

# PATENT SPECIFICATION

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## (54) PRETREATMENT DEGREASING APPARATUS

(71) We, HAJTOMUVEK ES FESTO BORBENDEZSEZ GYARA, a body corporate organized under the laws of Hungary of 98, Fehérvári út, Budapest XI, Hungary, do hereby declare the invention for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

10 The invention relates to pretreatment degreasing apparatus for workpieces to be subsequently coated, particularly for painting lines and electrophoretic painting equipments.

15 It is known that before surface protection or surface coating of an article it must be complete degreased. Generally immersion devices serve to degrease workpieces, wherein the workpieces are immersed in a tank containing a degreasing chemical, or with spraying devices e.g. a ring of jets, which spray the degreasing chemical on the surfaces of the articles to be degreased under pressure. In most known degreasing apparatus, the concentration of the degreasing chemical and its level in the containing vessel must be checked at least two to four times per shift. In hitherto known apparatus the concentration of the degreasing chemical is checked by taking a sample from the solution of this chemical and with the aid of an indicator the consumption rate of the chemical i.e. the quantity of top-up required, is ascertained. In the apparatus currently employed the degreasing chemical is generally dissolved in a chemical preparation, the solution is stored in tanks and from there is passed under manual control, by opening and closing valves to the chemical storage tank and the degreasing tank or into the liquid line of the spraying unit.

40 In these known apparatus, quite apart from the cumbersome and inaccurate manual control of the procedure, it is a particular disadvantage that the concentration

of the degreasing material cannot be maintained at a constant level due to the intermittence of sampling and the lengthy laboratory determination of concentration. The periodic nature of the control can also cause faults because the degree of contamination of the workpieces to be treated may change and thus the concentration of the degreasing material may vary also.

It is, however, also known (German published application No. 2 106 446) in a degreasing apparatus which serves, for instance, to degrease metallic objects, which subsequently are to be provided with a coating and which apparatus has three series-connected treatment chambers, wherein in the first chamber a treatment of the workpieces with solvent vapours takes place and in the second and third chambers a treatment with spray nozzles is performed, to provide a solvent circulation arrangement to connect the chambers one below the other and a cleaning cycle for the solvent which is connected with the pre-run duct at the first chamber and with the return flow at the third chamber and in which a distillation device for the solvent is connected in. The distillation device contains a certain amount of liquid solvent the constant level of which is externally maintained and controlled by feeding from outside. Nevertheless, in this known degreasing apparatus, apart from the constant filling of the solvent stock in the distillation device, there is no possibility provided of continually ensuring a constant concentration of the degreasing agent in the solvent.

In contrast, the present invention provides a pretreatment degreasing apparatus wherein intermittent sampling and manually controlled replenishment of the degreasing chemical on the basis of laboratory testing are obviated, and moreover a constant concentration of chemical for the treatment solution is ensured automatically and con-

tinuously.

According to the present invention there is provided pretreatment degreasing apparatus for workpieces to be subsequently coated, comprising a treatment station for immersing workpieces in, and/or spraying workpieces with, a liquid containing a degreasing chemical, a recirculation circuit for the liquid including a filter having an inlet from a drain at the treatment station, a concentrate outlet, and a filtrate outlet connected with a supply device for supplying the liquid to the station, controllable metering means for adding the said chemical to the liquid before the liquid reaches the supply devices, and a measuring device either for making measurements dependent on the number of workpieces passing through the treatment station, or for making measurements of the quantity of concentrate from the filter which are time dependent and/or dependent on the said number, the measuring device being coupled to the metering means to control the addition of the said chemical in accordance with the measurements made.

In an embodiment of the invention, a storage vessel for the said chemical may be connected into a return flow duct of the recirculation circuit, the metering means being connected to the storage vessel.

In an embodiment of the apparatus according to the invention, the measuring device may for instance continually measure the throughput of the "concentrate" passing from the concentrate outlet of the filter and the metering device can be controlled accordingly. In this way there results a measure of contamination arising at the treatment station, whereby inferences may be made about the concentration of the degreasing chemical in the treatment liquid. Another preferred possibility for the development of the measuring device consists in connecting the "concentrate" outlet of the filter to a collecting vessel and the measuring device is a level or weight measuring device which detects the content of the collecting vessel in a time-dependent manner.

Where partial or complete control of the metering is in dependence on the number of the workpieces passing the treatment station, it is proposed to provide a counting device for the workpieces passing through the treatment station.

In a preferred embodiment of the invention an immersion tank, and/or a spray device is connected to an ultra-filtration device by way of a tap-off pipe of a collecting basin, the filtrate outlet of the ultra-filtration device being directly or indirectly connected back to the immersion tank and/or the spraying device, while the other (concentrate) outlet of the ultra-filtration device is connected to a collecting vessel coupled with a

neutralizing device, a sensor mechanism being provided for the collecting vessel, the sensor being controlled either: by changes in weight and/or level in the collecting vessel and by a time relay alone or in some cases in conjunction with a pulse count representative of the number of articles passing through the degreasing apparatus; or by the said pulse count alone. By means of control pulses from the sensor mechanism, shut-off devices are actuated to open and close, these devices being positioned in the discharge duct of a metering container for the said chemical and/or a mixing container directly or indirectly connected with the immersion tank and/or the pipe line of the spray device.

Thus in the apparatus according to the invention the constancy of concentration of the degreasing chemical is ensured by continuous replenishment of the said chemical which may be at least partially in accordance with the number of workpieces passing through the apparatus, the level of contamination and/or the residence time in the apparatus of the individual article. Thus, for instance, if more heavily contaminated workpieces are passed through the apparatus, then from the upstream side of the ultra-filtration unit more greasy contaminant passes to the collecting tank. The liquid level or weight increases thereby, which is detected by the measuring device so that by means of its control pulses and in order to replenish the degreasing chemical used-up in correspondance with the quantity of grease separated, the shut-off devices in the discharge duct of the chemical metering tank and/or the mixing container open until the prescribed concentration of the degreasing chemical is again attained.

It is a great advantage of the invention that sampling, laboratory testing and manual replenishment are obviated and that a constant concentration of the degreasing chemical is more nearly achieved.

It is known for the chemical and/or electrolytic treatment of metallic parts in immersion apparatus (German Patent Specification No. 1088780) to control the lifting and lowering devices for the immersion of the workpieces independently of the immersion time determined by the normal cycle of the system and in dependence on the type and/or the state of exhaustion of the corresponding treatment bath as a function of time. However, no direct measurement of the state of exhaustion of the treatment liquid takes place, but rather the expected gradual exhaustion of the treatment liquid is determined empirically and the time control mechanism is adjusted accordingly for a gradual lengthening of the immersion time.

In an apparatus for monitoring acid-containing solutions which are used as washing solutions for metallic surfaces after their

treatment in a coating process, it is known (German published application No. 1621535) to measure the state of exhaustion of the treatment liquid directly and to control accordingly a replenishment of the treating agent and the carrier liquid. However, here the state of the treatment liquid is determined by means of conductivity measuring device directly in the treatment path so that a value for the direct contaminations arising in the bath is obtained only indirectly. Also a constant removal of the contaminations from the bath is not provided.

15 A preferred embodiment of the invention will now be described in detail, by way of example only, with reference to the drawing. The drawing illustrates the principle of the preferred apparatus according to the invention.

20 In the embodiment illustrated in the drawing, greasy contamination from the workpieces 2 to be degreased and suspended on a transport path 1 is washed off by a spraying device 3 equipped with nozzles. The jets of spraying device 3 are connected via a pipe 4 and a pump 5 to a storage tank 6 which in use stores degreasing chemical. The tank 6 containing the degreasing chemical is connected by a pipe to the filtrate side 7a of the ultra-filtration unit 7.

The contamination washed off the workpieces 2 is in the form of a greasy, alkaline emulsion collected in a spray liquor catcher 10 and passed from there via a pump 9 and pipe 8 to the ultra-filtration unit 7. The greasy emulsion is prevented from permeating from the "concentrate" side 7b to the filtrate side 7a so that the emulsion passes via a pipe 11 to a collecting tank 12 and from there as an overflow to a neutralising device 13.

The collecting tank 12 is provided with a measuring device 14 which is adapted to sense, as a function of time, changes in weight or level of the contaminants in the collecting tank 12. The sensing or measuring device 14 is connected to a non-illustrated mechanism which effects the opening and closing of shut-off device 15a and 15b of the chemical feeding tank 16 and of the chemical mixing tank 17. Thus the control pulses provided by the measuring device 14 open or close the shut-off devices 15a and 15b, which connect chemical feeding and mixing tanks 16, 17 with a pipe between the collecting tank 12 and the storage tank 6, the pipe being provided with a pump 18. In normal operation the portion of the pipe extending from the collecting tank 12 to the shut-off device 15b is not in use; however, the said portion can be used to convey chemical from the tank 6 (or the tank 17) to clean the interior of the collecting tank. In addition, the sensing device 14

is also coupled to a counter 19 for counting the workpieces 2 so that the replenishment of the chemical can be wholly or partially controlled by these pulses as required.

In operation, the jets of the spraying device 3 wash the contamination off the suspended workpieces 2 moving along the transport path 1. The spray liquor containing the contamination is collected in the spray catcher 10 and from there the pump 9 pumps it via pipe 8 to the ultra-filtration unit 7. The filtrate flowing through the ultra-filtration unit 7 passes to the storage tank 6 for the degreasing agent, from where this liquid is recycled to the jet spray device 3 by pump 5 via pipe 4. The "concentrate" filtered off in the ultra-filtration unit 7, i.e. the greasy emulsion, passes from the ultra-filtration unit 7 via pipe 11 to the collecting tank 12. Meanwhile, the measuring device 14 stores the pulses from the counter 19 and at the same time senses the changes in weight or level in the collecting tank 12. It then gives appropriate actuating pulses to the actuator mechanism of the shut-off devices 15a and 15b of the mixing tank 17 and the supply tank 16. Thus the appropriate amount of degreasing chemical replenishes the storage tank 6, in accordance with the amount of degreasing chemical used up.

Naturally, the invention may also be used where the jet spraying device 3 and the catcher 10 are substituted by an immersion tank. In this case the transport path 1 is so formed that the workpieces 2 dip into the bath in the immersion tank.

#### WHAT WE CLAIM IS:—

1. Pretreatment degreasing apparatus for workpieces to be subsequently coated comprising a treatment station for immersing workpieces in, and/or spraying workpieces with, a liquid containing a degreasing chemical, a recirculation circuit for the liquid including a filter having an inlet from a drain at the treatment station, a concentrate outlet, and a filtrate outlet connected with a supply device for supplying the liquid to the station, controllable metering means for adding the said chemical to the liquid before the liquid reaches the supply device, and a measuring device either for making measurements dependent on the number of workpieces passing through the treatment station, or for making measurements of the quantity of concentrate from the filter which are time dependent and/or dependent on the said number, the measuring device being coupled to the metering means to control the addition of the said chemical in accordance with the measurements made.

2. Apparatus according to claim 1 wherein the concentrate outlet of the filter is connected to a collecting vessel and the measuring device is a level or weight measuring device for sensing in a time-dependent manner

treatment in a coating process, it is known (German published application No. 1621535) to measure the state of exhaustion of the treatment liquid directly and to control accordingly a replenishment of the treating agent and the carrier liquid. However, here the state of the treatment liquid is determined by means of conductivity measuring device directly in the treatment path so that a value for the direct contaminations arising in the bath is obtained only indirectly. Also a constant removal of the contaminations from the bath is not provided.

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The contamination washed off the workpieces 2 is in the form of a greasy, alkaline emulsion collected in a spray liquor catcher 10 and passed from there via a pump 9 and pipe 8 to the ultra-filtration unit 7. The greasy emulsion is prevented from permeating from the "concentrate" side 7b to the filtrate side 7a so that the emulsion passes via a pipe 11 to a collecting tank 12 and from there as an overflow to a neutralising device 13.

The collecting tank 12 is provided with a measuring device 14 which is adapted to sense, as a function of time, changes in weight or level of the contaminants in the collecting tank 12. The sensing or measuring device 14 is connected to a non-illustrated mechanism which effects the opening and closing of shut-off device 15a and 15b of the chemical feeding tank 16 and of the chemical mixing tank 17. Thus the control pulses provided by the measuring device 14 open or close the shut-off devices 15a and 15b, which connect chemical feeding and mixing tanks 16, 17 with a pipe between the collecting tank 12 and the storage tank 6, the pipe being provided with a pump 18. In normal operation the portion of the pipe extending from the collecting tank 12 to the shut-off device 15b is not in use; however, the said portion can be used to convey chemical from the tank 6 (or the tank 17) to clean the interior of the collecting tank. In addition, the sensing device 14

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Naturally, the invention may also be used where the jet spraying device 3 and the catcher 10 are substituted by an immersion tank. In this case the transport path 1 is so formed that the workpieces 2 dip into the bath in the immersion tank.

#### WHAT WE CLAIM IS:—

1. Pretreatment degreasing apparatus for workpieces to be subsequently coated comprising a treatment station for immersing workpieces in, and/or spraying workpieces with, a liquid containing a degreasing chemical, a recirculation circuit for the liquid including a filter having an inlet from a drain at the treatment station, a concentrate outlet, and a filtrate outlet connected with a supply device for supplying the liquid to the station, controllable metering means for adding the said chemical to the liquid before the liquid reaches the supply device, and a measuring device either for making measurements dependent on the number of workpieces passing through the treatment station, or for making measurements of the quantity of concentrate from the filter which are time dependent and/or dependent on the said number, the measuring device being coupled to the metering means to control the addition of the said chemical in accordance with the measurements made.

2. Apparatus according to claim 1 wherein the concentrate outlet of the filter is connected to a collecting vessel and the measuring device is a level or weight measuring device for sensing in a time-dependent manner





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ner the content of the collecting vessel.

3. Apparatus according to claim 2 including a mixing tank having an outlet coupled to the supply device, a first inlet coupled to  
5 receive the filtrate from the filter and a second inlet coupled to receive liquid from the collecting vessel by way of the controllable metering means.

4. Apparatus according to any preceding  
10 claim wherein the measurements made by the measuring device are dependent on the number of workpieces passing through the treatment station, including a counting device for counting workpieces passing through  
15 the treatment station.

5. Apparatus according to any preceding

claim wherein the filter is an ultra-filtration device.

6. Pretreatment degreasing apparatus substantially as herein described with reference 20 to and as shown in the accompanying drawing.

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