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E. J. CLERMONT
PUMP AND FLUID CIRCULATING SYSTEM FOR HUMID
TREATMENT OF MASSES OF TEXTILE FIBERS

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2 Sheets-Sheet 1

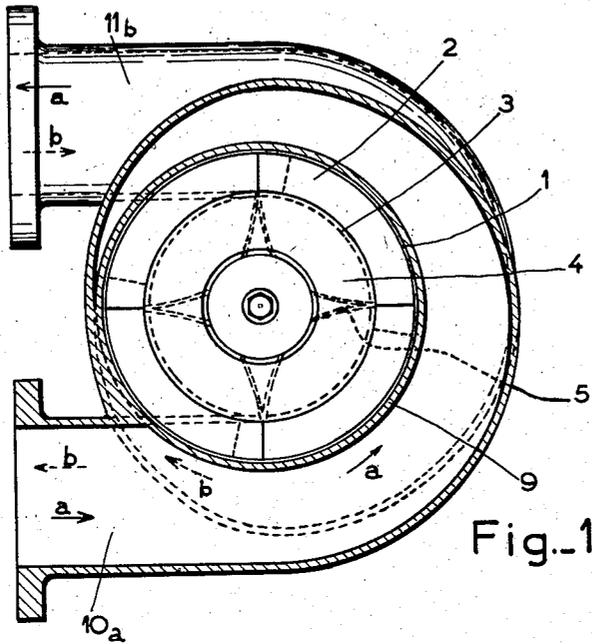


Fig. 1

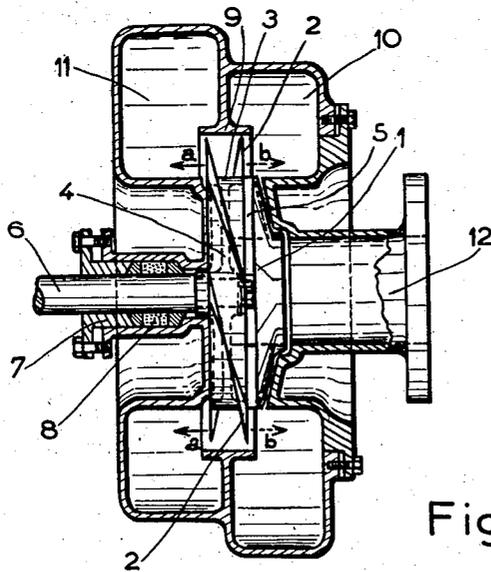


Fig. 2

Inventor:
Edgar Jules Clermont
By *[Signature]*
Attorney

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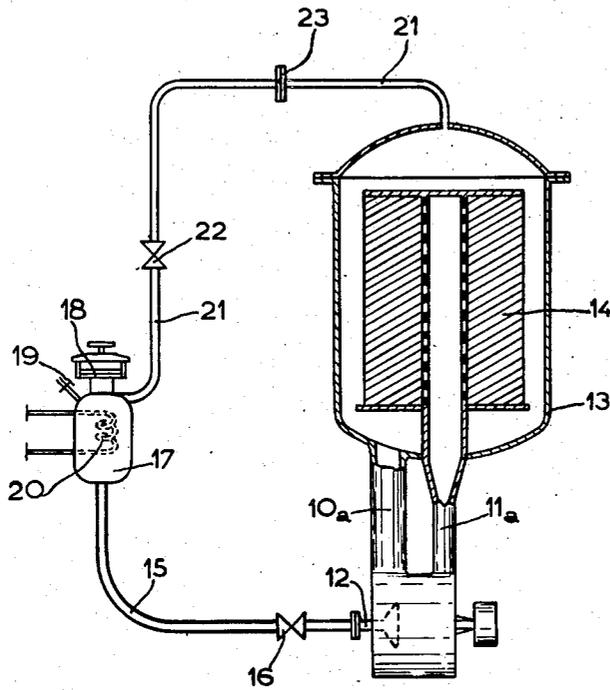


Fig. 3

Inventor:
Eugene Jules Clermont
By Emment Montague
Attorney

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PUMP AND FLUID CIRCULATING SYSTEM FOR HUMID TREATMENT OF MASSES OF TEXTILE FIBERS

Edgar Jules Clermont, Flers lez Lille (Nord), France

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2 Claims. (Cl. 137—563)

The present invention relates to a pump for autoclaves for the humid treatment of masses of textile fibers.

Apparatus is known for the humid treatment of textile or other material which apparatus comprises devices for feeding the products to be tinted into the autoclaves under pressure which apparatus, however, does not permit such continued and regular feeding. It requires a source of outside pressure and does not provide for the continued removal of the gases formed in the autoclave.

In effect it is necessary to remove particularly the gases formed in the autoclave. Furthermore, it is of advantage to provide the possibility of feeding the products to be tinted or others into the treatment bath, to provide a circulation across the material to be treated without stopping the operation of the apparatus and without providing an exterior pressure source, even if the housing of the autoclave is under higher pressure than atmospheric pressure.

It is also of advantage to provide the possibility of creation of a basic pressure in the autoclave which is higher than the strongest circulation pressure, in such manner that at no time and at no point in the apparatus a depression can arise. This arrangement avoids the possibility of entrance of air or of a complete evaporation which could lead to a sub-pressure in the pump or to accidental tinting.

It is, therefore, one object of the present invention to provide a pump which permits of arrangement of an auxiliary circulation of reduced output starting from the highest portion of the autoclave to pass to a container which can be completely closed and sealed and in which the coloring material may be introduced in such manner that the auxiliary output is taken up by the pump to be returned into the principal bath circulation across the material. It is believed that the evacuation of the formed gases takes place automatically from the highest portion of the autoclave toward said container and that the pump also creates the basic pressure in the housing of the autoclave. The arrangement of the auxiliary circulation is clearly disclosed in the French Patent No. 1,054,941, dated February 28, 1952.

It is another object of the present invention to provide a pump for autoclaves for the humid treatment of masses of textile fibers which comprises a turbine consisting of helicoidal blades adapted to create the bath circulation across the material to be treated to be rotated in one or the other direction and of centrifugal blades adapted to create in the housing of the autoclave the basic pressure and the auxiliary circulation pressure, always in the same direction whatever the direction of rotation of the turbine may be and consequently will be the direction of the bath circulation across the material.

With these and other objects in view which will become apparent in the following detailed description, the present invention will be clearly understood in connection with the accompanying drawings, in which:

Figure 1 is a side elevation, partly in section of the turbine perpendicular to the axis of rotation of said turbine;

Fig. 2 is an axial section of the turbine; and

Fig. 3 indicates schematically the entire assembly.

Referring now to the drawings, and in particular to Figs. 1 and 2, the turbine 1 comprises helicoidal blades 2, four of which are shown by example in the drawing, which blades 2 are disposed on a cylinder 3 which is integrally formed with a central member 4, and centrifugal blades 5, four of which are shown by example in the drawing, which are disposed on the face of the central member 4 opposite the supporting shaft 6.

The shaft 6 is mounted in a bearing 7 having packings 8.

The turbine 1 is mounted to turn in a cylinder 9 which is disposed between two snails 10 and 11. A tube 12 is disposed across the central portion of the centrifugal blades 5.

The pump operates in the following manner:

The output of the helicoidal part of the turbine is the principal output which passes across the material to be treated. The tube 10_a of the snail 10 is in communication with the housing 13 of the autoclave surrounding the material 14 to be treated. The tube 11_b of the snail 11 is in communication with the internal portion of the material 14 to be treated. The centrifugal blades 5 create a suction effect in the tube 12 which is transferred by means of the tube 15, which is equipped with a valve 16 to the closed and sealed container 17. This container 17 has at its upper portion an opening 18 closed by a liquid tight cover of any conventional structure in order to introduce therethrough tinting or other products and finally has also a removable valve 19. It is equipped in its interior with a cooling coil 20 and a pipe 21 of narrow cross section in communication with the container 17 at one end and with the upper portion of the autoclave 13 at its other end. This pipe 21 has a control valve 22 and a device 23 adapted to limit the output at a predetermined value, which device 23 may be, for instance, a diaphragm of predetermined setting. The centrifugal blades 5 suppress in the autoclave the auxiliary circulation by means of the snail 10, which auxiliary circulation is set up by the tubes of narrow cross section 15 and 21 across the closed and sealed container 17. The output in the circulation is controlled by the calibrated diaphragm 23 and its control may be complemented by a valve 22. This tube of narrow cross section permits the control of the basic pressure created by the centrifugal blades 5.

The gases which may possibly be formed in the autoclave are immediately evacuated through the tube 21 and remain in the upper portion of the container 17 wherefrom they do not return. In order to introduce tinting or other products into the autoclave during the operation of the apparatus, it suffices to close the valves 16 and 22 to cool the liquid in the container 17 if vapor pressure is present or to reduce the pressure by means of the valve 19. It is possible to introduce the products through the opening 18 in the container 17 and upon closing again said opening 18, the container 17 is put again into the circuit by opening the valves 16 and 22.

The introduction of the products is thus possible regularly into the principal circulation of the pump, said introduction of the products being controllable by the auxiliary circulation passing through the container 17.

If the pump operates in the direction indicated by the arrows *a* (Fig. 1), the centrifugal blades 5 operate into the snail 10 and create the basic pressure in the autoclave. The helicoidal blades 2 operate into the snail 11 and create in the interior of the material to be treated a pressure equal with that in the autoclave provided by the centrifugal blades 5 increased by the loss due to the bath circulation in the material.

If the pump operates in the direction indicated by the arrows *b* (Fig. 1), the centrifugal blades 5 operate always into the snail 10 and create the same basic pressure in the

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autoclave, while the helicoidal blades 2 create a suction effect in the snail 11 in such manner that the pressure in the interior of the material, transferred from 11_a to 11, is equal to the basic pressure in the autoclave, reduced however by the loss to the bath circulation across the material.

While I have disclosed one embodiment of the present invention, it is to be understood that this embodiment is given by example only and not in a limiting sense, the scope of the present invention being determined by the objects and the claims.

I claim:

1. A fluid circulating system for the treatment of masses of textile fibers comprising an autoclave, a pump having three exhaust openings, and a closed auxiliary conduit circuit, two of said exhaust openings being connected with said autoclave and the third of said exhaust openings being connected with said closed auxiliary conduit circuit, means for adding tinting matter into said auxiliary conduit circuit, a pump shaft rotatably mounted in either direction, a first wheel, creating pressure in axial direction, and a second wheel, creating the main pressure of said pump in radial direction, mounted on said pump shaft, said first wheel having exhaust openings, the latter being connected with said exhaust openings leading into said autoclave, and said second wheel having an exhaust opening and being connected with one of said exhaust openings lead-

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ing into said autoclave, and said auxiliary conduit circuit being connected with the suction side of said second wheel.

2. The system, as set forth in claim 1, which includes a disc mounted on said pump shaft and carrying a first hollow cylinder, and said hollow cylinder carries peripherally a plurality of helicoidal blades to constitute said first wheel, and said disc carries a plurality of centrifugal blades inside of said hollow cylinder to constitute said second wheel, and a second hollow cylinder disposed coaxially with said pump shaft and receiving said first and second wheels, and an outer wall defining a spiral housing having chambers disposed in opposite curvatures and carrying said second hollow cylinder.

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