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METHOD OF AND APPARATUS FOR PRODUCING GLASS FIBERS

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Fig. 1.

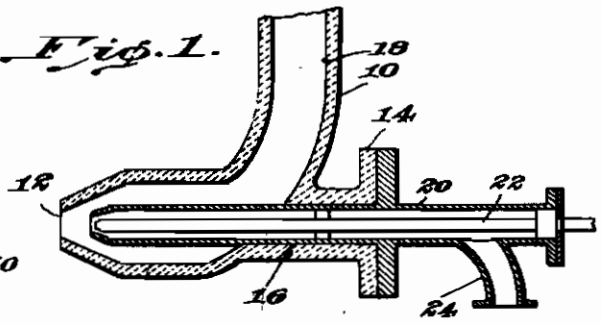


Fig. 2.

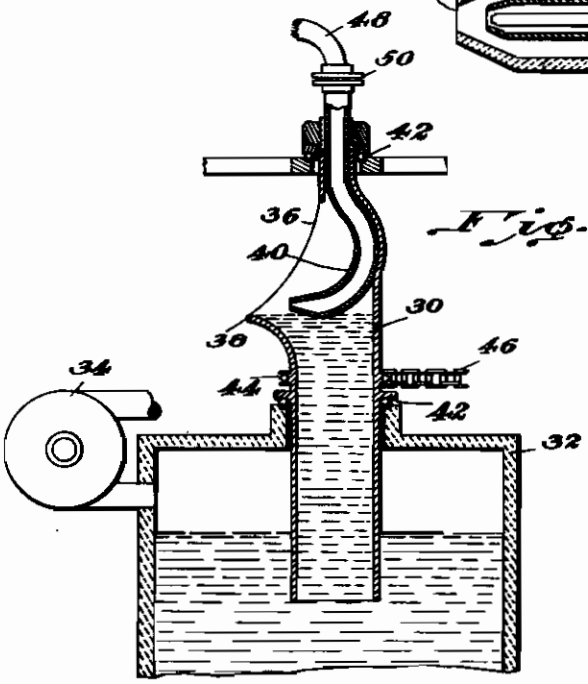
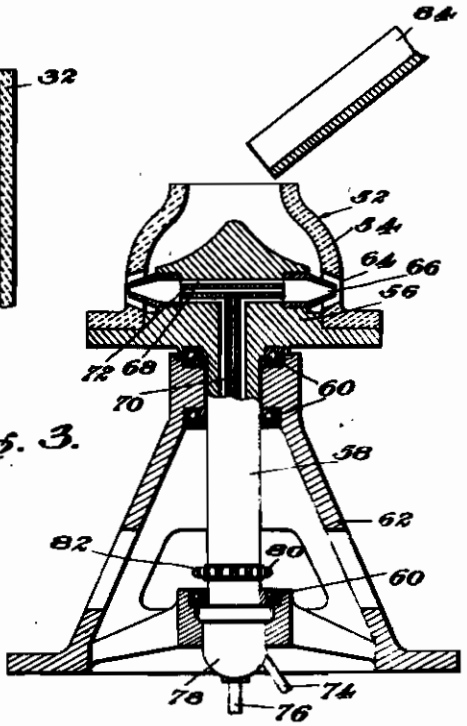


Fig. 3.



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METHOD OF AND APPARATUS FOR PRODUCING GLASS FIBERS

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The present invention relates to a method of and apparatus for producing relatively fine fibers or filaments from molten glass, slag and other inorganic materials which are plastic when heated.

The principal object of the invention is to provide such a method and apparatus wherein creation and attenuation of the fibers is accomplished by the blowing force of a flame together with the products of combustion thereof.

Another object of the invention, in connection with a modified form of the invention is to provide a method and apparatus of this character in which the attenuation of the fibers is further augmented by centrifugal force.

The provision of an apparatus for producing glass fibers which is relatively simple in its construction, consisting as it does of a minimum number of moving parts, and which is therefore unlikely to get out of order, is another desirable feature that has been borne in mind in the production and development of the present invention.

Other objects of the invention, not at this time enumerated, will become apparent as the nature of the invention is better understood.

In the accompanying single sheet of drawings three embodiments of the invention are shown. In these drawings:

Fig. 1 is a longitudinal sectional view taken substantially centrally through a fiber-producing nozzle constructed according to the principles of the present invention;

Fig. 2 is a sectional view taken substantially centrally through a modified form of fiber-producing and ejecting apparatus; and

Fig. 3 is a sectional view similar to Fig. 2 showing another modified form of fiber-producing and ejecting apparatus.

Referring now to Fig. 1, a nozzle-like body 10 having an outlet 12 is formed with an integral flanged cylindrical portion 14 having a bore 16 that communicates with the bore 18 of the body 10. Anchored in the bore 18 by a driven fit is an inner flame-producing burner including an elongated tubular fuel conducting member 20 through which there extends centrally an air conducting pipe or tube 22. Gaseous fuel is introduced into the tubular member 20 from a connection 24 and is combined with the air passed through the tube 22 at a point near the outlet 12 of the body 10 to produce a flame within the latter member. Glass introduced into the body 10 through the bore 18 thereof is heated to a high degree by the flame issuing from the flame producing burner 20, 22, and is attenuated as it is forced from the outlet 12 into the form of fine fibers. Obviously the gaseous fuel and/or the air employed for producing the flame is maintained under relatively high pressure so that the flame and its products of combustion will have sufficient jet effect to properly create and attenuate the fibers issuing from the outlet 12.

In Fig. 2 wherein a modified form of fiber-producing apparatus is shown, centrifugal force may be, but is not necessarily, utilized as an additional factor in the attenuation of the glass fibers. Toward this end, a substantially cylindrical and rotatable riser 30 in the form of a tube extends downwardly below the surface of the body of molten glass contained in a tank 32. The glass is forced upwardly in the riser 30 by means of air pressure which is built up in the tank 32 by means of a blower 34. The upper end of the riser 30 is formed with an opening 36 in one side thereof providing a weir 38 over which the molten glass is flung outwardly as the riser 30 rotates. A flame-producing burner 40 extends downwardly into the riser 30 and has its lower portion directed horizontally in close proximity to the level of glass in the riser 30 in such a manner that the flame strikes the body of glass and assists in forcing it over the weir 38. The riser 30 is rotatably supported in bearings 42 and is formed with a series of teeth 44 providing in effect a sprocket wheel over which there passes a chain 46 by means of which the entire unit including the riser 30 and burner 40 may be rotated in unison. A combustible mixture of gases is supplied to the burner 40 by means of a flexible conduit 48 which is connected thereto by means of a slip union 50.

In operation, the combustible mixture of gases is supplied to the burner 40 at relatively high pressure and the flame issuing from the burner assists the centrifugal force acting upon the glass in the vicinity of the weir 38 in creating and attenuating the glass fibers which are thrown laterally from the apparatus.

In Fig. 3, a tank 52 including a wall 54 of tapered cylindrical design, and a base portion 56 having a downwardly extending tubular portion 58 is rotatably mounted as a unit in bearing 60 carried by a stationary framework or supporting structure 62. A series of openings 64 are formed in the wall 54 while a series of burners 68 threadedly received in the base portion 56 of the tank 52 extend into the openings 64 and terminate just within the confines of the tank. Gaseous fuel is conducted to the burners 66 through the

hollow tubular portion 56 and through radially extending bores 68 communicating therewith, while air is conducted to the nozzles through a central conduit 70 and radial branch conduits 72. Supply conduits 74 and 78 for the fuel gas and air respectively communicate through a conventional slip union 78 with the conduit 70 and the space surrounding the same.

A series of teeth 60 are formed on the tubular portion 58 and provide in effect a sprocket wheel over which there passes a chain 82 by means of which the tank 52, including the base portion 58 and its extension 56, as a unit is rotated.

The base portion of the tank 52 slopes outwardly and downwardly in all directions from a central apex 83 toward the openings 64. Thus it will be seen that molten glass issuing from a supply chute 84 and entering the tank 52 will flow downwardly and outwardly toward the openings 64 and will be forced through the latter and attenuated in part by the action of centrifugal force created by rotation of the tank 52 and in part by the force of the flame jets and their respective products of combustion issuing from the burners 68.

In each of the forms of the invention set forth above the character of the flame produced may be varied to vary the character of fibers issuing from the apparatus. If the combustible gaseous mixture or the individual components thereof is or are released at relatively low pressures, combustion will take place at or very near the burner tip so that attenuation of the fibers will be effected by the spent products of combustion at a relatively high temperature. If the pressure of the mixture or of one or more of the components thereof is increased, combustion will take place further away from the burner tip so that attenuation of the fibers will be effected by the blowing force of the mixture substantially as combustion occurs. On the other hand, if the pressure of the mixture or its components is very high, attenuation will be effected initially by the relatively colder mixture before combustion has occurred and subsequently the fibers thus produced will be enveloped by the flame in the region of combustion and will be further attenuated by the spent products of combustion. Regardless however of the specific manner in which the flame is applied to the molten glass, the essential features of the invention are at all times preserved.

The invention is not to be limited to the exact arrangement of parts shown in the various figures of the drawings or to the exact description of the same set forth above. Various changes in the details of construction are contemplated without departing from the spirit of the invention. For example, while I have described the various burners as being operable to produce a flame by means of a combustible mixture of a gaseous fuel and air, it is obvious that an oxy-hydrogen, an oxy-acetylene or other flame utilizing a mixture of combustible gases under a suitable pressure may be employed. Steam or air may also be provided to accelerate attenuation over the weir.

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