ARRANGEMENT FOR LOOSENING ARTIFICIAL FIBER CABLES IN CONTINUOUS SINGLE THREADS

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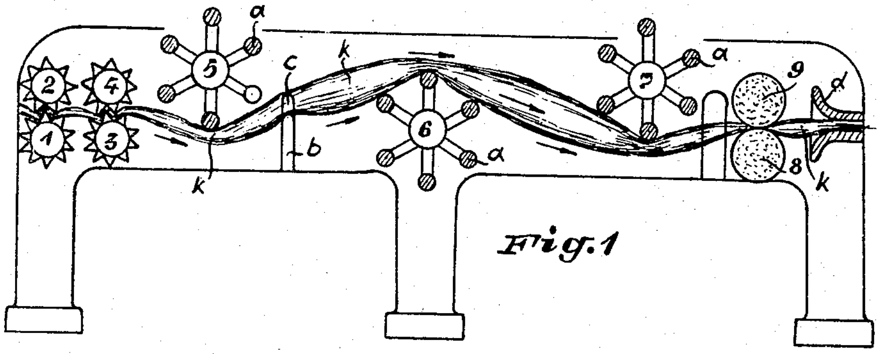
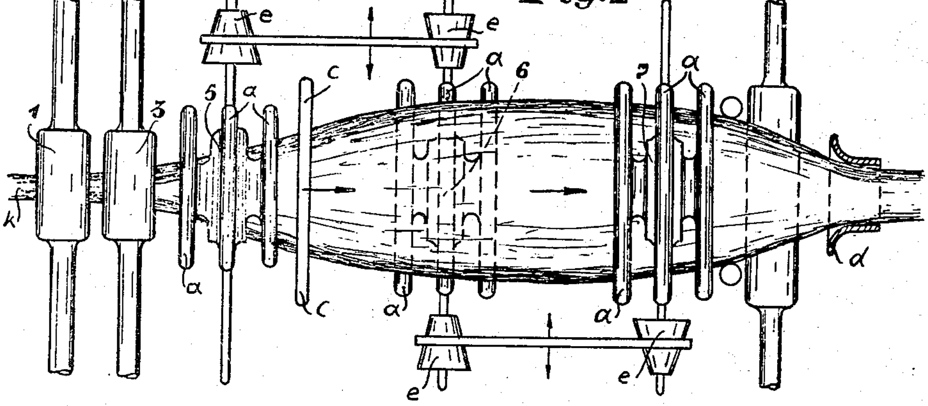


Fig. 1

Fig. 2



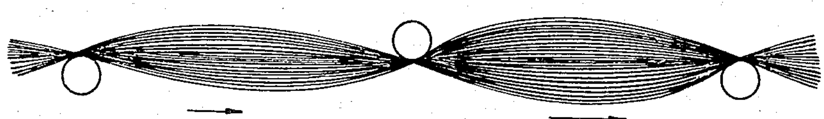


Fig. 3

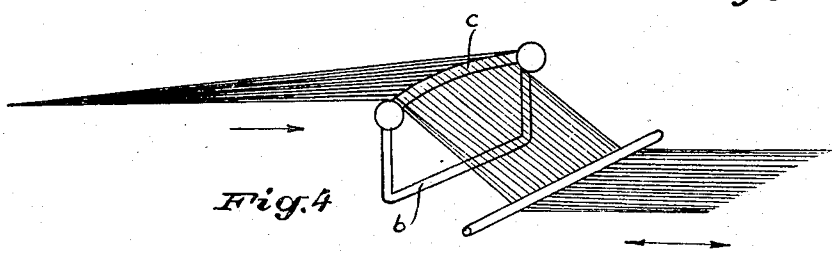


Fig. 4

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ARRANGEMENT FOR LOOSENING ARTIFICIAL FIBER CABLES IN CONTINUOUS SINGLE THREADS

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2 Claims. (Cl. 19—65)

The present invention relates to processes and devices for separating the fibers of fiber cables.

Some artificial fiber cables, especially those which in the manufacture of wool cellulose have originally been produced in ribbon form, whose continuous single threads mainly lie evenly directed side by side, are, in consequence of a bath treatment and drying, stuck together in almost inseparable hanks. To a certain extent, this is even still more noticeable with cellulose, in the production of which, the fiber cables are stacked in a wet condition, roughly preloosened and then dried. Even though cut in short lengths, the stack hanks and ribbon-like filaments of the cellulose are often so difficult to open that the spinning material, which is just the opposite to animal and vegetable fibers in not requiring cleaning or the removal of foreign matter, must be subjected to a strong mechanical action and fiber destruction in the preparatory operation of mechanical spinning which yields a staple cellulose, the condition of which is similar to the original and opened arrangement thereof, for instance, card silver.

The loosening of fiber cables which are stuck together in continuous single threads plays a most important part in the light of the latest development of spinning, and this is today especially important because in its technical solution, the evenly directed single fibers of existing cable ribbons, excluding certain known and generally used fiber devices which are expensive, are stapled according to a special process, so that the ribbon shape and the even direction of the fiber sections are kept upright and the drawing can be started immediately. The afo.ementioned also applies to the working of artificial fiber ribbons, the single fibers of which have already been fastened together in loosely twisted threads, hanks, and so forth.

The difficulties to be overcome for the preparation of material for the purpose of applying such a shortened spinning process, are as follows:

(a) To arrange existing cable ribbons into continuous single fibers, hanks or lightly twisted threads which have been stuck together, without,

(b) If possible, changing the natural features of the thread like the condition of the surface, curliness, breaking strength, elastic elongation, etc.,

(c) Especially, the damaging of the spinning material by knopping formation, and lastly, to find suitable methods for the practical execution of such a process.

Various efforts to solve the foregoing have already been made, attempts carried out and processes drawn up, the practical results of which were not satisfactory, because of the insufficient spacing of the fibers which resulted and led to larger damage, tearage and knopping of the fibers. One process has, for instance, passed the hard mass of sticking fiber cables from cellulose factories through cracking or roller-squeezing machines, like those known in the manufacture of jute, and ultimately endeavored to separate it in specially mounted hackling sheets, gill boxes, etc. suitable for the working up of continuous, that is, untorn and draftless fiber. As the single fibers in many cases curl of themselves in spite of their evenly directed position, the force of the pins is incomparably larger than the power of breakage of the single fibers. Moreover, even the closest rows of pins are not sufficiently capable of separating single fibers of the smallest fractions of a millimeter cross section in a tangled condition.

According to other trials, the artificial fiber cables were treated with flexible fine card clothings, brushes, etc., for instance in roller or caterpillar form. Apart from the creation of large machinery disturbances, winding of rollers, etc., with broken or torn fibers, the results are entirely unsatisfactory, in consequence of the damage to the fibers, that is, breakage and knopping. In the aforementioned cases, due to the comb and brush-like treatment, the fiber hanks, divided at various points, are naturally stretched out, which causes the inside to tighten itself all the more. The combing or brushing tools can only treat and loosen the outer cover of the hanks, thereby scratching and breaking and causing excessive knopping formation of the fibers long before they can penetrate into the core of the hanks, so that badly damaged, broken and still untouched bundles of fibers remain closely side by side.

Before stacking, etc., one process has finally tried to achieve the loosening of stuck fiber cables with rough methods like silicious marl, carborundum, emery, etc., by which the condition of the surface of the fibers, etc., is greatly changed.

The present invention, with due regard to the above mentioned methods and the damage done to the fibers by combs, brushes, knife rollers or similar tools which draw together or damage the hanks, has for its principal object a method which does not damage the fiber cable but has the hanks of the fiber cable and, finally, the single fibers brought to such a lively vibration, that the single fibers are loosened from one another. The arrangement which produces the vibrations, that is, a blunt and soft or elastic oscillating body, can, at the same time, bring about a mild beating action and thereby assist in loosening the fibers; however, a loosening of extraordinary delicate artificial fiber cables is just as well possible by oscillation, for example, by means of a steel membrane fixed between a fiber cable and a swinging body.

By mutually tuning several swinging inducers in order to cause the loosening of the fiber cables, resonance and eventually also dissonance symptoms can be produced so that an adaption to the fineness, delicateness and sticking of the fibers is possible by the enlargement or diminishment of the swinging movements.

Through this novel process, as set forth above, a far more effective loosening of the fibers, than through the methods adopted heretofore, will be achieved on the one hand, while, on the other hand, the natural condition of the materials is in no way impaired by force, that is, especially, the breaking strength or permanent elongation, curling, etc., of the single fibers, which are almost completely preserved. By passing the fiber cables through a machine or arrangement provided with swinging inducers, which are eventually and gradually increased to a high self-swinging power, for instance, 5,000, 10,000, 20,000 per minute each, the tangled or otherwise connected fibers separate one from another almost without any mechanical assistance.

In the accompanying drawing:

Fig. 1 is a side plan view, partly in cross section, of an arrangement for the carrying out of the present invention.

Fig. 2 is an enlarged top view of the mechanism of Fig. 1.

Fig. 3 is a schematic sketch of the swinging amplitudes which are changed by the resonance effect, and

Fig. 4 is a greatly enlarged detail perspective view of a broadening bracket forming part of the present device.

Referring now more particularly to the accompanying drawing wherein like and corresponding members have the same reference characters, *k* refers to a cable which is passed through in a more or less irregular, up and down, manner between the star-shaped vibration inducing rollers **5**, **6** and **7** which, at their outer ends, carry the swinging bodies *a* from deeply fluted or toothlike but not very heavily loaded feed rollers **1—2**, **3—4**, Figs. 1 and 2, which, on the one hand, feed the fiber cable and, on the other, take the stiffness and brittleness out of the ribbon by its bending thereof. The swinging bodies *a* may, for instance, consist of flexible round rods with leather covers, or other similar rods (see **Fig. 2**). If, for instance, roller **5**, provided with six swinging bodies *a* turns with only 500 revolutions per minute, 50 swings per second are produced in the fiber cable, and the turns may be gradually increased manifoldly to 300 swings per second, for instance, at 3000 revolutions of the roller, without any technical difficulties. In the movement of the bodies *a* and their contact with the fiber cable, a number of light knocks by the swinging bodies are simultaneously dealt out to the cable, whereby, the loosening of the hanks and separating of the fibers by the vibrations are assisted.

The preloosened and broadened fiber cable which, under the influence of roller **5**, is thereupon passed over or through suitable means which create a further artificial broadening and, accordingly, reduction in the thickness of the fiber cable. This can, for instance, be achieved by leading the fiber ribbon over a curve-shaped bracket *c* or something similar, the effect of which is shown in detail in **Fig. 4**.

This rather simple procedure for spacing the fiber by swinging the same can be repeated a number of times and eventually strengthened or reduced according to the degree of spacing desired, without technical difficulties and damage to the fiber worth mentioning, in a suitably constructed machine or device. As already mentioned above, the effect of the spreading can be influenced and changed to a larger degree (see **Fig. 3**), by the tuning of several vibration inducers by the laws of vibrations and thereby create a resonance which brings about a swelling of the amplitudes, as well as through the changing of the vibration frequencies, rotation per minute of the vibrated inducers, by means of cone gears *e*, etc. (Fig. 2).

When the spreading into single fibers has taken place, the continuous fiber cable can be removed from the machine in the known manner through the calender rollers **8** and **9** or the like, and again gathered together to the desired breadth by the usual method, such as a funnel or the like. Thereupon, the material can, as stated above, be immediately, or after being wound on spools or the like, stacked and drafted, or then worked up into an entirely separated wool cellulose.

Practical trials with a device working according to this process have achieved results with regard to the separating of fiber, knopping cleanness, preserving of fiber, elastic elongation, curling, etc., which, in comparison with the other separating methods mentioned, have not been surpassed.

Insofar as the fundamental thought of separating fibers is maintained through vibration inducers in the fiber cable, with or without additional knocking effect by circulating swinging bodies, etc., the process can be carried out also with means other than those already disclosed without affecting the thought of the invention.

I claim:

1. A device for separating artificial fiber cables into continuous single fibers comprising means for suspending said cable, a series of star-shaped rollers having flexible rods carried by the periphery thereof capable of striking and vibrating said cable and a member positioned adjacent one of said rollers for spreading said cable into individual fibers.

2. A device for separating artificial fiber cables into continuous single fibers comprising means for suspending said cable, a series of rotating members capable of striking and vibrating said cable, a plurality of cones each connected to one of said rotating members, a plurality of belts connecting each pair of said cones permitting a relative rotational adjustment between said rotating members, and a member positioned adjacent one of said rotating members for spreading said cable into individual fibers.

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