May 8, 1934. R. H. McKEE 1,958,009

PULSATION ELIMINATOR FOR RAYON SYSTEMS

Filed Dec. 23, 1929

FIG. 1.

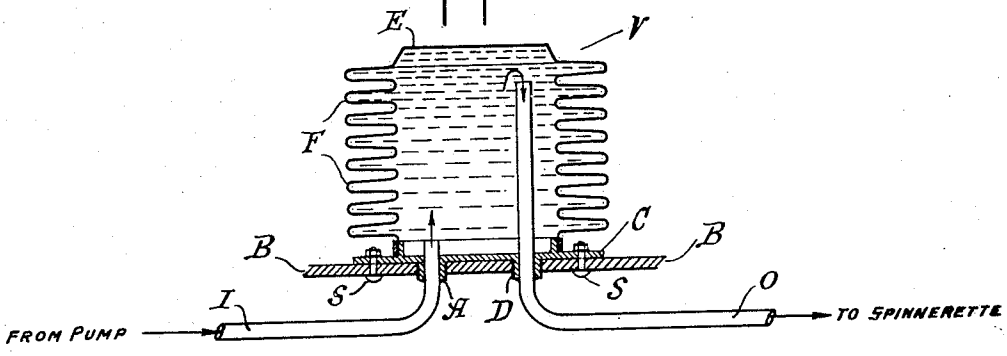


FIG. 2.

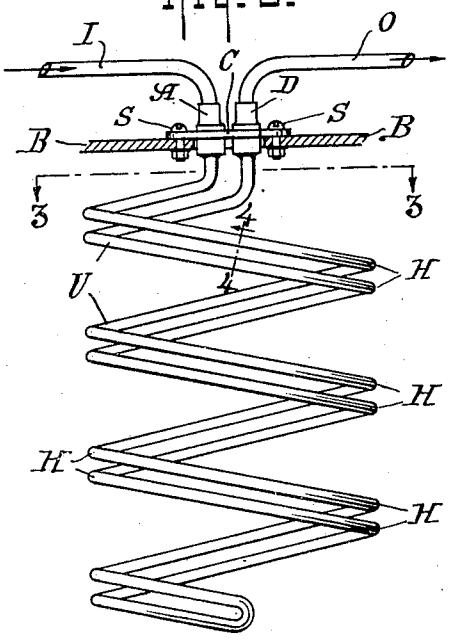


FIG. 4.

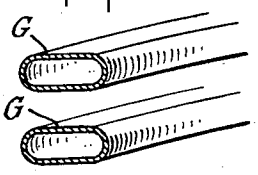


FIG. 5.

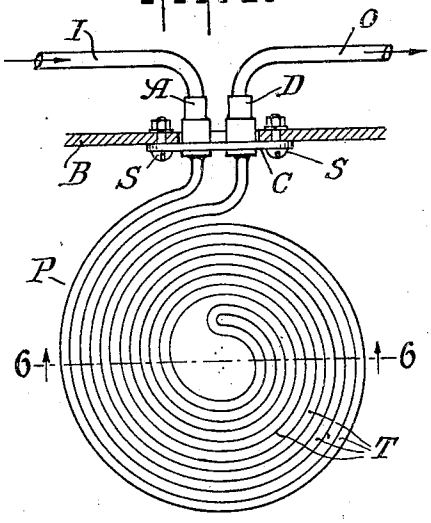


FIG. 3.

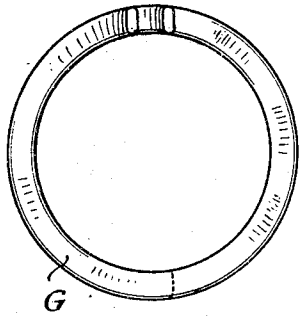
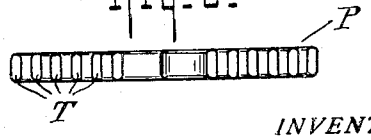


FIG. 6.



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PULSATION ELIMINATOR FOR RAYON SYSTEMS

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3 Claims. (Cl. 137—71)

The present invention relates to pulsation eliminators for rayon pumps, and more particularly to pulsation eliminators for smoothing the flow of fluid from rayon pumps to the spinneret.

It is the common experience in the manufacture of rayon that there are pulsations in the flow of the fluid whether piston or gear pumps are used. By rayon I mean not only viscose and cuprammonium but also the cellulose nitrate and cellulose acetate types of artificial silk. Except for the disadvantages of pulsations, the piston type of pump has advantages over the gear type both in operation and in life. However, the piston type is particularly prone to give troublesome pulsations. Various schemes have been proposed to modify, calm down, and remove the pulsations which are objectionable because they produce lack of uniformity in the rayon filaments as the latter issue from the spinneret. For instance, it has been proposed to use 3, 4, 5, 6, or 7 plungers instead of the simple 1 or 2 plungers which might otherwise be used. It is also quite common to use a pressure bottle which acts as an air chamber just as does the air chamber of the old fashioned force pump used for the pumping of water by hand. In rayon manufacture this air chamber is generally placed at the pump though in some cases it is placed in the line between the pump and the spinneret. It has the disadvantage that the treatment of the solution with air under a pressure of say 200 pounds per square inch dissolves the air in the solution and on the release of the pressure at the spinneret this air tends to come out of solution and makes the resulting filaments irregular. Moreover, in course of time, due to the solution of the air in the liquid in the air chamber, the latter fills up with this aerated liquid and then ceases to be operative. In practice these air chambers are often spoken of as pressure bottles and are generally made of glass. Accordingly they are fragile and it is difficult to make a tight joint that will not leak under the pressure used.

Some attempts have been made to overcome the trouble of pulsations by having the spinning liquid pass through the threads of a screw in its path between the pump and the spinneret. This arrangement, however, does not effect adequate absorption of the pulsations. Moreover the minute opening in the screw is easily obstructed and, due to its minuteness, increases the already high working pressure under which the rayon pump operates. An effort to improve this arrangement consists in placing a tube having an internal diameter of approximately 5 mm. and a length of 10 feet in the path of the spinning solution between the pump and the spinning nozzle. It is considered that the viscosity of the spinning solution in this long tube plays the part of an absorber.

An object of the present invention is to provide an apparatus and a method for overcoming the shortcoming noted hereinabove.

The invention also has within its contemplation the provision of an apparatus and a method which will practically eliminate the pulsations in the flow of rayon liquid in a simple and practical manner.

Other objects and advantages will become apparent from the following description taken in conjunction with the accompanying drawing in which:

Fig. 1 is an embodiment of my invention;

Fig. 2 is a modified embodiment;

Fig. 3 shows a sectional view taken on the line 3—3 of Fig. 2;

Fig. 4 is a sectional view taken on the line 4—4 of Fig. 2;

Fig. 5 represents another modification of my invention; and

Fig. 6 depicts a sectional view taken on the line 6—6 of Fig. 5.

In accordance with the present invention, a new method and apparatus have been devised for eliminating pulsations, whether they are caused by a piston pump or irregularities in the teeth of a gear pump or from other cause.

Generally speaking, my invention contemplates the interposition of a stabilizing device, such as a pipe, receptacle, or the like having an expansible and compressible construction, between the pump and the spinneret in the path of the spinning solution.

In Fig. 1 of the drawing I have illustrated a preferred embodiment of my invention which consists of a fluted vessel V which is fluted in the same way as a steam expansion joint is fluted, that is, with a plurality of flutes F passing around the expansion vessel. One end E of the expansion vessel will be closed by means of an approximately flat plate and into the other end will be inserted the inlet I and exit tubes O, via inlet and outlet connections A and D respectively, the said inlet and outlet tubes leading to the pump and spinneret respectively. One of these tubes will reach into the expansion vessel nearly its full length. If the vessel is set above the pump it is the exit tube to the spinneret which will be the longer tube just mentioned, that is, the expansion vessel will be set so that it will be continuously full of

the spinning solution. In this case pulsations will be taken up by the movements of the fluted portion together with the approximately flat surface at the end which does not carry the inlet and outlet tubes.

Still another embodiment of my invention is illustrated in Fig. 2 which consists of a flat sided tube U of elastic metal, say ordinary steel or chromium steel. Such a tube will expand with increased pressure and thereby take up the pulsations. This tube may be a straight tube, a helix or a coil although it is herein shown as made of a plurality of helical turns H. A tube of medium wall thickness whose internal bore is $\frac{1}{16}$ x $\frac{1}{4}$ inch and length is 24'' wound in the form indicated is ample in most cases. In the case of a coil I prefer to wind it with the flat side G of the tube at substantially right angles to the axis of the coil. In the case of a helix I prefer to make it a double helix as shown in Fig. 2, that is, the tube being wound about itself in one direction and then turned and wound back parallel to the original turns with the flat side of the tube at approximately right angles to the axis of the helix. By the use of this helix, with each pulsation, the tube will expand and the helix itself will tend to open, that is, increase in diameter, and the pulsations thereby be removed. With the coil mentioned above I will obtain a similar effect by which the pulsations will be absorbed.

Another modification of my invention is illustrated in Fig. 5 wherein the reference character B designates a base plate to which my stabilizing device is secured. In the present instance, the device is fastened to the base plate B by means of a cover plate C and a plurality of bolts S. The inlet pipe I which comes from the pump leads to an inlet A. Between the inlet A and the outlet D I interpose a coil pipe P constituted of a multiplicity of turns T. A cross section of the coil pipe may be clearly seen from Fig. 6 which illustrates the pipe as having a flat elliptical cross section. This pipe is capable of expanding and contracting when subject to variations in pressure. The construction is made compact by the pipe following a spiral curve from the inlet connection to a central portion and then bending back upon itself and forming another spiral which leads to the outlet connection D. From the outlet connection a pipe O conducts the rayon solution to a spinneret.

By interposing my stabilizing device between the inlet pipe coming from the pump and the outlet pipe O leading to the spinneret I am able to absorb and practically eliminate pulsations produced by the pump or other variations in the pressure of the rayon solution. The stabilizing device absorbs and eliminates practically all of the pressure variations so that the fluid flowing through outlet pipe O to the spinneret is free from detrimental pulsations or variations in pressure.

It is to be noted that the present invention provides a pulsation eliminator which requires only a small volume of liquid between the pump and spinneret and yet, as this liquid is constantly flowing to the spinneret, there will be no dead spaces where, for example, viscose may become over-ripe and form material which would clog the tubes, the candle filter or the spinneret. Pressure bottles cannot and do not smooth out pulsations to more than a quite limited extent. They must be changed and cleaned every two or three days. This entails a stoppage of production as well as the labor of changing and cleaning the pressure bottles. With the present device the stoppage of production and the labor of substitution and cleaning are avoided while a continuous and even flow of spinning solution is obtained.

It is sometimes desirable at the time of starting to spin, by the dry spinning process, solutions carrying volatile solvents, such as cellulose acetate or cellulose nitrate solutions, to give a sudden increased pressure to the liquid with which the spinneret is fed. It has been proposed to use a single plunger pump to give this sudden pressure so that the solution will leave the face of the spinneret in the form of threads rather than spread over the face of the spinneret. With the present device it will be sufficient for the operator to press upon the helix or coil or fluted tube with his hand when this pressure increase of the solution is desired. Once the thread is started through the spinneret the pressure can be relieved and the device will operate as before mentioned for the removal of pulsations.

What is claimed is:—

1. In a rayon spinning system having a pipe line between a pump and a spinneret that improvement which comprises a pressure equalizing device consisting of a flexible, non-rigid shell completely filled with a viscous rayon spinning solution, said shell being constituted of a resilient metal capable of substantially unrestricted expansion and contraction and capable of absorbing shocks and pulsations and of eliminating practically all of the detrimental pressure variations, an inlet tube opening at the bottom of said shell and connecting with said pump for the delivery of pulsating viscous rayon spinning solution, and a separate outlet tube opening within the interior of said shell and adjacent to the top thereof for transmitting the viscous rayon solution flowing through said shell to the spinneret whereby pulsating viscous rayon solution flows continuously into said flexible metal shell which removes the pulsations and substantially equalizes the pressure and which imparts to the viscous rayon solution flowing continuously through the outlet tube to the spinneret a substantially uniform pressure, said flexible metal vessel, said inlet and said outlet being devoid of air chambers and spaces.

2. A rayon pulsation eliminator for systems carrying viscous rayon liquid which comprises a flexible, non-rigid vessel, completely filled with rayon liquid and through which rayon liquid continuously flows, said vessel being located in the pipe line between the pump and the spinneret and being constituted of a resilient metal capable of substantially unrestricted expansion and contraction and capable of absorbing shocks and pulsations and of eliminating practically all of the detrimental pressure variations, an inlet connection secured to said device for introducing pulsating rayon liquid from the pump, and a separate outlet connection secured to said device for continuously removing rayon liquid therefrom, said metal vessel being substantially free from dead spaces, whereby pulsating viscous rayon solution flows continuously into said flexible metal vessel which removes the pulsations and substantially equalizes the pressure and which imparts to the viscous rayon solution flowing continuously through the outlet tube to the spinneret a substantially uniform pressure, said flexible metal vessel, said inlet and said outlet being devoid of air chambers and spaces.

3. A rayon pulsation eliminator for smoothing

the flow of viscous rayon liquid and substantially eliminating detrimental pulsations in systems carrying rayon liquid which comprises a plurality of fluted elements adapted to permit the continuous passage of rayon liquid interiorly thereof, said elements being constituted of a resilient metal capable of substantially unrestricted expansion and contraction and capable of absorbing shocks and pulsations and of eliminating practically all of the detrimental pressure variations, an inlet connection secured to said vessel for continuously introducing pulsating rayon liquid therein, and a separate outlet connection secured to said vessel for continuously removing non-pulsating rayon liquid therefrom, said vessel being substantially free from dead end spaces and air spaces, whereby pulsating viscous rayon solution flows continuously into said flexible metal vessel which removes the pulsations and substantially equalizes the pressure, and which imparts to the viscous rayon solution flowing continuously through the outlet tube to the spinneret a substantially uniform pressure, said flexible metal fluid elements, inlet and outlet being devoid of air chambers and spaces.

RALPH H. McKEE.