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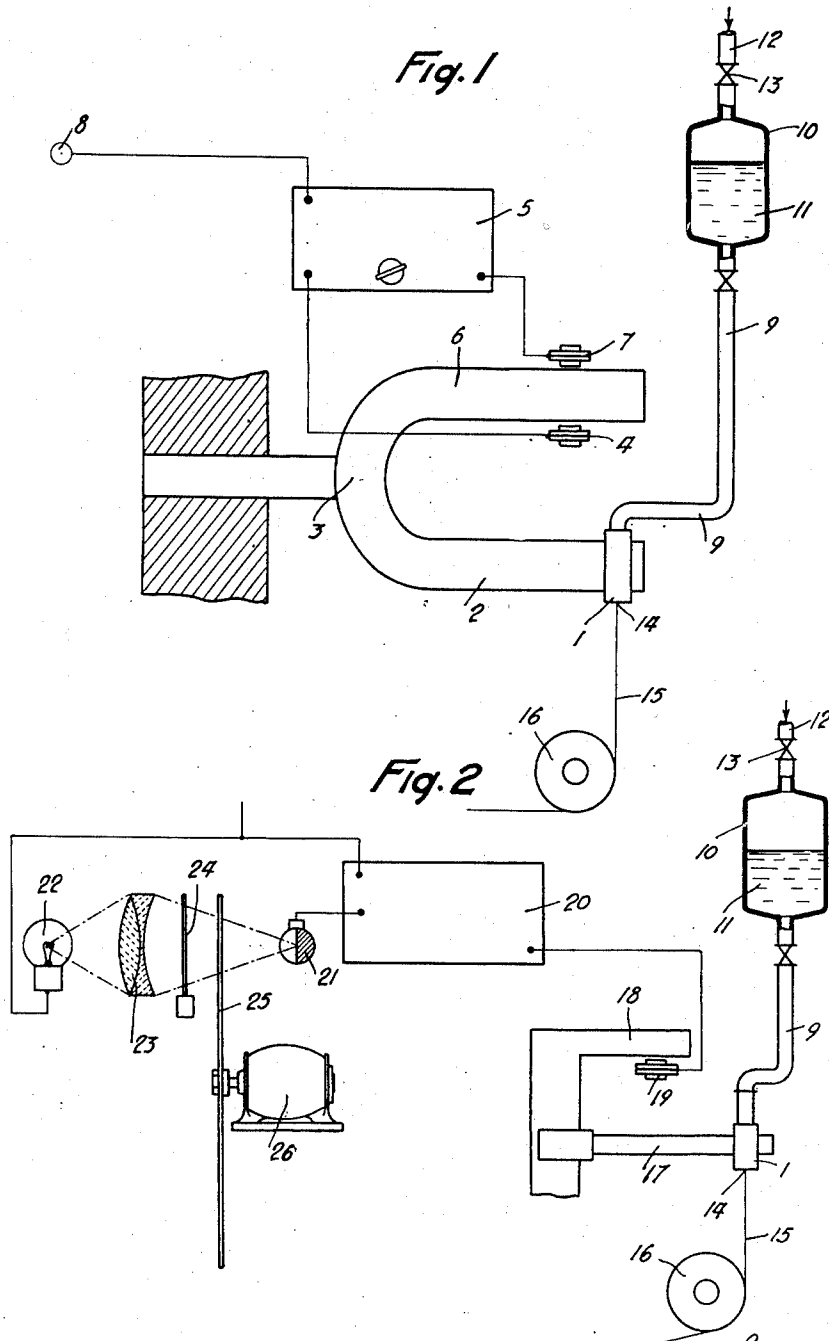
M. DELAMARE-DEBOUTTEVILLE

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DEVICE FOR THE MANUFACTURE OF ARTIFICIAL FIBERS

Filed Feb. 17, 1948

2 Sheets-Sheet 1



Inventor:
Marcel Delamare-Deboutteville,
By his attorneys:
Baldern, Wright & Prevost

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Fig. 3

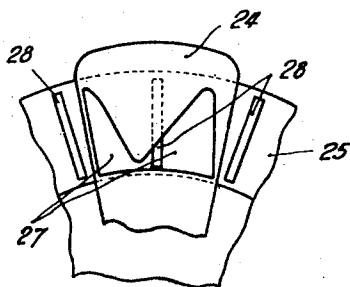


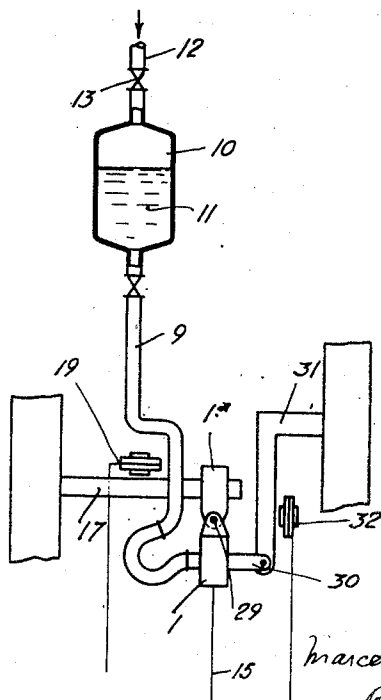
Fig. 5



Fig. 6



Fig. 4



Inventor:
Marcel Delamare-Deboutteville,
By his attorneys:
Baldwin, Wight, & Prevost

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DEVICE FOR THE MANUFACTURE OF
ARTIFICIAL FIBERSMarcel Delamare Deboutteville, Neuilly-sur-Seine,
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2 Claims. (Cl. 18—8)

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The present invention relates to a device for the manufacture of artificial fibres.

It is well known that artificial fibres of viscose, acetate and the like appear in the form of cylinders generally having a smooth surface and that it cannot be otherwise since up to now the coagulable solution is forced under a constant pressure through the cylindrical holes of a motionless nozzle.

On the contrary, natural fibres such as cotton and wool fibres appear, when seen through a microscope, as filaments having variable sections and very particular profiles which confer to these said fibres their remarkable physical properties.

For instance, wool and more generally the hair of animals show variations of diameter of a very particular aspect which are called "scales" or "hooks" and which help to bestow them together with their curliness, their felting power (theory of Monge).

As to the cotton fibre, it has the well known aspect of a kind of spiral or helix the cross section of which presents the form of dumb-bells.

These particular conformations of the natural animal and vegetable fibres bestow them precious properties which up to now have never been attained by artificial fibres.

One has vainly attempted to obtain the felting of such artificial fibres and it has only been possible to obtain fibres which are curled by their passage in the viscous state when coming out of the coagulating bath onto a cylinder from which they are separated by means of a knife blade; unfortunately the curliness is not absolutely stable and the absence of hooks does not permit the so obtained fibres to felt without being mixed with natural wool.

On the contrary, the present invention leads to giving the artificial fibres, variations of form such as those which, for instance, correspond to those of cotton and wool.

According to the present invention, this is obtained by imparting to the nozzle head, through which the solution is forced, vibratory movements of various predetermined natures (sinusoidal movements, movements with a constant acceleration or movements the acceleration of which follows any other predetermined law).

The vibratory movements which are imparted to the nozzle head can be exerted in the direction of the axis of the said head, in a direction perpendicular to the axis, in a circular direction or according to a combination of two of these movements.

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The successive portions of the coagulable solution which leave the nozzle have velocities and eventually directions which are different from those of the following portions and, due to the intervention of the inertia of the solution, the variable cross sections and the successive portions having different directions which are identically produced during each period of the selected vibratory movement give to the elementary fibre all kinds of profiles and variations of section, result which has not been obtained up to now.

The desired movements are imparted to the nozzle by any suitable vibratory device which is capable of translating the law of movement which will give the desired form to the artificial fibre, allowance being made for the velocity with which the coagulable solution leaves the nozzle. Thus will it be possible, for this purpose, to use either mechanical or magneto-mechanical devices.

The coagulation of the solution must take place quickly enough in order that the so formed fibre does not lose its form before the coagulation.

Two forms of execution of devices adapted for giving the desired result are shown diagrammatically and by way of example in the appended drawings.

In these drawings:

Figure 1 is a diagrammatical view of a device according to the invention and adapted for carrying out the method which forms the subject matter of the invention.

Figure 2 is a similar view of another device adapted for the obtention of artificial fibres equally according to the invention.

Figure 3 is a detail view of the device according to the invention.

Figure 4 is a partial view of another form of execution.

Figure 5 shows on a very large scale a fibre obtained according to the invention and the abrupt variations of the diameter of which form a "hook" which permits the felting.

Figure 6 is a similar view of a fibre having a helical profile with a section in the form of dumb-bells which is identical with that of the cotton and obtained according to the invention.

In the device shown in Figure 1 the nozzle 1 is secured on one of the branches 2 of tuning-fork 3 the vibratory movement of which is maintained by means of an electro-magnet 7 which receives from an amplifier 5 an oscillatory current the frequency of which is the resonance frequency of the tuning-fork itself, the said frequency being taken on the branch 6 by means of an electro-magnet 4.

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The amplifier 5 is fed by a source of current 8. The nozzle 1 secured on the branch 2 of the tuning-fork is supplied with a coagulable solution capable of giving an artificial fibre by coagulation after leaving the nozzle, by means of a flexible tube 9 which connects the movable nozzle with a vessel 10 containing the said solution 11 maintained under pressure by a pipe 12 with a pressure regulator 13.

The device operates as follows:

The tuning-fork 2—3—6 having been set and being maintained in vibration by the electro-magnets 4 and 7 the coagulable solution, a solution of viscose, for instance, flows through the flexible tube 9 and arrives to the outlet 14 of the nozzle. When flowing, it forms a thread 15 which, after coagulation, is led by the drum 16 toward the issue of the spinning plant. In such a device the longitudinal velocities of the nozzle 1 correspond to a sinusoidal law which, due to the inertia of the material flowing out of the nozzle and to the variations of the flowing speed of the coagulable material, gives rise to variations in the surface of the successive portions of the artificial fibre formed at the outlet of the nozzle.

In the device according to Fig. 2 the nozzle 1 is secured on a flexible blade 17 which is fast with a vibratory blade 18 the oscillatory movement of which is maintained by an electro-magnet 19. This electro-magnet is fed by an amplifier 20 the current of which is supplied by a photo-electric cell 21. This photo-electric cell receives a periodical flux of light coming from a source 22 and concentrated by a condenser 23, the variations of the intensity of the said flux resulting from the passage of the latter through a fixed mask 24 and through a rotary disc 25 to which a quick rotary movement is imparted by a motor 26.

The mask 24 is formed of an opaque blade in which a recess has been provided, which is limited by a curve which represents the law chosen for the variations of the acceleration of the vibratory movement.

The length of this curve, which represents a period of the vibratory movement equals the distance between two successive openings or ports of the rotating wheel 25, so that a wheel having for instance 50 slots and rotating with a speed of 30 revolutions per second would give a vibratory movement of $50 \times 30 = 1500$ periods or cycles per second.

The so obtained variations of the flux of light are converted by the photo-electric cell which receives them into an electric current of a variable intensity which is led to the amplifier 20.

In the device according to Figure 4 the nozzle 1 instead of being mounted directly on the vibrating blade 17 the vibration of which is maintained by the electro-magnet 19 is pivotally mounted in 29 on a holder 1a secured on the blade 17. The nozzle 1 is connected by an arm 30 with a vibrating blade 31 which is maintained in vibration by an electro-magnet 32. The electro-magnet 19 and the electro-magnet 32 are supplied with a

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pulsatory or alternating current of high frequency by an amplifier (not shown) such as that of Figure 1 or by an amplifying device (not shown either) comprising a photo-electric cell, a source of current, a mask and a rotating disc such as those of Figure 2. The thread 15 formed after coagulation of the solution leaving the nozzle 1 possesses in this case not only variations of section but also variations of direction through which the so formed artificial fibre is provided with hooks together with a stable curliness.

If it should be desired to impart to the nozzle an oscillatory rotating movement about its axis, the nozzle would then be mounted for instance on an axis coinciding or not coinciding with its figure axis and it would be made fast with a mass of magnetic metal located in a magnetic field having an oscillating rotation component.

What I claim is:

1. A device for giving periodical variations of section and profile to the artificial fibres obtained by spinning through a nozzle of coagulable solutions, which comprises a member capable of vibrations, a nozzle secured to said member, electro-magnetical means for imparting to said member a high frequency vibrating movement, a current amplifier for feeding said electro-magnetical means, and electro-magnetical means in connection with said member for producing in said amplifier oscillatory variations of the current with a frequency corresponding to the resonance frequency of said member.

2. A device for giving periodical variations of section and profile to the artificial fibres obtained by spinning through a nozzle of coagulable solutions, which comprises a tuning-fork, a nozzle secured to one branch of said tuning-fork, electro-magnetical means in connection with the other branch of said tuning-fork for maintaining said tuning-fork in periodical vibrations, a current amplifier for feeding said electro-magnetical means, and electro-magnetical means in connection with said tuning-fork for producing in said amplifier oscillatory variations of the current with a frequency corresponding to the resonance frequency of said tuning-fork.

MARCEL DELMAMARE DEBOUTTEVILLE.

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