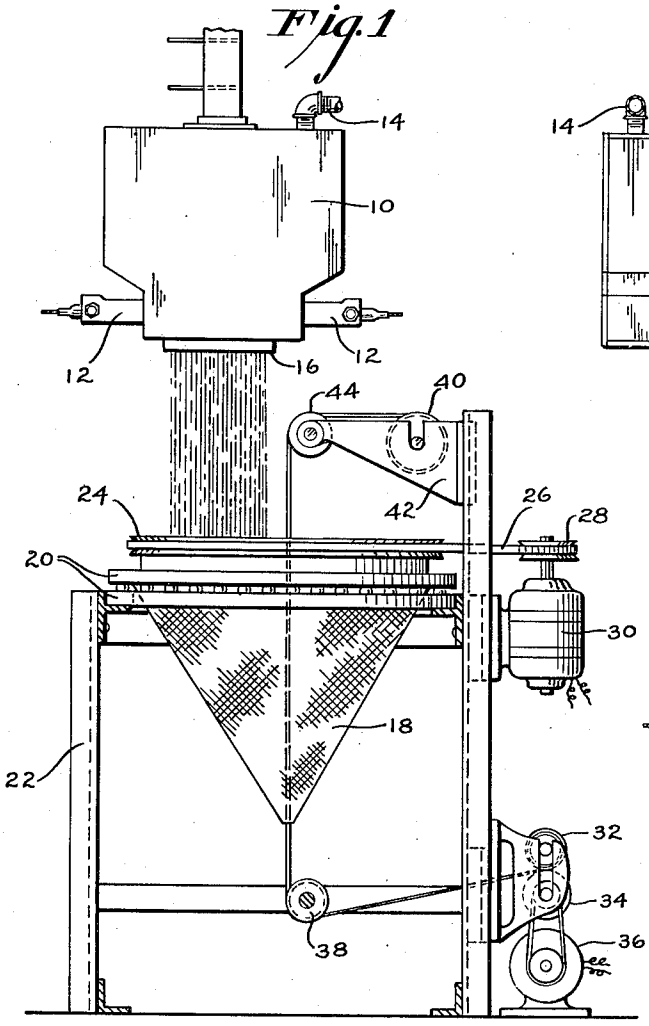


Fig. 2

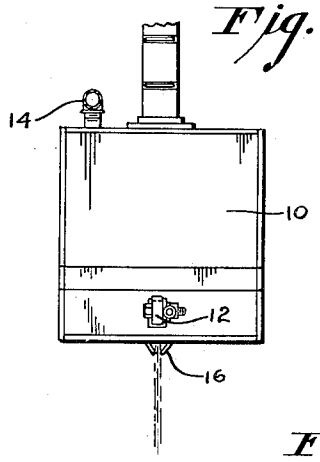
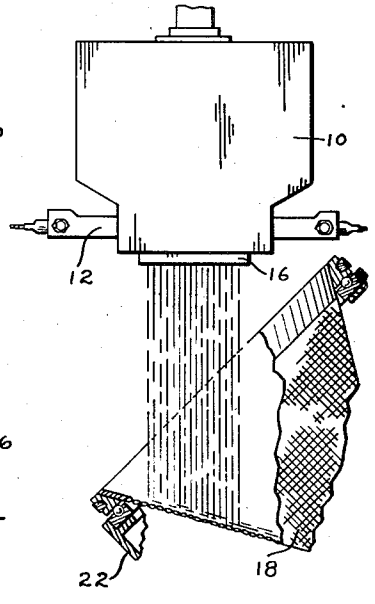


Fig. 3



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APPARATUS FOR GATHERING FIBERS

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Application January 13, 1939, Serial No. 250,836

8 Claims. (Cl. 57—5)

This invention relates to the forming of textile materials and more particularly to a method and apparatus for collecting textile fibers and forming them into a twisted yarn, roving or covering.

While the present invention is adapted for use with textile fibers generally, it relates particularly to the production of twisted rovings and coatings of artificial silicate fibers of fineness and considerable length which are adapted for fabrication into textile products. Heretofore, such fibers have been collected as a thin webbing, folded together to form a sliver and wound on tubes. Only subsequently are these slivers drafted and spun into yarns, threads, and rovings. Such a sequence of disconnected operations involves a considerable amount of manual labor which is expensive and often unsatisfactory.

The present invention has for its object a method of collecting artificial silicate fibers as they are formed and assembling them directly into a twisted yarn, roving, or coating of the desired characteristics, and mechanism for performing this method.

This invention includes among its features the steps of forming fine glass fibers by pneumatically attenuating streams of molten glass, collecting these fibers on the inside of a conical collector as a felted mass, and attenuating and twisting this mass of fibers as it passes through the collector so that it is formed into a twisted roving or yarn, or wound about a core as a coating thereover.

This invention likewise features means for producing fine glass fibers, a conical collector properly positioned with respect to the source of fibers, means for rotating this collector, and means for removing and winding up the material produced thereby.

These and other features of the invention will be readily apparent from the description of the particular embodiment of the invention disclosed in the accompanying drawing in which:

Fig. 1 is an elevation showing the assembled forming, collecting and winding mechanism;

Fig. 2 is a side elevation of the melting unit; and

Fig. 3 is an elevation, partially in section of a modified arrangement of the mechanism shown in Fig. 1.

Referring in somewhat greater detail to the structure shown in the above drawing, the fiber forming mechanism is of the general type disclosed in the co-pending application of Stuart M. Dockerty, Serial Number 209,822, filed May 24, 1938, and includes a resistance heating furnace enclosed in a pressure chamber 10 and supplied with electric energy through protruding terminals 12. Air under pressure is supplied to the chamber 10 by pipe 14 and passes around the furnace to a slot 16 in the bottom of the chamber in alignment with a series of orifice openings in the bottom of the furnace. Molten glass issuing from these orifices is drawn to fibers by the escaping air. Due to the flow characteristics of this stream of air, the fibers issuing from the chamber 10 do not spread widely, but retain a rather close grouping for a considerable distance below the slot from which they issue.

Located beneath the fiber forming mechanism and in position to intercept the stream of fibers issuing therefrom is a fiber collecting mechanism adapted to form the separate fibers into a twisted body such as a yarn, roving, or coating about a core. This mechanism may vary as to details of construction, but consists essentially of a conical collector 18 formed of fine mesh screen or similar open material and mounted for rotation in a bearing 20 encircling its large, upper end and supported by a framework 22. Rotation of the collector may be accomplished by any desired means, but as shown a pulley 24 is included as a part of the mounting structure and is connected by belt 26 with pulley 28 on the shaft of a variable speed motor 30.

Frame 22 likewise supports winding mechanism to take up the formed product which may consist of a reel or spool 32, preferably driven by frictional contact with a drum 34 rotated by variable speed motor 36, and a guide roll or pulley 38 whose periphery is tangential to the axis of rotation of the collector 18.

In operation it has been found desirable to position the collecting mechanism from two to four feet below the fiber producing mechanism so that the stream of fibers issuing from the slot 16 will enter the large, open end of the collector and deposit the fibers on the inner wall of the collector and preferably on a limited portion of this wall laterally disposed from its axis. Such disposition may conveniently be accomplished by positioning the collector slightly to one side of the center line of the slot 16 as shown in Fig. 1, or by centering the collector and tilting it so that its axis forms an angle with the vertical axis of the fiber producing mechanism as shown in Fig. 3. Either arrangement results in the majority of the fibers being deposited on one side of the conical collector. The collector is preferably rotated at a rather high speed ranging from 2,000 to 10,000 R. P. M., and must be of sufficiently rigid construction to withstand such speeds preferably without support at its apex or small end. However, the collector must be made of highly porous material which will offer the minimum of resistance to the passage of the fiber carrying air therethrough. A screen material having as much as 80% of its surface area given over to openings has been found de-

sirable, otherwise the carrying air will rebound from the collector surface and prevent the fibers from being uniformly deposited. Once in contact with the surface, they are held there by centrifugal force and a thin, uniform layer is built up around the inside of the collector due to its rotation. This layer is drawn downwardly through the small opening in the apex of the collector and is drafted and twisted into a yarn or roving.

If it is desired to form a spun coating of fibers about a core such as an electrical conductor, or even another yarn of fibers, a supply of the core material **40** is placed in a rack **42** on the frame **22** and a strand passed over a roller **44** whose surface is aligned with the axis of the collector **18**, through the collector and around aligned roller **38** to the winding mechanism. Since the collector is rotating rapidly relative to the strand passing along its axis, the fibers deposited on the collector are spun tightly onto the surface of the strand. Regulation of the speed of rotation of the collector **18** and the rate of take-up of the winding mechanism with respect to the production of fibers makes it possible to form a fibrous yarn or coating of any weight and twist that may be desired.

While the invention has been described with respect to a device in which fibers are produced with a blast of air, it has been found possible to make use of apparatus employing steam blowers of the type shown in the Slayter and Thomas United States Patent No. 2,133,236. When such a device is employed, it may be found desirable to surround the collector with a vacuum chamber maintained at a suitable reduced pressure to remove the considerable amount of steam expelled with the fibers by this apparatus. However, use of such a vacuum chamber is not desired as it augments centrifugal force to such an extent as to render removal of the fibers from the interior of the collector somewhat difficult. Suction is not necessary with the preferred structure here disclosed since the volume of gas accompanying the fibers and its velocity are both within such limits as to properly position the fibers on the collector without the aid of suction.

While various specific modifications of the present invention have been described, it should be appreciated that these are by way of illustration and the scope of the invention is to be limited only by the appended claims.

What is claimed is:

1. In combination, means for forming an unconfined moving column of fibers and gas, a hollow perforate collector positioned in the path of said column to receive said column within its body and remove the fibers therefrom, means for rotating said collector and means for continuously withdrawing said fibers from said collector along its axis of revolution.

2. In combination, means for forming a moving body of gas and fibers, a hollow perforate collector positioned to receive said body and separate the fibers therefrom, said collector being so positioned with respect to the path of said body that the fibers impinge on a portion only of its inner surface, means for rotating said collector and means for withdrawing said fibers from said collector along its axis of rotation.

3. In combination, means for forming a moving column of gas and fibers, a hollow perforate collector positioned to intercept said column and separate the fibers therefrom, said collector comprising a conical body of perforate material and means for rotating it about its longitudinal axis, said conical body being so positioned with respect to said moving column as to intercept it with a portion only of its inside surface, and means for withdrawing said fibers from said collector along its axis of rotation.

4. In combination, means for forming a moving column of gas and fibers, a hollow conical collector positioned to intercept said column and separate the fibers therefrom, said collector having an open end of greater diameter than said column to receive said column, and being so disposed with respect to said column that the fibers are intercepted by a portion only of its inner surface said portion being laterally spaced from the longitudinal axis of the collector, means for rotating said collector about said axis and means for withdrawing fibers from said collector along said axis.

5. In combination, means for forming a descending column of gas and fibers, a hollow conical collector formed of highly perforate material and having an open, large diameter end of greater diameter than said column, said collector being so positioned beneath the forming means that the column enters said open end and impinges on a lateral portion only of said perforate material, means for rotating said collector and means for withdrawing fibers therefrom along its axis of rotation.

6. In combination, means for forming a descending column of gas and fibers, a hollow conical collector formed of highly perforate material positioned beneath said forming means and in the path of said column with its large diameter end upwardly and its axis eccentrically disposed with respect to said column, said large diameter end being open and of greater diameter than said column, means for rotating said collector and means for withdrawing fibers from said collector along its axis of rotation.

7. In combination, means for forming a descending column of gas and fibers, a hollow conical collector formed of highly perforate material positioned beneath said forming means and in the path of said column with its large diameter end upwardly and its axis eccentrically disposed with respect to said column, said large diameter end being open and of greater diameter than said column, means for rotating said collector and means for withdrawing fibers from said collector along its axis of rotation and means for guiding a strand of material through said collector along its axis of rotation.

8. In combination, means for forming a descending column of gas and fibers, a hollow conical collector formed of highly perforate material positioned beneath said forming means and in the path of said column with its large diameter end upwardly and its axis eccentrically disposed with respect to said column, said large diameter end being open and of greater diameter than said column, means for rotating said collector and means for withdrawing fibers from said collector along its axis of rotation and means for guiding a strand of material through said collector along its axis of rotation, said guiding means being disposed out of alignment with said column of gas and fibers.

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