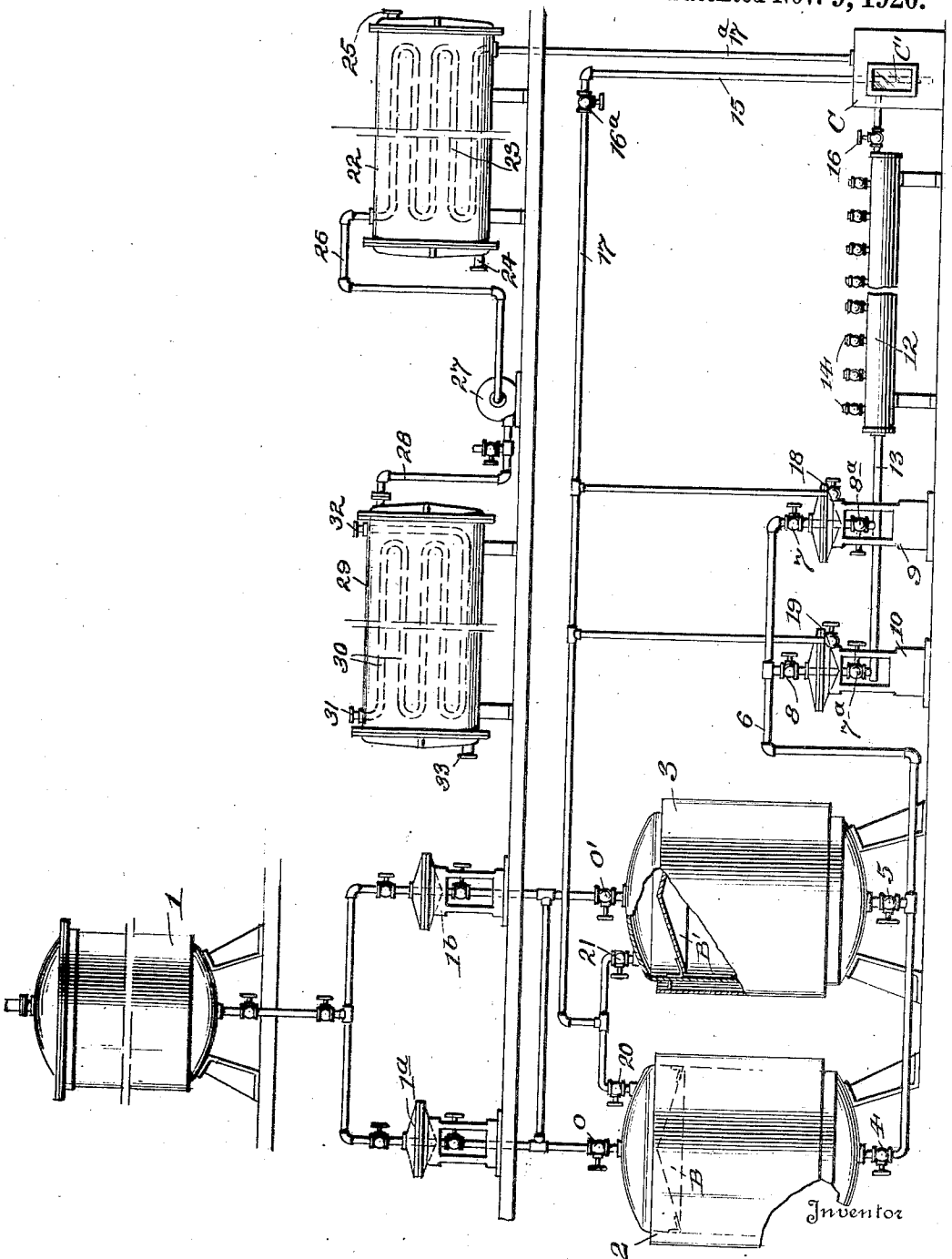
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METHOD FOR THE PRODUCTION OF MASSES OR SOLUTIONS FREE FROM AIR OR OTHER GASES.

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1,357,946.

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METHOD FOR THE PRODUCTION OF MASSES OR SOLUTIONS FREE FROM AIR OR OTHER GASES.

1,357,946. Specification of Letters Patent. Patented Nov. 9, 1920.

Application filed August 13, 1917. Serial No. 186,036.

To all whom it may concern:

Be it known that I, BENNO BORZYKOWSKI, a citizen of Russia, temporarily residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Methods for the Production of Masses or Solutions Free from Air or other Gases, of which the following is a specification.

My present invention pertains to an improved method for the production of masses or solutions free from air and other gases, and particularly those employed in the manufacture of artificial threads, films or other articles.

For the production of artificial articles, such as threads or films, from cellulose and other solutions, the material must be freed of every trace of air in suspension, because otherwise, when the material, interspersed with air bubbles, passes out of the spinning nozzles, or the apertures of the pourer, the threads will break, or films with air bubbles will be formed. It is also injurious for the material to contain an excess of gases or volatile solvents. For instance, an excess of free ammonia in cupric oxid-ammonia-cellulose solutions produces a weak thread of gray appearance, while free carbon disulfid in a viscose solution has an unfavorable action on the solution itself and on the coagulation of the same. To eliminate these drawbacks, various methods have heretofore been proposed, among others being that of using as little as possible of the volatile solving (gelatinizing) agents, and treating the solutions under the action of a vacuum in a kneading machine.

These methods have, however, proved imperfect and impracticable, to a greater or less extent, for the following reasons: The reduction of the solving (gelatinizing) agent can be carried only to a certain point, because there would otherwise be danger of non-homogeneous masses being formed, while the kneading of the material *in vacuo* requires expensive and complicated apparatus which is difficult to clean and does not entirely remove the air bubbles from the material since, after the kneading and exhaustion or evacuation, the material becomes mixed with the air which is contained in the pipes and receptacles from which the material is projected into the coagulating baths, or the like.

This invention pertains to a process by means of which the material can not only be absolutely freed in a simple manner of air and objectionable vapors, even inside of the receptacles and spinning tube, but which also renders it possible to recover the excess of the solving or gelatinizing agent, and is based on the following observations:

(A) That the desired result can be attained without the employment of special apparatus, simply by means of the ordinary receptacles and piping, provided the receptacles for the material are fitted with cone or umbrella shaped surfaces or spreaders over which the material, after exhaustion of the receptacles, is made to flow slowly in a thin layer, while the exhaustion is being continued, and the material, thus exhausted, is conveyed by means of a vacuum through the fine filters and spinning tube after exhaustion of the latter; and

(B) That materials which have been prepared with an excess of solving or gelatinizing agents can be treated, filtered and exhausted much more easily, or that materials with which a volatile solution, indifferent to the material, is admixed, may be readily treated by means of the vacuum for the elimination of the air bubbles and excess of solvent.

The process will be explained in connection with the accompanying drawing, wherein the apparatus is shown more or less diagrammatically.

The receptacle 1 contains a material which, in order to insure perfect homogeneity, has been prepared with an excess of solving or gelatinizing agents, or to which some indifferent and, if possible, highly volatile solution (*e. g.* sulfuric ether in case of viscose material) has been added, and which has been freed in a known manner of the coarser impurities by means of filters. 1^a and 1^b denote filters, interposed between receptacle 1 and the receptacles or chambers 2 and 3, from which latter the material, after the valves 4 and 5 have been opened, passes into the supply pipe 6, and when the valves 7 and 8 have been opened, into the filters 9 and 10, the exits of which are controlled by valves 7^a and 8^a. The filtering devices 9 and 10, which are designed for complete refiltration, are connected with the spinning tube 12 by a pipe 13. Said spinning tube has as many spinning nozzles 14 as may

be required, and is connected at its extreme end to a vacuum chamber C, fitted with a stop-cock 16. From the vacuum pipe 15 another pipe, 17, branches off at the stop valve 16ª and leads to the valves 18 and 19 located in the upper part of the filters 9 and 10, and to the valves 20 and 21 located in the covers of the receptacles 2 and 3. The vacuum pipes 15 and 17 lead to the vacuum chamber C, which is provided with an observation glass C′, while the main vacuum pipe 17ª extends from the chamber C and is connected to coils or manifolds 23, in the preheater 22. The coils 23 are capable of being heated by hot water or steam introduced through the inlet 24. 25 is the exhaust for the steam or water. 26 is the connecting pipe leading to the vacuum pump 27, while 28 designates the connecting pipe leading to the condenser 29. 30 are the cooling coils in the condenser, to which the cooling medium is admitted at 31, the same passing out at 32. The condensate is drawn off at 33.

The operation is as follows:

When the system is empty and both receptacles 2 and 3 are to be charged with material free of air and gases, which is to be passed through the fine filters 9 and 10 and the spinning tube 12, cocks O, O′, controlling the flow from the filters 1ª, 1ᵇ to the receptacles 2 and 3, and valves 4 and 5 are closed, and the cocks or valves 7, 8, 20, 21, 18, 19, 16 and 16ª are opened. The vacuum pump 27 is started, and as soon as the vacuum-meter indicates a sufficient vacuum in the system, the cocks O and O′ are opened and the material is allowed to flow from the receptacle 1 through filters 1ª and 1ᵇ onto the cone-shaped metal plates B and B′, which are spaced from the covers and walls of the receptacles 2 and 3. These plates are held in place by relatively few brackets or supports extending in from the walls of the receptacles, or in any other suitable manner. The material spreads in a thin layer over the cone-shaped deflectors, so that the vacuum pump removes all air bubbles and gases from the material while the latter is running onto the deflectors or spreaders, and from these along the walls of the receptacles 2 and 3. It thus becomes possible to free the material while it is thus filmed on the deflectors and the walls of the receptacles of air bubbles and surplus gases according to the rate of admission of the material and the height of the vacuum. When the receptacles 2 and 3 are full, the cocks and valves O, O′, 18, 19, 20, 21 and 16ª are closed and the cocks 4, 5, 7ª, and 8ª are opened. The vacuum pump continues to work until the material, sucked by the vacuum through the exhausted filters and spinning tube, begins to flow into the chamber C. At that moment the stop-cock 16 is closed and the whole system is filled with material free of air and gases. The subsequent passage of the material through the exhausted system (spinning tube and spinning nozzles) for continuous operation is then effected in any known manner by putting air pressure on the material in the receptacles 2 and 3, by gravity, or the like.

When one of the receptacles 2 and 3 is empty and is to be charged with material free of air and gases during the period of time that the material from the other receptacle is being discharged to the filters and the spinning tube, the operation is as follows:

The discharge cock of the receptacle which is being emptied is preferably closed while some of the material is still left in said receptacle in order that no air which is in the receptacle above the material may be able to enter the supply pipe 6. Any compressed air contained in the receptacle is then allowed to escape. Thereupon, the receptacle is exhausted by means of a vacuum pump, and as soon as the vacuum meter indicates a sufficient vacuum in the receptacle, the admission cock O is opened, while O′ of the other receptacle is closed. The material spreads, as described above, over the deflector B in a thin layer or film and is completely freed of air.

When it becomes necessary to renew the filtering material in one of the filters 9 or 10, the cock 7 or 8, respectively, is closed in order to shut off the supply of material to the filter. The cock 7ª or 8ª, respectively, is also closed to prevent the return flow of the material. The filter is then opened and a new filtering body introduced. After the filtering material has been put in place and the cover closed, cock 18 or 19 is opened in order to exhaust the air which has entered the upper part of the filter while open, which is done by putting the vacuum pump 27 in operation. As soon as the vacuum meter indicates a sufficient vacuum in the filter, the cock 7 or 8, respectively, is opened again, so that the mass freed of air is able to enter the vacuum filter.

The gases sucked out by the vacuum pump are preheated, if required, in the preheater 22, and as they are practically free of air they may be regenerated in the original form by condensation in the condenser 29.

It is obvious that by this process, without the employment of special expensive and complicated apparatus, continuous manufacture is insured, which is highly important and very economical, particularly in the production of artificial threads, films, etc., where it is necessary to keep up the manufacture without interruption day and night.

It is, of course, to be understood that the apparatus described above by way of example is capable of being modified in many ways, and of being employed not only for

the manufacture of threads and films, but wherever materials free of air, or of air and other gases, can be used, without thereby affecting the character of the invention. It is also to be understood that the regeneration of the gases may be effected by different means, *e. g.*, by absorption and distillation, without affecting the character of the invention.

The method of regeneration of the gases is not new in itself, but the essence of the invention, as previously stated, lies in the observation that an increase in the volatile solvents for the production of the materials, or the elimination of the excess gases, in combination with known methods of regeneration of the same and in combination with the system described, admits of the intermittent and continuous production and treatment of materials free of air and other gases.

In the case of materials containing a very volatile solvent of low boiling point, or materials which must not be heated, the receptacles 2 and 3 are fitted with cooling jackets or cooling coils through which a cooling medium is made to pass, or any other suitable device, especially during the exhausting operation.

No claim is made herein to the apparatus shown and described, as the same forms the subject matter of my divisional application filed on or about the 6th day of April, 1920, Serial No. 371,631, the same having been divided out of this application pursuant to the requirement of the Patent Office.

Having thus described my invention, what I claim is:

1. The herein described process of removing air from a fluid mass of viscose or like material, suitable for the production of artificial threads, films and the like, which consists in running the fluid mass onto a surface located within a hermetically sealed vessel, from which the air has been previously exhausted, and maintaining the vacuum in the vessel during the introduction of the mass.

2. The herein described process of removing air from a fluid mass of viscose or like material suitable for the production of artificial threads, films and the like, which consists in filming the mass onto a surface located within a hermetically sealed vessel, from which the air has been previously exhausted, and maintaining the vacuum during the introduction of the mass.

3. The herein described process of producing a mass suitable for the formation of artificial threads, films and the like, which consists in preparing the mass with an excess of a highly volatile solving agent indifferent to the mass, introducing such mass into a hermetically sealed vessel from which the air has been previously exhausted and onto a surface located within the vessel and so arranged as to film the mass, and maintaining the vacuum during the introduction of the material into the vessel.

4. The herein described process of producing a mass suitable for the formation of artificial threads, films and the like, which consists in preparing the mass with a highly volatile solving agent indifferent to the mass, filtering such mass, introducing the filtered mass into a hermetically sealed vessel and filming the same therein, and during such operation exhausting the air and gases from the vessel.

5. The herein described process of producing a mass suitable for the formation of artificial threads, films and the like, which consists in preparing the mass with an excess of volatile solving agent indifferent to the mass, filtering the mass, introducing the filtered mass in the form of a film into a sealed vessel and during such filming exhausting the air and other gases therefrom, and finally discharging the material through an exhausted filter into an air-exhausted supply pipe or head.

6. The herein described process of producing a mass suitable for the formation of artificial threads, films and the like, which consists in preparing the mass with an excess of a highly volatile solving agent indifferent to the mass, filtering such mass, introducing the filtered mass in the form of a film into a sealed vessel which has been evacuated, exhausting the air or gases from such filmed mass by continued exhaustion of the vessel aforesaid, recovering the exhausted solving agent, and finally discharging the material through an exhausted filter and into an air-exhausted spinning apparatus.

7. The herein described process of producing a mass suitable for the formation of artificial threads, films and the like, which consists in preparing the mass with an excess of a volatile solving agent, introducing the mass in the form of a film into a receptacle wherein a vacuum is maintained, and simultaneously cooling such material to prevent heating or boiling thereof.

8. The herein described process of producing a mass suitable for the formation of artificial threads, films and the like, which consists in preparing the mass with an excess of solving agent, subjecting the mass thus formed and while in an attenuated condition, to the action of a vacuum, and simultaneously cooling such material to prevent heating or boiling thereof.

In testimony whereof I have signed my name to this specification.

BENNO BORZYKOWSKI.