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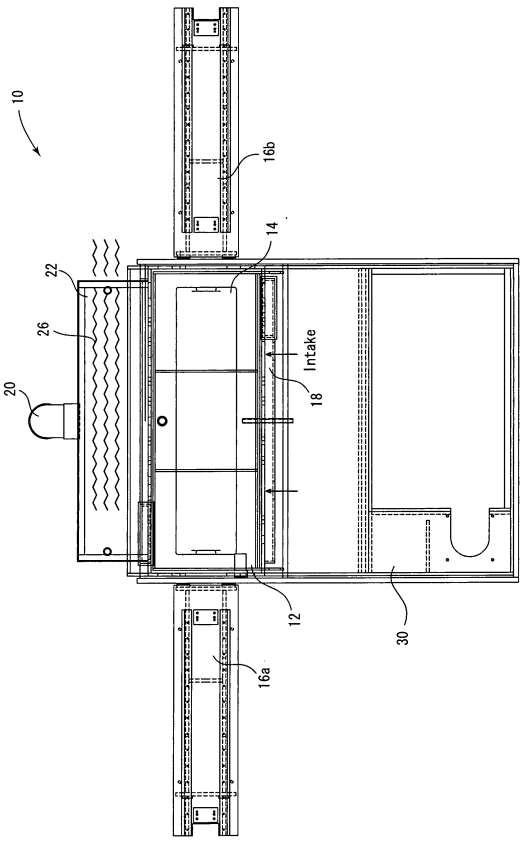
(54) PROCESSING UNIT HAVING CONDENSER, AND FULLY AUTOMATIC GRAVURE PLATEMAKING PROCESSING SYSTEM USING SAME

(57) Provided is a processing unit including a condenser, which is capable of condensing, during a plate-making process to be performed by the processing unit in a fully automatic gravure plate-making processing system, a processing solution vaporized into the form of mist so as to reuse the resultant as the processing solution, and to provide a fully automatic gravure plate-making processing system using the processing unit including a condenser. The processing unit includes a condenser, which is to be used for a fully automatic gravure plate-making processing system for manufacturing a plate-making roll by performing a series of processes on an unprocessed plate-making roll. The processing unit includes: a processing bath; chuck means for holding a gravure cylinder inside the processing bath; an intake port for taking in air, which is provided in a part of the processing bath; an exhaust port for exhausting gas, which is provided in another part of the processing bath; a condenser provided between the processing bath and the exhaust port; and a processing solution return pipe for returning, to the processing bath, a processing solution obtained by the condenser that liquefies a part of the gas to be exhausted.

FIG.1



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Description

Technical Field

[0001] The present invention relates to a processing unit including a condenser, which is to be used for a fully automatic gravure plate-making processing system for manufacturing a plate-making roll by performing a series of processes on a plate-making roll to be processed (hereinafter referred to as "unprocessed plate-making roll"), and to a fully automatic gravure plate-making processing system using the processing unit including a condenser.

Background Art

[0002] Conventionally, fully automatic gravure plate-making processing systems disclosed in, for example, Patent Documents 1 to 3 have been known.

[0003] Further, the applicant of this application has proposed a fully automatic gravure plate-making processing system having high degrees of freedom, which is capable of manufacturing a gravure plate-making roll more quickly as compared to a conventional system, achieving space saving, performing an unattended operation even in the nighttime, flexibly customizing a manufacturing line, and satisfying various customer needs (Patent Document 4).

[0004] The above-mentioned fully automatic gravure plate-making processing system is configured to manufacture a plate-making roll by performing a series of processes on an unprocessed plate-making roll, and the processes are performed by respective processing units.

[0005] A copper plating apparatus described in, for example, Patent Document 5 is known as a further specific example of the conventional processing unit.

[0006] In the copper plating apparatus described above, a processing solution vaporized into the form of mist during a plating process is exhausted as it is and filtrated with a filter or the like, and then the resultant is exhausted to the outside. Also in a case of a chromium plating apparatus and an etching apparatus, the processing solution vaporized into the form of mist during the process is exhausted as it is and filtrated with a filter or the like, and then the resultant is exhausted to the outside. Therefore, every time the plate-making process is performed by each processing unit, the amount of the processing solution is reduced, and as a measure against the reduction in amount of the processing solution, for example, the processing solution is added after the plate-making process by an amount corresponding to the vaporization amount.

[0007] Further, in the case of the copper sulfate plating apparatus described in Patent Document 5 and the like, the vapor is particularly liable to be generated, and hence there is a problem in that the vapor is jammed in the middle of the passage even when an exhaust gas cleaning apparatus such as a mist scrubber is mounted.

Prior Art Documents

Patent Documents

[0008]

Patent Document 1: JP Hei 10-193551 A
Patent Document 2: WO 2007/135898
Patent Document 3: WO 2007/135899
Patent Document 4: WO 2011/125926
Patent Literature 5: JP 2005-29876 A

Summary of the Invention

Problems to be solved by the invention

[0009] The present invention has been made in view of the above-mentioned problems inherent in the conventional technologies, and it is therefore an object thereof to provide a processing unit including a condenser, which is capable of condensing, during a plate-making process to be performed by the processing unit in a fully automatic gravure plate-making processing system, a processing solution vaporized into the form of mist so as to reuse the resultant as the processing solution, and to provide a fully automatic gravure plate-making processing system using the processing unit including a condenser.

Means for Solving Problems

[0010] In order to solve the above-mentioned problems, according to one embodiment of the present invention, there is provided a processing unit including a condenser, which is to be used for a fully automatic gravure plate-making processing system for manufacturing a plate-making roll by performing a series of processes on an unprocessed plate-making roll, the processing unit including: a processing bath; chuck means for holding a gravure cylinder inside the processing bath; an intake port for taking in air, which is provided in a part of the processing bath; an exhaust port for exhausting gas, which is provided in another part of the processing bath; a condenser provided between the processing bath and the exhaust port; and a processing solution return pipe for returning, to the processing bath, a processing solution obtained by the condenser that liquefies a part of the gas to be exhausted.

[0011] Further, it is preferred that the condenser be an air-cooled condenser. This is because space saving can be achieved. As the air-cooled condenser, a mist collector that is a plate having a large number of baffles arranged thereon is taken as an example. This is because, through use of this mist collector, the processing solution vaporized into the form of mist can be collected and liquefied efficiently.

[0012] As the processing unit including a condenser, the present invention is applicable to any processing unit

of the type in which the processing solution is used during the plate-making process, and the processing solution is vaporized into the form of mist and then exhausted. In particular, it is suitable that the processing unit including a condenser be at least one processing apparatus selected from among a copper plating apparatus, a chromium plating apparatus, or an etching apparatus.

[0013] The fully automatic gravure plate-making processing system according to the present invention is constructed by assembling the above-mentioned processing unit including a condenser according to the present invention.

Advantageous Effects of the Invention

[0014] The present invention has a remarkable effect of providing the processing unit including a condenser, which is capable of condensing, during the plate-making process to be performed by the processing unit in the fully automatic gravure plate-making processing system, the processing solution vaporized into the form of mist so as to reuse the resultant as the processing solution, and providing the fully automatic gravure plate-making processing system using the processing unit including a condenser.

[0015] As described above, through use of the processing unit including a condenser according to the present invention, during the plate-making process to be performed by the processing unit in the fully automatic gravure plate-making processing system, the processing solution vaporized into the form of mist is condensed so that the resultant can be reused as the processing solution. Thus, the reduction in amount of the processing solution is suppressed, and hence the cost for the plate-making process is reduced. Moreover, the total amount of gas to be exhausted is reduced, and hence there is an advantage in that the load on the exhaust gas cleaning apparatus such as a filter is reduced and the improvement is satisfactorily achieved in the environmental issues around the system.

Brief Description of Drawings

[0016]

FIG. 1 is a plan view illustrating a processing unit including a condenser according to one embodiment of the present invention as seen from the top.

FIG. 2 is a left-hand side view of the processing unit including a condenser in FIG. 1.

Modes for Carrying out the Invention

[0017] Embodiments of the present invention are described below, but those embodiments are described as examples, and hence it is understood that various modifications may be made thereto without departing from the technical spirit of the present invention. In addition, the same members are represented by the same reference symbols.

[0018] In the drawings, reference symbol 10 represents a processing unit including a condenser of the present invention.

[0019] The processing unit 10 including a condenser is a processing unit including a condenser, which is to be used for a fully automatic gravure plate-making processing system for manufacturing a plate-making roll by performing a series of processes on an unprocessed plate-making roll. The processing unit 10 includes a processing bath 12, chuck means 16a and 16b for holding a gravure cylinder 14 inside the processing bath 12, an intake port 18 for taking in air, which is provided in a part of the processing bath 12, an exhaust port 20 for exhausting gas, which is provided in another part of the processing bath 12, a condenser 22 provided between the processing bath 12 and the exhaust port 20, and a processing solution return pipe 24 for returning, to the processing bath 12, a processing solution obtained by the condenser 22 that liquefies a part of the gas to be exhausted.

[0020] Further, the condenser 22 illustrated in the figures is an air-cooled condenser. As the air-cooled condenser, there is described an example in which a mist collector that is a plate (made of hard vinyl chloride) having a large number of baffles 26 arranged thereon is used as the condenser 22. That is, when the processing unit 10 performs a plate-making process (in a case of a copper plating apparatus, a copper plating process) on the gravure cylinder 14, a processing solution vaporized into the form of mist impinges and adheres onto the baffles 26 while passing through the condenser 22. Thus, the mist of the processing solution is collected and condensed into liquid again.

[0021] The processing solution thus liquefied is returned again to the processing bath 12 through the processing solution return pipe 24, and the returned processing solution is reused. Further, a part of the exhaust gas that is not condensed into liquid again is exhausted through the exhaust port 20.

[0022] In the processing unit 10 including a condenser in the figures, there is described an example in which "SUNLOID" Eliminator manufactured by Sumitomo Bakelite Co., Ltd. is used as the mist collector serving as the condenser 22. Through use of this mist collector, the processing solution vaporized into the form of mist can be collected and liquefied efficiently.

[0023] In the example of the figures, there is described an example in which a copper plating apparatus is used as the processing unit 10 including a condenser. In addition to the example of the figures, the present invention is applicable to any processing unit of the type in which the processing solution is used during the plate-making process, and the processing solution is vaporized into the form of mist and then exhausted. In particular, the processing unit including a condenser according to the present invention is suitably used as a copper plating

apparatus, a chromium plating apparatus, an etching apparatus, or the like.

[0024] Further, in the figures, reference symbol 28 represents a frame member for supporting components of the processing unit 10, such as an electrode, and reference symbol 30 represents a casing of the processing unit 10. As the basic structure of the processing unit 10 other than the condenser 22, for example, the structure similar to that of the processing unit described in Patent Document 4 and the like may be employed.

[0025] Further, the fully automatic gravure plate-making processing system according to the present invention is constructed by assembling the processing unit 10 including a condenser according to the present invention into the fully automatic gravure plate-making processing system described in, for example, Patent Documents 1 to 4. Among others, it is suitable to assemble the processing unit including a condenser according to the present invention into the fully automatic gravure plate-making processing system disclosed in Patent Document 4. This is because the fully automatic gravure plate-making processing system described in Patent Document 4 is a fully automatic gravure plate-making processing system having high degrees of freedom, which is capable of manufacturing a gravure plate-making roll more quickly as compared to a conventional system, achieving space saving, performing an unattended operation even in the nighttime, flexibly customizing a manufacturing line, and satisfying various customer needs.

[0026] As described above, through use of the processing unit including a condenser according to the present invention, during the plate-making process to be performed by the processing unit in the fully automatic gravure plate-making processing system, the processing solution vaporized into the form of mist is condensed so that the resultant can be reused as the processing solution. Thus, the reduction in amount of the processing solution is suppressed, and hence the cost for the plate-making process is reduced. Moreover, the total amount of gas to be exhausted is reduced, and hence there is an advantage in that the load on the exhaust gas cleaning apparatus is reduced and the improvement is satisfactorily achieved in the environmental issues around the system.

Reference Signs List

[0027] 10: processing unit including condenser, 12: processing bath, 14: gravure cylinder, 16a, 16b: chuck means, 18: intake port, 20: exhaust port, 22: condenser, 24: solution return pipe, 26: baffle, 28: frame member, 30: casing.

Claims

1. A processing unit including a condenser, which is to be used for a fully automatic gravure plate-making processing system for manufacturing a plate-making roll by performing a series of processes on an unprocessed plate-making roll,
the processing unit comprising:

a processing bath;
chuck means for holding a gravure cylinder inside the processing bath;
an intake port for taking in air, which is provided in a part of the processing bath;
an exhaust port for exhausting gas, which is provided in another part of the processing bath;
a condenser provided between the processing bath and the exhaust port; and
a processing solution return pipe for returning, to the processing bath, a processing solution obtained by the condenser that liquefies a part of the gas to be exhausted.

2. A processing unit including a condenser according to claim 1, wherein the condenser comprises an air-cooled condenser.

3. A processing unit including a condenser according to claim 1 or 2, wherein the processing unit including a condenser comprises at least one processing apparatus selected from among a copper plating apparatus, a chromium plating apparatus, or an etching apparatus.

4. A fully automatic gravure plate-making processing system, which is constructed by assembling the processing unit including a condenser according to any one of claims 1 to 3.

FIG.1

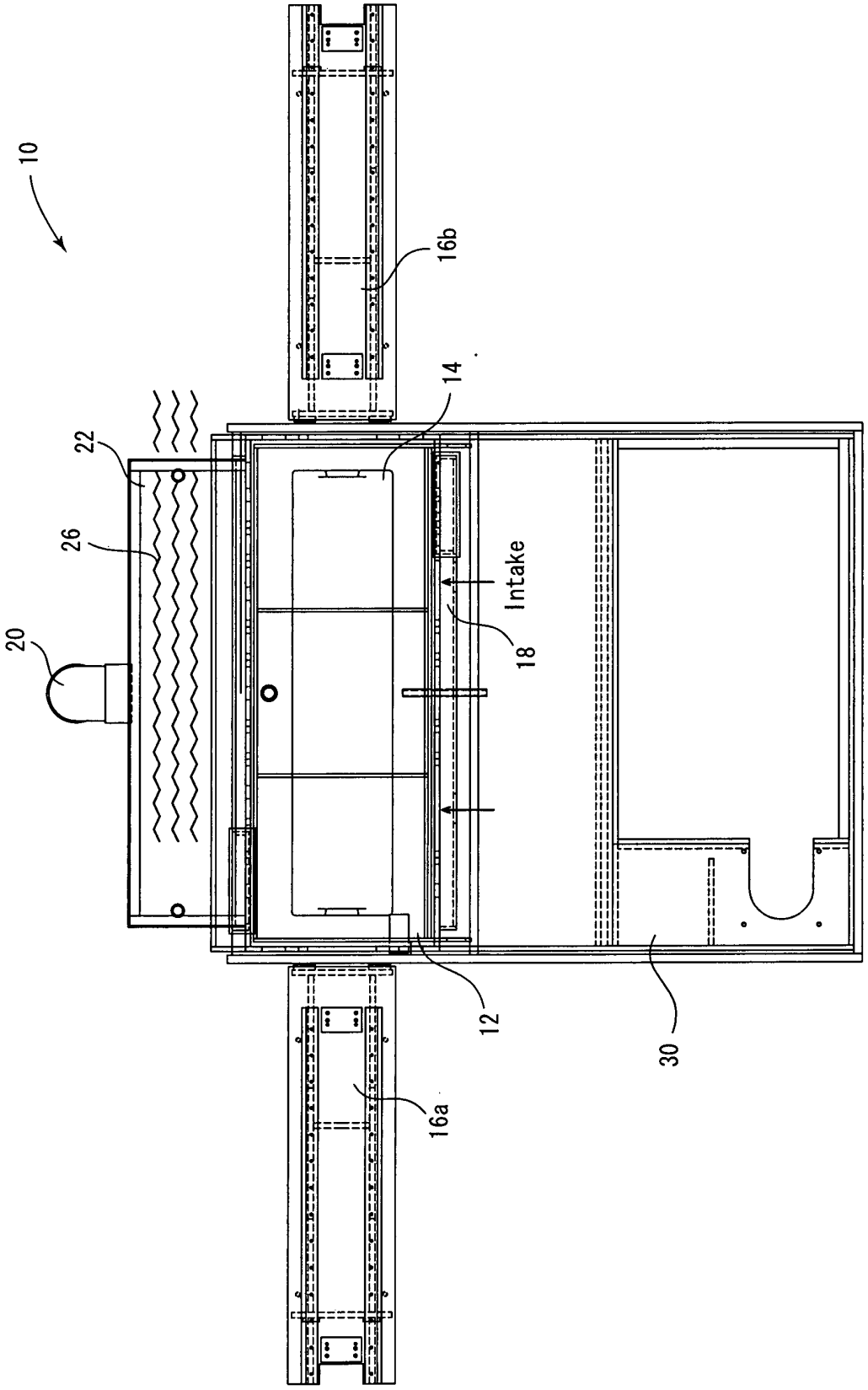
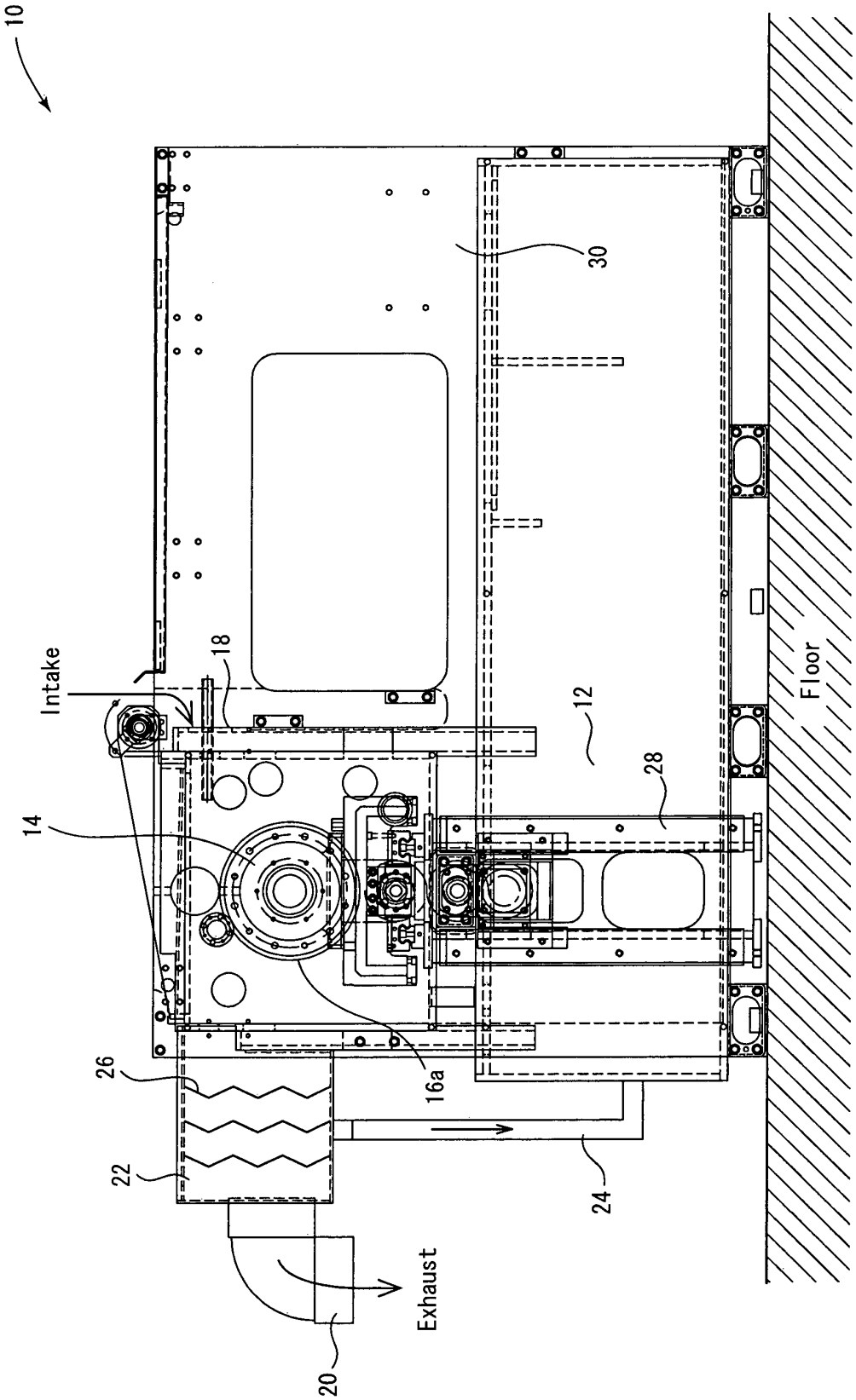


FIG.2



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2012/081489

A. CLASSIFICATION OF SUBJECT MATTER
C25D21/18(2006.01)i, *B41C1/18*(2006.01)i, *B41N1/06*(2006.01)i, *C23F1/08*(2006.01)i, *C25D7/00*(2006.01)i, *C25D17/00*(2006.01)i, *C25D19/00*(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
C25D21/18, B41C1/18, B41N1/06, C23F1/08, C25D7/00, C25D17/00, C25D19/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Jitsuyo Shinan Koho	1922-1996	Jitsuyo Shinan Toroku Koho	1996-2013
Kokai Jitsuyo Shinan Koho	1971-2013	Toroku Jitsuyo Shinan Koho	1994-2013

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 10-193551 A (Think Laboratory Co., Ltd.), 28 July 1998 (28.07.1998), claims; paragraphs [0001], [0002], [0013] to [0015] (Family: none)	1-4
Y	JP 9-165699 A (Nichiei Hard Chrome Industrial Co.), 24 June 1997 (24.06.1997), claims; paragraphs [0011] to [0014]; fig. 1, 4 & US 5766428 A & EP 781864 A1	1-4

☒ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
05 March, 2013 (05.03.13)	12 March, 2013 (12.03.13)
Name and mailing address of the ISA/ Japanese Patent Office Facsimile No.	Authorized officer Telephone No.

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2012/081489

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 66193/1984(Laid-open No. 179302/1985) (NEC Corp.), 28 November 1985 (28.11.1985), claims; fig. 1 (Family: none)	1-4
A	JP 7-252697 A (Taiho Kogyo Co., Ltd.), 03 October 1995 (03.10.1995), claims; paragraph [0002]; fig. 7 (Family: none)	1-4
A	JP 9-111498 A (Yazaki Corp.), 28 April 1997 (28.04.1997), claims; paragraph [0017]; fig. 5 (Family: none)	1-4

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP HEI10193551 A **[0008]**
- WO 2007135898 A **[0008]**
- WO 2007135899 A **[0008]**
- WO 2011125926 A **[0008]**
- JP 2005029876 A **[0008]**