

PUBLISHED
APRIL 27, 1943.

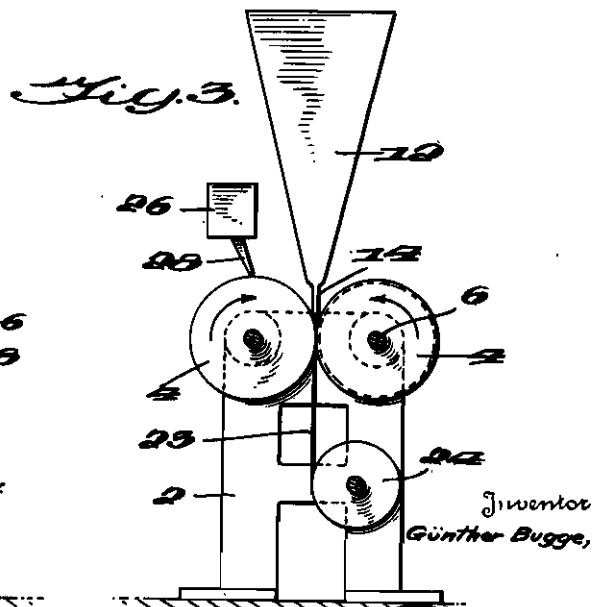
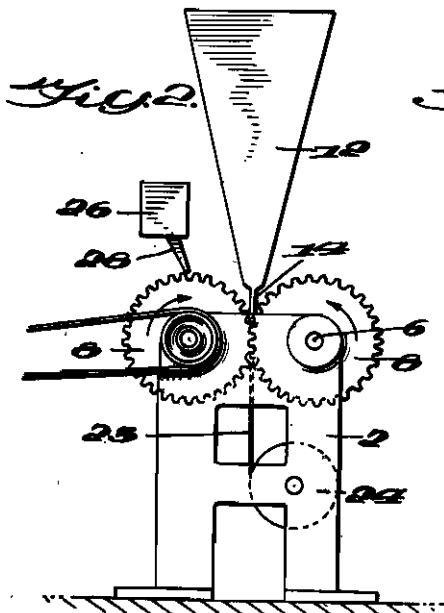
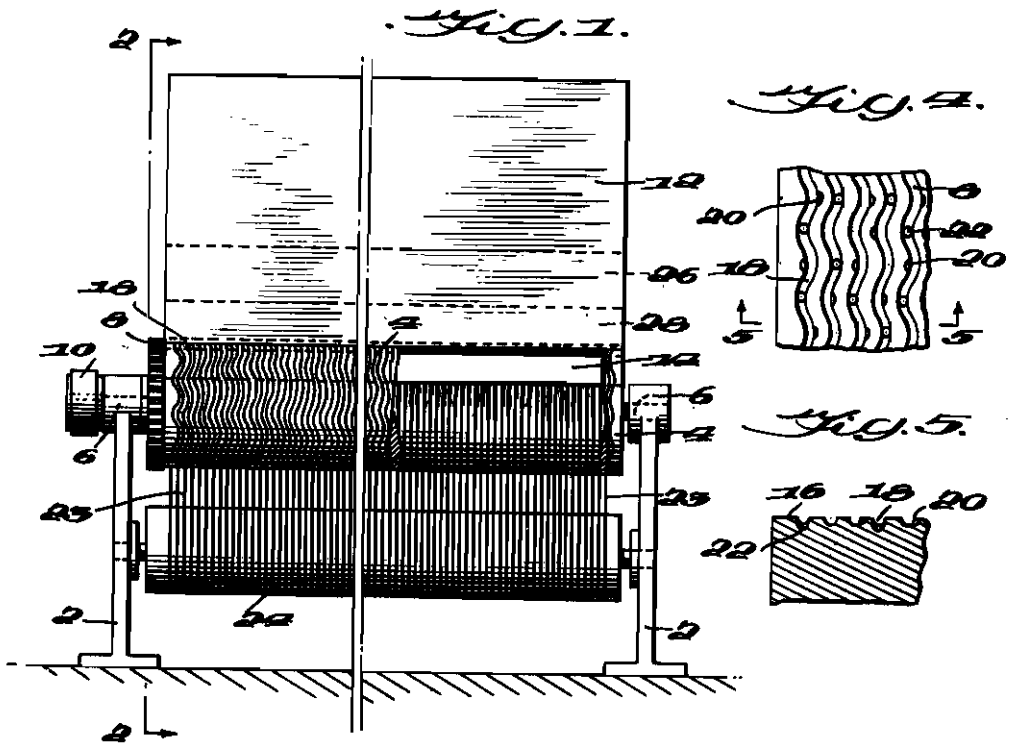
G. BUGGE
WOOL-LIKE ARTIFICIAL FILAMENTS

Serial No.
285,774

BY A. P. C.

Filed July 21, 1939

2 Sheets-Sheet 1

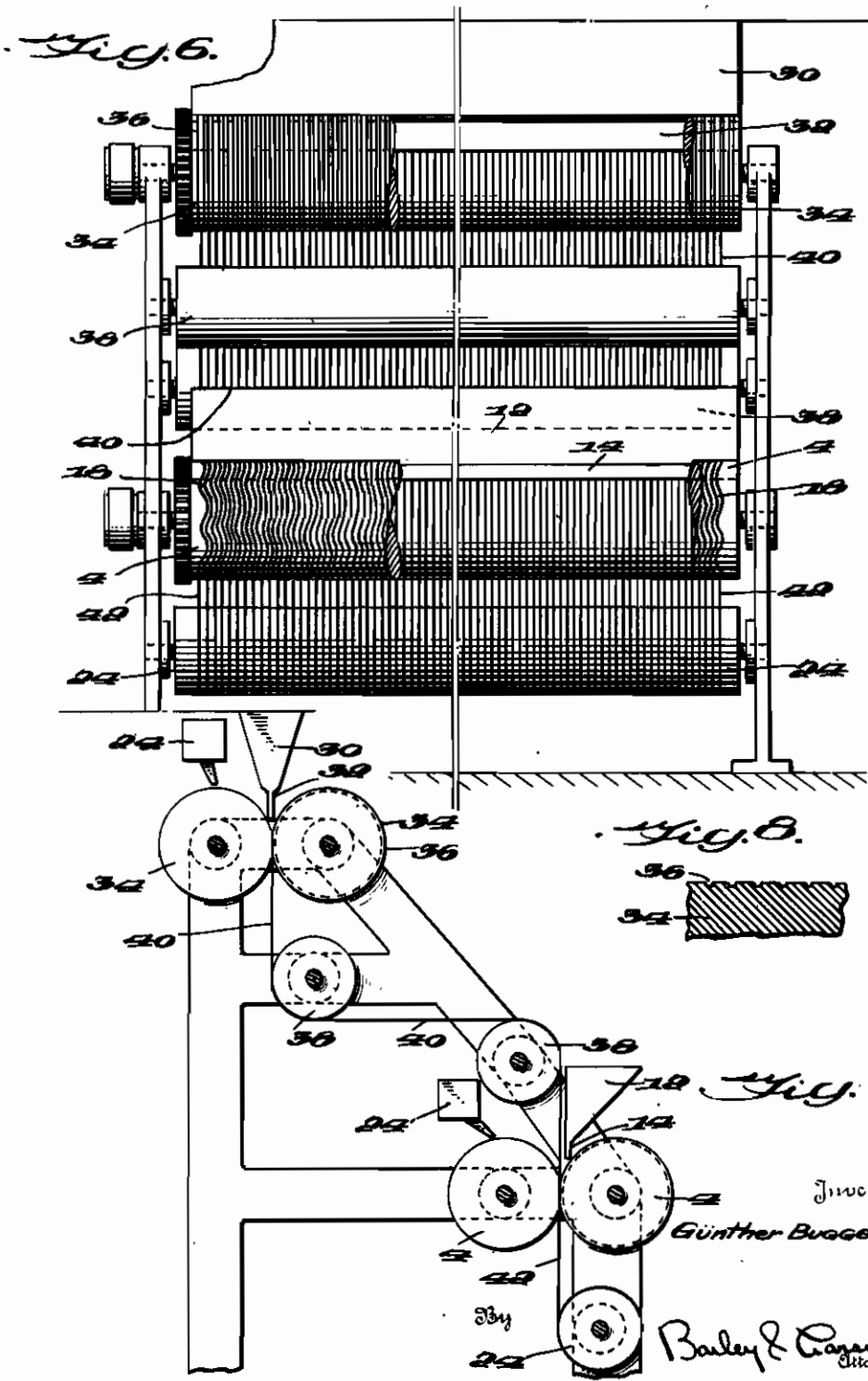


By *Bailey & Harner* Attorneys

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Inventor
Günther Bugge
Barley & Casper
Attorney

ALIEN PROPERTY CUSTODIAN

WOOL-LIKE ARTIFICIAL FILAMENTS

Günther Bugge, Neu-Isenburg, Germany; vested
in the Alien Property Custodian

Application filed July 21, 1939

Numerous processes are known for curling artificially produced filaments formed of materials capable of being spun, such as cellulose solutions and the like, and thus converting them into a form in which they can be easily formed into a fleece and then into wool-like spinning threads. The chemical and/or physical means heretofore used for such curling make possible only relatively coarse, inaccurate and poorly controlled curling. In addition, threads so produced do not provide when woven a material even closely approximating in appearance or feel that produced from genuine wool fibres.

It is also old to use, instead of spinnerets, in the production of artificial silk, an arrangement consisting of a pair of rotating rollers the surfaces of which are provided with grooves semi-circular in cross section and disposed perpendicularly to the roller axis. With such a device, by feeding an artificial silk spinning solution, filaments are produced which are merely similar to those extruded from a spinneret. On the other hand, it is also old to produce fabric imitations by means of engravings on rotating rollers which simulate fabric patterns. These procedures, however, have nothing to do with the production of curled artificial silk filaments with irregular surface forms, similar, for example, to natural wool. In one case, uncurled smooth filaments are produced; in the other, no filaments are produced, but only stamped or pressed film-like structures, intended to make the preliminary production of filaments unnecessary. Another old method, similar to the two above described, consists in providing the engraved portions of the pressing rolls from which thicker portions of the structure are to be produced with ribs. This method likewise is in no way analogous to the production of curled and superficially irregular spun filaments, but is based on the opposite purpose, that is, of avoiding the production of spun filaments entirely.

The primary object of the present invention is to produce artificial filaments having the feel and appearance of wool, and particularly when such filaments are woven into a cloth. The invention does not contemplate the production of the cloth directly, but only in the usual manner of forming threads and then weaving them.

A second object of the invention is to produce a curled artificial thread, and especially such a thread having irregularities therein so as more nearly to resemble a natural wool thread. More especially, the invention relates to the manufacture of a thread which has a natural or set curl, or in other words, one which is solidified in a

curled state, as contrasted with a thread to which the curl is applied after it has been solidified.

A further object of the invention is to provide a simple and economical method and apparatus by which such threads may be produced directly from a solution of artificial silk or other material.

Further objects and advantages of this invention will be seen from the following description taken in conjunction with the accompanying drawings which form a part thereof.

In the drawings:

Fig. 1 shows in front elevation a machine embodying the invention;

Fig. 2 is a side view thereof;

Fig. 3 is a cross section on the line 3—3 of Fig. 2;

Fig. 4 is a detail view on a large scale of a portion of the surface of one of the rolls;

Fig. 5 is a cross section on the line 5—5 of Fig. 4;

Fig. 6 shows in front elevation a modified form of machine, for producing threads with cores;

Fig. 7 is a side view thereof; and

Fig. 8 is a view similar to Fig. 5 of a portion of one of the upper rolls of Fig. 6.

It has been discovered that curled artificial filaments with irregular surfaces can be produced if the artificial silk is shaped by a pair of rolls, these rolls being provided with parallel or approximately parallel grooves engraved therein perpendicular to the axis, these grooves being of undulating, zig-zag, or other suitable shape, and being preferably also provided with extensions, enlargements, bulges or the like. The filaments formed in these grooves may deviate or differ from the conventional smooth cylindrical form as much as desired. It is thus possible to produce surface structures of the filament which resemble the natural wool fibre with its squamous or scale-like appearance. For this purpose it is necessary only to give the groove the negative shape of a wool fibre.

The velocity of the rotating rolls and the concentration or composition of the spinning solution are so selected that the filaments formed during the filling of the grooves are more or less coagulated. This can be done according to the wet spinning method by applying to the rolls a coagulating liquid. In a dry spinning method any suitable procedure may be used. The engraving of the rolls, which are preferably of metal, for example, copper, can be carried out in the same manner as screen etching. Use can also be made of rolls of pressed synthetic material, on the plastic surfaces of which the desired filament

forms can be pressed by patterns of steel or the like, after which the rolls are hardened.

Figs. 1 to 5 of the drawings show one type of machine for carrying out the process according to the invention.

Mounted in a frame 2 are rollers 4, the surfaces of which are in contact with each other. These rollers rotate in the frame on shafts 6, and the rolls are connected to each other by gears 8 to turn together at the same speed in opposite directions. The rolls may be driven by a wheel 10 from any suitable source of power.

Mounted above the rolls is a reservoir 12 for the liquid which is to be formed into threads, which may, for example, be a solution of a cellulose derivative, such as cellulose acetate, or any other suitable organic material. The reservoir 12 has a downwardly extending feed member 14 arranged in the space between the rolls and close to the line of contact therebetween.

The rolls themselves are provided with suitable mating grooves for forming threads having a wool-like appearance. For example, the flat surface 10 may, as shown in Figs. 1 and 4, be provided with a plurality of grooves 16 which are of wavy shape, although any other irregular shape may be provided if desired. The term "undulating" is used to describe such irregular shapes, which lie outside of planes transverse to the roll axis. Preferably these grooves are substantially parallel, although exact parallelism is not in any sense requisite. The grooves are generally semi-circular in cross section, as shown by the second groove in Fig. 5. However, these grooves are also provided with projections or recesses in order to give irregularity to the shape of the filaments, so that these will not be of purely circular cross section. These irregularities may comprise lateral projections or widenings of the grooves, as indicated at 20, or may consist of deepening of parts of the grooves, as indicated at 22.

Of course, the grooves on the two rolls are arranged exactly opposite each other, so far as their general outlines are concerned, although this is not requisite as far as the enlargements or recesses are concerned.

There is also provided below the rolls 4 a take-up roll 24 upon which the finished threads may be wound.

In a wet spinning process, a coagulating liquid is supplied to at least one of the rolls from a reservoir 26, from which the liquid flows through an outlet 28 to the surface of one of the rolls, preferably adjacent the top thereof.

The device above described operates in the following manner. The reservoir 12 is filled with a suitable solution, such as a solution of cellulose acetate. This solution flows out through the outlet 14 into the space between the rolls. As the rolls turn, the solution is forced into the grooves 18, while any excess is squeezed back upwardly by the flat surfaces 16 which are maintained in contact with one another. The lefthand roll brings with it a coagulating liquid from the reservoir 28, so that the filaments formed within the grooves 18 are immediately coagulated.

The coagulated filaments 23 leaving the rolls are wound on the take-up roll 24.

Since the filaments are coagulated while they are in the wavy portions of the grooves 18, they

are inherently curled as they leave the rolls. In other words, the filaments are hardened or solidified while in a curled state so that they have a natural tendency to hold this curled shape.

Furthermore, the cross section of the filaments is not regular and circular throughout, but is irregular because of the projections 20, 22, which form bumps on the filament surfaces. The filaments thus produced resemble natural wool fibres and are particularly similar to natural wool when woven into a cloth.

The filaments are thereafter dried, hardened or treated in any other conventional manner.

The modified form of the invention shown in Figs. 6 to 8 produces the additional effect of making the filaments even more irregular and of giving them a heat insulating effect. For this purpose, the reservoir 30 and nozzle 32 feed to the space between two rolls 34, which preferably have circular grooves 36 of regular semi-circular cross section, although undulating grooves may be used. The radius of the grooves 36 is somewhat less than that of the grooves 18. The filaments 40 formed between the rolls 34 are fed over guide rolls 38 to the space between the rolls 4. At this point, the small diameter filaments 40 are fed into the grooves 18 of the rolls 2, but, of course, do not fill these grooves. At the same time, reservoir 12 through nozzle 14 feeds additional solution into the space between the two rolls 2. This forms a second layer on the filaments 40 so as to produce a double-layer filament 42 which is wound on the take-up roll 24.

The outer coating, at least, of this filament is inherently curled, because of the undulating nature of the grooves 18. It is also of irregular cross section because of the projections 20, 22 of the grooves 18. At the same time, the coating layer will be of irregular thickness, or, in other words, will not be concentric with the core filament 40, since there is no positive guiding of the core filament to insure that it is held rigidly in the center of the grooves 18. Finally, a filament so formed has great heat insulating qualities since a layer of air is usually trapped between the core 40 and the outer covering, even though this air layer is quite thin.

The diameter of the grooves, and therefore of the filaments, is limited only by the skill of the engraver or etcher. However, as the filaments produced shrink during hardening and drying and are also stretched in the usual manner, the cross section of the grooves should be somewhat larger than the desired cross section of the finished filament.

The invention provides filaments which, by reason of their irregular surface formation which promotes mutual coherence, make it possible to produce a very good fleece, whether the filaments are cut in the staple or treated as endless filaments. The fabrics produced from such threads are thus characterized by resistance to creasing and by elasticity and have good heat-insulating properties. A special advantage of the invention lies in the possibility of obtaining an exact limitation of a natural wool thread, that is, to attain the desired degree of curling, as well as to produce the typical superficial structure of natural wool.

GÜNTHER BUGGE.