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MANUFACTURE OR TREATMENT OF ARTIFICIAL FILAMENTS,
THREADS, YARNS, AND LIKE MATERIALS
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FIG. 1

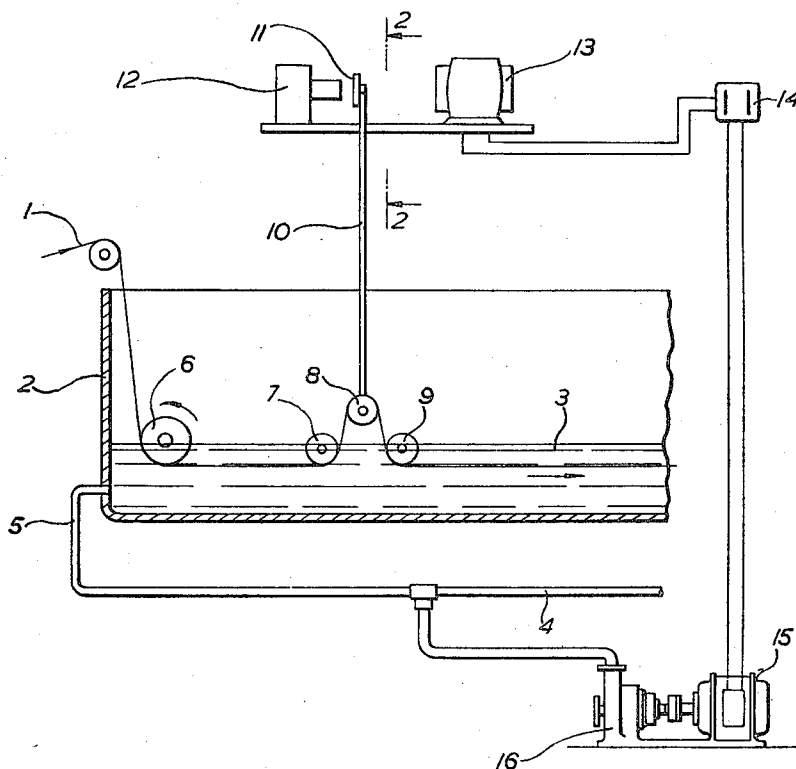


FIG. 2

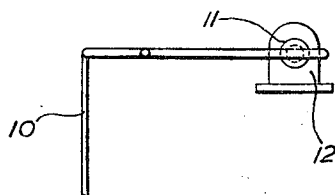
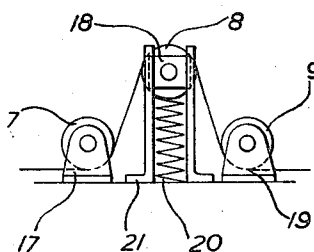


FIG. 3



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MANUFACTURE OR TREATMENT OF ARTIFICIAL FILAMENTS, THREADS, YARNS, AND LIKE MATERIALS

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7 Claims. (Cl. 18—8)

This invention relates to improvements in or relating to the manufacture or treatment of artificial materials, and is particularly concerned with the tensioning of artificial filaments, threads or yarns while in a softened state.

In a number of processes running artificial filaments, threads and yarns, are subjected to the action of agents which have a softening action upon them. For instance, running filaments, threads and yarns of organic derivatives of cellulose are treated with diluted solvents or swelling agents or with hot water or steam to prepare the materials for stretching operations, carried out subsequently to or concurrently with such treatment, or to effect a shrinkage of the materials.

In such processes change in the conditions under which the filaments or like materials are softened, causes change in tension of the materials treated and consequently a change in the amount of stretch applied to the materials.

According to the present invention, in processes of the above mentioned type, in which running artificial filaments, threads, yarns or like materials are subjected to the action of a softening agent, the tension in the materials undergoing the softening treatment is maintained substantially constant by causing this tension to control the conditions under which the materials are softened.

In carrying the invention into effect the running filaments or like materials, conveniently as they enter or leave the apparatus in which they are softened, may be harnessed, for instance by means of a system of pulleys or rollers arranged as a dynamometer, in such a manner that any change in tension in the materials completes an electric circuit which operates apparatus adapted to effect the necessary alteration in the conditions under which the materials are softened. Conveniently a photo-electric cell, a term which includes besides light sensitive cells, cells actuated by infra red radiations, may be arranged as a relay to set into operation such apparatus.

In processes in which the filaments or like materials are softened by passing them through a bath of a diluted solvent or swelling agent, change in the concentration of the solvent or swelling agent due, for example, to a difference

in the rate of the evaporation of the constituents of the softening medium or to differential absorption of the constituents, causes a corresponding change in the effectiveness of the solution employed with a consequent change in the tension of the materials treated. In such processes apparatus of the type referred to above may be caused to set into operation a pump arranged to supply the constituent it is necessary to add to the solution in the bath in order to maintain its concentration substantially constant. Preferably the added constituent is supplied, not in concentrated form, but as a solution of the same general constitution as the bath liquor, but containing the added constituent in slightly higher concentration than the bath liquor itself, e. g. in 3 to 8% higher concentration. The quantity of added constituent it is necessary to supply is usually small, and its addition in the manner indicated avoids the development of local patches of high concentration. When the softening solution is circulated through the bath by being withdrawn at one end, passed through an outside conduit and returned to the other end of the bath, adequate mixing can be assured by introducing the added constituent into the circulating liquor before re-entry into the bath.

In processes in which the filaments or like materials are softened by means of hot water or steam, change in temperature of the water or steam causes a corresponding change in its effectiveness with a consequent change of tension in the materials treated. In such processes the apparatus may be caused to effect the necessary change in the temperature of the water or steam; in the case of steam the apparatus may very suitably be arranged to alter the setting of a valve controlling the supply of steam to the stretching chamber.

The accompanying drawing illustrates diagrammatically an apparatus found very convenient for putting the invention into practice.

In the drawing:

Fig. 1 shows a side view, in part section, of the apparatus;

Fig. 2 shows a section on the line 2—2 of Fig. 1; and

Fig. 3 shows an enlarged view of the three pulleys or rollers forming the dynamometer.

The apparatus shown in Figs. 1 and 2 consists of a stretching bath 2 provided with a conduit 4 for withdrawing liquid from one end of the bath and returning it to the other end of the bath by the inlet 5. Mounted on suitable bearings in the bath are a delivery roller 6 and pulleys or rollers 7, 8 and 9 arranged as a dynamometer, the upper or middle pulley or roller 8 carrying an arm 10 adapted to operate a disc-like member 11 through a pivoted arm so as to move across the path of a beam of infra red rays passing from their source 12 to a photo-electric cell 13. The photo-electric cell operates a switch 14 in the power supply to a motor 15 driving a pump 16 which feeds into the conduit 4.

Referring to Fig. 3 the pulleys or rollers 7 and 9 are carried on fixed bearings 17 and 19 respectively while the upper or middle pulley or roller 8 is mounted on bearing 18 carried on the spring 20 and capable of vertical movement in the slide 21. Thus, an increase in tension in filaments passing over the pulleys or rollers 7, 8 and 9 causes the top or middle pulley or roller 8 to be depressed against the action of the spring 20 while the spring 20 will return the pulley or roller 8 when the tension is again reduced.

In operation the artificial filaments 1 are subjected to one or more stages of stretching during their passage through the bath 2 which contains a dioxane solution 3, the dioxane solution being continuously withdrawn by a pump (not shown) from one end of the bath, passed through conduit 4 and returned to the bath at inlet 5. The filaments entering the bath pass round delivery roller 6 and thence to the pulleys or rollers 7, 8 and 9.

An increase in tension in the filaments causes the beam of infra red rays falling upon the photo-electric cell 13 to be interrupted by the disc-like member (as shown in Fig. 2) and the pump 16 is thereby set in operation. The pump 16 is connected to a supply of dioxane solution of about 3-8% higher concentration than the circulating liquor in the bath 2 and this more concentrated solution the pump introduces into conduit 4 and so via inlet 5 into the bath 2.

The supply of this more concentrated dioxane solution restores to its original concentration the dioxane in the bath, which accordingly has its original softening action on the filaments treated whose tension thus returns to normal. With the return to normal tension of the filaments the disc-like member 11 moves out of the path of the beam of the infra red rays which thus fall upon the photo-electric cell 13 causing the supply of more concentrated dioxane solution to cease. By this means it is possible to prevent substantial fluctuation in the tension in the running materials.

Similar apparatus may be employed when, instead of aqueous dioxane, the stretching is effected in the presence of steam. In this case the stretching may be effected in a chamber provided with inlet and outlet orifices for steam supplied from a source of pressure steam, a valve being provided between the source of pressure steam and the chamber in which the stretching is effected. In this case the photo-electric cell employed may very suitably be one operated by a light beam and so arranged that as the light beam is interrupted by the disc-like member, arranged as previously described, an electric contact is made and a motor set in operation so as to open wider the valve referred to. The steam, with the valve open wider, is at a higher pressure in the

stretching chamber and consequently at a higher temperature. With the return to normal tension of the filaments the disc-like member moves out of the path of the beam of light which thus falls upon the photo-electric cell thus preventing any further opening of the valve in the steam supply. By means of a second cell and light beam a second circuit can be operated so as to close the valve partly in the event of slackening of the filaments by reason of the steam being supplied at too high a temperature.

While the invention has been described more particularly in connection with the stretching of artificial filaments the invention is not limited in this respect but may be applied to any process in which filaments, threads or yarns while undergoing treatment with a solution in a softened state, are subject to change in tension consequent upon a change in the conditions under which they are softened.

Having described our invention what we desire to secure by Letters Patent is:—

1. In processes in which running artificial filaments, threads, yarns or like materials are subjected to the action of a softening agent, the step of maintaining substantially constant the tension in the materials undergoing the softening treatment by controlling the conditions under which the materials are softened by the tension itself.

2. In processes in which running artificial filaments, threads, yarns or like materials are subjected to the action of a softening agent and are stretched, the step of maintaining substantially constant the tension in the materials undergoing the softening treatment by controlling the conditions under which the materials are softened by the tension itself.

3. In processes in which running artificial filaments, threads, yarns or like materials are subjected to stretching while softened by means of an aqueous solution of a softening agent, the step of maintaining substantially constant the tension in the running materials by causing an increase in tension to initiate, and a return to normal tension to terminate, the introduction into said solution of a quantity of another solution of similar composition but containing the softening agent in higher concentration.

4. In processes in which running artificial filaments, threads, yarns or like materials are subjected to stretching while softened by means of a heated softening medium, the step of maintaining substantially constant the tension in the running materials by causing a change in tension to effect a change in the temperature of the softening medium, which modifies the extent to which the materials are softened so as to counteract said change in tension.

5. Apparatus for maintaining substantially constant the tension in running artificial filaments, threads, yarns or like materials being subjected to the action of a heated softening medium, which comprises means for controlling the temperature of said medium and a device controlled by the tension in the running materials and operating said means so that a change in tension in the materials produces a change in the temperature of the softening medium, which modifies the extent to which the materials are softened so as to counteract said change in tension.

6. Apparatus for maintaining substantially constant the tension in running artificial filaments, threads, yarns or like materials being subjected to the action of a fluid softening mixture, which comprises means for introducing into said

mixture a supply of at least one of its ingredients and a device controlled by the tension in the running materials and arranged to initiate, on increase in tension, and to terminate, on return to normal tension, the operation of said means.

5 7. Apparatus for maintaining substantially constant the tension in running artificial filaments, threads, yarns or like materials being subjected to the action of a fluid softening mixture, 10 which comprises a pump adapted to introduce

into said mixture a supply of at least one of its ingredients and a system of rollers arranged as a dynamometer and controlled by the tension in the running materials and arranged to initiate, on increase in tension, and to terminate, on return 5 to normal tension, the operation of said pump.

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