

May 9, 1933.

H. SUTER

1,907,610

PRODUCTION OF ARTIFICIAL SILK, PARTICULARLY VISCOSE SILK

Filed Dec. 5, 1931

2 Sheets-Sheet 1

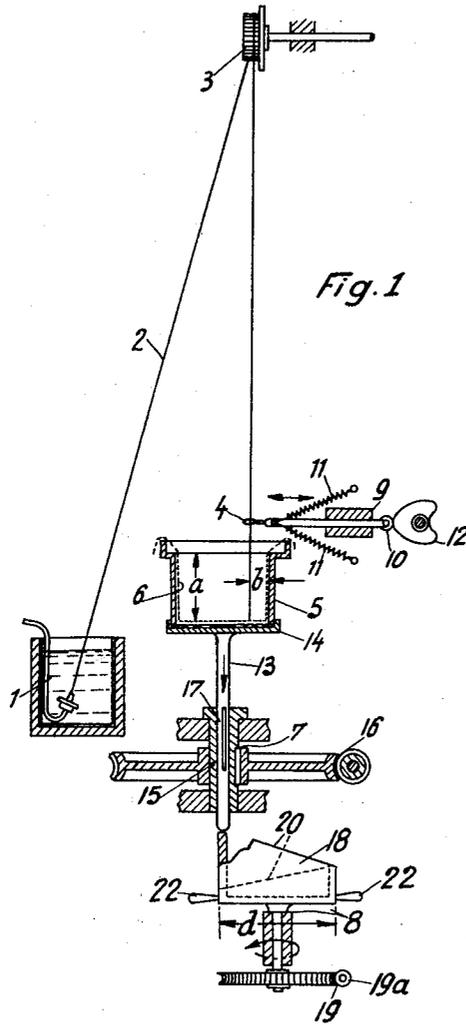


Fig. 1

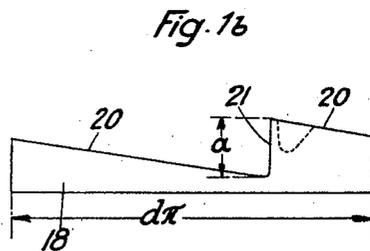


Fig. 1b



Fig. 1a

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Fig. 2

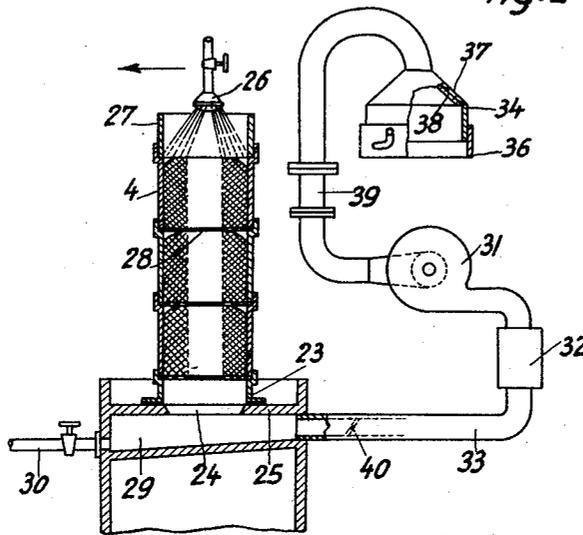
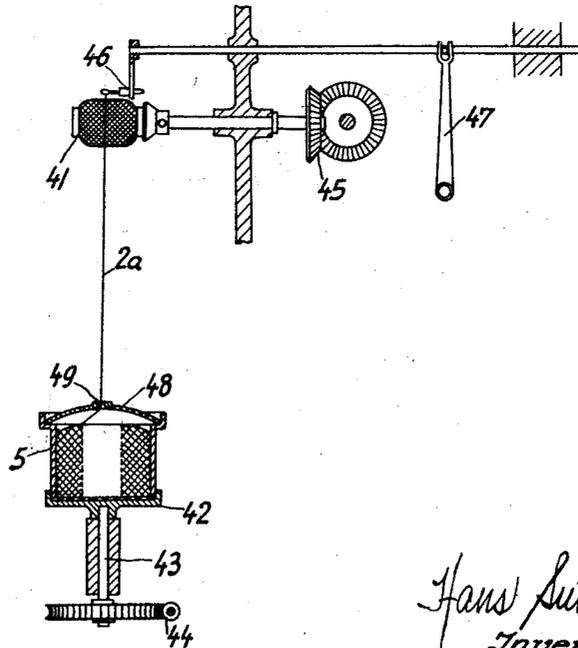


Fig. 3



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UNITED STATES PATENT OFFICE

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PRODUCTION OF ARTIFICIAL SILK, PARTICULARLY VISCOSE SILK

Application filed December 5, 1931, Serial No. 579,156, and in Germany December 23, 1930.

I have filed an application in Germany dated December 23rd, 1930.

Suggestions have already been made to collect freshly spun artificial silk in the form of loops in a slowly rotating spinning pot, and for the purpose of producing the loops to agitate the dry spinning nozzle or the spinning pot itself in a horizontal direction. It has, however, not been possible hitherto, particularly also in the case of the wet spinning process, to introduce such a process into industry and to work up the products in a form capable of use.

According to the present process the threads produced by the wet spinning process, for example by the viscose process, are withdrawn from the spinning bath by means of a withdrawing roller of known construction, and allowed to fall into the slowly rotating spinning pot located underneath the withdrawing roller.

It has been found by experiment that the release of the thread from the withdrawing roller and the depositing thereof in the pot is best effected in a satisfactory manner if there is used a withdrawing roller with a distinctly toothed surface.

The spinning pot itself is removable from its driving disk, on which it is mounted, and is driven so as to rotate slowly. In order that the thread loops assume the required shape in the spinning pot and fill the pot in the desired manner the spinning pot itself receives in addition to the rotary movement also a reciprocating horizontal movement, or the thread falling into the spinning pot is allowed to fall through a thread guide to which there is imparted an alternating movement in a horizontal direction. Finally the withdrawing roller itself may also carry out a reciprocating horizontal movement.

A further improvement resides in the fact that the spinning pot together with the rotary plate by which it is driven and on which it is mounted, is made adjustable in height. In this manner it is possible when the filling of the pot increases to retain the same distance between the withdrawing roller and the top of the spinning cake. In a similar manner it is also possible to vary the position in

height of the depositing thread guide which is used in any case.

The pile of threads collected in the spinning pot is then advantageously sprayed therein, and the subsequent treatment, especially in the viscose process, comprising desulphurization, bleaching, deacidification and oiling can also be carried on within said pots. For this purpose the bottoms of the spinning pots are perforated and the interior of each spinning pot, including the bottom, may be lined advantageously with a layer of porous cloth, for example muslin, artificial silk fabric, etc. Such lining may have the shape of a round bag, closely fitting the interior surface of the spinning pot, with the upper rim long enough to be folded over the edge of the pot during filling and to cover the top of the entire spinning cake after filling. After filling the pots are removed from their rotary disks and are sprayed from the top either separately or preferably piled one upon the other in the form of a column. The pots, for this latter purpose, are provided at the upper edge with a disked flange, so that it is possible to conveniently fit one pot into the upper edge of the other pot. When using the protecting cloths above referred to the upper edge of the bag is folded inwardly so as to cover the entire cake. In addition it is also possible to fit into each separate pot a perforated cover which lies directly on the spun pile or on the protecting cloth.

By such an arrangement all the desired and any other wet treatments which may be necessary are carried out successively on the artificial silk. Finally the pot is allowed to drain by gravity or is centrifuged. The finishing operation is then carried out with an oil or sizing bath which as regards its quantity and strength is such that a suitable and uniform sizing or oiling takes place. After renewed draining or centrifuging it is dried. For this purpose the pots, which are preferably perforated on all sides, may be introduced into drying chambers or passages of known construction and subjected to the action of hot air. Or it is feasible to use pots perforated at the bottom only, piled upon each other in the form of a column, as above

described, and dry them directly by passing dry air through these columns either from the bottom upwards or from the top downwards. Instead of the wet treatment by spraying, the spun masses enclosed in the spinning pots; and if necessary weighted down in the protecting cloths may also be subjected to other known washing processes, for example by dipping or lixiviating or rinsing, whilst the spinning pot is either held stationary and the liquid poured through it, or the pot is moved through a stationary bath or with any other suitable combination.

It has further been found that when it is desired to obtain a good viscose silk attention must be paid also to the spinning bath which is used. It has been found that the most suitable spinning baths are those which, in the manner of the spinning baths according to French Patent 698,413, are capable of producing viscose silk which shrinks as little as possible when being dried. In this manner the article acquires the desired gloss, remains soft, extensible, solid and does not crimp, even if washed and dried without tension. The effect of properly sizing the thread piles is that the separate thread stalks acquire a cohesion and that it is subsequently possible to work up a good silk free from down. The thread masses thus produced which are practically untwisted can be directly applied to reels or bobbins from the spinning pot and brought into any suitable assembly and wound form.

When winding the threads on reels or bobbins directly from the pot this may be rotated at substantially the same speed as when spinning the threads but naturally in the opposite direction.

The invention will now be described with reference to the accompanying drawings, wherein Figure 1 shows the thread 2 coming from the precipitating bath 1, the toothed roller 3, the thread guide 4, the pot 5, the cloth 6 for enclosing the cake, the driving mechanism 7 for the pot and the device 8 for raising and lowering the pot.

The thread guide is mounted in a member 9. Its free end is provided with a roller 10 which is constantly pressed by springs 11 against a heart shaped cam 12. The heart shaped cam imparts a reciprocating movement to the thread guide. The amount of movement of the thread guide is indicated by *b*.

The pot 5 is removably mounted on a plate 14 carried by a spindle 13. The spindle 13 is axially movable in a hollow shaft 15 serving as the driving shaft for the pot and which is rotated by the worm drive 16. The spindle 13 is driven by the hollow shaft 15, the key 17 of the spindle engaging a keyway in the shaft 15. This keyway extends along the whole length of the hollow shaft 15.

The spindle 13 rests on a cam drum 18

which is rotated in the direction of the arrow by the worm gearing 19. A development of the cam drum is shown in Figure 1*b*. The edge 20 of the cam drum, of which a portion is broken away for the sake of clearness (see dotted line in Figure 1*b*) forms an inclined plane.

In Figure 1 the pot is shown in its highest position. When the cam drum rotates the spindle 13, according to the increase in size of the cake in the pot, moves downwardly on the edge 20 of the drum 18. In this manner the distance of the thread, measured from the roller 3, is kept constant. The size of the cake is indicated by *a*. The difference in height of the edge of the drum 20 must, therefore also correspond with the amount *a*.

When the spindle 13 has reached its lowest position the drum runs with its surface 21 against the spindle 13. In this manner the tooth pressure in the worm gearing 19 increases. This increasing tooth pressure may be used in well known manner for disengaging the worm 19*a* (on the receding worm principle). The return of the cam drum and thus of the pot into its highest position is effected by hand by means of the handles 22.

A screw spindle, rack gearing, a lifting cam, hydraulic pressure and so forth are to be regarded as equivalent to the cam drum.

Figure 1*a* shows the method and manner in which the thread 2*a* is deposited in the pot.

Figure 2 shows the manner in which the pots 5 are superposed, so as to form a column for the purpose of the subsequent treatment. The lowermost pot of the column rests in this case on a hollow socket 23 which, preferably with the interposition of packing, is rigidly connected to a platform 25 provided with a suitable opening 24.

The liquid for the subsequent treatment is supplied by the conical spray 26. In order to prevent liquid being lost a short pipe section 27 is fitted on the top pot. The perforations of the spray nozzle are so arranged that only the column of cakes and not the free inner space of the column of cakes is supplied with liquid. The spray nozzle can be shut off.

In order to enable the liquid to pass from cake to cake the bottom 28 of the pots 4 is perforated. When the entire column of cakes has been traversed by the treating liquid the liquid flows through the opening 24 into the chamber 29 underneath the platform to which is connected an outflow pipe 30 provided with a cut off valve.

If a gas, for example dry air, is to be passed through the column of cakes the pipe 30 is first closed and the pipe section 27 is removed. The fan 31 is then set in operation and the heating device 32 is also set in operation.

The dry air passes through the pipe 33 into the chamber 29 and from there passes

through the separate cakes. In order to prevent the air from flowing freely through the inner space of the column of cakes only that portion of the bottom of the pot which is covered by the cake is perforated.

The dry air can escape either into the atmosphere or be collected and repeatedly used. In the latter case the spray 26 is removed in the direction of the arrow and replaced by the hood 34 is moved into its position which is rendered possible by turning the tubular member 35.

The hood is provided with a casing 36 which can be lowered and thus cuts off the outer atmosphere from the column of cakes. There is also provided an inlet 37 for fresh air which can be controlled by a slide 38 according to requirements.

A mechanical drier 39 of known construction (the moist air is caused to follow a spiral movement therein by an impact surface and the specifically heavier air is thus projected outwardly) serves to ensure that dry air always enters the column of cakes.

The pipe 33 is provided with a throttle valve 40.

Figure 3 shows how the thread 2a from the pot 5 is wound on a spool 41. The pot 5 is mounted removably as in Figure 1 on a rotating disk 42 of which the spindle 43 is driven by worm gearing 44. If the direction of rotation of the pot is reversed relatively to that which was imparted to the pot during spinning and a suitable speed of rotation is selected it is possible to obtain a thread which is entirely free from twist.

The spool is driven in the usual manner by bevel gearing 45. The thread guide 46 is reciprocated by the forked rocking arm 47.

In order that the thread 2a is guided immediately as it leaves the pot there is provided a cover 48 having a central opening 49.

I claim:—

1. A process for the production of artificial silk, particularly viscose silk, consisting in withdrawing freshly spun threads by means of an auxiliary roller, which is preferably toothed, delivering the threads in the form of loose loops into a spinning pot lined with cloth, covering the threads with said cloth, washing the threads in said pot and subsequently treating them therein, drying the said threads in the loose condition and finally bringing them into wound form while withdrawing them from the pot.

2. A process for the production of artificial silk, particularly viscose silk, consisting in withdrawing freshly spun threads by means of a preferably toothed auxiliary roller depositing said threads in loose loops in a slowly rotating spinning pot lined with cloth, covering the threads with said cloth, washing, subsequently treating and sizing said threads in said pot, drying said threads in the loose condition and finally working up

said threads directly from the pot by winding them on reels.

3. A process for the production of artificial silk, particularly viscose silk, consisting in withdrawing freshly spun threads by means of a preferably toothed auxiliary roller, then passing said threads in the form of loose loops into a slowly rotating spinning pot, said spinning pot being at least perforated at the bottom and lined with cloths for protecting the threads, covering the threads with said cloth, washing, subsequently treating and also sizing said threads in said pots by spraying them exposing them to drops or lixiviation, drying said threads in the loose condition, and finally working up said threads directly from the pot by winding them on reels or spools.

4. In a process according to claim 1, the step of maintaining the distance of the point of deposition from the withdrawing roller and from the thread guide, whilst the spinning pot is being filled.

5. A process according to claim 1, wherein when the threads are rewound directly on their passage from the pot, the said pot is rotated at substantially the same speed or at the same speed as when spinning the threads but in the opposite direction.

6. Apparatus for use in the production of artificial silk, particularly viscose silk, comprising a pot for receiving the spun threads from an auxiliary toothed roller, means for guiding said threads into said pot, means for driving said pot during the total period from the start to the finish of spinning slowly and at an even rate from its highest to its lowest position, and means for lowering said pot so that the distance between the layer of thread and said toothed roller remains constant.

7. Apparatus according to claim 6, wherein the means for rotating said pot comprise a spindle, a plate on said spindle on which said pot is detachably mounted, a hollow shaft through which said spindle passes, said hollow shaft having an internal keyway extending along the whole length of said hollow shaft, said keyway receiving a key, fastened to the spindle, and worm gearing operatively connected to said hollow shaft.

8. Apparatus according to claim 6, wherein the means for lowering said pot comprise a cam drum, said cam drum in development forming an inclined plane, a spindle supporting said pot, said spindle co-operating with said cam drum, and means for rotating said cam drum.

9. Apparatus for the production of artificial silk, particularly viscose silk, comprising a series of pots having perforated bottoms, said pots being superposed so as to form a column, a pipe section fitted on the uppermost pot, a hollow support supporting the column of superposed pots, a table on which said support is mounted, said table having

a hole therein adjacent said support, a collecting chamber in said table, and means for supplying finely dispersed liquid to the uppermost pot of the column.

5 10. Apparatus for the production of artificial silk, particularly viscose silk comprising a pot, means for rotating said pot, means for raising and lowering said pot, a toothed roller from which thread passes to said pot
10 and a reciprocating thread guide, actuated by an eccentric disk for guiding said thread into said pot in such a manner that the thread forms in the pot a star shaped cake with a
15 hollow central portion, the eccentricity of said thread guiding members being less than the radius of the spinning pot.

11. Apparatus according to claim 6, wherein said pot is lined with a cloth adapted to be folded over the thread which is passed
20 into said pot.

In testimony whereof I affix my signature.
HANS SUTER.

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