[Second Edition.]

PATENT SPECIFICATION

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PROVISIONAL SPECIFICATION.

Improvements in Concentrating Latex.

We, DUNLOP RUBBER COMPANY LIMITED, a British Company, of 32, Osnaburgh Street, London, N.W.1, ALBERT NELSON WARD and GEOFFREY WILLIAM TROBRIDGE, both British Subjects of the aforesaid Company's Works, at Fort Dunlop, Erdington, Birmingham, in the County of Warwick, do hereby declare the nature of this invention to be as follows :—

This invention concerns improvements in or relating to the concentration of latex by evaporation, the term "latex" meaning natural or artificial dispersions of rubber, gutta percha or the like.

Besides facilitating a higher concentration of latex, the invention may also be applied to the removal of ammonia or other volatisable ingredients.

The invention depends upon the fact that the free surface of a liquid when rotated about an axis at right angles to the surface of the liquid tends to assume and retain the shape of a paraboloid, in which the ratio of the square of the distance of any point from the axis to the corresponding height, varies inversely as the square of the angular velocity.

By the present invention the latex is automatically caused to distribute itself over a large surface in a comparatively thin and uniform film which facilitates the treatment of the film necessary to vapourise and remove the volatile constituents and permits both the separation of such constituents and the removal of the concentrated latex itself in a continuous and progressive manner.

The progressively uniform action obtained is of particular value in the concentration of latex since localised agitation tending to promote local coagulation is entirely obviated.

According to this invention the method of continuously separating vapourisable constituents from latex is characterised by feeding the latex to a container having a paraboloidal surface or surfaces and rotating the container about its axis at such a speed that the latex is caused to rise and form thereupon a paraboloidal film, the edge part of which passes over the edge of the container for collection.

[*Price* 1*s*.]

The latex may be gravity fed through a pipe, the lower end of which may coincide with the axis of the container and the axis of rotation.

The surface of the container which supports or assists the formation and distribution of the latex may be wholly or in part of a smooth paraboloidal form and it will be understood that the invention does not exclude local variations in the container surface such as may consist of circumferential, helical, or radial grooves.

The wall or upper portion of the container in particular at its edge may be flared inwardly or outwardly if required in order to provide additional control of the latex film.

A pipe or pipes having air passages from which warm air may be blown at a suitable angle upon the film of latex revolving upon the paraboloidal or other surface of the container may be positioned inside the container.

The container may if required have within it, one or more distributor blades.

The latex enters the base of the container which is then rotated at a speed such that a latex film of substantially uniform thickness is maintained over the inner surface of the container and the concentrated latex flows over the lip of the container into a circular stationary gallery whence it may be collected for further use.

The input of latex and speed of rotation are adjusted for the particular size and shape respectively of the container so that the latex is maintained as a substantially uniform film in the container for a period sufficient to effect a predetermined degree of concentration or other treatment.

In one embodiment of the invention a truncated paraboloidal container of maximum diameter of 53.3 c.m. and internal height 57.1 c.m. having a hot water jacket, is rotated at 120 revolutions per minute about its vertical axis, the water being let in through an axial gland, and let out by drainage into a circular gallery at the base concentric with the axis.

Latex is allowed to flow at a speed of

one third of a gallon per minute down a pipe into the centre of the base of the container and the surface of the resulting latex film is subjected to currents of dried and/or warmed air or gas.

Treated latex (of 60% rubber content before treatment) flowing over the edge of the container is collected and is found to have a rubber content of 65%.

The container may be surrounded by a jacket or jackets through which a heating or cooling fluid such as water may be circulated.

Dated this 27th day of February, 1935.

W. BOND,
Acting for the Applicants.

COMPLETE SPECIFICATION.

Improvements in Concentrating Latex.

We, DUNLOP RUBBER COMPANY LIMITED, a British Company, of 32, Osnaburgh Street, London, N.W.1, ALBERT NELSON WARD and GEOFFREY WILLIAM TROBRIDGE, both British Subjects of the aforesaid Company's Works, at Fort Dunlop, Erdington, Birmingham, in the County of Warwick, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement :—

This invention concerns improvements in or relating to the concentration of latex by evaporation, the term " latex " meaning natural or artificial dispersions of rubber, gutta percha or the like.

Besides effecting concentration the invention may also operate to remove ammonia or other volatile ingredients from the latex.

The invention depends upon the fact that the free surface of a liquid when rotated about an axis at right angles to the surface of the liquid tends to assume and retain the shape of a paraboloid, in which the ratio of the square of the distance of any point from the axis to the corresponding height, varies inversely as the square of the angular velocity.

By the present invention the latex is automatically caused to distribute itself over a large surface in a comparatively thin and uniform film which facilitates the treatment of the film necessary to vapourise and remove the volatile constituents and permits both the separation of such constituents and the removal of the concentrated latex itself in a continuous and progressive manner.

The progressively uniform action obtained is of particular value in the concentration of latex since localised agitation tending to promote local coagulation is entirely obviated.

According to this invention a process of concentrating latex by evaporation is characterised by maintaining a rising annular film of latex of substantially uniform thickness by rotation about a vertical axis while removing volatile constituents from the said film by evaporation.

In order that the invention may be more easily understood and readily carried into effect, the same will now be described with reference to the accompanying drawing which is a diagrammatic elevation of apparatus suitable therefor.

The latex to be concentrated is continuously fed to the base of a paraboloidal container 1 through a pipe 2, the end portion at least of which is centred over the base of the container and is coincident with the axis A.A. as shown in the drawing.

The centering of the pipe 2 along the axis at the point of delivery reduces any tendency to local thickening of the film with consequent retardation of concentration.

The container 1 is rotated on axis A.A. by a shaft 3 passing through a gland 4 which seals the shaft opening through the wall of a jacket 5 which encloses the paraboloidal container, the space between which and the jacket may be filled with hot water circulated through an inlet pipe 6 and kept at a constant level 18 by an outlet pipe 7.

To the upper end of the jacket a circular gallery 8 is secured, the base of the gallery being lower on one side than the other so that latex discharged into the gallery runs to the lower side and is delivered by a discharge pipe 9.

When the paraboloidal container 1 is stationary a quantity of latex introduced through the tube 1 collects in the base of the container at the level shown for example in dotted lines at 10.

When initial rotation is imparted to the container 1 by the shaft 3 the surface 10 of the quantity of latex so introduced assumes the cup-shaped surface 11 and finally a critical speed is arrived at at which the latex is caused to rise and spread uniformly in a thin film as shown by the dotted line 20 over the whole of the internal paraboloidal surface 19 of the container 1.

If the critical speed is maintained and

additional latex is continuously added through the tube 2, a continuously rising annular film of latex 20 is formed and maintained, and the concentrated surplus corresponding to the relatively unconcentrated addition continuously overflows the flange 12 into the gallery 8 whence it is discharged for further use.

The container 1 may be of thin section since its weight and that of the latex inside it are largely supported by the water in the surrounding jacket.

The thin rising film 19 of latex within the container is heated (a) through the container wall by the hot water jacket 5, and (b) by heated air passing into the container through the mouth 13 of a pipe 14 which is conveniently concentric with the latex input pipe 2 so that the latex is warmed before its release into the container.

The input of latex and the speed of rotation may be adjusted for any particular size and shape respectively of the paraboloidal container so that the period required for the film to rise from the bottom to the discharge flange is sufficient to effect the required concentration.

In one example for instance, a paraboloidal container of maximum diameter 53.3 c.m. and internal height of 57.1 c.m. and having a hot water jacket, is rotated at 120 revolutions per minute about its vertical axis.

Latex of 60% concentration is continuously introduced at a speed of one third of a gallon per minute through the pipe 2 into the centre of the base, and the resultant film is subjected while rising to the action of heated air as described.

The latex collected in the discharge gallery is found to have a concentration of 65%.

In order to obtain a higher concentration by prolonging the period during which the volatile constituents of the rising film are exposed to evaporation, one or more annular portions of the said film may be intercepted at different stages during its upward progress by a plurality of interceptor blades 15.

The blades 15 are positioned by arms 16 the inner ends of which extend from the air pipe 14. The edges of the blades adjacent the container are positioned so as just to clear the rotating surface of the container.

The central and lesser radial parts of each blade are bent downwards so that the tail portions 17 deflect the intercepted liquid back towards the base of the container.

We are aware that the principle of utilising rotation to produce a film of liquid having an axial flow up the wall of a containing vessel to facilitate treatment such as distilling and pasteurising, is known to those skilled in these things, but so far as we are aware this principle has not hitherto been applied to the continuous concentration of latex by evaporation, as herein described and claimed.

Having now particularly described and ascertained the nature of our said invention, and in what manner the same is to be performed, we declare that what we claim is :—

1. The process of concentrating latex by evaporation characterised by maintaining a rising annular film of latex of substantially uniform thickness by rotation about a vertical axis while removing volatile constituents from the said film by evaporation.

2. The process according to claim 1 characterised by maintaining the said film by rotation within a paraboloidal containing surface.

3. The process according to any of the preceding claims characterised by continuously adding latex to be concentrated to the lower portion of the film.

4. The process according to any of the preceding claims characterised by continuously adding latex to be concentrated to the lower portion of the film along the said axis.

5. The process according to any of the preceding claims characterised by permitting the said film to overflow at that end of the paraboloidal surface to which the film is caused to rise by rotation.

6. The process according to any of the preceding claims characterised by returning a portion or portions of the said film to the base of the containing surface.

7. The process according to any of the preceding claims wherein the film is heated through the said containing surface and/or by heated air within the space enclosed by said annular film.

8. The process according to any of the preceding claims characterised by rotating the said containing surface on the said axis.

9. The process according to claims 3 or 4, characterised in that the latex to be added is warmed prior to its release upon the containing surface.

10. When used for carrying out the process claimed in any of the preceding claims, apparatus comprising a substantially paraboloidal container adapted to be rotated on its vertical axis for the purposes specified.

11. Apparatus as in claim 10, wherein the edge of said vessel constitutes a weir over which the rising film cascades, and

additional latex is continuously added through the tube 2, a continuously rising annular film of latex 20 is formed and maintained, and the concentrated surplus corresponding to the relatively unconcentrated addition continuously overflows the flange 12 into the gallery 8 whence it is discharged for further use.

The container 1 may be of thin section since its weight and that of the latex inside it are largely supported by the water in the surrounding jacket.

The thin rising film 19 of latex within the container is heated (a) through the container wall by the hot water jacket 5, and (b) by heated air passing into the container through the mouth 13 of a pipe 14 which is conveniently concentric with the latex input pipe 2 so that the latex is warmed before its release into the container.

The input of latex and the speed of rotation may be adjusted for any particular size and shape respectively of the paraboloidal container so that the period required for the film to rise from the bottom to the discharge flange is sufficient to effect the required concentration.

In one example for instance, a paraboloidal container of maximum diameter 53.3 c.m. and internal height of 57.1 c.m. and having a hot water jacket, is rotated at 120 revolutions per minute about its vertical axis.

Latex of 60% concentration is continuously introduced at a speed of one third of a gallon per minute through the pipe 2 into the centre of the base, and the resultant film is subjected while rising to the action of heated air as described.

The latex collected in the discharge gallery is found to have a concentration of 65%.

In order to obtain a higher concentration by prolonging the period during which the volatile constituents of the rising film are exposed to evaporation, one or more annular portions of the said film may be intercepted at different stages during its upward progress by a plurality of interceptor blades 15.

The blades 15 are positioned by arms 16 the inner ends of which extend from the air pipe 14. The edges of the blades adjacent the container are positioned so as just to clear the rotating surface of the container.

The central and lesser radial parts of each blade are bent downwards so that the tail portions 17 deflect the intercepted liquid back towards the base of the container.

We are aware that the principle of utilising rotation to produce a film of liquid having an axial flow up the wall of a containing vessel to facilitate treatment such as distilling and pasteurising, is known to those skilled in these things, but so far as we are aware this principle has not hitherto been applied to the continuous concentration of latex by evaporation, as herein described and claimed.

Having now particularly described and ascertained the nature of our said invention, and in what manner the same is to be performed, we declare that what we claim is :—

1. The process of concentrating latex by evaporation characterised by maintaining a rising annular film of latex of substantially uniform thickness by rotation about a vertical axis while removing volatile constituents from the said film by evaporation.

2. The process according to claim 1 characterised by maintaining the said film by rotation within a paraboloidal containing surface.

3. The process according to any of the preceding claims characterised by continuously adding latex to be concentrated to the lower portion of the film.

4. The process according to any of the preceding claims characterised by continuously adding latex to be concentrated to the lower portion of the film along the said axis.

5. The process according to any of the preceding claims characterised by permitting the said film to overflow at that end of the paraboloidal surface to which the film is caused to rise by rotation.

6. The process according to any of the preceding claims characterised by returning a portion or portions of the said film to the base of the containing surface.

7. The process according to any of the preceding claims wherein the film is heated through the said containing surface and/or by heated air within the space enclosed by said annular film.

8. The process according to any of the preceding claims characterised by rotating the said containing surface on the said axis.

9. The process according to claims 3 or 4, characterised in that the latex to be added is warmed prior to its release upon the containing surface.

10. When used for carrying out the process claimed in any of the preceding claims, apparatus comprising a substantially paraboloidal container adapted to be rotated on its vertical axis for the purposes specified.

11. Apparatus as in claim 10, wherein the edge of said vessel constitutes a weir over which the rising film cascades, and

wherein a gallery is disposed beneath said weir to catch said overflow, said gallery connecting with suitable outlet means.

12. Apparatus as in either of the preceding claims 10 or 11 having a latex supply pipe concentric with the axis of the vessel, substantially as described.

13. Apparatus as in claim 12 having an air supply pipe through which said latex supply pipe extends concentrically, substantially as described.

14. Apparatus as in any of the preceding claims 10 to 13 inclusive having means for deflecting parts of the rising film of latex from a given height or heights, substantially as described.

15. For the continuous concentration of latex by evaporation, a process substantially as herein described.

16. When used for the continuous concentration of latex by evaporation according to the process herein described and claimed, apparatus substantially as herein described with reference to the accompanying drawing.

17. Latex when concentrated by the process herein described and claimed.

Dated this 5th day of December, 1935.

W. BOND,
Acting for the Applicants.

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