Oct. 17, 1944. K. H. QUASEBARTH 2,360,445

EVAPORATING APPARATUS

Filed Sept. 14, 1943

Fig. 1

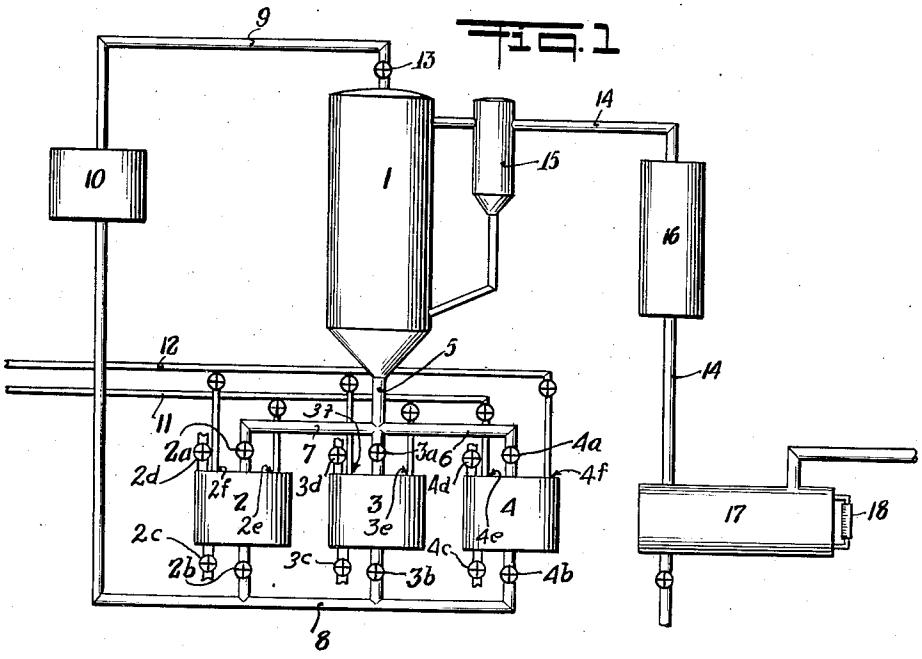
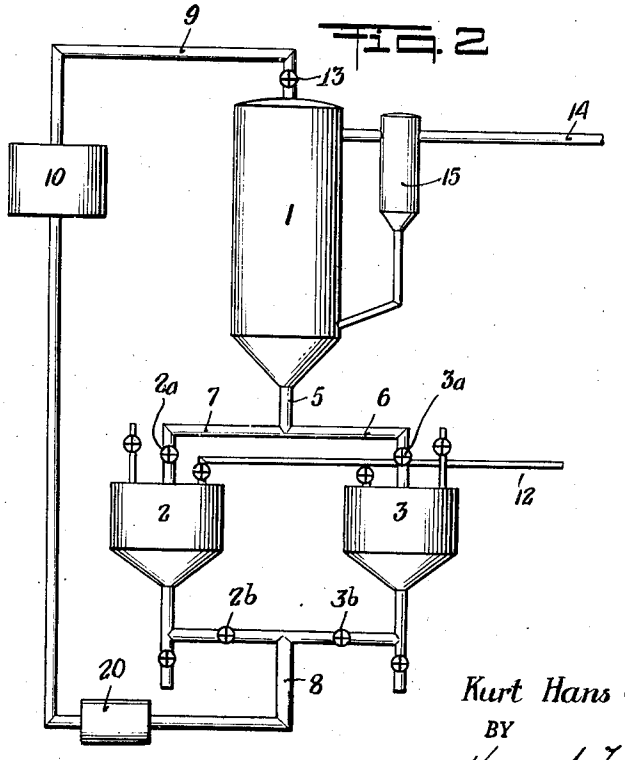


Fig. 2



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EVAPORATING APPARATUS

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2 Claims. (Cl. 159—43)

The present invention pertains to improvements in apparatus for concentrating rubber latex by evaporation.

Apparatus of the contemplated type are described in Patent 2,081,556, issued May 25, 1937. They include an evaporator operated under reduced pressure, into which preheated latex is fed in a finely divided state.

The apparatus described in the aforesaid patent has one undesirable feature; that is, the vacuum prevailing in the evaporator must be interrupted every time the finished concentrate is to be withdrawn. This feature is particularly inconvenient when the circulation of latex in the apparatus is to be effected without a pump.

An object of the present invention is to devise an improved apparatus which may be continuously operated without interruption and in which the circulation is effected by a pump or, preferably, by means of differential pressure.

To that end, one of the principal features of the present invention is to employ a plurality of tanks with the evaporator. Each of these tanks serves, alternatingly, as a source of supply of latex to be fed to the evaporator or as a return reservoir for concentrated latex returning from the same.

When the pump is not used, each tank feeding the evaporator communicates with the atmosphere or a source of gas under increased pressure, while the pressure in each return tank is reduced to a value similar to that prevailing in the evaporator.

Further features of the present invention will become apparent from the following description of two embodiments thereof given by way of example and illustrated in the accompanying drawing, in which

Fig. 1 is a schematic section of an apparatus according to the present invention in which the latex is circulated by means of differential pressure;

Fig. 2 is a schematic section of a similar apparatus including a pump for the circulation of the latex.

In Fig. 1 an evaporator 1 communicates with three tanks 2, 3, 4, either directly through conduits 5, 6, and 7, respectively, or through conduits 8, 9 and a preheater 10. The flow of latex through conduits 5—8 to and from tanks 2, 3, 4 is controlled by valves 2*a*, 2*b*, 3*a*, 3*b*, 4*a* and 4*b*, respectively. Furthermore, each tank has four valve controlled outlets for communication with the atmosphere and supply of latex (2*d*, 3*d*, 4*d*), with a compressed air manifold 11 (2*e*, 3*e*, 4*e*), with a vacuum manifold 12 (2*f*, 3*f*, 4*f*), and outlets 2*c*, 3*c*, 4*c* for the withdrawal of latex.

The admission of latex into evaporator 1 is controlled by a valve 13.

Vacuum is produced wherever required in the apparatus by one—or more—conventional pumps (not shown) which communicate with the evaporator 1 through conduit 14 and with tanks 2—4 through manifold 12. A deflector 15, a condenser 16 and a storage tank for condensate 17 are interposed in conduit 14.

At the beginning of an operation tank 2 is, for instance, filled with dilute latex while tank 4 is empty. Tank 2 is, then, placed in communication with manifold 11 and tank 4 with manifold 12. Simultaneously valves 2*b* and 4*a* are opened while valves 2*a*, 3*a*, 3*b* and 4*b* are closed. Accordingly, the contents of tank 2 will pass into evaporator 1 and the resulting concentrate will be drained into tank 4. When tank 2 is empty the valves will be actuated so that the contents of tank 4 pass through evaporator 1 into tank 3 which is placed under vacuum in advance. This circulation from one tank into another through evaporator 1 is repeated until the concentrate in one of the tanks has the desired final concentration. Thereupon, the contents of that tank is withdrawn while another one is refilled with raw latex.

This arrangement has an advantage in that there is always one of the three tanks available which may be evacuated in advance so that no time is lost when evaporator 1 is switched from one tank to another. Also, when a charge of latex has reached the approximate final concentration, the idle tank may be refilled with raw latex while the circulation continues between the two other tanks and, while end products are withdrawn from one tank, the refilled tank can be switched on to the preheater so that the operation of the apparatus is at no time interrupted.

As an alternative, the operation of the apparatus may be started with two full and one empty tanks. In that case, there will be a slight delay during the first passages of liquid from one tank to another, before the receiving tank is evacuated and can be placed in direct communication with the evaporator. However, the latter may continue in operation, as the accumulation of a certain amount of concentrate therein is not objectionable. Owing to the rapidly rising concentration, the available concentrate can, after a certain number of circulations from one tank to another, be accommodated in one tank alone,

so that the third tank may assume the function of the idle tank described above.

Obviously, the number of tanks may be reduced to two, although more than three may be provided.

It is also possible to omit the pressure manifold and simply place a tank whose contents are to be passed into the evaporator in communication with the atmosphere. On account of the vacuum prevailing in the evaporator, this will be sufficient to cause the desired flow of latex. However, it has been observed that the use of increased pressure is helpful inasmuch as it assists in avoiding the formation of steam in the preheater.

Tank 17 may be provided with a measuring device, such as a gauge glass 18, so that the amount of evaporated water can be easily determined. This makes it easy to ascertain the right time for withdrawing a charge of finished concentrate.

The apparatus shown in Fig. 2 is similar to that of Fig. 1 except for the omission of tank 4 and the addition of a pump 20 for the circulation of latex.

In the initial stage of operation, according to Fig. 2, tank 2, for instance, is filled with raw latex. Valves 2*a* and 3*b* are closed, while 2*b* and 3*a* are open. Both tanks are placed in communication with vacuum manifold 12. Pump 20 will, then, cause the contents of tank 2 to pass into evaporator 1, whence it returns, concentrated, into tank 3. When tank 2 is empty the valves are reversed so that latex flows from tank 3 through evaporator 1 into tank 2. The cycle of operations is repeated until the latex has reached the desired concentration. The tank containing the concentrate, for example tank 3, is then cut off from the evaporator, the pump and manifold 12, the tank is opened to the atmosphere and the contents withdrawn. Simultaneously, fresh dilute latex is supplied to the other tank 2 and, thence, fed to evaporator 1. The refilling with fresh latex can be so rapidly effected that no interruption in the operation of pump 20, preheater 10 and evaporator 1 is necessary. However, there will be a slight delay before tank 3 is again evacuated and ready to receive a fresh portion of concentrate. During that interval a certain amount of latex may be allowed to accumulate in evaporator 1 or a third tank may be added, as in the apparatus according to Fig. 1.

The apparatus in which a pump is included has the advantage that latex may be circulated from one tank to the other through the evaporator while both tanks are under vacuum. At the option of the operator, the tank to be drained may be cut off from the vacuum manifold and opened to the atmosphere. In the latter case, the differential pressure in the tanks will assist in causing circulation. The apparatus according to Fig. 1 is, in many cases, more advantageous since it is frequently observed that a latex cannot be passed through a pump without risk of coagulation.

While the apparatus has been described in connection with latex, it may just as well be applied to the concentration of any similar substance.

The foregoing description is not intended to limit the present invention which extends to all changes, modifications and equivalents within the scope of the appended claims.

What is claimed is:

1. An apparatus for concentration of liquid, such as latex or the like, by evaporation under vacuum which comprises an evaporator, a source of vacuum, a preheater connected to said evaporator for heating said liquid prior to feeding the same to said evaporator, a plurality of tanks, conduits to connect said tanks to said evaporator and to said preheater, respectively, means to reduce the pressure in each said tank to a value similar to that prevailing in said evaporator, a pump to cause said liquid to flow from said tanks to said preheater, and valve means in said conduits adapted to afford, alternatingly, flow of said liquid from one said tank through said preheater and said evaporator into another said tank.

2. An apparatus for concentration of liquids, such as latex or the like, by evaporation under vacuum which comprises an evaporator, a source of vacuum, a preheater connected to said evaporator for heating said liquid prior to feeding the same to said evaporator, a plurality of tanks, conduits to connect said tanks to said evaporator and to said preheater, respectively, means to alternatingly reduce the pressure in each said tank to a value similar to that prevailing in said evaporator and to increase the same to a substantially higher value, and valve means in said conduits adapted alternatingly to afford flow of said liquid from one said tank through said preheater and said evaporator into another said tank.

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