

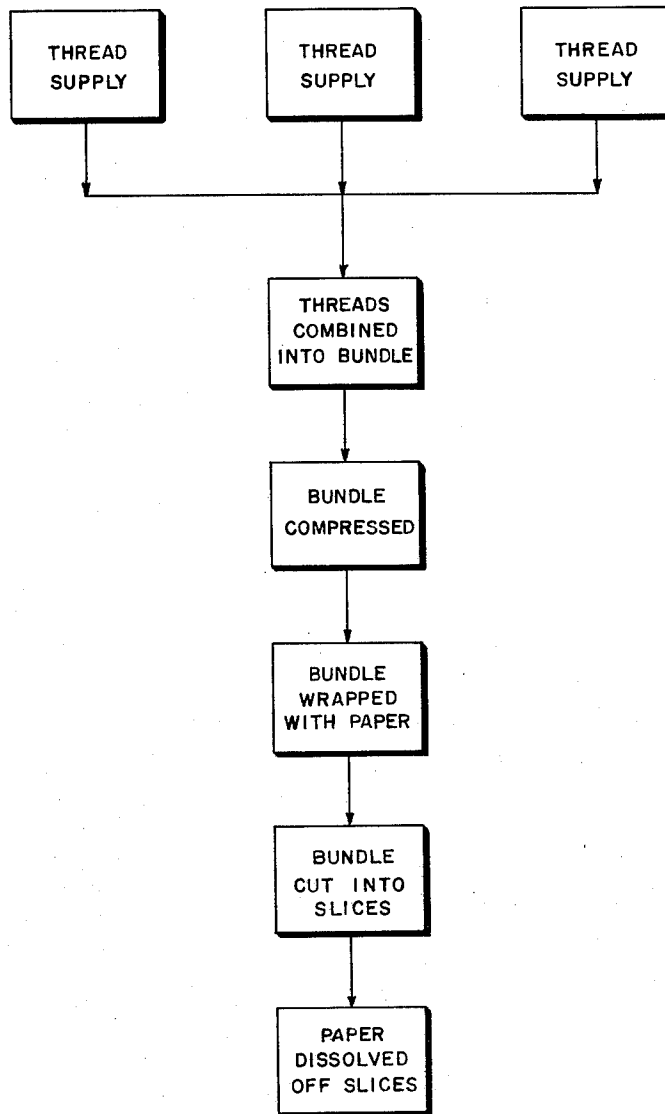
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MANUFACTURE OF PAPER

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MANUFACTURE OF PAPER

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This invention relates to the manufacture of paper from threads consisting of man-made fibers such as linear polycondensation products. More particularly the invention relates to a process for making paper wherein endless threads are cut into staple, the cut fibers are collected in water and the resulting pulp is formed into paper.

Similar processes are generally known.

One of the difficulties encountered in these known processes is in the step of cutting the threads into fibers of the desired length. For the manufacture of paper, a fiber length of less than 10 mm., and preferably of 2 to 5 mm. is desired. The apparatus used for cutting endless threads into staple fibers of the length suitable for the textile industry are often unserviceable for cutting such short lengths. Insofar as they are serviceable, however, they supply fibers which vary too greatly in length, contain irregular ends, or stick together at the ends.

Now a way of cutting has been found which makes it possible to obtain, from endless threads, staple fibers of a length corresponding with that of the customary paper fiber, the individual fibers being of uniform length and being completely separated from each other.

In accordance with the invention, the fibers are obtained from the threads by bringing together a large number of threads in parallel relationship to form an elongate stiff bundle, this bundle is enclosed in a wrapping, the formed package is cut in a direction perpendicular to the direction of the threads into slices less than 10 mm. and preferably 2 to 5 mm. thick, after which the cut fibers are collected in water in order to be made into a paper pulp.

The drawing illustrates the operations involved in the invention.

The number of filaments which are brought together in parallel relationship to form the stiff bundle can amount to tens of thousands. Favorable results have been obtained by forming from the threads a bundle 4 to 12 cm. thick, and preferably about 10 cm. thick.

For wrapping the bundle of threads strips of paper are preferably used. These may be wrapped spirally around the formed bundle.

Although a single strip of packing paper, wound around the bundle in such a manner that the wraps overlap to some extent, can be used to provide a covering which keeps the filaments together in the form of a sufficiently compact rod, it is preferred to use a larger number of strips, which are wound in successive layers around the bundle of threads.

It has been found to be desirable, in order to obtain a compact bundle, to pull the combined threads through a funnel-shaped member which is preferably somewhat elastic, in order to press the threads closely together. Immediately after leaving the funnel, the bundle of threads is wound with the strips of paper. This can be done in a known manner, by causing one or more supply spools, on which the paper strips are wound, to rotate around the bundle of threads which is moving forward.

Although not strictly necessary, it is useful in connection with obtaining a constant length of fiber, to cause the strips of paper to cohere during wrapping, so that a tube is formed.

If only one helically overlapping strip of paper is applied, coherence may be effected by causing the coils

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of the wrapping to stick together in the overlapping places. However, the strip may also be affixed to the bundle of threads itself. In case more strips of paper are wrapped around the bundle of threads, it is only necessary that the outer strip should be an adhesive strip.

If a type of paper is used for wrapping which disintegrates fairly easily in water into the component fibers, it is not necessary that the rings cut off from the wrapping should be removed from the mass of fibers. These rings then disintegrate in the water. In most cases the rings are removed from the dry fiber mass, for example with the aid of so-called windsifters. They can, however, also be removed from the fiber pulp.

It is also possible to form the tube around the bundle of threads out of a thermoplastic mass, for example by extrusion following the compressing of the bundle of threads in the compressing funnel. After the tube has been formed, it should immediately be cooled in order that the compactness of the bundle of threads is not lost.

It is acknowledged that it has been previously proposed to combine a series of threads into a bundle, to wrap this bundle with paper and to subdivide the thus-formed rod by cutting in such a manner that the lengths of thread obtained are suitable for use, for example, as pile in the manufacture of carpets or as binding-thread.

In such known processes, however, the rod is subdivided so that the length of the rod sections is at least equal to the diameter.

It has now been surprisingly found that the wrapping also sufficiently preserves the stiffness of the rod on either side of the cutting plane, which is of decisive importance in obtaining fibers of uniform length, when the thickness of the slice to be cut off is considerably smaller than the diameter. In other words, the above-described process is also suitable for cutting fibers into constant lengths of less than 10 mm.

The cutting of the wrapped bundle of threads is preferably performed with the aid of a rotating cutter, although cutting apparatus of the so-called guillotine type may also be used. The use of rotating knives is preferred, however, because they give rise to less sticking of the fibers in the places where they are cut off.

After dispersing the fibers in water, in which a thickening agent, for example, a cellulose ether, can be present, and after the addition, if desired, of paper fibers having a cellulose base to the pulp the latter can be formed into paper on the customary paper machine.

Among the linear polycondensation products useful in practicing the invention are included polyamides, and also polyesters, such as high-polymer polymethyleneterephthalate and polyurethanes. Of course, the invention may also be applied to the manufacture of short lengths of rayon staple, or staple fibers made from other substances.

To further illustrate the invention, the following example is given. The invention is not to be restricted thereby, however.

Example

Endless threads consisting of polycaprolactam, with a filament denier of 1½, were combined into a cable measuring about 10 cm. in diameter. The cable was then pulled through a trumpet-shaped funnel of elastic material in order to compress the cable. Immediately after leaving the stem of the funnel, the cable was helically wound with two successive paper strips having a width of 3 cm. The paper strips consisted of a packing paper, and the inside of the outer paper strip was provided with an adhesive layer which was moistened immediately before wrapping the cable.

After wrapping, the outer paper strip was pressed on with the aid of pressure rollers. The wrapped bundle of threads was then fed into a cutting apparatus with a

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rotating knife, which cut off slices 4 mm. thick from the wrapped package of threads. The paper rings of the wrapping were removed from the mass of fibers with the aid of wind-sifters.

The cut fibers were suspended in deaerated water for the preparation of a fiber pulp. The pulp with a polyamide fiber concentration of 1.5% by weight was then mixed in the ratio 3:1 with a pulp having a sulfide cellulose concentration of 1.5% by weight and a freeness of 255 Canadian Standard (=45° SR). The mixed pulp was fed into a paper machine with Fourdrinier wire, on which it was dehydrated and dried in the usual manner.

The paper may, if desired, be treated with a swelling agent for polyamide and thereafter hot-calendered.

In paper manufactured according to the invention the length of the polyamide fibers is substantially homogeneous.

While one embodiment of the invention has been described, it is to be understood that the invention is limited only by the following claim.

What is claimed is:

A process for producing short fibers of uniform length

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suitable for use in the manufacture of paper comprising the steps of combining a plurality of continuous filaments in parallel relationship into a cable measuring about 10 cm. in diameter, compressing said cable into an elongated stiff bundle by passing the combined filaments through an elastic funnel-shaped member, wrapping the bundle of filaments while compressed with a strip of paper having adhesive thereon to preserve the stiff bundle formation, repeatedly cutting the bundle of filaments in a direction perpendicular to the axis thereof into uniform slices from 2 to 5 mm. in thickness, and collecting the slices in water to disintegrate the paper layer and liberate the fibers contained therein.

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