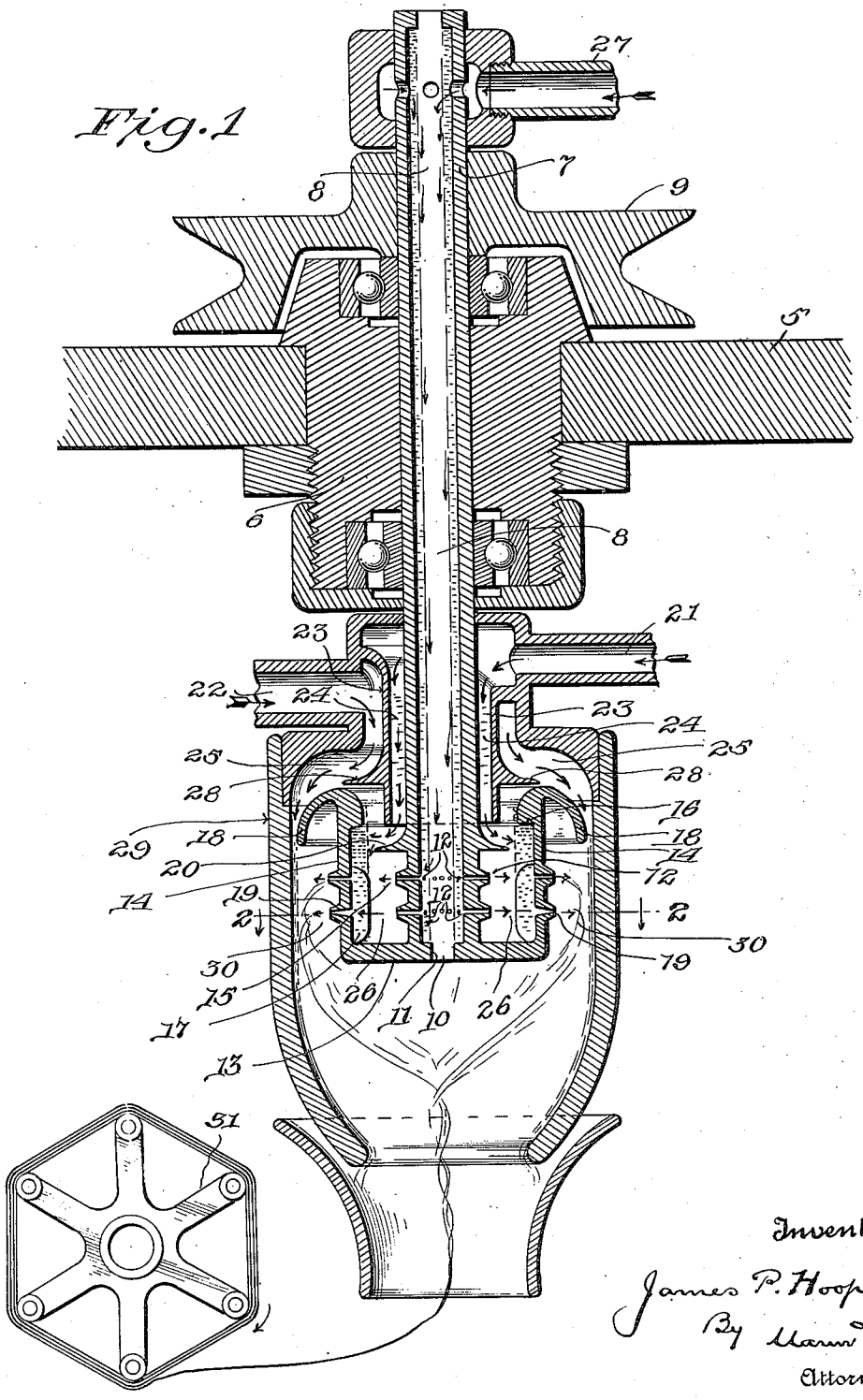
July 8, 1924. 1,500,931

J. P. HOOPER

CENTRIFUGAL SPINNERET

Filed Feb. 23, 1922 2 Sheets-Sheet 1

Fig. 1

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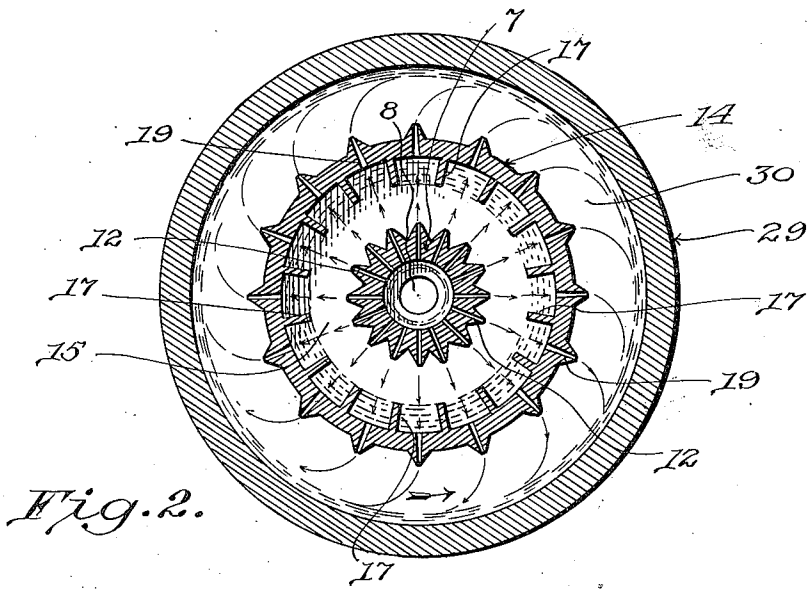


Fig. 2.

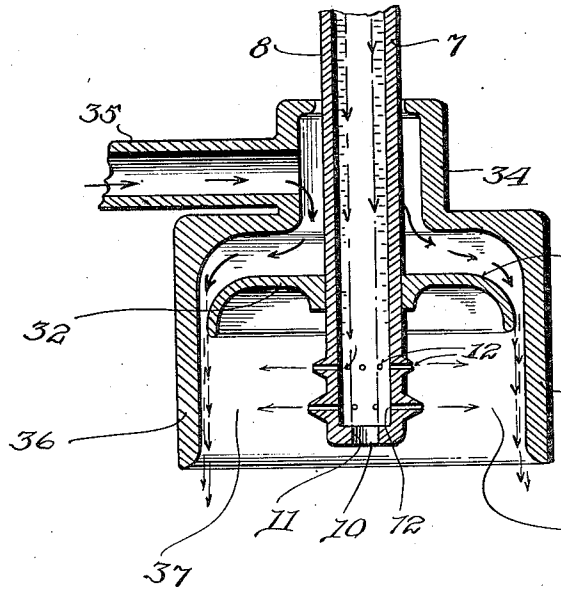


Fig. 3.

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# UNITED STATES PATENT OFFICE.

JAMES P. HOOPER, OF RUXTON, MARYLAND, ASSIGNOR TO JAMES P. HOOPER MANUFACTURING COMPANY, OF BALTIMORE, MARYLAND, A CORPORATION OF MARYLAND.

## CENTRIFUGAL SPINNERET.

Application filed February 23, 1922. Serial No. 538,733.

*To all whom it may concern:*

Be it known that JAMES P. HOOPER, a citizen of the United States, residing at Ruxton, in the county of Baltimore and State of Maryland, has invented certain new and useful Improvements in Centrifugal Spinnerets, of which the following is a specification.

This invention relates to an improved apparatus for producing artificial silk threads from viscose or equivalent substances.

One object of the invention is to provide an improved structure whereby the viscose solution may be ejected in the form of threads by centrifugal force.

Another object is to combine with a centrifugal spinneret an improved structure for supplying a setting solution to act upon the ejected threads.

A further object is to provide a structure that combines a centrifugal distributor or spinneret with means for forming a wall of setting solution into which the threads are directed and which are so related as to provide an air gap across which the threads will extend in passing from the ejector means to the setting solution, and

Another object is to provide an improved device for producing artificial silk threads wherein the threads, while in the form of single strands and before becoming twisted with other strands, may be subjected to a stretching operation or a plurality of such operations.

With these, and other objects in view, the invention is illustrated in the accompanying drawings, wherein,—

Fig. 1 shows an apparatus embodying the invention, the same being shown in vertical section.

Fig. 2 illustrates a cross-sectional detail through the same,—the section being taken on the line 2—2 of Fig. 1.

Fig. 3 shows a vertical sectional detail through a spinneret embodying the invention but having a modified form.

Referring to the structures shown in Figs. 1 and 2 of the drawings the numeral 5 designates a supporting frame in which a bearing block 6 is sustained and through which a vertical spindle 7 extends. This spindle is tubular and therefore has a central vertical passage 8.

A pulley 9 is provided on the vertical spindle whereby to rotate the same at a high rate of speed.

The lower end of the spindle in this instance is open at 10 and an annular flange 11, is provided on the interior of the passage at said opening for a purpose that will presently be explained.

Above the annular flange 11 the spindle is provided with a series of laterally-extending or radial passages 12 which extend all the way through the wall thereof.

In practice I have found it advantageous in some instances to provide two series of these lateral passages 12,—one series being above the other so that a greater number of strands may be centrifugally ejected than is possible from a single series of such perforations.

In the present instance an upper and a lower series of such passages are shown in the structures of Figs. 1 and 3, but it is to be understood that the number of these passages and their arrangement in one, two or more series is considered as within the scope of the present invention.

In this form of structure (Fig. 1), I provide an outwardly-extending flange 13 around the exterior of the spindle, which flange carries an annular and upwardly-projecting wall 14 whereby the flange 13 and its said wall 14 will together form an annular chamber 15 around the lower end of the spindle into which the outer ends of the lateral passages 12 open.

The wall 14 extends upwardly around the spindle and above the outlets of the passages 12, and at its inner side and near its top, this wall has an inner circumferential flange 16, for a purpose presently to be explained.

Between the inwardly-projecting flange 16 and the flange 13 which forms the bottom of the chamber 15, the vertical wall 14 is provided with a series of spaced-apart vertical fins or webs 17 which project into the chamber 15,—the fins being clearly shown in Fig. 2 of the drawing.

At the upper edge of the wall 14 there is provided an annular exterior flange 18 which latter has an upper surface which is convex and which curves downwardly.

The wall 14 also has two series of spaced-

apart passages 19,—one series above the other, which passages extend from the chamber 15 to the outer side of the said wall.

Around the exterior of the spindle 7 and in a horizontal plane below the flange 16 on the interior of wall 14, there is provided an outwardly-curved deflector-flange 20, which latter is obviously located in the chamber 15.

From the foregoing explanation it will be understood that the flange 13, wall 14, deflector-flange 20 and spindle 7 all revolve together and that the passages 12 in the spindle and the passages 19 in the annular wall 14 are so disposed with respect to each other that a viscous strand ejected from one of the passages 12 will be projected across the chamber 15 and through one of the passages 19 in the annular wall 14.

Above the convex flange 18 at the top of wall 14, I provide a shell structure which has two inlet pipes 21 and 22. On the interior of this shell there is a division wall 23 which forms two chambers 24 and 25. One of these chambers (24) opens at its lower end into the annular chamber 15, so that a setting solution entering by pipe 21 may flow down and around the spindle 7 to the upper side of the deflector flange 20 at which point said solution will be deflected outwardly into the chamber 15 and against the inner side of the annular wall 14.

As the wall 14 and spindle 7 are revolved together at a high rate of speed the setting solution thus discharged into chamber 15 will be caught up by the fins or webs 17 on said revolving wall 14, and rotated at the same speed thus causing said solution, because of the centrifugal force set up by the rapid rotation, to hug the vertical wall 14 and form a vertical column of fluid which will be thrown out through the passage 19 in the wall. The inwardly-projecting flange 16 on the inner top edge of the wall 14 will determine the thickness of the fluid column in a horizontal direction and will also ensure that there be maintained an air-gap 26 between the inner circumference of the fluid column and the outer side of the spindle so that the viscous strand ejected from the passages 12, will be carried by centrifugal force across said air-gap 26 through the fluid column and then out through the passages 19 by the escaping fluid as the latter is thrown from said passages.

By providing this air-gap 26 the thread is subjected to a longitudinal pull, and a consequent stretch, by which it is reduced in diameter and materially elongated.

The viscous solution enters the spindle passages 8 from a supply-pipe 27 and flows down said passage while the spindle is rapidly revolved. As the lower end of this passage 8 is restricted at 10, the viscous solution hugs the wall of the spindle-passage, also because of the centrifugal force, and readily passes out through the lateral passages 12 in the form of fine strands. By leaving the lower end of the spindle-passage open, access may readily be gained to the inner ends of the passages 12 to keep them open.

The setting solution entering the chamber 25 from the pipe 24 is deflected outwardly by a deflector-flange 28 and carried over the convex side of the flange 18, and as this flange 18 and the wall 14 are encircled by an annular shell 29 which depends below the rotating elements, the deflected solution from chamber 25, as well as the fluid ejected from the chamber 15, will flow down the inner side of the shell 29 in the form of a second fluid column which latter however need not necessarily be revolved, although in this instance it is revolved by the rotating flange 18.

As the threads or strands pass through the passages 19 in the rotating wall 14, they will again be projected by centrifugal force and the ejected fluid from chamber 15 across a second air-gap 30 before they enter the second and outer column of setting solution.

This outer column of setting solution around the inner wall of the annular shell 29 is rotated as it passes over the convex flange 18 which latter is revolved at a high speed, but the speed of rotation of this column of solution is preferably less than that of the spinneret and flange so that when the strands pass through the passages 19 and extend over the second air-gap 30 they are caught up by the rotating column of setting solution in the shell 29 and twisted together as they are carried beyond the end of the spinner, after which the thread is wound on a reel 31.

In Fig. 3, I show a simplified form of spinneret which however embodies the invention. In this form I utilize the spindle 7: its central passage 8 and the lateral passages 12 through which the viscous material is discharged by centrifugal action in the form of a series of strands.

The lower end of the spindle is open at 10 but is restricted by the internal flange 11 as set forth in connection with the structure shown in Figs. 1 and 2 of the drawings.

I also provide a deflector flange 32 on the spindle with a convex upper side 33 so that the setting solution from the shell 34 may be thrown laterally and rotated.

The supply of setting solution to the shell 34 is provided through the pipe 35, and an annular wall 36 is carried by the shell so as to surround the periphery of the flange 32 whereby the setting solution will take the form of a rotating column, at the inner circumference of the said wall 36.

In this structure the strands ejected through the passages 12 will be projected across the air-gap 37 that intervenes be-

tween the outlets of passages 12 and the column of setting solution so that a longitudinal stretch of the threads takes place before those threads are acted upon by the setting solution.

Having described my invention, I claim,—

1. A mechanism for forming threads including a rotating member having a plurality of passages through a wall thereof, means for supplying a thread-forming substance to said member, means for rotating said member at a rate of speed to centrifugally discharge said substance through said passages in the form of threads, means for maintaining a wall of setting solution around the rotating member and means for twisting the threads together.

2. A mechanism for forming threads including a rotating member having a central passage and a series of lateral passages, means for supplying a thread-forming substance through the central passage, means for rotating said member to centrifugally discharge said substance through said lateral passages in the form of threads, means for supplying a setting solution to act upon the ejected threads and a baffle between the said lateral passages and the setting solution supply to prevent contact of the solution with the outlet ends of said passages.

3. A mechanism for forming threads including a rotating member having a series of lateral passages, means for supplying a thread-forming substance to said member, means for rotating said member at a rate of speed to centrifugally discharge said substance through said passages in the form of threads, means for directing a setting solution across the path of the ejected threads and means for maintaining a gap between the discharge-ends of said passages and the said setting solution.

4. A mechanism for forming threads including a rotatable member having means for forming threads as the same is revolved, means for supplying a thread-forming solution to said member, means for rotating said member to discharge the solution by centrifugal force in the form of threads, a shell around the member for directing a setting solution across the path of the ejected threads and means for continuously supplying a setting solution to said shell at a point above the threads.

5. A mechanism for forming threads including a rotatable member having means for forming a series of threads as the same is revolved, means for continuously supplying a thread-forming solution to said member to be centrifugally ejected therefrom in the form of threads, an annular shell around the member, means for continuously supplying a setting solution to said shell and means independent of said member for imparting a whirling motion to the setting solution.

6. A mechanism for forming threads including a centrifugal member having thread-forming openings therein, means for supplying a thread-forming solution to said member, means about the member for directing a setting solution across the path of the ejected threads said member-openings and the setting-solution device being arranged to provide a gap across which the threads pass to enter the solution.

7. A mechanism for forming threads including a hollow spindle having a series of lateral passages near one end thereof, an annular shell about the passages in the spindle, means for continuously supplying a thread-forming solution to the interior of the spindle, and means for directing a setting solution across the path of the threads ejected from the spindle passages.

8. A mechanism for forming threads including a hollow pendent spindle having a series of lateral passages extending therethrough, an annular shell about the spindle and means for maintaining a column of setting solution between the shell and the outer discharge-ends of said passages.

9. A mechanism for forming threads including a hollow pendent spindle having a series of lateral passages extending therethrough, an annular shell about the spindle, means for supplying a setting solution to the shell above the said lateral passages and a deflector above the passages to direct the setting solution downwardly but keep it spaced from the outlet-ends of said passages.

10. A mechanism for forming threads including a rotary member having a plurality of passages arranged in different planes at right angles to the axis of rotation, means for supplying a thread-forming substance to the interior of said member whereby the rotation will cause the substance to be discharged through said passages in different planes in the form of threads and means for conveying the threads past the rotating member and twisting them together.

11. The combination with a hollow spindle having a series of lateral passages, of an annular member about said spindle and also having a series of lateral passages equal in number to the passages in the spindle, means for rotating the spindle and annular member together to discharge a thread-forming solution from the spindle passages through the annular wall passages, and means for setting said threads.

12. The combination with a hollow spindle having a series of lateral passages, of an annular member about the spindle and also having a series of lateral passages, a shell about the annular member and means for

directing a flow of setting solution through the shell and past the passages in the annular member.

13. The combination with a hollow spindle having a plurality of series of lateral passages extending therethrough,—the several series of passages being in different planes with respect to the axis of the spindle, and means for maintaining a setting solution about the discharge-ends of said passages.

14. The combination with a hollow spindle having lateral passages, of an annular wall about the spindle and having lateral discharge means, means for supplying a setting solution to the interior of the annular wall, a shell about the annular wall, and means for supplying a setting solution to the shell.

In testimony whereof I affix my signature.

JAMES P. HOOPER.