

UNITED STATES PATENT OFFICE.

FRIEDRICH LEHNER, OF ZURICH, SWITZERLAND, ASSIGNOR TO VEREINIGTE KUNSTSEIDE-FABRIKEN, A. G., OF FRANKFORT-ON-THE-MAIN, GERMANY.

PROCESS OF MANUFACTURING ARTIFICIAL HORSEHAIR.

SPECIFICATION forming part of Letters Patent No. 713,999, dated November 18, 1902.

Application filed December 26, 1900. Serial No. 41,120. (No specimens.)

To all whom it may concern:

Be it known that I, FRIEDRICH LEHNER, a citizen of the Empire of Germany, residing at Zurich, Switzerland, have invented certain
5 new and useful Improvements in Processes of Manufacturing Artificial Horsehair; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which
10 it appertains to make and use the same.

This invention relates to the manufacture of threads which have all the physical characteristics of natural horsehair; and the object thereof is to prepare such threads or filaments of indefinite length which at the same
15 time possess all the characteristic properties which make horsehair valuable in the arts.

Natural horsehair is a perfectly smooth elastic filament of suitable thickness, but of
20 limited length. When the same is employed in the textile arts—for example, for bordering, trimming, or embroidering—the shortness of the individual hairs requires that they be united or spliced, so as to form a continuous thread adapted for uninterrupted
25 work. This preparatory operation must be carried out by special machines. This tedious work is eliminated when employing artificial horsehair made under my invention, which consists in using as starting material
30 threads which have already been spun from cotton, ramie, cellulose, artificial silk, viscose, nitrocellulose, or the like, and in imparting to such threads the valuable properties of natural horsehair, so that they form a perfectly smooth, thick, compact, integral
35 filament—that is to say, to radically modify these threads, which consist of a number of separate spun strands. The individual fibers or strands of the material used for this purpose must disappear to such an extent that the inner microscopic structure of the same disappears and the separate fibers or strands will merge into the single integral thick filament without spaces or intervals.
40

In order to enable those skilled in the art to practice my invention, I will now give a

detailed description of what I consider the preferred embodiment of the said invention.

The cellulose, which is used as the starting
50 material, may be in its natural state—as, for instance, in the case of cotton, ramie, hemp, &c.—or it may be in a converted form, such as nitrocellulose, artificial silk, viscose, or the like. The term “cellulose” as used by
55 me is intended to embrace cellulose matter in a natural or artificial condition.

If natural cellulose material is to be used, I take one or more filaments, strands, or
60 fibers, or one or more threads composed of such strands, filaments, or fibers, according as a larger or smaller product may be desired. The material is then placed in a suitable solvent. In case of the natural material I preferably employ an ammoniacal solution
65 of copper oxid or a concentrated aqueous solution of zinc-chlorid. The material is drawn through this solution and allowed to remain therein sufficiently long to thoroughly dissolve and cause a conversion of the same and
70 an amalgamation of the fibers, strands, or filaments into one homogeneous whole.

If the artificial forms of cellulose are used—such as artificial silk, viscose, nitrocellulose, &c.—I take a plurality of strands or filaments or a twisted thread of the same and
75 subject such material to a bath, preferably of ether or alcohol, thus effecting a sufficient dissolving action to attain a union of the several strands or threads into a homogeneous
80 strand.

It will be understood that when artificial silk or the like is used the material already possesses the peculiar properties which are necessary to be imparted to the natural
85 cellulose material. In the one case it is only requisite to bring about such a degree of softening as will permit of the cohesion and amalgamation of the threads or strands of the converted cellulose, whereas in the other instance it is necessary to subject the natural material to the dissolving and converting action of the baths described.

After the material has emerged from the

solvent-bath and it is found that the solvent has sufficiently penetrated and caused a merging or fusing together of the strands it is immediately drawn through any known or
 5 suitable congealing or solidifying bath in order to arrest the further action of the solvent-bath and to attain the form of a close compact filament. This congealing liquid depends on the starting material and the sol-
 10 vent-bath employed. For example, where an ammoniacal copper-oxid solution has been employed as a solvent an acid such as sulfuric or acetic acid, &c., is used, where zinc-chlorid was used as a solvent alcohol is to be
 15 employed as a congealing agent, when sulfuric acid was the solvent water should be the congealing agent, where nitrocellulose and ether or alcohol have been employed a mere exposure to the air or drawing the fila-
 20 ment through water will be sufficient to arrest the solvent action. Thereupon the solvents and the congealing substances are completely removed from the filament by washing in much water, and the product is
 25 dried on reels. Thereupon it may be further treated in the usual manner—that is, may be dyed and, if desired, denitrated. In order to correct any flaws resulting from the imper-
 30 fectly-united strands of the components of the artificial horsehair where they have not been perfectly united without again drawing the product through the solvent and congeal-
 ing bath, the artificial horsehair may be finally drawn through a solution of caout-
 35 chouc or gelatin or collodion. This will suffice to cover any such flaws. The product so formed possesses the appearance and proper-
 40 ties of natural horsehair. It may be used for all the purposes for which the latter is employed. It may be employed in the textile arts and in embroidering. It may also be
 45 knit into the form of mantles, which, when impregnated with incandescent salts, can be used for the Welsbach burners. It may also
 be carbonized and used as a filament for incandescent electric lamps.

For stout artificial horsehairs a plurality—that is, two or more—spun threads or strands are combined to form a compound thread, as
 50 stated above. In this case the impregnation of the strands with the solvent, in addition to the effects above set forth with respect to the individual component strands, leads to the further result that the transverse pres-
 55 sure due to drawing the compound threads through the solvent-baths, in conjunction with the softened exterior of the component strands, welds the latter together into one integral filament. This portion of my inven-
 60 tion is particularly useful where the materials are composed in whole or in part of artificial silk, viscose, or nitrocellulose, of which not only the strands in the individual com-
 65 pound threads weld together into compact and tough filmanent, due in part to the prior

spinning action and in part to the action of the solvent, conjunctive with the drawing operation, but the said component strands in turn are welded together to form a single
 70 integral filament of artificial horsehair in which all the initial component parts are merged into a solid, strong, and compact whole.

What I claim, and desire to secure by Letters Patent of the United States, is—

1. The process of preparing artificial horse-
 hair which consists in submitting spun
 threads to the action of a solvent until the
 entire substance of the same has become im-
 pregnated with the said solvent, and then re-
 80 moving the solvent.
2. The process of preparing artificial horse-
 hair which consists in submitting a filament
 to a solvent-bath until the entire substance
 of the same has become impregnated with the
 85 said solvent, and then to a congealing-bath.
3. The process of preparing artificial horse-
 hair which consists in submitting spun
 threads to a solvent until the entire substance
 of the same has become impregnated with the
 90 said solvent-bath and then to a congealing-
 bath.
4. The process of preparing artificial horse-
 hair which consists in first drawing spun
 threads of cellulose, such as cotton, ramie,
 95 artificial silk, viscose and the like, through
 a solvent-bath, until the entire substance has
 become impregnated with the said solvent
 and then drawing the same through a con-
 gealing-bath.
5. The process of preparing artificial horse-
 hair which consists in drawing a thread of
 cellulose through a solvent-bath until the en-
 tire substance of the same has become im-
 100 pregnated with the said solvent and then
 through a congealing-bath, and finally wash-
 ing and drying the resultant thread.
6. The process of preparing artificial horse-
 hair which consists in first drawing a thread
 through a solvent-bath and then through a
 110 congealing-bath whereby its individual com-
 ponent strands are welded together into an
 integral filament.
7. The process of preparing artificial horse-
 hair which consists in first drawing a thread of
 115 cellulose material such as described, through
 a solvent-bath until the same is welded into
 one integral filament and then drawing the
 same through a congealing-bath.
8. The process of preparing artificial horse-
 hair which consists in first drawing a thread of
 120 cellulose material such as described, through
 a solvent-bath until the same is compacted
 into one integral filament and then drawing
 the same through a congealing-bath and
 125 finally washing and drying the resultant
 thread.
9. The process of preparing artificial horse-
 hair which consists in submitting cellulose
 material to a solvent-bath, then removing the
 130

solvent and finally drawing the same through a coating solution such as caoutchouc solution, gelatin or collodion.

5 10. The process of preparing artificial horse-hair which consists in drawing a spun thread of fibrous material through a solvent-bath, then drawing the same through a congealing-bath, and finally through a coating-bath whereby its fibers are welded together, such

as a solution of caoutchouc, gelatin or collodion.

In testimony whereof I affix my signature in presence of two witnesses.

FRIEDRICH LEHNER.

Witnesses:

A. LIEBERKNECHT,
A. ROTH.