

UNITED STATES PATENT OFFICE.

FRIEDRICH TODTENHAUPT, OF COLOGNE - EHRENFELD, GERMANY.

PRODUCTION OF ARTIFICIAL SILK AND ARTIFICIAL HAIR FROM CASEIN.

No. 836,788.

Specification of Letters Patent.

Patented Nov. 27, 1906.

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To all whom it may concern:

Be it known that I, FRIEDRICH TODTENHAUPT, chemist, doctor of philosophy, a subject of the King of Prussia, German Emperor, residing at Cologne-Ehrenfeld, in the Kingdom of Prussia, German Empire, have invented new and useful Improvements in the Production of Artificial Silk and Artificial Hair from Casein, of which the following is a specification.

The present invention relates to a special process for the production of artificial silk and artificial hair from casein. In this process the casein is dissolved in an alkaline fluid and is then pressed in the form of thin threads into a bath of dilute acid or is allowed to fall into such a bath. Treated according to this process the casein is converted into an elastic compound insoluble in water and of great hardness.

It has already been proposed to form artificial filaments of solutions of albuminous materials and even of casein; but the filaments prepared from albuminous substances, though they have approximately the same chemical composition as natural silk and natural hair, are yet considerably soluble in water, so that these articles could hitherto find no general application. The products obtained from the casein of milk have the advantage that they burn with great difficulty and carbonize in like manner to natural silk. Moreover, they fairly accurately resemble natural silk, having a percentage of nitrogen of from about fifteen to sixteen per cent. Moreover, the products are very insoluble in water. If casein, for instance, be dissolved in acetic acid and the solution be pressed in thin filaments upon a traveling cloth, these filaments when dry produce so brittle a product and which absorbs such a quantity of water that its practical application is impossible; but if the casein be dissolved in an alkaline solution, according to this invention, and then pressed in the form of thin filaments into a bath of dilute acid, the casein is converted into a very elastic compound of great hardness and insoluble in water. This compound may further be hardened by formaldehyde or other known means. This com-

pound possesses qualities similar to those of natural silk and fulfils the requirements of a good artificial silk in a remarkably high degree. The compounds of casein with the above-mentioned bases, as such occur in trade under the name of "water-soluble casein," can be used, dissolved in water, as the spinning fluid. Instead of pressing the threads into the bath of acid they can also be allowed to fall into such a bath.

As alkaline fluid, use may be made of solution of potash, soda, ammonia, hydrate of lime, amin, or ammonium bases and their compounds reacting alkalinely. For the acid bath all acids, as well as acid salts, may be applied. To the alkaline solution of casein a small portion of tannic acid or chromic acid may be added, but not more than the solution remains alkaline. The concentration of the acid bath will be according to the nature of the acid employed. It is advisable to add to the bath a fluid of light specific gravity, such as methyl alcohol, ethyl alcohol, or the like, so that the filaments easily sink in the acid bath. To the acid bath formalin may also initially be added. The casein may be applied in fresh precipitated condition as well as in a dried condition.

The various caseins obtainable in commerce all require different quantities of alkaline fluids in order to give a clear solution adapted for producing the filaments. The quantities may be easily determined by any previous experiments.

Having now described my invention and in what manner the same is to be performed, what I claim, and desire to secure by Letters Patent, is—

1. The process for the production of artificial silk and artificial hair from casein, which consists in dissolving the casein in combination with bases to a solution of such viscosity to allow to draw threads of it, which by means of an acid bath containing formaldehyde into which these threads are brought, are converted into threads of precipitated casein and finally drying the threads obtained, substantially as described.

2. The process for the production of arti-

ificial silk and artificial hair from casein,
which consists in dissolving the casein in al-
kaline fluid, then pressing it in the form of
continuous thin threads into and through an
5 acid bath containing formalin and finally
drying the threads obtained, substantially as
described

In testimony whereof I have signed my
name to this specification in the presence of
two subscribing witnesses.

FRIEDRICH TODTENHAUPT.

Witnesses:

MARGARETE GÄNZ,
WILLIAM KUEPPERS.