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C. HATFIELD  
SPINNING FUNNEL

2,544,018

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2 Sheets-Sheet 1

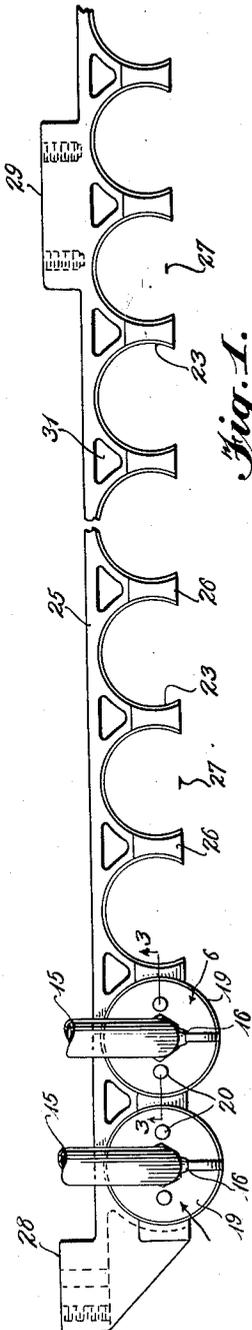


Fig. 1.

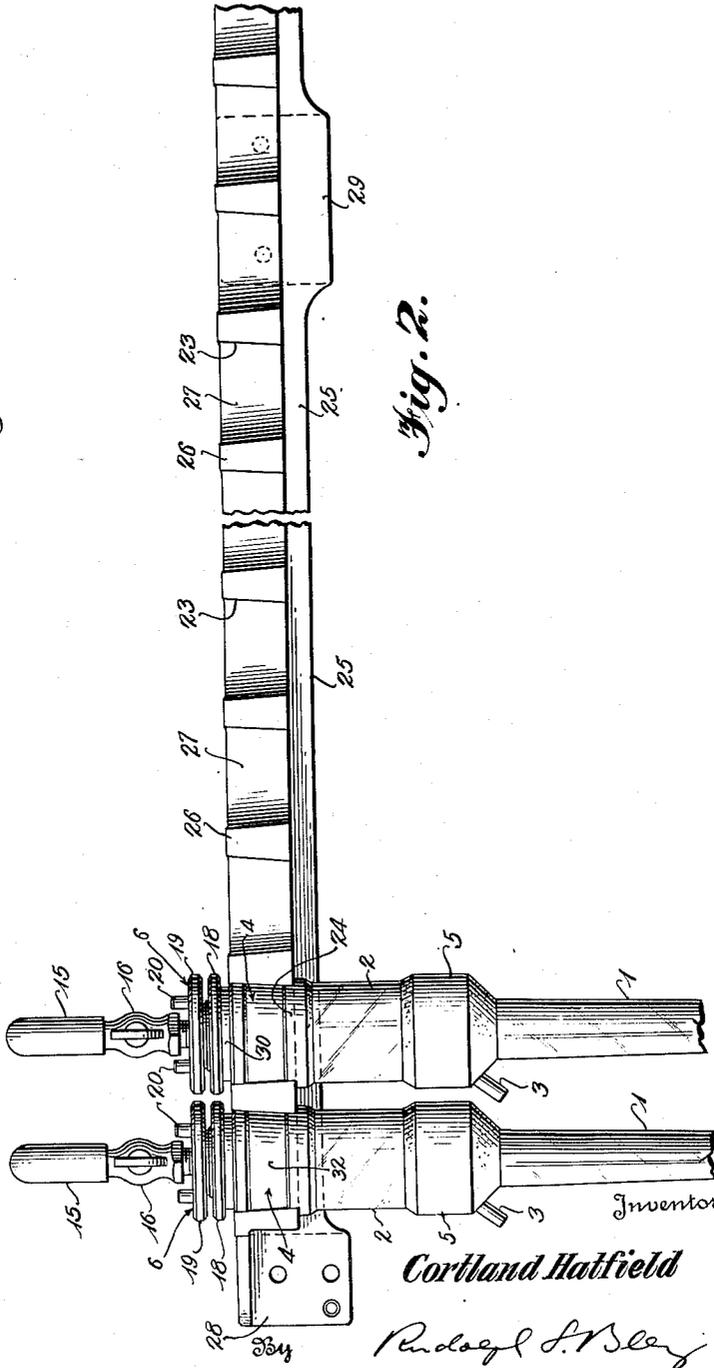


Fig. 2.

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Fig. 3.

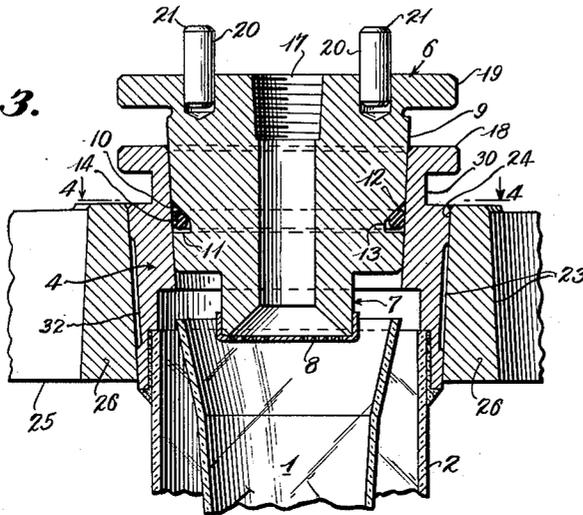


Fig. 4.

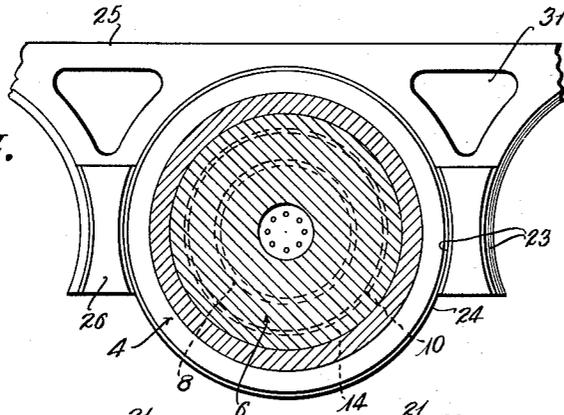
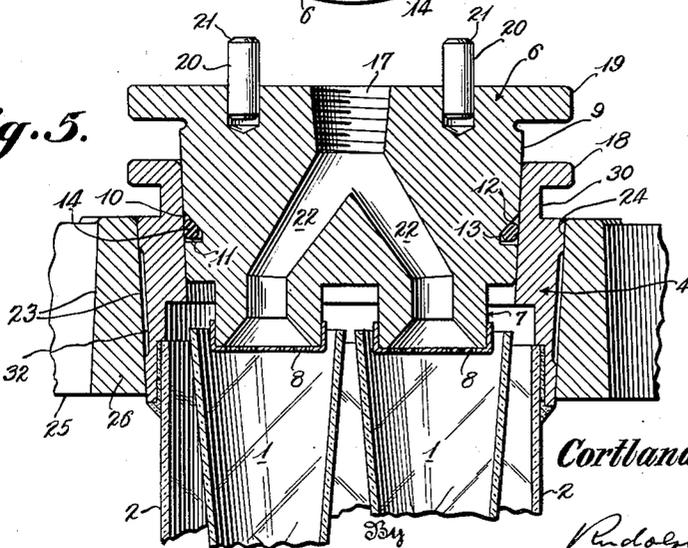


Fig. 5.



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# UNITED STATES PATENT OFFICE

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## SPINNING FUNNEL

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The present invention relates to improvements in spinning funnels intended for the production of synthetic thread and more particularly funnels of the type used in the stretch spinning of cuprammonium cellulose.

One object of the invention is to provide a funnel structure which, in cooperation with an improved, simplified support means associated therewith, will permit the rapid removal and replacement of the funnel with a minimum of mechanical manipulations and tools.

Another object of the invention is to produce a funnel and associated support structure adapted, when used in large numbers in a spinning plant, to simplify maintenance, reduce operational interruptions to a minimum and impart a neat, unencumbered appearance to the spinning machine on which it is used that facilitates supervision.

A further object is to provide a support for the improved funnel, constituted as a single unitary member adapted to hold a large number of funnels and which is capable of fabrication by relatively simple casting and machining operations, devoid of pivotally or otherwise attached supplementary parts, adapted to withstand corrosion, and from which any or all of the funnels can be removed in an extremely rapid manner.

An additional object is to provide an improved funnel wherein the spin solution supply head is retained on the funnel by the frictional engagement of mutually contacting tapered surfaces provided on the supply head and the funnel body, without the aid of clamps or other retaining devices.

A still further object is to retain the funnel in the improved support by means analogous to those used in retaining the spinning solution supply head on the funnel, as by the frictional engagement of mutually contacting tapered surfaces provided on a portion of the funnel and the support.

In spinning synthetic threads, e. g. rayon by the funnel stretch-spinning process it is customary to use so-called spinning funnels of either the single or multiple thread type. Such funnels comprise essentially elongated, tapered glass tubes into the top of which the spinning solution is extruded through spinnerets (filament-forming means) to form filaments and from the bottom of which the coagulated filaments issue, in the form of thread bundles. Suitable coagulant is circulated through the tube with the aid of a jacket that surrounds the top of the funnel and from which, either by overflow action, pressure or other means, the coagulant is conducted to the tube proper, to emerge, along with the threads, at the bottom (nipple) thereof. In single funnels only one spinneret having a plurality of orifices is provided to form a single thread bundle.

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In the multiple type, two or more individual spinnerets are provided, each directing its own group of filaments into a separate elongated tapered tube, although several of such thread producing tubes may be encased in and served by a single coagulant supplying jacket.

In both the single and multiple spin funnels the spinning solution, e. g. a cuprammonium solution of cellulose, is supplied by a funnel head member that carries the filament-forming means and which is held in sealing relation to the funnel body proper, said means comprising at least one spinneret. For this purpose the top of the funnel is provided with a flanged metal ferrule against which the funnel head is pressed by suitable clamps or screw actuated means, a yielding, flat, cylindrical or annular compressible gasket being interposed between the cooperating surfaces of the ferrule and the head. The funnel head is connected to a spinning solution supply pipe by means of flexible, e. g. rubber tubing, so as to permit of a limited amount of manipulation of the funnel and head member, suitable cocks being provided either in the head, pipe, or flexible tubing to permit the cutting out of any given funnel. Large numbers of these funnels, all usually supplied by a common spinning solution supply pipe are disposed in rows or banks and constitute the main operative portion of a spinning machine. The funnels are usually held in place on the spinning machine as by seating the ferrules, which are circular and provided with shouldered portions, in suitable sockets or the like, after which the head is placed in position and clamped down. This arrangement however necessitates the use of large numbers of clamping or analogous head retaining devices, one set being required for each funnel, and each set often being constituted of a number of machined parts, pivots, screws, and the like. The gaskets, usually of rubber, are prone to become partially vulcanized in place due to the pressure required to insure a tight joint, thus requiring undue force to remove the head and increasing the possibilities of accidents, breakage of funnels, etc. The funnel supports, usually of iron, and the clamping means, usually of brass, are subject to corrosion and require constant cleaning and coating with corrosion resisting paints, lacquers and the like. In addition, the arrangement presents a cumbersome appearance which is inconvenient to supervise and maintain in operating order.

These drawbacks are eliminated by the improved funnel and support arrangement of the present invention wherein all clamping, screw and analogous means are dispensed with in holding the head in liquid supply engagement with the funnel and in retaining the funnel, together with its head, in position on the spinning machine. This is accomplished by providing a

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tapered surface on the inside of the funnel ferrule and a tapered surface on the outside of the head member, adapted to cooperate with the tapered surface in the ferrule, a supplementary sealing member being also provided between these cooperating tapered surfaces in lieu of the flat annular gasket heretofore employed. An analogous arrangement is provided for retaining the funnel, along with its fitted head in place on a spinning machine, tapered surfaces provided on the funnel support and the outside of the funnel ferrule serving to cooperate to hold the funnel in place in rapidly removable relation.

The invention is illustrated in the accompanying drawing, where:

Fig. 1 is a plan view of a funnel support, showing several funnels in place.

Fig. 2 is a front elevation of the arrangement of Fig. 1.

Fig. 3 shows a fragmentary section along line 3—3 of Fig. 1.

Fig. 4 is a section on line 4—4 of Fig. 3.

Fig. 5 is a view similar to Fig. 3, showing a multiple funnel to which the invention may be applied.

Referring in detail to the drawing, the spinning funnel is constituted, as usual, of an elongated tapered tube 1 usually of glass or transparent plastic material. Surrounding the upper portion of the tube 1 is a jacket 2 to which suitable coagulant, e. g. warm or hot water, or other liquid, is supplied as by means of a stud pipe 3. This liquid flows from the jacket through the tapered tube 1 and out at the bottom of the latter as waste. The jacket 2 is held in spaced relation to the tapered tube 1 by means of an upper metal ferrule, generally indicated by 4 and a lower ferrule 5 with the aid of suitable cement, or otherwise. The inside of ferrule 4 has a conical bore, the taper thereof being directed downwardly. This internal, tapered surface of the ferrule cooperates in frictionally retentive and substantially liquid-tight relation with a correspondingly tapered, removable, plug-like head member generally indicated by 6 and preferably made of substantially non-corrodible metal. The lower portion of the head member terminates in a stud 7 of lesser diameter that carries the usual spinneret or nozzle unit 8 which is retained thereon in suitable manner, e. g. by a friction fit. Although the tapered outer wall 9 of the head member 6 may be machined or ground to produce a liquid-tight fit with the internal tapered wall of the ferrule 4, it is preferable to provide supplementary sealing means to insure against leakage incident to any inaccuracies in machining. Such supplementary seal is provided by a groove 10 machined in the tapered plug portion of the head, preferably near the lower end thereof. In the preferred embodiment shown, the lowermost side 11 of the groove is at right angles to the longitudinal axis of the head; the upper side 12 of the groove slants upwardly at an acute angle with respect to the lower side, and the bottom 13 of the groove is preferably of approximately the same width as the endless sealing or packing ring 14 or slightly wider than the diameter of the latter. This sealing ring 14 is made of suitable resilient material such as rubber and preferably of a synthetic rubber known in the trade as "Neoprene." It is of such size that it snaps snugly into the groove when being fitted and extends out beyond the groove far enough to contact with and be compressed by the inside wall of the ferrule when the head is placed in

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position, the rolling movement engendered by the fitting together of the parts serving additionally to insure tight sealing. Ring seals of this type are disclosed in U. S. Patent No. 2,180,795 of Nov. 21, 1939 to N. A. Christensen, for example. In the drawing, Figs. 3 and 5, the ring is shown in compressed sealing position.

Spinning solution is supplied to the head 6 by flexible tubing 15 connected to a suitable supply pipe (not shown) that serves the spinning machine. Cocks 16 permit disconnection of any desired funnel from the supply pipe and such cocks may be screwed directly into suitably threaded openings 17 in the head. Each funnel may be provided with a separate spinning pump provided with spinning solution from a common supply line to insure an even supply of spinning solution to each spinneret (filament-forming means).

As can be seen from Figs. 3 and 5, the head member 6 reposes in tapered fitting relation in the ferrule 4 of the funnel, and the proper engagement of these parts is insured by imparting a relative twisting or lapping movement to the parts when the head is placed in position, analogous, for example to that invoked in seating a tapered shank center into a lathe tail-stock, the ring aiding in effecting a liquid-tight seal. A flange 18 is provided on the ferrule and another flange 19 on the head member, sufficient space being left between these flanges to permit insertion of a suitable tool for more readily effecting separation of the head 6 from the ferrule 4. The lower surface of flange 18, in cooperation with the seat portion 23 hereinafter described, also serves in similar fashion to facilitate removal of the funnel from its seat. Pins 20, suitably chamfered, as at 21 may also be provided in the head member for various manipulatory purposes, as for receiving spanners for releasing and turning the head, or for supporting the same on jigs while renewing the spinneret unit.

In the embodiment shown in Fig. 5 the funnel is of the multiple type. Two independent spinneret units (filament-forming means) 8 are shown by way of illustration, these being supplied with spinning solution by the common inlet 17 and suitable passages 22, the spinnerets delivering their filaments to the separate tubes 1. Funnels of the type to which the invention is applicable are shown for example in U. S. Patent 1,682,797 of Sept. 4, 1928 to G. Otto et al.

The spinning funnel hereinbefore described is held in place in the spinning machine by the novel supporting means shown in the drawing. Considered individually, each support portion is constituted as a conical seat 23 of downwardly directed taper, adapted to cooperate with a corresponding taper 24 on the outside of the ferrule on the funnel. Such supports may be constituted as individual units but in accordance with a preferred embodiment of the invention they are preferably constituted as unitary blocks 25 cast from non-corrosive metal, e. g. stainless steel and machined to provide a large number of funnel seats as shown in Figs. 1 and 2.

The walls of the tapered seats 23 extend, in front, slightly beyond a line passing through the theoretical centers of the seats so as to leave an opening 27 large enough to permit facile insertion of the jacket 2 during the time that the funnel is being positioned, but small enough to provide a secure seat for the ferrule 4 when the latter is seated. In other words, while the jacket 2 will pass readily through the opening 27, the

ferrule, when seated will not pass therethrough. As shown in Fig. 1, the block 25 may contain as many funnel seats as desired for constructing a given spinning machine. The block 25 may be provided with suitable lugs 28, 29 at the ends and center or elsewhere to facilitate mounting upon a spinning machine, and such lugs may be cast integral with the block or attached separately thereto. In Figs. 3 and 5 the outer tapered surface of the ferrule is shown recessed to a certain extent as at 32, which may be of advantage in effecting the ready removal of the funnels. Apertures 31 may be provided in blocks 25 either during casting or by machining, to lighten the structure if desired, or for passing tubes or the like therethrough when the block is mounted on the spinning machine.

The use of the improved funnel structure of the invention in conjunction with the improved funnel support on a spinning machine makes for an unencumbered stream-lined arrangement devoid of clamps and supplementary retaining devices, thus effecting appreciable economy in construction while permitting rapid removal of the funnels or merely the heads thereof.

It is evident that the embodiment here shown is only illustrative, and it may be modified in many ways without departing from the scope and spirit of the invention as more particularly pointed out and described in the appended claims.

What is claimed is:

1. A spinning funnel and support assembly comprising, in combination, a funnel constituted of an elongated funnel body, a ferrule larger than said body and carried by said body for removably seating said funnel in a support portion of a spinning machine said ferrule having a gradual external taper, an aperture in said ferrule having a gradual taper, a head member adapted for connection to a supply of spinning solution, filament-forming means carried by said head member, said head member having a gradual external taper, the degree of said tapers interiorly of said ferrule and exteriorly of said head member being such as to cause said head member to become securely wedged in place when said head member is frictionally rotated in said ferrule while applying pressure, a support for said funnel provided with an opening having a taper corresponding to the external taper on said ferrule, said opening extending laterally through said support as a passage and being larger at one end than said funnel body but smaller than the smallest portion of the taper on said ferrule to permit lateral insertion of said funnel body through said opening and seating of said tapered ferrule in the tapered opening in said support without requiring the entire funnel body to be passed downwardly through said opening, the degree of the taper on said ferrule and in the opening of said support being such as to cause said ferrule and the head member carried by it to become securely wedged in place when said ferrule is frictionally rotated in the opening in said support while applying pressure.

2. A spinning funnel and support assembly comprising, in combination, a funnel constituted of an elongated funnel body, a ferrule larger than said body and carried by said body for removably seating said funnel in a support portion of a spinning machine said ferrule having a gradual external taper, an aperture in said ferrule having a gradual taper, a head member adapted for connection to a supply of spinning solution, filament-forming means carried by said head mem-

ber, said head member having a gradual external taper, the degree of said tapers interiorly of said ferrule and exteriorly of said head member being such as to cause said head member to become securely wedged in place when said head member is frictionally rotated in said ferrule while applying pressure, a support for said funnel provided with an opening having a taper corresponding to the external taper on said ferrule, said opening extending laterally through said support as a passage and being larger at one end than said funnel body but smaller than the smallest portion of the taper on said ferrule to permit lateral insertion of said funnel body through said opening and seating of said tapered ferrule in the tapered opening in said support without requiring the entire funnel body to be passed downwardly through said opening, the degree of the taper on said ferrule and in the opening of said support being such as to cause said ferrule and the head member carried by it to become securely wedged in place when said ferrule is frictionally rotated in the opening in said support while applying pressure, an angularly shaped groove extending peripherally of said head member intermediate the top and bottom thereof, a resilient compressible sealing ring in said groove and extending slightly beyond the outer surface of said head member, the fit of said ring in said groove being such as to permit said ring to roll freely therein vertically and thereby become wedged between the inner surface of said groove and the inner surface of said ferrule during the frictional rotational fitting of said head member into said ferrule to provide supplementary liquid-tight sealing between said head member and said ferrule, a flange on said head member and a flange on said ferrule, said flanges remaining spaced apart when said head member is seated in said ferrule to permit insertion of means for forcibly separating said head member from said ferrule, the external taper of the ferrule and the internal taper of the opening in the support being such as to cause the flange on said ferrule to remain spaced from the support, to permit insertion of means between said flange and said support for removing said ferrule and said head as a joined-together unit from said support.

CORTLAND HATFIELD.

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