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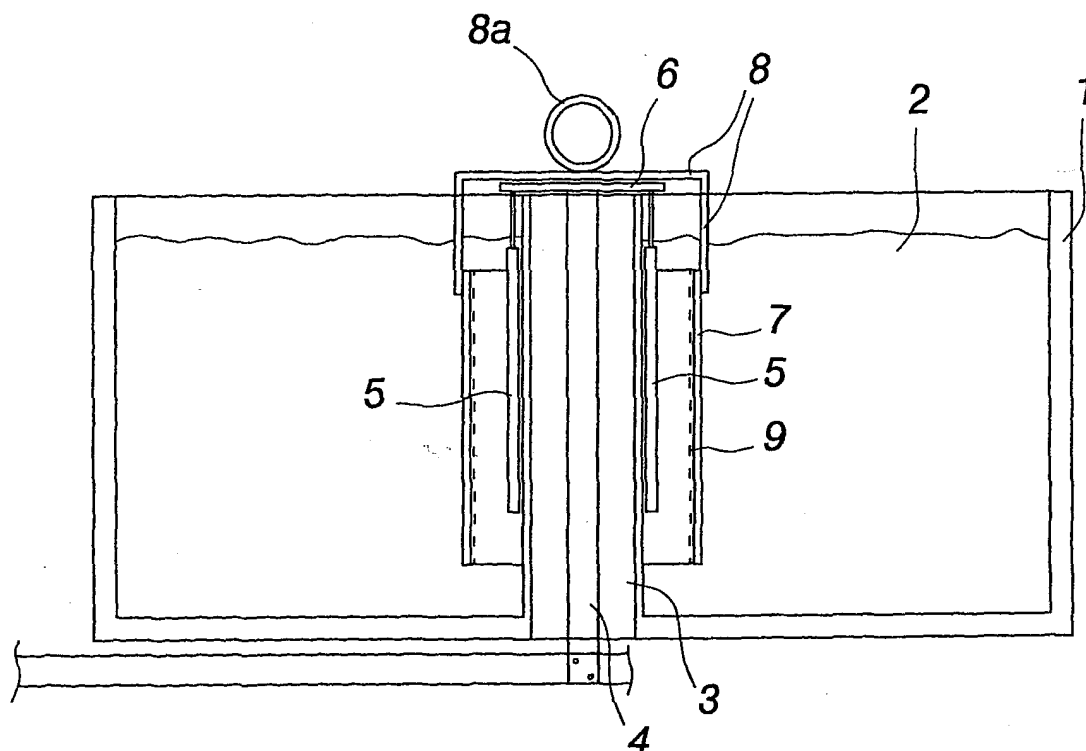
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### (54) A plating method and apparatus with fixed immersed plating tool

(57) A plating method and apparatus, in which the object (7) to be coated is immersed in a bath (2) in a basin (1). A plating tool (5) is kept permanently in the basin (1), in the vicinity of a pipe or duct (3) passing through the basin, and the object (7) to be coated is not placed in conjunction with the tool (5) until inside the

bath (2). In electrolytic plating, a current is supplied to the anodes (5) by means of a conductor rail (4), which is located in the pipe (3) in the basin, which the electrolytic liquid (2) surrounds and which extends above the liquid surface. The object (7) to be coated is immersed in the basin (1) by means of a suspender (8) supported on the upper end of the pipe (3).



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## Description

A plating method and apparatus

**[0001]** The invention relates to a plating method, in which the object to be plated is immersed in a bath in a basin, a plating tool is kept permanently in the basin, and the object to be plated is not placed in conjunction with the tool until inside the bath. The invention also relates to a plating apparatus, which comprises a plating basin containing the liquid bath and the plating tool immersed permanently in the liquid bath.

**[0002]** A special application of the invention is internal plating of objects with chromium coating.

**[0003]** When objects are plated electrolytically with chromium, the plating period is long, which is often due to the thick plating layer required, and the fact that in electrolysis, chromium is reduced poorly and requires much electricity. This necessitates strong electric fields, and it must be possible to direct them to a desired point at the desired intensity.

**[0004]** In the methods currently applied the plating tool, such as anode plates, electric field screens, etc., is fixed to the object to be coated outside the bath and then immersed in the bath together with the object to be coated. The anodes are often contaminated and difficult to handle.

**[0005]** From the inventor's certificate SU 509664 is known a method and apparatus of the type mentioned above. In this known solution, the anode acting as the plating tool is fixed around a mounting bar in the basin. The electric current for this anode must be provided by a particular contactor arrangement located on a cover which can be opened and closed.

**[0006]** The aim of the invention is to improve known methods and apparatuses in such a way that the handling of plating tools will be substantially facilitated and production will thus be increased.

**[0007]** This aim is achieved by means of the invention, in accordance with the characteristics presented in the accompanying claims. Claim 1 discloses the characteristic features of the method and claim 4 discloses the characteristic features of the apparatus.

**[0008]** Since in the solution according to the invention the tool is permanently in the basin and the object to be coated is placed in conjunction with the tool inside the bath, only the object to be coated needs to be changed. The attachments of the tool or the supply of electricity or chemicals to the tool do not have to be disassembled and reassembled when objects are changed.

**[0009]** One embodiment of the invention is described in greater detail in the following, with reference to the accompanying drawing, which shows a section of the plating basin with its plating apparatus, by means of which the method according to the invention can be implemented.

**[0010]** In the following, the invention is described when applied to electrolytic plating, but it may be applied

more widely in hydrometallurgy, in which case a pipe or duct 3 arranged in the basin 1 will serve the supply of chemicals or when, for example, technical nickel plating is carried out without electricity by means of reduction on desired surfaces. Reducing chemicals or electrolytes in general can be supplied through the pipe 3 to the tool.

**[0011]** Most preferably the invention is, however, applicable to electrolytic plating with chromium (hard chromium plating).

**[0012]** In the embodiment described, the plating basin 1 is, for example, a plastic-coated steel basin containing electrolytic liquid 2. The basin 1 comprises one or more vertical pipes 3 passing through the bottom of the basin, the upper ends of which extend above the liquid surface.

In the pipe 3 is located a conductor rail which is fixed to a plate 6 resting on the upper end of the pipe 3, the plate being of electrically extremely conductive material, for example, copper. On the plate 6 are suspended the anode plates 5, which settle around the pipe 3 in a circle.

Through the pipe 3 can also be arranged current supply to the cathode. This type of an arrangement may advantageously be used in the processing industry for the internal plating of tubular objects.

**[0013]** The object 7 to be coated is immersed in the basin 1 by means of a suspender 8 supported on the upper end of the pipe 3 which comprises a lifting lug 8a. Reference numeral 9 denotes the plating precipitated on the inner surface of the object 7.

**[0014]** In addition to the anodes 5, the plating tool often comprises current screens located, for example, in the vicinity of the ends of the object 7. This type of current screens or other components of the apparatus associated with the plating tool may also be supported or suspended on the pipe 3 in such a way that they will be permanently in the basin for as long as identical objects are being coated. When the object to be coated changes, the plating tools are changed or replaced in accordance with the object to be coated.

**[0015]** Through the pipe 3 may also be conducted cooling water or compressed air or the hydraulics required, for example, for expanding or contracting the anodes.

**[0016]** located symmetrically in the basin 1, are vertical and pass through the bottom of the basin.

**[0017]** In the following is in addition a short list of essential features relating to the invention:

1. The plating tools are fixedly in the basin (conventional method: the tool is lifted into the basin together with the object to be coated)
2. The objects to be coated are placed in tools already present in the basin (conventional method: the object to be coated is fixed on the plating tool outside the basin)
3. The new basin makes possible efficient serial working, which saves time and work substantially
4. Makes possible automated operation
5. Applicable for use in both chemical and electrical

precipitation

6. The apparatus is particularly well suited for internal plating

7. The supply of electrical current or chemicals used in the plating takes place mainly through ducts passed through the bottom of the basin

8. The apparatus is also suitable for electrolytic polishing

9. The basin system also comprises all other auxiliary equipment required for managing the bath (e. g. heating, cooling, filtration, chemicals' supply, etc.) located either in the plating basin itself, an auxiliary basin or in the vicinity of the basin.

## Claims

1. A plating method, in which the object (7) to be coated is immersed in a bath (2) in a basin (1), a plating tool (5) is kept permanently in the basin (2) and the object (7) to be coated is not placed in conjunction with the tool (5) until inside the bath (2), **characterised in that** the plating tool (5) is kept in conjunction with a pipe or duct (3) passed through the basin, and that electric current and/or chemicals are supplied to the plating tool (5) through the said pipe or duct (3).

2. A method as claimed in claim 1 for electrolytic plating, **characterised in that** the plating tool, which comprises anodes (5), is kept permanently in the basin, that a current is conveyed to the anodes (5) by means of a conductor rail (4) located in the pipe (3) in the basin, which is surrounded by electrolytic liquid (2) and extends above the liquid surface.

3. A method as claimed in claim 1 or 2, **characterised in that** the object (7) to be coated is immersed in the basin (1) by means of a suspender (8) supported on the upper end of the pipe (3).

4. A plating apparatus, which comprises a plating basin (1) containing a liquid bath (2) and a plating tool (5) immersed in the liquid bath (2), the said tool being permanently in the basin, **characterised in that** in the basin is a pipe (3) surrounded by the liquid bath (2), in conjunction with which the plating tool (5) is arranged and which comprises means (4) for supplying electricity or chemicals to the plating tool (5).

5. An apparatus as claimed in claim 4 for electrolytic plating, **characterised in that** the plating tool comprises anodes (5) to which a current is supplied by means of a conductor rail (4) located in the pipe (3) in the basin (1), which the electrolytic liquid (2) surrounds and which extends above the liquid surface.

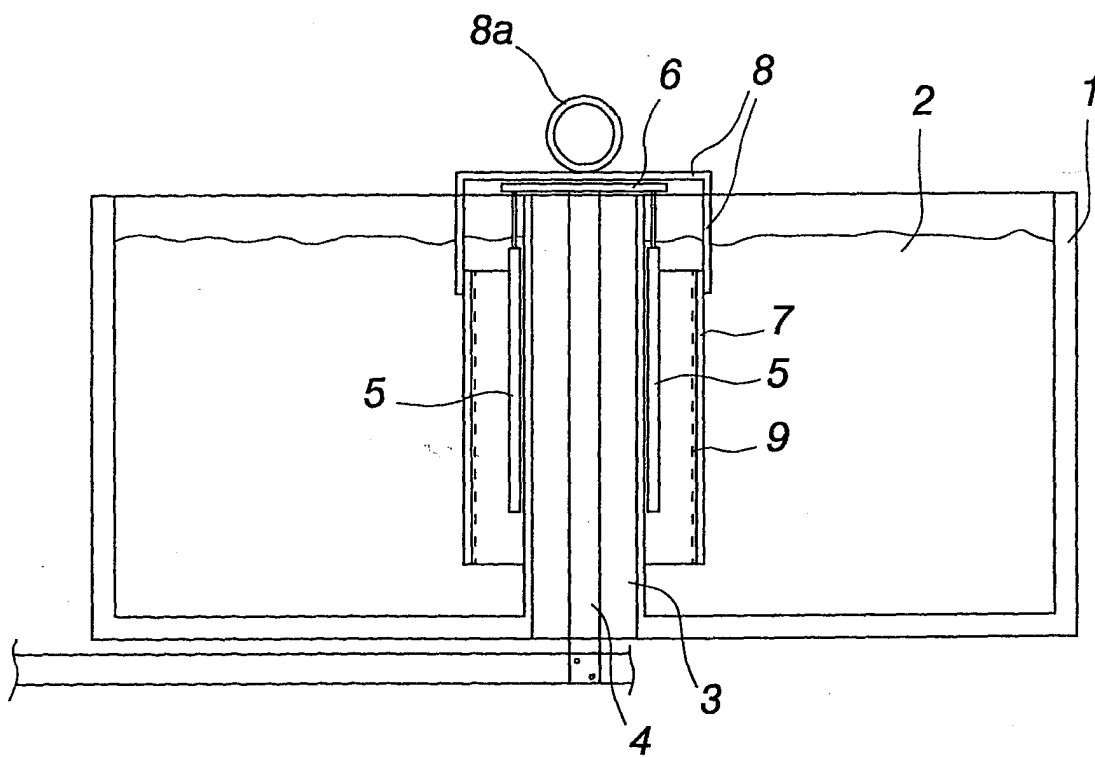
6. An apparatus as claimed in claim 4 or 5, **characterised in that** one or more vertical pipes (3) pass through the bottom of the basin (1).

7. An apparatus as claimed in any of the claims 4 to 6, **characterised in that** the object (7) to be coated can be immersed in the basin (1) by means of a suspender (8) supported on the upper end of the pipe (3).

8. An apparatus as claimed in any of the claims 4 to 6, **characterised in that** the anode plates (5) comprised in the plating tools are arranged in a circle surrounding the pipe (3) and the arrangement is used for the internal plating of tubular objects of the processing industry.

9. An apparatus as claimed in any of the claims 4 to 8, **characterised in that** one or more pipes (3) surrounded by a liquid bath (2) are located symmetrically in the basin (1).

10. The use of the method according to any of the claims 1 to 3 or of the apparatus according to any of the claims 4 to 8 for plating objects with a chromium coating.





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# EUROPEAN SEARCH REPORT

Application Number  
EP 03 10 0234

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X	US 4 303 481 A (MORTIER FRANCOIS ET AL) 1 December 1981 (1981-12-01) * column 1, line 25-34 * * figure 5 * * claims 1,7,8 *	1,3,4, 7-10	C25D17/00 C25D7/04
Y	* abstract *	2,5,6	
X	US 4 853 099 A (SMITH GARY W) 1 August 1989 (1989-08-01) * figure 1 * * column 5, line 5-57 * * claim 1 *	1,3,4, 7-10	
Y	* abstract *	2,5,6	
X	US 5 985 123 A (KON KAM KWAN) 16 November 1999 (1999-11-16) * figure 1 * * column 3, line 26 - column 4, line 24 *	1,3,4,7, 9	
			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			C25D
The present search report has been drawn up for all claims			
Place of search MUNICH		Date of completion of the search 27 May 2003	Examiner Haering, C
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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**ANNEX TO THE EUROPEAN SEARCH REPORT  
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EP 03 10 0234

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.  
The members are as contained in the European Patent Office EDP file on  
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