United States Patent [19]

Nystrom

[11] **3,916,937**

[45] **Nov. 4, 1975**

[54] **APPARATUS FOR SURFACE PROCESSING**

[76] Inventor: **Bror Erik Nystrom,** Rosenvagen 21, S-560 23 Bankeryd, Sweden

[22] Filed: **July 8, 1974**

[21] Appl. No.: **486,625**

[52] **U.S. Cl.** **137/255;** 204/275; 134/99; 134/153

[51] **Int. Cl.**..... **B01k 3/00;** F16k 51/00

[58] **Field of Search** 137/255, 259, 256, 266, 137/103; 204/275, 276; 134/103, 99, 153

[56] **References Cited**

UNITED STATES PATENTS

3,793,178	2/1974	Austin et al.	204/275 X
3,823,083	7/1974	Minbiole et al.	204/275

FOREIGN PATENTS OR APPLICATIONS

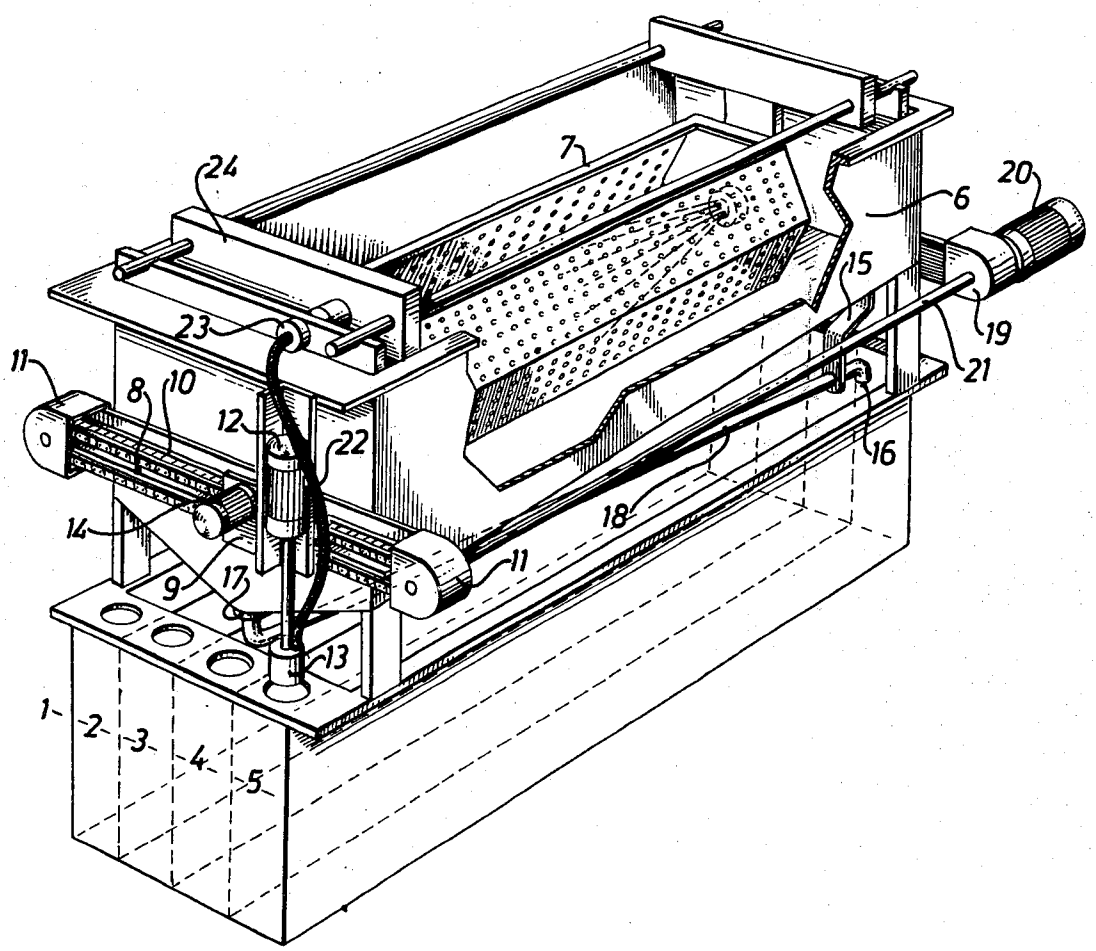
332,108	1/1971	Sweden	137/255

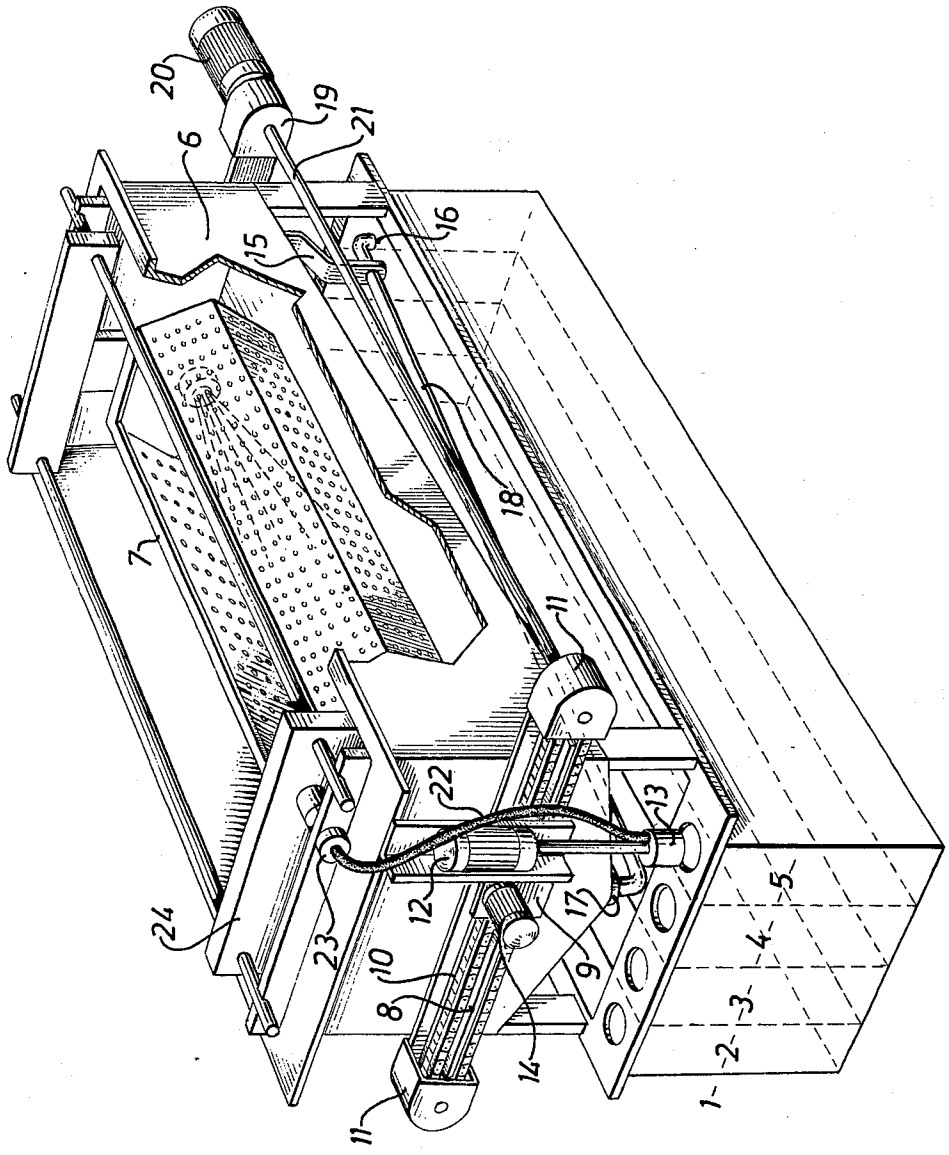
Primary Examiner—Martin P. Schwadron
Assistant Examiner—Robert J. Miller
Attorney, Agent, or Firm—James N. Blauvelt

[57] **ABSTRACT**

An apparatus for the surface processing of articles wherein the number of stations at which the article is treated is minimized. This is accomplished by the provision of means whereby each processing liquid is successively delivered and drained from the same processing bath. A supply chamber for each processing liquid is provided, the liquid from a respective supply chamber being delivered therefrom to the processing bath and returned thereto from the bath simultaneously and synchronously.

9 Claims, 1 Drawing Figure




20
19
21
6
16
15
18
7
11
22
13
24
12
17
5
4
23
10
9
3
8
2
14
1
11

APPARATUS FOR SURFACE PROCESSING

The present invention relates to apparatus for the surface processing of articles which are immersed in a surface processing bath. More particularly the invention relates to apparatus for preparatory or further processing of articles which are enclosed in an electroplating drum immersed in a surface processing bath.

In mass electroplating installations of this kind a plurality of different surface treatments have to be carried out, each of which in conventional installations require a surface station of its own, the surface stations being arranged in the order required by the process cycle used.

Such conventional installations therefore, require much space and are correspondingly expensive. The number of stations can, however, be substantially reduced if the so-called coil rinsing drums according to the Swedish Pat. No. 211,026 are employed.

The object of the apparatus according to the invention therefore is to reduce the number of surface processing stations, which is achieved by enabling the prior and subsequent treatment of the article to be carried out without passing it to another drum at the same station, where the rinsing of the article takes place. The counter-stream rinsing method which is described in the Swedish Pat. No. 332,108 can be employed to advantage at the rinsing stage where poisonous matter has to be removed from the article before subsequent surface processing. It is also possible to provide direct "depoisoning" by spraying the article with dilute antipoison or neutralizing liquids in the electroplating drum according to the Swedish Pat. No. 211,026.

According to the invention therefore an apparatus is provided for surface processing comprising a surface processing bath and a plurality of collaterally arranged supply chambers for containing different surface processing liquids, a pump for delivering the surface processing liquid from a desired one of the supply chambers to the surface processing bath, and an outlet from the surface processing bath adapted to return the surface processing liquid to said desired one of the supply chambers characterised in that the pump has a suction orifice which is movable about and along the adjacent ends of one end of the collaterally arranged supply chambers and vertically movable for immersion into a selected end of said adjacent ends of the supply chambers, the pump having an outlet which is connected to a duct opening into the surface processing bath, an outlet duct communicating with the outlet in the base of the surface processing bath, the outlet duct having an orifice movable over and along the other end of the collaterally arranged supply chambers synchronously with the movement of suction orifice along the ends of said one end of the collaterally arranged supply chambers.

The invention will now be described with reference to the attached drawing, which shows diagrammatically and in perspective an apparatus according to the invention.

Referring to the drawing, **1** is a common supply bath, which is divided in this case into four separate and parallel supply baths **2, 3 4** and **5** for the respective surface treatment liquids. A surface processing bath **6** is placed over the supply bath **1.** The former is so arranged that one or more electroplating drums **7** for the article to be treated can be lowered into the surface processing bath and there set in rotation in a conventional manner.

Along a rail **8** on one end of the surface processing bath is a horizontally movable bracket **9,** which is coupled to a horizontal part of an endless chain **10,** passing over sprocket wheels (not shown) which are accommodated in covers **11** and **19** at both ends of a rail. A centrifugal pump **12** is vertically movable in the bracket and can be set at different heights by means of a motor **14.** By moving the bracket along the mutually adjacent ends of the supply chambers **2–5** a suction orifice **13** of the centrifugal pump can be fitted into the relevant end of the selected supply chamber. On another bracket **15,** which is movable along a rail similar to the rail **8** on the other end of the surface processing bath **6,** there hangs the orifice **16** of an outlet duct **18** mounted in an outlet **17** in the base of the surface processing bath. The bracket **15** is coupled to a horizontal part of an endless chain similar to the chain **10,** the endless chain being passed over sprocket-wheels, one of which is housed in a cover **19** and driven by an electric motor **20.** Since the sprocket wheels in the cover **19** shown and a respective cover **11** are connected by means of a shaft **21,** the two chains and so the two brackets **9** and **15** move synchronously with each other. Thus the suction orifice **13** of the centrifugal pump can be brought by means of the motor **20** into a position over one end of the supply chamber at the same time as the orifice **16** of the outlet duct is passed to the other end of the same supply chamber. Once the centrifugal pump is inserted with its suction orifice **13** into one end of the supply chamber **5,** the liquid from the supply chamber is pumped into the upper part of the surface processing bath through a pliable hose **22,** whose upper end is connected to an electromagnetic switching means **23** for connection to a hollow bearing bush **24** for the electroplating drum **7,** so that the liquid can be injected into the electroplating drum through a journal not shown in the drawing. The liquid flowing out of the perforated electroplating drum is collected in the surface processing bath **6** and flows through the outlet **17** and the outlet duct **18** to the other end of the supply chamber **5.** Hence, this liquid can be mixed with the liquid in the supply chamber, so that any direct passing of the liquid is prevented.

Any direct mixing of the liquids in the different supply chambers **2–5** is obviated by the fact that the bracket with the centrifugal pump **12** is so mechanically coupled to the orifice **16** of the outlet duct **18** that the suction orifice **13** and the orifice **16** of the outlet duct find themselves simultaneously over or in the same supply chamber. A contributory factor is that the pump is a centrifugal pump, from which the liquid flows out when it is turned off.

If for some reason the liquid flowing out of the outlet pipe **18** were to be returned to the corresponding supply chamber the outlet pipe could be set into direct communication with a separate collecting bath or an outlet system. In such a case water from a water pipe can be delivered to the corresponding supply chamber and controlled by a level control means.

Every surface treatment is followed by rinsing with water before the next surface processing liquid is injected into the electroplating drum. This presents the advantage that when the apparatus according to the invention is used the electroplating drum can stay in its position in the surface processing bath **6** throughout the whole of the preparatory treatment programme, which may consist, for instant, of partial emptying, rinsing, pickling, etching and rinsing. Only then is the electroplating drum transferred into the plating bath. With

the plating completed the electroplating drum is returned to its position in the surface processing bath for further treatment. This may consist, for example, of rinsing, pickling, chromating and final rinsing. As the final step the electroplating drum is now taken out of the surface processing bath and the article is allowed to dry, whereby it is finally processed.

The invention can be modified within the scope of the following claims. Thus a suitable programmed control means may be used, and a preliminary and subsequent treatment station may be made completely automatic. Further, the surface processing bath may be adapted for handling several electroplating drums simultaneously, these being arranged beside each other or, preferably, in succession. The cleaning of the apparatus may be made easier if the surface processing bath, together with the pump, outlet duct and the means for the horizontal movement of the pump and the outlet duct that are mounted thereon, is formed as a detachable unit, upon which are mounted supply chambers **1–5** in a common case **1.**

I claim:

1. An apparatus for the surface processing of articles comprising: a surface processing bath having an inlet and an outlet for processing the articles utilizing a plurality of different processing liquids, a plurality of collaterally arranged supply chambers each containing a respective one of said processing liquids; pump means for delivering the processing liquid from each of said supply chambers to said processing bath; said pump means having a suction orifice which is movable above and along the adjacent ends of said supply chambers at one end of said collateral arrangement thereof, and vertically movable for selective immersion into said adjacent ends of the supply chambers and an outlet coupled to the inlet of said processing bath; duct means coupled to the outlet of said processing bath for delivering processing liquid from the processing bath to respective ones of said supply chambers, said duct means having an outlet orifice movable over and along the adjacent ends of the supply chambers at the other end of said collaterally arranged supply chambers synchronously with the movement of said pump means above and along said one end of the collaterally arranged supply chambers whereby as said pump means delivers a processing liquid from a respective one of said supply chambers to the processing bath through the inlet thereof, said duct means simultaneously returns that processing liquid from the bath to said respective one of the supply chambers through the outlet orifice thereof.

2. An apparatus as claimed in claim **1,** wherein first track means is operatively disposed along said one end of the collaterally arranged supply chambers, said first track means having a bracket movably mounted thereon for adjustment relative thereto, said pump means being connected to said bracket for verticle movement relative thereto whereby said pump means is movable along and over said supply chambers and immersable therein respectively.

3. An apparatus as claimed in claim **2,** wherein the outlet orifice of said duct means is connected to said bracket for synchronous movement therewith.

4. An apparatus as claimed in claim **3,** wherein said pump means is a centrifugal pump.

5. An apparatus as claimed in claim **4,** wherein a duct is provided for coupling said pump means to the inlet of said processing bath said duct consisting partially of a pliable hose.

6. An apparatus as claimed in claim **5,** wherein said duct means is a pipe slewably mounted in the base of the said processing bath.

7. An apparatus as claimed in claim **6,** wherein said pipe is a flexible hose.

8. An apparatus as claimed in claim **7,** wherein second track means is operatively disposed along said other end of the collaterally arranged supply chambers, said second track means comprising a rail having a bracket movably mounted thereon which is coupled to the outlet orifice of said duct means, and an endless movable chain coupled to said bracket and passing over sprocket wheels respectively connected to each end of said rail; and said first track means includes a rail having said bracket thereof movably mounted thereon and an endless movable chain coupled to the bracket and passing over sprocket wheels respectively connected to each end of the rail of said first track means; shaft means for coupling one of the sprocket wheels of said first track means with one of the sprocket wheels of said second track means whereby the suction orifice of said pump means and the outlet orifice of said duct means move synchronously with one another.

9. An apparatus as claimed in claim **8,** wherein said processing bath, said pump means, said duct means and said first and second track means are detachably mounted as a unit upon said supply chambers accommodated in a common casing.

* * * * *