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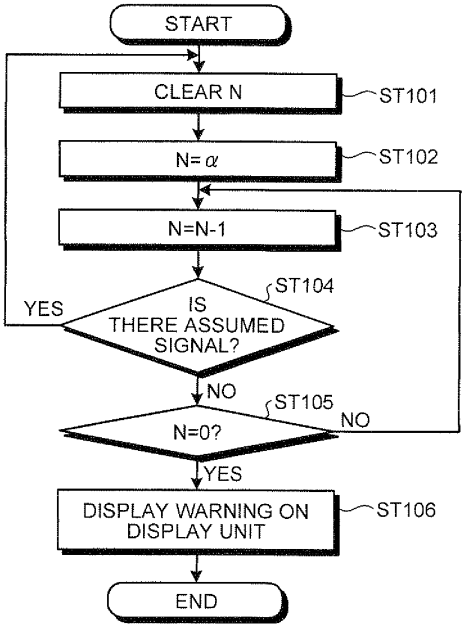
(54) MAINTENANCE SUPPORT EQUIPMENT FOR PRINTING MACHINE, PRINTING MACHINE, AND MAINTENANCE SUPPORT METHOD FOR PRINTING MACHINE

(57) A maintenance support device comprises: a determining unit that determines whether a maintenance work has been performed based on presence of a second work, which is different from the maintenance work and is performed at a time of performing the maintenance work for maintaining a printing press; and a display controller that causes to display information prompting to perform the maintenance work, when a predetermined period has passed since a last determination that the maintenance work has been performed until a next determination that the maintenance work has been performed again. Accordingly, because information indicating that the first work has been performed is automatically input to the maintenance support device, the maintenance support device can display more accurate information relating to maintenance to an operator.

FIG.10



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Description

TECHNICAL FIELD

[0001] The present invention relates to a maintenance support device that displays a scheduled date on which an operator performs maintenance for a device next time to the operator, and relates to a printing press and a maintenance support method.

BACKGROUND ART

[0002] For example, Patent Document 1 discloses a printing press including a counter. When a certain count level is reached, for example, when the number of printing times reaches 10,000,000, an operating system of this printing press informs an operator who operates the operating system of the printing press that it is a maintenance timing.

[0003] Patent Document 1: Japanese Patent Application Laid-open No. 2001-202225 (paragraph 0028)

DISCLOSURE OF INVENTION

PROBLEM TO BE SOLVED BY THE INVENTION

[0004] However, in the technique disclosed in Patent Document 1, the counter needs to be reset manually by the operator who operates the operating system. Therefore, in the operating system, if the operator forgets to reset the counter, an accurate maintenance timing may not be informed to the operator.

[0005] The present invention has been achieved to solve the above problem, and an object of the present invention is to display more accurate information relating to the maintenance to an operator.

MEANS FOR SOLVING PROBLEM

[0006] According to an aspect of the present invention, a maintenance support device for a printing press includes: a determining unit that determines whether a first work has been performed based on presence of a second work, which is different from the first work and is performed at a time of performing the first work for maintaining the printing press; and a display controller that causes to display information prompting to perform the first work, when the determining unit cannot determine that the first work has been performed within a predetermined period since a last determination by the determining unit that the first work has been performed.

[0007] According to the above configuration, the maintenance support device for a printing press can determine whether the first work has been performed based on the presence of the second work, without requiring a unit that directly determines whether the first work has been performed. Further, because the second work is normally performed at the time of performing the first work, information indicating that the first work has been performed is automatically input to the maintenance support device for a printing press, even if an operator does not intentionally input that the first work has been performed to the maintenance support device for a printing press.

[0008] Accordingly, the maintenance support device for a printing press according to the present invention can avoid a case such that the information indicating that the first work has been performed is not input to the maintenance support device for a printing press by an operator. Further, the maintenance support device for a printing press according to the present invention counts the predetermined period since a point in time when the information indicating that the first work has been performed is input automatically to the maintenance support device for a printing press, to display information prompting the operator to perform the first work. Therefore, the maintenance support device for a printing press according to the present invention can display accurate information relating to maintenance to the operator.

[0009] Advantageously, the second work is opening and closing of a cover, and the determining unit determines presence of the first work based on whether the cover has been opened and closed.

[0010] When a target part of the first work is blocked by the cover, an operator generally performs the first work by opening the cover. Accordingly, the maintenance support device for a printing press according to the present invention can determine whether the first work has been performed by detecting opening/closing of the cover.

[0011] The maintenance support device for a printing press according to the present invention determines that the first work has been performed by detecting opening/closing of the cover, and counts the predetermined period since a point in time when it is assumed that the first work has been performed, to display information prompting the operator to perform the first work. Accordingly, the maintenance support device for a printing press according to the present invention can display more accurate information relating to maintenance to the operator.

[0012] Advantageously, the second work is a work for bringing a tool closer to a tool mounting unit, and the determining unit determines presence of the first work based on whether the tool has been brought closer to the tool mounting unit.

[0013] When the first work is performed by using the tool, an operator generally performs the first work by bringing the tool closer to the tool mounting unit. Accordingly, the maintenance support device for a printing press according to the present invention can determine whether the first work has been performed by detecting an access between the tool and the tool mounting unit.

[0014] The maintenance support device for a printing press according to the present invention determines that the first work has been performed based on the access between the tool and the tool mounting unit, and counts the predetermined period since a point in time when it is assumed that the first work has been performed, to display information prompting the operator to perform the first work. Accordingly, the maintenance support device for a printing press according to the present invention can display more accurate information relating to maintenance to the operator.

[0015] Advantageously, the second work is a work for inserting a tool into a tool mounting unit and the determining unit determines presence of the first work based on whether the tool has been inserted into the tool mounting unit.

[0016] When the first work is performed by using the tool, an operator generally performs the first work by inserting the tool into the tool mounting unit. Accordingly, the maintenance support device for a printing press according to the present invention can determine whether the first work has been performed by detecting an insertion of the tool into the tool mounting unit.

[0017] The maintenance support device for a printing press according to the present invention determines that the first work has been performed based on the insertion of the tool into the tool mounting unit, and counts the predetermined period since a point in time when it is assumed that the first work has been performed, to display information prompting the operator to perform the first work. Accordingly, the maintenance support device for a printing press according to the present invention can display more accurate information relating to maintenance to the operator.

[0018] Advantageously, the second work is a controlling work for operating the printing press as a target of the first work to perform the first work, and the determining unit determines presence of the first work based on whether the controlling work has been performed.

[0019] When an operator needs to perform a work for controlling the printing press before performing the first work, the operator performs the first work after having performed a predetermined controlling work on the printing press. Accordingly, the maintenance support device for a printing press according to the present invention can determine whether the first work has been performed by detecting the controlling work on the printing press by the operator.

[0020] The maintenance support device for a printing press according to the present invention determines that the first work has been performed based on the controlling work on the printing press by the operator, and counts the predetermined period since a point in time when it is assumed that the first work has been performed, to display information prompting the operator to perform the first work. Accordingly, the maintenance support device for a printing press according to the present invention can display more accurate information relating to maintenance with to the operator.

[0021] According to another aspect of the present invention, a printing press includes: a feeder unit that feeds set paper; a printing unit that performs printing on the paper; a delivery unit that ejects the paper after printing from the printing unit, and a maintenance support device for a printing press that comprises a determining unit that determines whether a first work has been performed based on presence of a second work, which is different from the first work and is performed at a time of performing the first work for maintaining the printing press, and a display controller that causes to display information prompting to perform the first work, when the determining unit cannot determine that the first work has been performed within a predetermined period since a last determination by the determining unit that the first work has been performed.

[0022] Accordingly, the printing press according to the present invention can avoid a case such that the information indicating that the first work has been performed is not input to the printing press by an operator. Further, the printing press according to the present invention counts the predetermined period since a point in time when the information indicating that the first work has been performed is input automatically to the printing press, to display information prompting the operator to perform the first work. Accordingly, the printing press according to the present invention can display more accurate information relating to maintenance to the operator.

[0023] Advantageously, the second work is opening and closing of a cover, and the determining unit determines presence of the first work based on whether the cover has been opened and closed.

[0024] When a target part of the first work is blocked by the cover, an operator generally performs the first work by opening the cover. Accordingly, the printing press according to the present invention can determine whether the first work has been performed by detecting opening/closing of the cover.

[0025] The printing press according to the present invention determines that the first work has been performed by detecting opening/closing of the cover, and counts the predetermined period since a point in time when it is assumed that the first work has been performed, to display information prompting the operator to perform the first work. Accordingly, the maintenance support device for a printing press according to the present invention can display more accurate information relating to maintenance to the operator.

[0026] Advantageously, the second work is a work for bringing a tool closer to a tool mounting unit, and the determining unit determines presence of the first work based on whether the tool has been brought closer to the tool mounting unit.

[0027] When the first work is performed by using the tool, an operator generally performs the first work by bringing the tool closer to the tool mounting unit. Accordingly, the printing press according to the present invention can determine whether the first work has been performed by detecting an access between the tool and the tool mounting unit. The printing press according to the present invention determines that the first work has been performed based on the access between the tool and the tool mounting unit, and counts the predetermined period since a point in time when it is assumed that the first work has been performed, to display information prompting the operator to perform the first work. Accordingly, the printing press according to the present invention can display more accurate information relating to maintenance to the operator.

[0028] Advantageously, the second work is a work for inserting a tool into a tool mounting unit and the determining unit determines presence of the first work based on whether the tool has been inserted into the tool mounting unit.

[0029] When the first work is performed by using the tool, an operator generally performs the first work by inserting the tool into the tool mounting unit. Accordingly, the printing press according to the present invention can determine whether the first work has been performed by detecting an insertion of the tool into the tool mounting unit.

[0030] The printing press according to the present invention determines that the first work has been performed based on the insertion of the tool into the tool mounting unit, and counts the predetermined period since a point in time when it is assumed that the first work has been performed, to display information prompting the operator to perform the first work. Accordingly, the printing press according to the present invention can display more accurate information relating to maintenance to the operator.

[0031] Advantageously, the second work is a controlling work for operating the printing press as a target of the first work to perform the first work, and the determining unit determines presence of the first work based on whether the controlling work has been performed.

[0032] When an operator needs to perform a work for controlling the printing press before performing the first work, the operator performs the first work after having performed a predetermined controlling work on the printing press. Accordingly, the printing press according to the present invention can determine whether the first work has been performed by detecting the controlling work on the printing press by the operator.

[0033] The printing press according to the present invention determines that the first work has been performed based on the controlling work on the printing press by the operator, and counts the predetermined period since a point in time when it is assumed that the first work has been performed, to display information prompting the operator to perform the first work. Accordingly, the printing press according to the present invention can display more accurate information relating to maintenance to the operator.

[0034] According to still another aspect of the present invention, a maintenance support method for a printing press includes: a procedure of determining whether a first work has been performed based on presence of a second work, which is different from the first work and is performed at a time of performing the first work for maintaining the printing press; and a procedure of causing to display information prompting to perform the first work, when it is not determined that the first work has been performed within a predetermined period since a last determination that the first work has been performed.

[0035] According to the above configuration, in the maintenance support method for a printing press, it can be determined whether the first work has been performed based on the presence of the second work, without requiring a unit that directly determines whether the first work has been performed. Further, because the second work is normally performed at the time of performing the first work, information indicating that the first work has been performed is automatically input to the maintenance support device for a printing press, even if an operator does not intentionally input that the first work has been performed.

[0036] Accordingly, the maintenance support method for a printing press according to the present invention can avoid a case such that the information indicating that the first work has been performed is not input to the maintenance support device for a printing press by an operator. Further, in the maintenance support method for a printing press according to the present invention, the predetermined period is counted since a point in time when the information indicating that the first work has been performed is input automatically to the maintenance support device for a printing press, and information prompting the operator to perform the first work is displayed. Therefore, the maintenance support method for a printing press according to the present invention can display accurate information relating to maintenance to the operator.

[0037] Advantageously, the second work is opening and closing of a cover, and the determining unit determines presence of the first work based on whether the cover has been opened and closed.

[0038] When a target part of the first work is blocked by the cover, an operator generally performs the first work by opening the cover. Accordingly, the maintenance support method for a printing press according to the present invention can determine whether the first work has been performed by detecting opening/closing of the cover.

[0039] In the maintenance support method for a printing press according to the present invention, it is determined that the first work has been performed by detecting opening/closing of the cover, and the predetermined period is counted since a point in time when it is assumed that the first work has been performed, to display information prompting the operator to perform the first work. Accordingly, the maintenance support method for a printing press according to the

present invention can display more accurate information relating to maintenance to the operator.

[0040] Advantageously, the second work is a work for bringing a tool closer to a tool mounting unit, and the determining unit determines presence of the first work based on whether the tool has been brought closer to the tool mounting unit.

[0041] When the first work is performed by using the tool, an operator generally performs the first work by bringing the tool closer to the tool mounting unit. Accordingly, the maintenance support method for a printing press according to the present invention can determine whether the first work has been performed by detecting an access between the tool and the tool mounting unit.

[0042] In the maintenance support method for a printing press according to the present invention, it is determined that the first work has been performed based on the access between the tool and the tool mounting unit, and the predetermined period is counted since a point in time when it is assumed that the first work has been performed, to display information prompting the operator to perform the first work. Accordingly, the maintenance support method for a printing press according to the present invention can display more accurate information relating to maintenance to the operator.

[0043] Advantageously, the second work is a work for inserting a tool into a tool mounting unit and the determining unit determines presence of the first work based on whether the tool has been inserted into the tool mounting unit.

[0044] When the first work is performed by using the tool, an operator generally performs the first work by inserting the tool into the tool mounting unit. Accordingly, the maintenance support method for a printing press according to the present invention can determine whether the first work has been performed by detecting an insertion of the tool into the tool mounting unit.

[0045] In the maintenance support method for a printing press according to the present invention, it is determined that the first work has been performed based on the insertion of the tool into the tool mounting unit, and the predetermined period is counted since a point in time when it is assumed that the first work has been performed, to display information prompting the operator to perform the first work. Accordingly, the maintenance support method for a printing press according to the present invention can display more accurate information relating to maintenance to the operator.

[0046] Advantageously, the second work is a controlling work for operating the printing press as a target of the first work to perform the first work, and the determining unit determines presence of the first work based on whether the controlling work has been performed.

[0047] When an operator needs to perform a work for controlling the printing press before performing the first work, the operator performs the first work after having performed a predetermined controlling work on the printing press. Accordingly, the maintenance support method for a printing press according to the present invention can determine whether the first work has been performed by detecting the controlling work on the printing press by the operator.

[0048] In the maintenance support method for a printing press according to the present invention, it is determined that the first work has been performed based on the controlling work on the printing press by the operator, and the predetermined period is counted since a point in time when it is assumed that the first work has been performed, to display information prompting the operator to perform the first work. Accordingly, the maintenance support method for a printing press according to the present invention can display more accurate information relating to maintenance to the operator.

[0049] Advantageously, the first work is a cleaning work on members constituting the printing press, the second work is an operation of a tool used when the members are cleaned, and the determining unit determines presence of the first work based on whether the tool has been operated.

[0050] Accordingly, the present invention can determine presence of the first work based on not only whether the tool has been operated but also whether a cleaning tool has been operated.

[0051] Advantageously, the tool is a fluid discharging unit that discharges a fluid to a cleaning target when an operating unit is operated, and the determining unit determines presence of the first work based on whether the operating unit in the fluid discharging unit has been operated.

[0052] For example, the fluid discharging unit is an airgun, and the operating unit is a trigger of the airgun, for example. An operator operates the trigger of the airgun at the time of performing the first work. Accordingly, the present invention can determine presence of first work based on whether the operator has used the airgun.

[0053] Advantageously, the printing press includes: a fluid discharging unit that discharges a fluid to a cleaning target; a hose connected to the fluid discharging unit to cause the fluid to flow toward the fluid discharging unit; and an storage unit that stores the hose. The tool is the storage unit, and the determining unit determines presence of the first work based on whether the storage unit is operated and the hose has been pulled out from the storage unit.

[0054] For example, the fluid discharging unit is an airgun that discharges air, and in this case, the storage unit stores the hose for supplying the air to the airgun. An operator pulls out the hose of the airgun from the storage unit at the time of performing the first work. Accordingly, the present invention can determine presence of the first work based on whether the operator has used the airgun.

[0055] Advantageously, the first work is cleaning of a fan provided in a delivery unit that accumulates paper ejected from a printing unit of the printing press that performs printing on the paper, the second work is an operation of moving an delivery pile board on which the paper ejected from the printing unit is stacked, and the determining unit determines presence of the first work based on whether the operation of moving the delivery pile board has been performed.

[0056] When the fan provided in the delivery unit, proximity of the fan, and the entire delivery unit are to be cleaned, the delivery pile board is moved in a direction away from the fan. Accordingly, the present invention can determine presence of the first work based on whether there has been a movement of the delivery pile board.

[0057] Advantageously, the first work is maintenance of an oil filter that removes a foreign material included in an oil supplied to the printing press, the second work is removal of a cover that covers the oil filter, and the determining unit determines that the first work has been performed when the cover is removed from a part where the oil filter is provided.

[0058] The maintenance of the oil filter means cleaning, replacement or the like of the oil filter. When the maintenance of the oil filter is to be performed, an operator removes the cover. Accordingly, the present invention can determine presence of the first work based on whether the cover has been removed.

[0059] According to still another aspect of the present invention, a maintenance support method for a printing press includes: a determining unit that determines whether a maintenance work has been performed, based on a magnitude of change in a value of a variable per unit time that changes gradually with a passage of a using time of the printing press and changes in a stepwise manner when the maintenance work for maintaining the printing press is performed, and a display controller that causes to display information prompting to perform the maintenance work, when the determining unit cannot determine that the maintenance work has been performed within a predetermined period since a last determination by the determining unit that the maintenance work has been performed.

[0060] The change in a stepwise manner means a change such that a value changes not gradually but instantly. The value of the variable normally changes gradually. However, when the maintenance work is performed, the value of the variable changes in a stepwise manner. Accordingly, the present invention can determine whether the maintenance work has been performed based on a magnitude of change in the value of the variable.

[0061] Advantageously, the maintenance work is maintenance of an oil filter that removes a foreign material included in an oil supplied to the printing press, the value of the variable is a magnitude of an electric current to be supplied to an oil pump for driving the oil pump that feeds the oil, and the determining unit determines that the maintenance work has been performed when a magnitude of change in a value of the electric current per unit time is equal to or larger than a predetermined value.

[0062] A pressure loss of the oil flowing via the oil filter changes with a passage of time. Accordingly, the magnitude of the value of an electric current to be supplied to the oil pump also changes. The magnitude of a current value normally changes gradually with a passage of time.

[0063] However, when the maintenance work is performed, the pressure loss of the oil flowing via the oil filter changes in a stepwise manner, and thus the magnitude of the current value also changes in a stepwise manner. Accordingly, the present invention can determine whether the maintenance work has been performed based on the magnitude of change in the current value per unit time.

[0064] Advantageously, the maintenance work is maintenance of an air pump filter that removes a foreign material included in air supplied to an air pump provided in the printing press, the value of the variable is a magnitude of a valve opening for adjusting a flow rate of air fed from the air pump, and the determining unit determines that the maintenance work has been performed when the magnitude of the valve opening per predetermined time is equal to or larger than a predetermined value.

[0065] A pressure loss of air flowing via the air pump filter changes with a passage of time. Accordingly, the valve opening for adjusting the flow rate of the air fed from the air pump is gradually increased with a passage of time.

[0066] The valve opening normally increases gradually with a passage of time. However, when the maintenance work is performed, the pressure loss of the air flowing via the air pump filter changes in a stepwise manner, and thus the valve opening also decreases in a stepwise manner. Accordingly, the present invention can determine whether the maintenance work has been performed based on the magnitude of change in the valve opening per predetermined time.

EFFECT OF THE INVENTION

[0067] According to the present invention, more accurate information relating to maintenance can be displayed to an operator.

BRIEF DESCRIPTION OF DRAWINGS

[0068]

[Fig. 1] Fig. 1 is a schematic diagram of a configuration of a maintenance support device according to an embodiment of the present invention.

[Fig. 2] Fig. 2 is a schematic diagram of a display unit according to the embodiment.

[Fig. 3] Fig. 3 is a schematic diagram of another display unit according to the embodiment.

[Fig. 4] Fig. 4 is a schematic diagram of still another display unit according to the embodiment.

[Fig. 5] Fig. 5 is a schematic diagram of an assumed signal generator according to the embodiment.
[Fig. 6] Fig. 6 is a schematic diagram of another assumed signal generator according to the embodiment.
[Fig. 7] Fig. 7 is a schematic diagram of still another assumed signal generator according to the embodiment.
[Fig. 8] Fig. 8 is a schematic diagram of still another assumed signal generator according to the embodiment.
[Fig. 9] Fig. 9 is a conceptual diagram of a configuration of a printing press control device according to the embodiment.
[Fig. 10] Fig. 10 is a flowchart for explaining a process procedure performed by the maintenance support device according to the embodiment.
[Fig. 11] Fig. 11 is an explanatory diagram of an example of the maintenance support device according to the embodiment.
[Fig. 12] Fig. 12 is a schematic diagram of an assumed signal generator provided in an airgun.
[Fig. 13] Fig. 13 is a schematic configuration diagram of an delivery pile board and a delivery fan in a delivery unit.
[Fig. 14] Fig. 14 is a schematic configuration diagram of an oil pump and an oil filter used for a printing press.
[Fig. 15] Fig. 15 is a configuration diagram of an example of a configuration when an assumed signal is transmitted to a calculating device when a switch is turned off.
[Fig. 16] Fig. 16 is a schematic configuration diagram of an air pump and a valve.

EXPLANATIONS OF LETTERS OR NUMERALS

[0069]

10	maintenance support device
100	printing press
101 (101a to 101e)	nipple
102	grease gun
103	printing press control device
103m	storage unit
103p	CPU
104	airgun
104a	discharge port
104b	hose fitting port
104c	lever
105	hose
106	reel
111	oil path
112	oil pump
113	oil filter
114	filter cover
115	power supply
116	air filter

117	air pump
118	valve
119	air supply path
11	calculating device
11a	counter calculator
11b	information acquiring unit
11c	determining unit
11d	display controller
12	display unit
13	input unit
14	printing press control unit
20 (20A, 20B, 20C, 20D, 20E, 20F, 20G, 20H)	assumed signal generator
21	(21a, 21b, 21c, 21d) limit switch
21e	switch
21f	rotation sensor
21g	switch
21h	current-value change-rate monitor
21i	opening change-rate monitor
22 (22a, 22b)	cover
23 (23a, 23b)	checking window
24a	IC tag reader
24b	antenna
25 (25a, 25b, 25c, 25d)	IC tag
2	feeder unit
3	printing unit
4	delivery unit
30	transfer cylinder
32	plate cylinder
33	blanket cylinder

34	impression cylinder
41	delivery pile board
42	delivery fan
43	operating unit
43down	down button
43up	up button
A, B, C, D, E	lubrication target
B01, B02, B03	bus
E01	input port
E02	output part
E03	input interface
E03a	analog-to-digital converter
E03b	digital input buffer
E04	output interface
E04a	control circuit
R	pull-up resistor

BEST MODE(S) FOR CARRYING OUT THE INVENTION

[0070] The present invention is explained below in detail with reference to the accompanying drawings. The present invention is not limited to the best mode for carrying out the invention (hereinafter, "embodiment"). In addition, constituent elements in the embodiment include those that can be easily assumed by persons skilled in the art, that are substantially equivalent, and so-called equivalents.

[0071] Fig. 1 is a schematic diagram of a configuration of a maintenance support device according to an embodiment of the present invention. It is explained that a maintenance support device 10 according to the embodiment supports lubrication as a first work for supplying lubricant to respective units of a printing press 100; however, the present invention is not limited thereto. For example, the maintenance support device 10 can support lubrication with respect to respective units of a general machine tool. For example, the maintenance support device 10 can support procedures such as visual inspection, cleaning, and replacement of respective units as the first work other than lubrication. In the present embodiment, supply of lubricant is referred to as "lubrication".

[0072] As shown in Fig. 1, the maintenance support device 10 supports lubrication in the printing press 100. The printing press 100 includes rotary members and sliding members. Therefore, an operator needs to supply lubricant to these rotary members and sliding members regularly. A supply destination of lubricant is referred to as "lubrication target". The printing press 100 has a plurality of lubrication targets. The maintenance support device 10 displays information prompting an operator to lubricate the lubrication target when a predetermined period has passed since last lubrication to the respective lubrication targets.

[0073] For example, the printing press 100 is a sheet-fed rotary printing press. The printing press 100 includes a feeder unit 2, a plurality of printing units 3, and a delivery unit 4. The feeder unit 2 feeds set paper and supplies paper to the printing unit 3. The printing units 3 include a plate cylinder 32, a blanket cylinder 33, and an impression cylinder 34. For example, in the case of a printing press for color printing, in the printing unit 3, four units corresponding to respective printing colors of K, C, M, and Y are connected. Paper is carried from the feeder unit 2 to the delivery unit 4 by the impression cylinders 34 and transfer cylinders 30, and chain grippers. In the delivery unit 4, the paper printed by the printing unit 3 is accumulated in a stacked state.

[0074] The printing unit 3 includes an ink supply unit including a plurality of rollers for supplying ink to the plate cylinder 32 and a water roller group that supplies dampening water. The ink supply unit supplies ink to the plate cylinder 32. The ink supply unit includes an ink bottle, an intermediate ink-roller group, a plurality of ink reciprocating rollers, and a plurality of inking rollers.

[0075] In the ink supply unit, ink in the ink bottle is appropriately kneaded while being sequentially transferred through the intermediate ink-roller group, the respective ink reciprocating rollers, and the inking roller, and is supplied to the plate cylinder 32. A plate of a printing image is mounted on the plate cylinder 32. The blanket cylinder 33 transfers the printing image from the plate cylinder 32 to the paper.

[0076] The impression cylinder 34 presses the paper against the blanket cylinder 33. In the printing unit 3, the paper is carried to pass between the blanket cylinder 33 and the impression cylinder 34, thereby transferring the printing image to the paper.

[0077] The maintenance support device 10 includes a calculating device 11, a display unit 12, and an input unit 13. The calculating device 11 performs a maintenance support procedure described later. For example, the calculating device 11 is incorporated in a printing press control device 103 that controls an operation of the printing press 100. The display unit 12 is electrically connected to the calculating device 11. The display unit 12 displays a result of the maintenance support procedure to inform information relating to maintenance of the printing press 100 to an operator. The display unit 12 is a monitor, for example.

[0078] The input unit 13 is electrically connected to the calculating device 11. The input unit 13 is operated by an operator, and inputs information relating to maintenance, such as maintenance date, name, and ID of the operator who has performed the maintenance, to the calculating unit 11. The input unit 13 is a keyboard, a mouse, and an assumed signal generator 20A, for example. The maintenance support device 10 has a different feature as compared with the conventional technique, such that it includes the assumed signal generator 20A. The assumed signal generator 20A is explained later in detail.

[0079] The calculating device 11 is incorporated in the printing press control device 103; however, the present embodiment is not limited thereto. The calculating device 11 can be provided as a dedicated device separately from the printing press control device 103.

[0080] Fig. 2 is a schematic diagram of the display unit according to the present embodiment. Fig. 3 is a schematic diagram of another display unit according to the present embodiment. Fig. 4 is a schematic diagram of still another display unit according to the present embodiment. As shown in Fig. 2, the display unit 12 displays, for example "date". The display unit 12 also displays information such as "last lubrication date", "scheduled lubrication date", and "days remaining until next feed" for each "lubrication target". In Fig. 2, it is assumed that the "date" is January 8th, for example.

[0081] As for a lubrication target A, the "last lubrication date" is January 1st and the "scheduled lubrication date" is January 8th, which is a week later. In the lubrication target A, because today is the scheduled lubrication date, the "days remaining until next lubrication" of the lubrication target A is 0. As shown in Fig. 2, when the "days remaining until next lubrication" is 0, the display unit 12 highlights the "days remaining until next lubrication" so that the display is highly visible than a case that the "days remaining until next lubrication" is not 0. The display unit 12 highlights an item of the lubrication target with the "days remaining until next lubrication" being 0 by flashing or setting a background color to a different color from other lubrication targets, for example.

[0082] As for a lubrication target B, the "last lubrication date" is January 2nd and the "scheduled lubrication date" is February 2nd, which is a month later. The "days remaining until next lubrication" of the lubrication target B is 24 days. As for a lubrication target C, the "last lubrication date" is January 3rd and the "scheduled lubrication date" is March 3rd, which is two months later. The "days remaining until next lubrication" of the lubrication target C is 54 days. As for a lubrication target D, the "last lubrication date" is January 4th and the "scheduled lubrication date" is April 4th, which is three months later. The "days remaining until next lubrication" of the lubrication target D is 86 days.

[0083] The display unit 12 is not limited thereto, and for example, as shown in Fig. 3, the display unit 12 can display only the "days remaining until next lubrication" for each "lubrication target". Accordingly, the maintenance support device 10 can simplify display contents. The maintenance support device 10 can inform only information relating to required maintenance to an operator.

[0084] For example, as shown in Fig. 4, the display unit 12 can prompt an operator to lubricate respective "lubrication" targets" as "waring", only when lubrication is required. In this case, the display unit 12 is not a general monitor, and can be a display unit using a more inexpensive LED than the general monitor. The LED lights up when the "days remaining until next lubrication" becomes 0.

[0085] When the display unit 12 includes the LED, the LED can be provided near the actual lubrication target. Accordingly, the maintenance support device 10 can display information prompting an operator to lubricate the lubrication target so that the operator instinctively feels necessity of lubrication.

[0086] The LED can emit lights of multiple colors. In this case, the display unit 12 changes the mode of information relating to maintenance to be displayed on the display unit 12 based on the days remaining until the next maintenance of the printing press 100 (in the present embodiment, "days remaining until next lubrication"). Specifically, the LED emits

light of a first color when the "days remaining until next lubrication" approaches 0. Thereafter, the LED emits light of a second color when the "days remaining until next lubrication" becomes 0. Accordingly, the maintenance support device 10 can display information prompting an operator to lubricate the lubrication target, by dividing the information into several stages by the "days remaining until next lubrication".

[0087] The display unit 12 can be constituted by combining any one of display units 12 shown in Figs. 2 to 4. For example, as shown in Fig. 2, the maintenance support device 10 can includes a monitor that displays "date", and "last lubrication date", "scheduled lubrication date", and "days remaining until next lubrication" for each "lubrication target", and an LED provided near the actual lubrication target to emit light. Accordingly, the maintenance support device 10 can display information prompting an operator to lubricate the lubrication target at a more accurate timing.

[0088] Fig. 5 is a schematic diagram of the assumed signal generator according to the present embodiment. As shown in Fig. 5, the assumed signal generator 20A includes a limit switch 21. The limit switch 21 is electrically connected to the calculating device 11. The limit switch 21 is respectively provided in nipples 101a to 101d as a tool mounting unit, which is a lubricant filler port provided in the printing press 100.

[0089] The nipple 101a is an opening for supplying lubricant to the lubrication target A. The nipple 101b is an opening for supplying lubricant to the lubrication target B. The nipple 101c is an opening for supplying lubricant to the lubrication target C. The nipple 101d is an opening for supplying lubricant to the lubrication target D.

[0090] The limit switch 21 includes limit switches 21a, 21b, 21c, and 2ld, for example. The limit switch 21a is provided on the nipple 101a. The limit switch 21b is provided on the nipple 101b. The limit switch 21c is provided on the nipple 101c. The limit switch 21d is provided on the nipple 101d.

[0091] First, for example, when supplying lubricant to the lubrication target A, an operator inserts without fail a grease gun 102, as a tool, into the nipple 101a. At this time, the grease gun 102 presses the limit switch 21a. Accordingly, the limit switch 21a transmits an assumed signal indicating that the grease gun 102 is inserted into the nipple 101a to the calculating device 11. The calculating device 11 assumes that lubricant is supplied to the lubrication target A by the operator based on the assumed signal. A signal indicating that the operator performs the maintenance work on each maintenance target is referred to as "assumed signals".

[0092] Next, for example, when supplying lubricant to the lubrication target B, an operator inserts the grease gun 102 into the nipple 101b without fail. At this time, the grease gun 102 presses the limit switch 21b. Accordingly, the limit switch 21b transmits an assumed signal indicating that the grease gun 102 is inserted into the nipple 101b to the calculating device 11, and thus the calculating device 11 assumes that lubricant is supplied to the lubrication target B by the operator.

[0093] Next, for example, when supplying lubricant to the lubrication target C, an operator inserts the grease gun 102 into the nipple 101c without fail. At this time, the grease gun 102 presses the limit switch 21c. Accordingly, the limit switch 21c transmits an assumed signal indicating that the grease gun 102 is inserted into the nipple 101c to the calculating device 11, and thus the calculating device 11 assumes that lubricant is supplied to the lubrication target C by the operator.

[0094] Next, for example, when supplying lubricant to the lubrication target D, an operator inserts the grease gun 102 into the nipple 101d without fail. At this time, the grease gun 102 presses the limit switch 21d. Accordingly, the limit switch 21d transmits an assumed signal indicating that the grease gun 102 is inserted into the nipple 101d to the calculating device 11, and thus the calculating device 11 assumes that lubricant is supplied to the lubrication target D by the operator.

[0095] Thus, when a work to insert the grease gun 102 as a tool into the nipple 101 as a tool mounting unit is performed as a second work, the maintenance support device 10 determines that the maintenance as the first work has been performed.

[0096] The assumed signal generator 20A can include a proximity switch instead of the limit switch 21. The proximity switch detects that the grease gun approaches the nipple, and transmits an assumed signal to the calculating device 11. The proximity switch is a sensor that turns on/off a relay by using a change in magnetic flux when a detected body, such as the grease gun 102 is approaching thereto in this context, by a combination of a magnetic-flux detecting element and a magnet.

[0097] Fig. 6 is a schematic diagram of another assumed signal generator according to the present embodiment. It is explained that the assumed signal generator 20A includes one limit switch 21 for each of the nipples; however, the present embodiment is not limited thereto. For example, as shown in Fig. 6, an assumed signal generator 20B can further include a cover 22 having the limit switch 21. The printing press 100 is constituted such that an operator cannot insert the grease gun into the nipple unless the cover 22 is opened at the time of lubrication.

[0098] In this case, it is most preferable that lubrication periods are the same for a plurality of nipples separated by one cover 22. The lubrication period is an interval between the "last lubrication date" and the "scheduled lubrication date". The "lubrication period of the nipple 101a" indicates an interval between the "last lubrication date" and the "scheduled lubrication date" for the lubrication target A. When nipples having different lubrication periods are separated by the cover 22, it is desired that the nipples with the lubrication periods thereof being close to each other are sorted together and separated. In this case, even if the lubrication period of the nipple 101 is different, the maintenance support device

10 can display the information prompting an operator to lubricate the lubrication target at a right lubrication timing, for at least one nipple 101.

[0099] For example, as shown in Fig. 6, nipples 101a to 101c separated by a cover 22a have the same lubrication period. Further, the nipple 101d and a nipple 101e separated by a cover 22b have the same lubrication period. The lubrication period of the nipples 101a to 101c is different from that of the nipples 101d and 101e.

[0100] The lubrication targets A, B, and C have the same lubrication period. Therefore, an operator normally performs lubrication to the lubrication targets A, B, and C simultaneously. Further, the lubrication target D and a lubrication target E have the same lubrication period, and thus the operator normally performs lubrication to the lubrication targets D and E simultaneously.

[0101] The limit switch 21a is provided on the cover 22a. The limit switch 21b is provided on the cover 22b. The limit switch 21a transmits a signal indicating opening/closing of the cover 22a to the calculating device 11 as an assumed signal. The limit switch 21b transmits a signal indicating opening/closing of the cover 22b to the calculating device 11 as an assumed signal.

[0102] For example, when supplying lubricant to the lubrication targets A, B, and C, an operator opens the cover 22a without fail. Accordingly, the limit switch 21a transmits a signal indicating that the cover 22a is opened and closed as an assumed signal to the calculating device 11. The calculating device 11 assumes that lubricant is supplied to the lubrication targets A, B, and C by the operator based on the assumed signal.

[0103] When supplying lubricant to lubrication targets D and E, an operator opens the cover 22b without fail. Accordingly, the limit switch 21b transmits a signal indicating that the cover 22b is opened and closed as an assumed signal to the calculating device 11. The calculating device 11 assumes that lubricant is supplied to the lubrication targets D and E by the operator based on the assumed signal.

[0104] Thus, when the cover is opened and closed as the second work, the maintenance support device 10 determines that the maintenance has been performed as the first work.

[0105] The cover 22 sorts and separates the nipples 101 by lubrication period. Accordingly, the assumed signal generator 20 can decrease the number of limit switches 21 required than a case that the limit switch 21 is provided respectively in all nipples 101. Accordingly, the maintenance support device 10 can reduce costs required for manufacturing the maintenance support device 10. Further, the maintenance support device 10 can simplify wiring for connecting the calculating device 11 and the limit switch 21.

[0106] Fig. 7 is a schematic diagram of still another assumed signal generator according to the present embodiment. It is explained that the assumed signal generator 20B includes the cover 22; however, the present embodiment is not limited thereto. For example, as shown in Fig. 7, conventionally, an assumed signal generator 20C can substitute a checking window 23 at the time of lubrication provided in the printing press 100 as the cover 22. The printing press 100 is constituted such that an operator cannot insert the grease gun into the nipple unless the operator opens the cover 22 at the time of lubrication.

[0107] In this case, it is most preferable that the lubrication periods are the same for the plurality of nipples separated by one checking window 23. When nipples having different lubrication periods are separated by the checking window 23, it is desired that the nipples with the lubrication periods thereof being close to each other are sorted together and separated. In this case, even if the lubrication period of the nipple 101 is different, the maintenance support device 10 can display the information prompting an operator to lubricate the lubrication target at a right lubrication timing, for at least one nipple 101.

[0108] In the present embodiment, as shown in Fig. 7, the nipples 101a to 101c separated by a checking window 23a have the same lubrication period. Further, nipples 101d and 101e separated by a checking window 23b have the same lubrication period. The lubrication period of the nipples 101a to 101c is different from that of the nipples 101d and 101e.

[0109] The lubrication targets A, B, and C have the same lubrication period. Therefore, an operator normally performs lubrication to the lubrication targets A, B, and C simultaneously. Further, the lubrication targets D and E have the same lubrication period, and thus the operator normally performs lubrication to the lubrication targets D and E simultaneously.

[0110] The limit switch 21a is provided in the checking window 23a. The limit switch 21b is provided in the checking window 23b. The limit switch 21a transmits a signal indicating opening/closing of the checking window 23a to the calculating device 11 as an assumed signal. The limit switch 21b transmits a signal indicating opening/closing of the checking window 23b to the calculating device 11 as an assumed signal.

[0111] For example, when supplying lubricant to the lubrication targets A, B, and C, an operator opens the checking window 23a without fail. Accordingly, the limit switch 21a transmits a signal indicating that the cover 22a is opened and closed as an assumed signal to the calculating device 11. The calculating device 11 assumes that lubricant is supplied to the lubrication targets A, B, and C by the operator.

[0112] When supplying lubricant to the lubrication targets D and E, an operator opens the checking window 23b without fail. Accordingly, the limit switch 21b transmits a signal indicating that the checking window 23b is opened and closed as an assumed signal to the calculating device 11. The calculating device 11 assumes that lubricant is supplied to the lubrication targets D and E by the operator.

[0113] Thus, when the checking window 23 is opened and closed as the second work, the maintenance support device 10 determines that the maintenance has been performed as the first work.

[0114] Accordingly, the maintenance support device 10 can determine whether lubricant has been supplied to the respective lubrication targets, even if the cover 22 is not newly formed in the printing press 100. Therefore, the maintenance support device 10 can reduce costs required for manufacturing the maintenance support device 10.

[0115] Fig. 8 is a schematic diagram of still another assumed signal generator according to the present embodiment. For example, as shown in Fig. 8, an assumed signal generator 20D includes an IC tag reader 24a, an antenna 24b, and an IC tag 25. The IC tag reader 24a and the antenna 24b are provided on the grease gun 102. The IC tag 25 is provided in each of the nipples 101. Accordingly, in the printing press 100, the IC tag reader 24a and the antenna 24b approach the IC tag 25 at the time of lubrication without fail.

[0116] The IC tag reader 24a reads information individually held by the IC tags 25. The antenna 24b wirelessly transmits the information to the calculating device 11. The IC tag reader 24a and the calculating device 11 can be electrically connected to each other by wire not via the antenna 24b. However, wiring of the maintenance support device 10 can be simplified by electrically connecting the IC tag reader 24a and the calculating device 11 wirelessly via the antenna 24b. Accordingly, the maintenance support device 10 can suppress interruption of a lubrication work performed by an operator due to the wiring.

[0117] The IC tag 25 includes IC tags 25a, 25b, 25c, and 25d, for example. The IC tag 25a is provided on the nipple 101a. The IC tag 25b is provided on the nipple 101b. The IC tag 25c is provided on the nipple 101c. The IC tag 25d is provided on the nipple 101d.

[0118] For example, when supplying lubricant to the lubrication target A, an operator inserts the grease gun 102 into the nipple 101a without fail. At this time, the IC tag 25a approaches the IC tag reader 24a without fail. Accordingly, the IC tag reader 24a wirelessly communicates witch the IC tag 25a. The IC tag 25a transmits a signal indicating that the grease gun 102 is inserted into the nipple 101a to the calculating device 11. Accordingly, the calculating device 11 assumes that lubricant is supplied to the lubrication target A by the operator.

[0119] Next, for example, when supplying lubricant to the lubrication target B, the operator inserts the grease gun 102 into the nipple 101b without fail. At this time, the IC tag 25b approaches the IC tag reader 24a without fail. Accordingly, the IC tag reader 24a wirelessly communicates with the IC tag 25b. The IC tag 25b transmits a signal indicating that the grease gun 102 is inserted into the nipple 101b to the calculating device 11. Accordingly, the calculating device 11 assumes that lubricant is supplied to the lubrication target B by the operator.

[0120] Next, for example, when supplying lubricant to the lubrication target C, the operator inserts the grease gun 102 into the nipple 101c without fail. At this time, the IC tag 25c approaches the IC tag reader 24a without fail. Accordingly, the IC tag reader 24c wirelessly communicates with the IC tag 25c. The IC tag 25c transmits a signal indicating that the grease gun 102 is inserted into the nipple 101c to the calculating device 11. Accordingly, the calculating device 11 assumes that lubricant is supplied to the lubrication target C by the operator.

[0121] Next, for example, when supplying lubricant to the lubrication target D, the operator inserts the grease gun 102 into the nipple 101d without fail. At this time, the IC tag 25d approaches the IC tag reader 24a without fail. Accordingly, the IC tag reader 24a wirelessly communicates with the IC tag 25d. The IC tag 25d transmits a signal indicating that the grease gun 102 is inserted into the nipple 101d to the calculating device 11. Accordingly, the calculating device 11 assumes that lubricant is supplied to the lubrication target D by the operator.

[0122] Thus, when the grease gun 102 as a tool approaches the nipple 101 as a tool mounting unit as the second work, the maintenance support device 10 determines that the maintenance as the first work has been performed.

[0123] In the assumed signal generator 20D, the IC tag reader 24a is provided on the grease gun 102, and the IC tag 25 is provided on the nipple 101; however, the present embodiment is not limited thereto. In the assumed signal generator 20D, the IC tag reader 24a can be provided on the nipple 101 and the IC tag 25 can be provided on the grease gun 102. However, because the IC tag 25 is less expensive than the IC tag reader 24a, production costs of the assumed signal generator 20D can be reduced by providing the inexpensive IC tag 25 on the respective nipples 101 than providing the expensive IC tag reader 24a on the respective nipples 101.

[0124] The assumed signal generator 20 can transmit an assumed signal to the calculating device 11 without having the limit switch 21, the IC tag reader 24a, the IC tag 25, or the like. For example, the printing press 100 causes a rotation member such as a roller to move to a predetermined lubrication position when an operator lubricates the respective lubrication targets. This is referred to as "cue". Normally, the printing press 100 includes a cue button on an operation panel of the printing press 100. The operator normally operates the cue button as a control operation at the time of performing lubrication.

[0125] Therefore, an assumed signal generator 20E transmits an assumed signal to the calculating device 11 based on cueing by the operator. Specifically, the assumed signal generator 20E transmits an assumed signal to the calculating device 11 when the operator operates the cue button and the roller of the printing press 100 moves to the lubrication position. For example, when supplying lubricant to the lubrication target A, the operator operates the cue button of the lubrication target A. Accordingly, the assumed signal generator 20E transmits an assumed signal to the calculating

device 11. Therefore, the calculating device 11 assumes that the operator has supplied lubricant to the lubrication target A.

[0126] Accordingly, the calculating device 11 can assume that the operator has supplied lubricant to the respective lubrication targets without adding parts to a conventional printing press. Therefore, the maintenance support device 10 can reduce costs required for manufacturing the maintenance support device 10.

[0127] Fig. 9 is a conceptual diagram of a configuration of the printing press control device according to the present embodiment. The printing press 100 shown in Fig. 1 is controlled by the printing press control device 103. The maintenance support device 10 is controlled by the calculating device 11 that functions by being incorporated in the printing press control device 103.

[0128] As shown in Fig. 9, the printing press 100 includes the calculating device 11 inside the printing press control device 103. The printing press control device 103 includes a central processing unit (CPU) 103p, a storage unit 103m, an input port E01 and an output port E02, an input interface E03, and an output interface E04.

[0129] The calculating device 11 includes a counter calculator 11a, an information acquiring unit 11b, a determining unit 11c, a display controller 11d, and a printing press control unit 14. The counter calculator 11a performs substitution and subtraction of numerical values with respect to a counter N described later. The information acquiring unit 11b acquires an assumed signal and information stored in the storage unit 103m described later.

[0130] The determining unit 11c determines contents of a process procedure performed by the calculating device 11 based on information acquired by the information acquiring unit 11b and a value of the counter N. The display controller 11d displays information required for an operator to perform maintenance of the printing press 100, such as "date" and "last lubrication date", "scheduled lubrication date", and "days remaining until next lubrication" for each "lubrication target" on the display unit 12, based on the determination by the determining unit 11c.

[0131] The CPU 103p includes the printing press control unit 14 in addition to the calculating device 11. The printing press control unit 14 controls drive of the printing press 100. The CPU 103p and the storage unit 103m are connected to each other by a bus B03. The CPU 103p and the input port E01 are connected to each other by a bus B01. The CPU 103p and the output port E02 are connected to each other by a bus B02.

[0132] The input interface E03 is connected to the input port E01. The assumed signal generator 20 (the assumed signal generators 20A, 20B, 20C, 20D, and 20E) shown in Figs. 5 to 8 is connected to the input interface E03. Signals output from these various detecting units are converted to signals that can be used by the CPU 103p by an analog-to-digital converter E03a and a digital input buffer E03b in the input interface E03, and transmitted to the input port E01. Accordingly, the CPU 103p can acquire information required for control of the maintenance support device 10 and control of the printing press 100.

[0133] The output interface E04 is connected to the output port E02. The display unit 12 and other control targets in the printing press 100 are connected to the output interface E04. The output interface E04 includes a control circuit E04a, and causes the control targets to operate based on a control signal computed by the CPU 103p.

[0134] According to such a configuration, the CPU 103p of the printing press control device 103 controls the display unit 12 and other control targets of the printing press 100 based on output signals from the detecting units. A computer program including a control procedure of the maintenance support device 10 by the calculating device 11 and a control data map are stored in the storage unit 103m. The storage unit 103m can be constituted of a volatile memory such as a random access memory (RAM) or a nonvolatile memory such as a flash memory, or a combination thereof.

[0135] The computer program can be a program that can realize the control of the maintenance support device 10 in combination with the computer program already stored in the CPU 103p. Further, the calculating device 11 can be one that realizes the same functions as those of the configuration described above by using dedicated hardware instead of the computer program.

[0136] Fig. 10 is a flowchart for explaining a process procedure performed by the maintenance support device according to the present embodiment. A process procedure with respect to one lubrication target is explained here. At ST101, the counter calculator 11a clears the counter N. In the present embodiment, a value substituted in the counter N is the number of days, for example. At ST102, the information acquiring unit 11b acquires a predetermined value α from the storage unit 103m. In addition, the counter calculator 11a substitutes the predetermined value α in the counter N. The predetermined value α indicates the lubrication period of the lubrication target.

[0137] Next, when a day has passed, at ST103, the counter calculator 11a subtracts 1 from the current counter N to update the counter N to a new value. The determining unit 11c determines whether an assumed signal is input from the assumed signal generator 20 to the calculating device 11. When it is determined that an assumed signal has not been input from the assumed signal generator 20 to the calculating device 11 (NO at Step ST104), the maintenance support device 10 proceeds to Step ST105.

[0138] At Step ST105, the determining unit 11c determines whether the counter N is 0. When it is determined that the counter N is 0 (YES at Step ST105), the maintenance support device 10 proceeds to Step ST106. At Step ST106, the display controller 11d displays information prompting an operator to lubricate the lubrication target.

[0139] When it is determined that the counter N is not 0 (NO at Step ST105), the maintenance support device 10 repeatedly executes Steps ST103 and ST104 until the counter N becomes 0.

[0140] At Step ST103, when it is determined that an assumed signal has been input from the assumed signal generator 20 to the calculating device 11 (YES at Step ST104), the maintenance support device 10 proceeds to Step ST101. That is, the counter calculator 11a clears the counter N and substitutes the predetermined value α in the counter N again at Step ST102.

[0141] With the maintenance support device 10 having the configuration described above, an operator does not need to manually input a signal indicating completion of lubrication to the input unit, as with a conventional maintenance device. Therefore, according to the maintenance support device 10, because a human operation is not required, reliability of information of "last lubrication date" is improved more than that of conventional information of "last lubrication date". Accordingly, the maintenance support device 10 can display information prompting an operator to lubricate the lubrication target more accurately.

[0142] Fig. 11 is an explanatory diagram of an example of the maintenance support device according to the present embodiment. As shown in Fig. 11, the maintenance support device 10 can use the assumed signal generators 20A, 20B, 20C, 20D, and 20E in combination for each lubrication target. In the following explanations, explanations of terms will be omitted within a range that persons skilled in the art can understand the present invention.

[0143] For example, the maintenance support device 10 applies the assumed signal generator 20B to a dampening system of the printing press 100 as the assumed signal generator 20. The maintenance support device 10 applies the assumed signal generator 20B to a dampening system of the printing press 100 as the assumed signal generator 20. The maintenance support device 10 applies the assumed signal generator 20E to a first transfer cylinder of the printing press 100 as the assumed signal generator 20. The maintenance support device 10 applies the assumed signal generator 20C to the impression cylinder of the printing press 100 as the assumed signal generator. The maintenance support device 10 applies the assumed signal generator 20C to a double-diameter transfer cylinder of the printing press 100 as the assumed signal generator 20.

[0144] The maintenance support device 10 applies the assumed signal generator 20C to separator lifting sucker of the printing press 100 as the assumed signal generator 20. The maintenance support device 10 applies the assumed signal generator 20C to separator forwarding sucker of the printing press 100 as the assumed signal generator 20. The maintenance support device 10 applies the assumed signal generator 20B to a separator foot of the printing press 100 as the assumed signal generator 20. The maintenance support device 10 applies the assumed signal generator 20E to a side-lay (a vacuum absorption feeder type) (an oil pump) of the printing press 100 as the assumed signal generator 20. The maintenance support device 10 applies the assumed signal generator 20E to a side-lay preset device of the printing press 100 as the assumed signal generator 20.

[0145] The maintenance support device 10 applies the assumed signal generator 20E to a front-lay of the printing press 100 as the assumed signal generator 20. The maintenance support device 10 applies the assumed signal generator 20C to an inking unit of the printing press 100 as the assumed signal generator 20. The maintenance support device 10 applies the assumed signal generator 20E to the delivery unit and the chain grippers of the printing press 100 as the assumed signal generator 20. The maintenance support device 10 applies the assumed signal generator 20C to a vacuum slowdown wheel of the printing press 100 as the assumed signal generator 20. The maintenance support device 10 applies the assumed signal generator 20C to the feeder unit of the printing press 100 as the assumed signal generator 20.

[0146] The maintenance support device 10 applies the assumed signal generator 20E to a vertical movement device of the printing press 100 as the assumed signal generator 20. The maintenance support device 10 applies the assumed signal generator 20C to a cocking front-lay device (an oil pump) and to the side-lay preset device of the printing press 100 as the assumed signal generator 20. The maintenance support device 10 applies the assumed signal generator 20E to a plate cylinder and to a blanket cylinder of the printing press 100 as the assumed signal generator 20. The maintenance support device 10 applies the assumed signal generator 20B to a main motor of the printing press 100 as the assumed signal generator 20. The maintenance support device 10 applies the assumed signal generator 20B to a compressor of the printing press 100 as the assumed signal generator 20.

[0147] The maintenance support device 10 has a feature such that it can omit inputting the information indicating completion of lubrication by the operator; however, for example, the operator can input the information indicating completion of lubrication in the configuration described above. Accordingly, the maintenance support device 10 can specify the last lubrication date more reliably. The maintenance support device 10 can transmit information required for the operator to perform maintenance of the printing press 100 to the operator more accurately. As a result, the maintenance support device 10 can display information prompting the operator to lubricate the lubrication target at a more accurate timing.

[0148] Furthermore, in the assumed signal generator 20, a pressure sensor or a quantitative valve can be provided in the nipple, for example, to directly detect whether lubricant has been supplied to the nipple by the grease gun. In this case, the determining unit 11c can determine that lubricant has been surely supplied to the lubrication target. Therefore, the maintenance support device 10 can specify the last lubrication date more surely. Accordingly, the maintenance support device 10 can transmit the information required for the operator to perform maintenance of the printing press

100 to the operator more reliably. As a result, the maintenance support device 10 can display information prompting the operator to lubricate the lubrication target at a more accurate timing.

[0149] It has been explained that the maintenance support device 10 supports the lubrication work; however, the present embodiment is not limited thereto. For example, when supporting visual check, the maintenance support device 10 can determine whether the visual check has been performed based on information of opening/closing of the checking window 23 shown in Fig. 7. Thus, if the maintenance support device 10 can determine whether an operator has performed a predetermined maintenance work based on presence of a work inevitably required for performing the predetermined maintenance work, the content of the maintenance work in the present embodiment is not limited to lubrication.

[0150] Fig. 12 is a schematic diagram of an assumed signal generator provided in an airgun. An airgun 104 is provided in the printing press 100 as a fluid discharging unit. The airgun 104 discharges air as a fluid to a cleaning target in the printing press 100. The airgun 104 is a cleaning tool for cleaning the printing press 100.

[0151] As shown in Fig. 12, the airgun 104 includes a discharge port 104a, a hose fitting port 104b, and a lever 104c. A hose 105 through which air supplied to the airgun 104 flows is connected to the hose fitting port 104b. The air supplied from the hose fitting port 104b is discharged from the discharge port 104a when an operator operates the lever 104c.

[0152] An assumed signal generator 20F includes a switch 21e. The switch 21e is provided at a position where the switch is turned on when the lever 104c of the airgun 104 is held. Specifically, the switch 21e is attached to a griping part at a position facing the lever 104c, for example.

[0153] The switch 21e is electrically connected to the calculating device 11 shown in Fig. 9. Accordingly, the switch 21e transmits an assumed signal to the calculating device 11 when the lever 104c of the airgun 104 is held. The assumed signal in this case is a signal for assuming that cleaning as the first work has been performed based on whether the airgun 104 has been operated as the second work.

[0154] When the operator operates the lever 104c, the switch 21e is turned on and an assumed signal is input to the calculating device 11. Accordingly, in the maintenance support device 10, the determining unit 11c can determine whether cleaning as the first work has been performed based on the assumed signal. Thus, the assumed signal generator 20F can determine whether the first work has been performed based on not only whether the tool has been operated but also whether the cleaning tool has been operated.

[0155] For example, the assumed signal generator 20F can be configured to generate an assumed signal, assuming that a work for pulling the hose 105 out from a reel 106 as a storage unit is the second work. In this case, the assumed signal generator 20F includes a rotation sensor 21f on the reel 106, for example.

[0156] The hose 105 is wound around and stored in the reel 106. The hose 105 is pulled out from the reel 106 when the airgun 104 is used. The reel 106 rotates about a rotation axis when the hose 105 is pulled out. The rotation sensor 21f is provided on the reel 106 to detect rotation of a rotation member of the reel 106.

[0157] The rotation sensor 21f includes a fixed member and a movable member, for example. The fixed member is provided on a frame of the reel 106, for example. The frame does not rotate about the rotation axis even when the hose 105 is pulled out from the reel 106.

[0158] On the other hand, the movable member is attached to the rotation member of the reel 106 that rotates when the hose 105 is pulled out. When the hose 105 is pulled out and the rotation member of the reel 106 rotates, the fixed member and the movable member face each other.

[0159] The rotation sensor 21f transmits an assumed signal to the calculating device 11 shown in Fig. 9, when the fixed member and the movable member face each other. That is, when the hose 105 of the airgun 104 is pulled out from the reel 106 and the reel 106 rotates, the assumed signal generator 20F determines that cleaning has been performed as the first work, and transmits an assumed signal to the calculating device 11.

[0160] The fixed member and the movable member face each other every time the reel rotates once. The timing when the rotation sensor 21f transmits an assumed signal to the calculating device 11 is, for example, a timing when the fixed member and the movable member face each other for the first time. That is, the assumed signal generator 20F does not transmit an assumed signal to the calculating device 11 every time the reel 106 rotates once, but transmits an assumed signal to the calculating device 11 once while the rotation member of the reel 106 is rotating.

[0161] The rotation sensor 21f is not limited to the configuration described above, and can be any means capable of detecting that the hose 105 is pulled out from the reel 106. For example, the movable member of the rotation sensor 21f is provided on the hose 105 and the fixed member is provided on the frame of the reel 106.

[0162] When the hose 105 is pulled out from the reel 106, the movable member passes through the fixed member provided on the frame. Accordingly, the rotation sensor 21f detects that the hose 105 is pulled out from the reel 106, and transmits an assumed signal to the calculating device 11.

[0163] According to the configuration, when the hose 105 is pulled out from the reel 106 by an operator, the rotation sensor 21f is turned on and an assumed signal is input to the calculating device 11. Accordingly, in the maintenance support device 10, the determining unit 11c can determine that cleaning as the first work has been performed based on the assumed signal. Thus, the assumed signal generator 20 can determine whether the first work has been performed based on not only whether the tool has been operated but also whether the cleaning tool has been operated.

[0164] In this case, for example, when the airgun 104 is arranged to be used only for a specified part, a cleaning target can be specified; however, when the airgun 104 is arranged to be used for unspecified parts of the printing press 100, it is difficult to specify the cleaning target. For example, when the cleaning target needs to be specified, the assumed signal generator 20F is configured as explained below.

[0165] Fig. 13 is a schematic configuration diagram of an delivery pile board and a delivery fan in a delivery unit. For example, it is assumed that cleaning as the first work is performed for the delivery unit 4 including a delivery fan 42 and the periphery of the delivery fan 42 shown in Fig. 13. The delivery unit 4 includes an delivery pile board 41, the delivery fan 42, and an operating unit 43. Printed paper is accumulated on the delivery pile board 41. The delivery pile board 41 is provided opposite to the floor so that a surface on which the paper is accumulated and the floor on which the printing press 100 is installed are substantially parallel with each other.

[0166] For example, the delivery fan 42 fans the paper accumulated on the delivery pile board 41 to press the paper to the delivery pile board 41. The delivery fan 42 is provided at a position facing the surface of the delivery pile board 41 on which the paper is accumulated. For example, the delivery fan 42 fans the frame of the delivery unit 4 downward in a vertical direction toward the delivery pile board 41.

[0167] The operating unit 43 is a part that operates up and down of the delivery pile board 41. The operating unit 43 includes an up button 43up and a down button 43down, for example. A distance between the floor and the delivery pile board 41 is automatically adjusted normally based on the amount of the paper to be accumulated. The distance between the floor and the delivery pile board 41 can be adjusted based on an operation of the operating unit 43 by an operator. Hereinafter, a movement of the delivery pile board 41 in a direction away from the floor is referred to as "moving up (upward)", and a movement of the delivery pile board 43 in a direction approaching the floor is referred to as "moving down (downward)".

[0168] Specifically, when the up button 43up is pressed, the delivery pile board 41 moves up, and when the down button 43down is pressed, the delivery pile board 41. moves down. Normally, when the delivery unit 4 including the delivery fan 42 and the periphery thereof is to be cleaned, the delivery pile board 41 is moved down.

[0169] That is, when cleaning the delivery unit 4 including the delivery fan 42 and the periphery thereof, an operator first presses the down button 43down of the operating unit 43 to move the delivery pile board 41 in a direction away from the delivery fan 42, that is, in a direction approaching the floor. The operator then removes the paper accumulated on the delivery pile board 41.

[0170] A work to move the delivery pile board 41 downward is to ensure a wide space between the delivery fan 42 and the delivery pile board 41 to improve work efficiency of cleaning of the delivery fan 42. Further, according to the mode of the printing press 100, there may be a case that cleaning of the delivery unit 4 including the delivery fan 42 and the periphery thereof is very difficult unless the delivery pile board 41 is moved down. Therefore, an operator normally presses the down button 43down to move the delivery pile board 41 downward at the time of cleaning the delivery unit 4 including the delivery fan 42 and the periphery thereof.

[0171] The down button 43down is electrically connected to the calculating device 11. Accordingly, the maintenance support device 10 can determine whether the down button 43drown is pressed. When the switch 21e or the rotation sensor 21f shown in Fig. 12 is turned on within a predetermined time since pressing of the down button 43down, the assumed signal generator 20F transmits an assumed signal to the calculating device 11.

[0172] According to the operator, there may be a case that after the hose 105 is pulled out from the reel 106, the down button 43down is pressed. Therefore, when the down button 43down is pressed within a predetermined time since the hose 105 is pulled out from the reel 106 and the rotation sensor 21f is turned on, the assumed signal generator 20F can transmit an assumed signal to the calculating device 11.

[0173] The predetermined time is set based on an average time since moving down of the delivery pile board 41 until start of cleaning of the delivery unit 4 including the delivery fan 42 and the periphery thereof, when an operator cleans the delivery unit 4 including the delivery fan 42 and the periphery thereof.

[0174] To be precise, when the assumed signal generator 20F includes the switch 21e provided on the airgun 104 shown in Fig. 12, the predetermined time is set based on an average time since moving down of the delivery pile board 41 until holding of the lever 104c of the airgun 104, when an operator cleans the delivery unit 4 including the delivery fan 42 and the periphery thereof.

[0175] When the assumed signal generator 20F includes the rotation sensor 21f provided on the reel 106 shown in Fig. 12, the predetermined time is set based on an average time since moving down of the delivery pile board 41 until pulling out of the hose 105 from the reel 106, when an operator cleans the delivery unit 4 including the delivery fan 42 and the periphery thereof.

[0176] As a time interval between a work to press the down button 43down and a work to operate the airgun 104 by the operator becomes shorter, there is a high possibility that the cleaning target is the delivery unit 4 including the delivery fan 42 and the periphery thereof. Therefore, as the predetermined time is set shorter, there is a decreased risk that the determining unit 11c erroneously determines that the delivery unit 4 including the delivery fan 42 and the periphery thereof is being cleaned, although the operator is cleaning other parts than the delivery fan 42 and the periphery of the

delivery fan 42 by the airgun 104.

[0177] On the other hand, in some cases, an operator may start cleaning of the delivery unit 4 including the delivery fan 42 and the periphery thereof, after the operator presses the down button 43down to perform a work other than cleaning of the delivery unit 4 including the delivery fan 42 and the periphery thereof, for example.

[0178] In this case, as the predetermined time is set shorter, there is an increased risk that the determining unit 11c determines that the delivery unit 4 including the delivery fan 42 and the periphery thereof is not cleaned because the airgun 104 is not used within the predetermined time, although the operator cleans the delivery unit 4 including the delivery fan 42 and the periphery thereof by the airgun 104.

[0179] It is desired that the predetermined time is set in a range capable of suppressing these risks. The predetermined time is between 5 to 15 minutes, for example. When the lever 104c of the airgun 104 is held within 15 minutes after the down button 43down for moving the delivery pile board 41 downward is pressed, or when an interval between a point in time when the down button 43down is pressed and a point in time when the hose 105 is pulled out from the reel 106 is within 15 minutes, the assumed signal generator 20F transmits an assumed signal to the calculating device 11.

[0180] According to the configuration described above, the assumed signal generator 20F can determine whether cleaning of a specific part. In this case, the delivery unit 4 including the delivery fan 42 and the periphery thereof has been performed by determining whether the first work has been performed, designating a work combining a work for moving the delivery pile board 41 downward and a work using the airgun 104 as the second work.

[0181] A period since an operator has cleaned the delivery unit 4 including the delivery fan 42 and the periphery thereof until the delivery unit 4 including the delivery fan 42 and the periphery thereof is to be cleaned next is two weeks, for example.

[0182] The first work is not limited to cleaning of respective units of the printing press 100, and, it can be replacement of parts constituting the printing press 100, for example. Further, the target of the first work is not limited to the delivery fan 42 in the delivery unit 4 of the printing press 100. Cleaning of a filter that removes a foreign material in the fluid or replacement of the filter is explained below as the first work. A period since last cleaning of the filter by the operator until the filter is to be cleaned next is two weeks, for example.

[0183] Fig. 14 is a schematic configuration diagram of an oil pump and an oil filter used for a printing press. As shown in Fig. 14, the printing press 100 includes an oil path 111, an oil pump 112, an oil filter 113, and a filter cover 114. The oil to be supplied to the respective units of the printing press 100 flows into the oil path 111.

[0184] The oil filter 113 and the oil pump 112 are provided in the oil path 111. The oil filter 113 removes a foreign material in the oil. The oil pump 112 feeds the oil to a supply destination. The oil pump 112 includes an electric motor, for example. When power is supplied to the electric motor, the oil pump 112 feeds the oil to the supply destination.

[0185] The filter cover 114 covers the oil filter 113. The oil filter 113 is clogged with a passage of an operation time of the printing press 100. Therefore, the oil filter 113 needs to be cleaned or replaced regularly. An operator first removes the filter cover 114 from a part where the oil filter 113 is provided, and then cleans or replaces the oil filter 113.

[0186] An assumed signal generator 20G includes a switch 21g. The switch 21g is provided on the filter cover 114. When the filter cover 114 is removed, the switch 21g is turned on. The switch 21g is electrically connected to the calculating device 11. Accordingly, the switch 21g transmits an assumed signal to the calculating device 11.

[0187] When the filter cover 114 is removed as the second work, the assumed signal generator 20G transmits an assumed signal to the calculating device 11. Accordingly, the determining unit 11c determines that the oil filter 113 has been cleaned or replaced as the first work.

[0188] The switch 21g can be a switch that is turned on when the filter cover 114 is attached. The operator normally attaches the filter cover 114 after the oil filter 113 has been cleaned or replaced. Therefore, also in this case, the determining unit 11c can determine that the oil filter 113 has been cleaned or replaced as the first work.

[0189] In the above explanations, when the various switches, such as the switch 21e shown in Fig. 12 and the switch 21g shown in Fig. 13 are turned on, the assumed signal generator 20G transmits an assumed signal to the calculating device 11; however, the assumed signal generator can transmit an assumed signal to the calculating device 11 when the various switches are turned off.

[0190] Fig. 15 is a configuration diagram of an example of a configuration when an assumed signal is transmitted to the calculating device when the switch is turned off. When an assumed signal is transmitted to the calculating device 11 when the various switches are tuned off, as shown in Fig. 15, for example, the maintenance support device 10 is constituted such that power is always supplied to the input port E01 of the calculating device 11.

[0191] At this time, power is always supplied to the input port E01 via a pull-up resistor R. The switch 21e or the switch 21g is arranged between the pull-up resistor R and a ground GND. In the case that the various switches are electrically connected with the calculating device 11, when the switch 21e or the switch 21g is turned off, a signal is transmitted to the calculating device 11. When the switch 21e or the switch 21g is turned on, because the signal flows toward the ground GND, transmission of the signal to the calculating device 11 is turned off.

[0192] The assumed signal generator 20G can determine whether the maintenance work on the printing press 100 has been performed, for example, based on a change in the magnitude of energy supplied to the oil pump 112, other

than removal and attachment of the filter cover 114. The oil pump 112 includes the electric motor, for example. For example, the magnitude of the energy is a value of a current supplied to the electric motor.

[0193] The value of the current supplied to the oil pump 112 is generally a variable value that gradually charges, so long as printing conditions such as printing speed, and the size and thickness of the paper is constant. The oil flows via the oil filter 113 while the oil pump 112 is driven.

[0194] At this time, the foreign material in the oil does not pass through the oil filter 113 and is accumulated in the oil filter 113. The oil filter 113 is gradually clogged with a passage of a driving time of the oil pump 112. Accordingly, loss of pressure of the oil flowing via the oil filter 113 gradually changes.

[0195] A load of the oil pump 112 also changes gradually. However, when the oil filter 113 is cleaned or replaced as a maintenance work, the loss of pressure of the oil flowing via the oil filter 113 changes in a stepwise manner. The stepwise manner in this context means a state that a value does not change gradually but changes suddenly.

[0196] The magnitude of change in the magnitude of the variable value per unit time is referred to as a change rate. The case that the variable value changes in a stepwise manner means a state that the change rate of the variable value is higher than a predetermined value. Specifically, the case that the variable value changes in a stepwise manner means a state that the change rate of the variable value is twice as high as the change rate when the variable value changes gradually, for example.

[0197] When the loss of pressure of the oil flowing via the oil filter 113 changes in a stepwise manner, the load of the oil pump 112 also changes in a stepwise manner. Therefore, the magnitude of the current supplied to the electric motor of the oil pump 112 also changes in a stepwise manner.

[0198] As shown in Fig. 14, the assumed signal generator 20G includes a current-value change-rate monitor 21h on the wiring between a power supply 115 that supplies power to the oil pump 112 and the oil pump 112. The current-value change-rate monitor 21h monitors a change rate of the current supplied to the oil pump 112. The current-value change-rate monitor 21h transmits an assumed signal when the change rate of the current supplied to the oil pump 112 is equal to or larger than a predetermined value.

[0199] The current-value change-rate monitor 21h is electrically connected to the calculating device 11. Accordingly, when the change rate of the current supplied to the oil pump 112 becomes equal to or larger than the predetermined value, the current-value change-rate monitor 21h determines that the maintenance work has been performed, and transmits an assumed signal to the calculating device 11.

[0200] For example, when the filter cover 114 shown in Fig. 14 is attached or removed, and when the change rate of the current supplied to the oil pump 112 is equal to or larger than the predetermined value, the assumed signal generator 20G can transmit an assumed signal to the calculating device 11. In this case, the maintenance support device 10 can determine whether the maintenance work has been performed more accurately.

[0201] when the filter cover 114 is attached or removed, and when the change rate of the current supplied to the oil pump 112 is equal to or larger than the predetermined value, the assumed signal generator 20G can transmit an assumed signal to the calculating device 11. In this case, for example, even when an operator forgets to attach the filter cover 114 after cleaning or replacing the oil filter 113, the maintenance support device 10 can determine that a maintenance work has been performed.

[0202] Fig. 16 is a schematic configuration diagram of an air pump and a valve. A target of the maintenance work is not limited to the oil filter 113, and can be an air filter 116 shown in Fig. 16, for example.

[0203] As shown in Fig. 16, in the printing press 100, the air filter 116, an air pump 117, and a valve 118 are provided on an air supply path 119. Air flows in the air supply path 119. The air filter 116 removes a foreign material in the air. The air pump 117 feeds air to a supply destination. The valve 118 adjusts a flow rate of the air fed to the supply destination.

[0204] The air flows via the air filter 116 while the air pump 117 is driven. At this time, the foreign maternal in the air does not pass through the air filter 116 and is accumulated in the air filter 116. The air filter 116 is gradually clogged with a passage of a driving time of the air pump 117.

[0205] Accordingly, a flow rate of the air passing through the air filter 116 gradually decreases with a passage of an operating time of the air pump 117. Therefore, the operator gradually increases opening of the valve 118 with a passage of a driving time of the air pump 117.

[0206] When the air filter 116 is cleaned or replaced as a maintenance work, the amount of air passing through the air filter 116 increases in a stepwise manner. Accordingly, the operator decreases the opening of the valve 118 in a stepwise manner for adjusting the amount of air supplied to the supply destination.

[0207] An assumed signal generator 20H includes an opening change-rate monitor 21i. The opening change-rate monitor 21i is provided on the valve 118, and monitors the opening of the valve 118 as a variable value. The opening change-rate monitor 21i is electrically connected to the calculating device 11.

[0208] The opening change-rate monitor 21i transmits an assumed signal when a change rate of the opening of the valve 118 is equal to or larger than a predetermined value. The case that the change rate of the opening of the valve 118 is equal to or larger than a predetermined value means a case that the valve 118 is rotated more than once per unit time, for example.

[0209] According to the above configuration, in an assumed signal generator 20H, when the change rate of the opening of the valve 118 is equal to or larger than the predetermined value, the determining unit 11c can determine that the air filter 116 has been cleaned or replaced as a maintenance work.

[0210] Thus, the maintenance support device 10 can determine whether the maintenance work has been performed based on the magnitude of the change rate of the variable value that gradually changes normally, other than a work performed by an operator such as opening/closing of the cover or the cover, and the operation of the tool. During the work performed by the operator, he may forget to close the cover or the cover, for example.

[0211] However, the magnitude of the change rate of the variable value becomes equal to or larger than the predetermined value when the operator performs the maintenance work. Accordingly, the maintenance support

[0212] However, the magnitude of the change rate of the variable value becomes equal to or larger than the predetermined value when the operator performs the maintenance work. Accordingly, the maintenance support device 10 determines whether the maintenance work has been performed based on the magnitude of the change rate of the variable value that gradually changes normally, thereby enabling to determine whether the maintenance work has been performed, without putting any human work therebetween.

[0213] As described above, the determining unit 11c of the maintenance support device 10 can determine whether the first work has been performed based on whether the second work has been performed, or based on the change rate of the variable value. In the maintenance support device 10, when the determining unit 11c cannot determine that the maintenance work has been performed within a predetermined period since a point in time when the determining unit 11c determines that the maintenance work has been performed last, the display controller 11d shown in Fig. 9 causes the display unit 12 to display information prompting an operator to perform the maintenance work. Accordingly, the maintenance support device 10 can transmit more accurate information relating to the maintenance to the operator.

INDUSTRIAL APPLICABILITY

[0214] As described above, the maintenance support device according to the present invention is useful to inform information relating to maintenance to an operator, and more particularly, it is useful to inform more accurate information relating to maintenance to an operator.

Claims

1. A maintenance support device for a printing press, comprising:

   a determining unit that determines whether a first work has been performed based on presence of a second work, which is different from the first work and is performed at a time of performing the first work for maintaining the printing press; and
   a display controller that causes to display information prompting to perform the first work, when the determining unit cannot determine that the first work has been performed within a predetermined period since a last determination by the determining unit that the first work has been performed.

2. The maintenance support device for a printing press according to claim 1, wherein the second work is opening and closing of a cover, and the determining unit determines presence of the first work based on whether the cover has been opened and closed.

3. The maintenance support device for a printing press according to claim 1, wherein the second work is a work for bringing a tool closer to a tool mounting unit, and the determining unit determines presence of the first work based on whether the tool has been brought closer to the tool mounting unit.

4. The maintenance support device for a printing press according to claim 1, wherein the second work is a work for inserting a tool into a tool mounting unit and the determining unit determines presence of the first work based on whether the tool has been inserted into the tool mounting unit.

5. The maintenance support device for a printing press according to claim 1, wherein the second work is a controlling work for operating the printing press as a target of the first work to perform the first work, and the determining unit determines presence of the first work based on whether the controlling work has been performed.

6. The maintenance support device for a printing press according to claim 1, wherein
   the first work is a cleaning work on members constituting the printing press,

the second work is an operation of a tool used when the members are cleaned, and
the determining unit determines presence of the first work based on whether the tool has been operated.

7. The maintenance support device for a printing press according to claim 6, wherein
the tool is a fluid discharging unit that discharges a fluid to a cleaning target when an operating unit is operated, and
the determining unit determines presence of the first work based on whether the operating unit in the fluid discharging unit has been operated.

8. The maintenance support device for a printing press according to claim 6, wherein
the printing press comprises:

a fluid discharging unit that discharges a fluid to a cleaning target;
a hose connected to the fluid discharging unit to cause the fluid to flow toward the fluid discharging unit; and
an storage unit that stores the hose,
the tool is the storage unit, and
the determining unit determines presence of the first work based on whether the storage unit is operated and the hose has been pulled out from the storage unit.

9. The maintenance support device for a printing press according to claim 1, wherein
the first work is cleaning of a fan provided in a delivery unit that accumulates paper ejected from a printing unit of the printing press that performs printing on the paper,
the second work is an operation of moving an delivery pile board on which the paper ejected from the printing unit is stacked, and
the determining unit determines presence of the first work based on whether the operation of moving the delivery pile board has been performed.

10. The maintenance support device for a printing press according to claim 1, wherein
the first work is maintenance of an oil filter that removes a foreign material included in an oil supplied to the printing press,
the second work is removal of a cover that covers the oil filter, and
the determining unit determines that the first work has been performed when the cover is removed from a part where the oil filter is provided.

11. A maintenance support device for a printing press comprising:

a determining unit that determines whether a maintenance work has been performed, based on a magnitude of change in a value of a variable per unit time that changes gradually with a passage of a using time of the printing press and changes in a stepwise manner when the maintenance work for maintaining the printing press is performed, and
a display controller that causes to display information prompting to perform the maintenance work, when the determining unit cannot determine that the maintenance work has been performed within a predetermined period since a last determination by the determining unit that the maintenance work has been performed.

12. The maintenance support device for a printing press according to claim 11, wherein
the maintenance work is maintenance of an oil filter that removes a foreign material included in an oil supplied to the printing press,
the value of the variable is a magnitude of an electric current to be supplied to an oil pump for driving the oil pump that feeds the oil, and
the determining unit determines that the maintenance work has been performed when a magnitude of change in a value of the electric current per unit time is equal to or larger than a predetermined value.

13. The maintenance support device for a printing press according to claim 11, wherein
the maintenance work is maintenance of an air pump filter that removes a foreign material included in air supplied to an air pump provided in the printing press,
the value of the variable is a magnitude of a valve opening for adjusting a flow rate of air fed from the air pump, and
the determining unit determines that the maintenance work has been performed when the magnitude of the valve opening per predetermined time is equal to or larger than a predetermined value.

14. A printing press comprising:

a feeder unit that feeds set paper;
a printing unit that performs printing on the paper;
a delivery unit that ejects the paper after printing from the printing unit, and
a maintenance support device for a printing press that comprises a determining unit that determines whether a first work has been performed based on presence of a second work, which is different from the first work and is performed at a time of performing the first work for maintaining the printing press, and a display controller that causes to display information prompting to perform the first work, when the determining unit cannot determine that the first work has been performed within a predetermined period since a last determination by the determining unit that the first work has been performed.

15. The printing press according to claim 14, wherein the second work is opening and closing of a cover, and the determining unit determines presence of the first work based on whether the cover has been opened and closed.

16. The printing press according to claim 14, wherein the second work is a work for bringing a tool closer to a tool mounting unit, and the determining unit determines presence of the first work based on whether the tool has been brought closer to the tool mounting unit.

17. The printing press according to claim 14, wherein the second work is a work for inserting a tool into a tool mounting unit and the determining unit determines presence of the first work based on whether the tool has been inserted into the tool mounting unit.

18. The printing press according to claim 14, wherein the second work is a controlling work for operating the printing press as a target of the first work to perform the first work, and the determining unit determines presence of the first work based on whether the controlling work has been performed.

19. The printing press according to claim 14, wherein
the first work is a cleaning work on members constituting the printing press,
the second work is an operation of a tool used when the members are cleaned, and
the determining unit determines presence of the first work based on whether the tool has been operated.

20. The printing press according to claim 19, wherein
the tool is a fluid discharging unit that discharges a fluid to a cleaning target when an operating unit is operated, and
the determining unit determines presence of the first work based on whether the operating unit in the fluid discharging unit has been operated.

21. The printing press according to claim 19, comprising:

a fluid discharging unit that discharges a fluid to a cleaning target;
a hose connected to the fluid discharging unit to cause the fluid to flow toward the fluid discharging unit; and
an storage unit that stores the hose,
the tool is the storage unit, and
the determining unit determines presence of the first work based on whether the storage unit is operated and the hose has been pulled out from the storage unit.

22. The printing press according to claim 14, wherein
the first work is cleaning of a fan provided in a delivery unit that accumulates paper ejected from a printing unit of the printing press that performs printing on the paper,
the second work is an operation of moving an delivery pile board on which the paper ejected from the printing unit is stacked, and
the determining unit determines presence of the first work based on whether the operation of moving the delivery pile board has been performed.

23. The printing press according to claim 14, wherein
the first work is maintenance of an oil filter that removes a foreign material included in an oil supplied to the printing press,
the second work is removal of a cover that covers the oil filter, and

the determining unit determines that the first work has been performed when the cover is removed from a part where the oil filter is provided.

24. A printing press comprising:

a feeder unit that feeds set paper;
a printing unit that performs printing on the paper;
a delivery unit that ejects the paper after printing from the printing unit, and
a determining unit that determines whether a maintenance work has been performed, based on a magnitude of change in a value of a variable per unit time that changes gradually with a passage of a using time of the printing press and changes in a stepwise manner when the maintenance work for maintaining the printing press is performed, and
a display controller that causes to display information prompting to perform the maintenance work, when the determining unit cannot determine that the maintenance work has been performed within a predetermined period since a last determination by the determining unit that the maintenance work has been performed.

25. The printing press according to claim 24, wherein
the maintenance work is maintenance of an oil filter that removes a foreign material included in an oil supplied to the printing press,
the value of the variable is a magnitude of an electric current to be supplied to an oil pump for driving the oil pump that feeds the oil, and
the determining unit determines that the maintenance work has been performed when a magnitude of change in a value of the electric current per unit time is equal to or larger than a predetermined value.

26. The printing press according to claim 24, wherein
the maintenance work is maintenance of an air pump filter that removes a foreign material included in air supplied to an air pump provided in the printing press,
the value of the variable is a magnitude of a valve opening for adjusting a flow rate of air fed from the air pump, and
the determining unit determines that the maintenance work has been performed when the magnitude of the valve opening per predetermined time is equal to or larger than a predetermined value.

27. A maintenance support method for a printing press comprising:

a procedure of determining whether a first work has been performed based on presence of a second work, which is different from the first work and is performed at a time of performing the first work for maintaining the printing press; and
a procedure of causing to display information prompting to perform the first work, when it is not determined that the first work has been performed within a predetermined period since a last determination that the first work has been performed.

28. The maintenance support method for a printing press according to claim 27, wherein the second work is opening and closing of a cover, and the determining unit determines presence of the first work based on whether the cover has been opened and closed.

29. The maintenance support method for a printing press according to claim 27, wherein the second work is a work for bringing a tool closer to a tool mounting unit, and the determining unit determines presence of the first work based on whether the tool has been brought closer to the tool mounting unit.

30. The maintenance support method for a printing press according to claim 27, wherein the second work is a work for inserting a tool into a tool mounting unit and the determining unit determines presence of the first work based on whether the tool has been inserted into the tool mounting unit.

31. The maintenance support method for a printing press according to claim 27, wherein the second work is a controlling work for operating the printing press as a target of the first work to perform the first work, and the determining unit determines presence of the first work based on whether the controlling work has been performed.

32. The maintenance support method for a printing press according to claim 27, wherein
the first work is a cleaning work on members constituting the printing press,

the second work is an operation of a tool used when the members are cleaned, and
the determining unit determines presence of the first work based on whether the tool has been operated.

33. The maintenance support method for a printing press according to claim 32, wherein
the tool is a fluid discharging unit that discharges a fluid to a cleaning target when an operating unit is operated, and
the determining unit determines presence of the first work based on whether the operating unit in the fluid discharging unit has been operated.

34. The maintenance support method for a printing press according to claim 32, wherein
the printing press comprises:

a fluid discharging unit that discharges a fluid to a cleaning target;
a hose connected to the fluid discharging unit to cause the fluid to flow toward the fluid discharging unit; and
an storage unit that stores the hose,
the tool is the storage unit, and
the determining unit determines presence of the first work based on whether the storage unit is operated and the hose has been pulled out from the storage unit.

35. The maintenance support method for a printing press according to claim 27, wherein
the first work is cleaning of a fan provided in a delivery unit that accumulates paper ejected from a printing unit of the printing press that performs printing on the paper,
the second work is an operation of moving an delivery pile board on which the paper ejected from the printing unit is stacked, and
the determining unit determines presence of the first work based on whether the operation of moving the delivery pile board has been performed.

36. The maintenance support method for a printing press according to claim 27, wherein
the first work is maintenance of an oil filter that removes a foreign material included in an oil supplied to the printing press,
the second work is removal of a cover that covers the oil filter, and
the determining unit determines that the first work has been performed when the cover is removed from a part where the oil filter is provided.

37. A maintenance support method for a printing press comprising:

a determining unit that determines whether a maintenance work has been performed, based on a magnitude of change in a value of a variable per unit time that changes gradually with a passage of a using time of the printing press and changes in a stepwise manner when the maintenance work for maintaining the printing press is performed, and
a display controller that causes to display information prompting to perform the maintenance work, when the determining unit cannot determine that the maintenance work has been performed within a predetermined period since a last determination by the determining unit that the maintenance work has been performed.

38. The maintenance support method for a printing press according to claim 37, wherein
the maintenance work is maintenance of an oil filter that removes a foreign material included in an oil supplied to the printing press,
the value of the variable is a magnitude of an electric current to be supplied to an oil pump for driving the oil pump that feeds the oil, and
the determining unit determines that the maintenance work has been performed when a magnitude of change in a value of the electric current per unit time is equal to or larger than a predetermined value.

39. The maintenance support method for a printing press according to claim 37, wherein
the maintenance work is maintenance of an air pump filter that removes a foreign material included in air supplied to an air pump provided in the printing press,
the value of the variable is a magnitude of a valve opening for adjusting a flow rate of air fed from the air pump, and
the determining unit determines that the maintenance work has been performed when the magnitude of the valve opening per predetermined time is equal to or larger than a predetermined value.

FIG.1

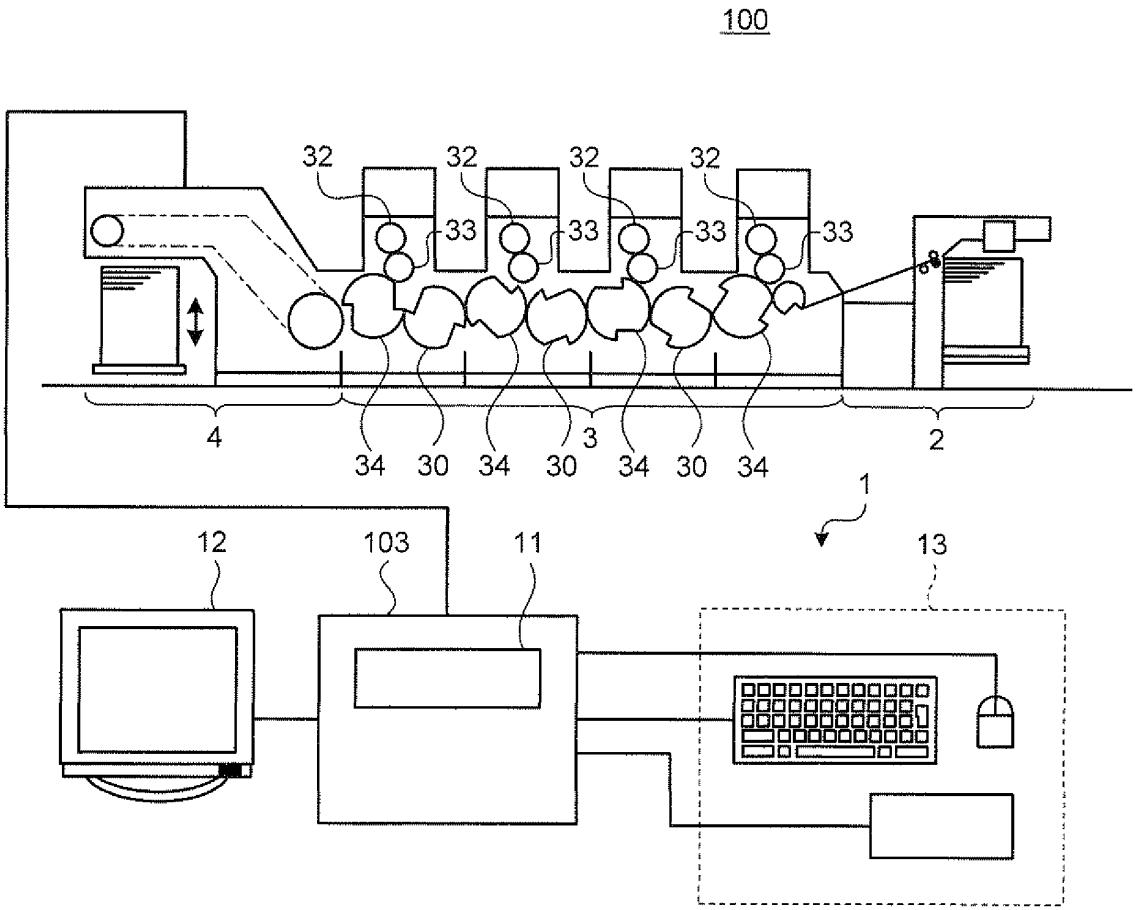


FIG.2

DATE
200x/01/08

LUBRICATION TARGET	LAST LUBRICATION DATE	SCHEDULED LUBRICATION DATE	DAYS REMAINING UNTIL NEXT FEED
A	200x/01/01	200x/01/08	0 DAY
B	200x/01/02	200x/02/02	24 DAYS
C	200x/01/03	200x/03/03	54 DAYS
D	200x/01/04	200x/04/04	86 DAYS

FIG.3

LUBRICATION TARGET	DAYS REMAINING UNTIL NEXT FEED
A	0 DAY
B	24 DAYS
C	54 DAYS
D	86 DAYS

FIG.4

LUBRICATION TARGET	WARNING
A	
B	●
C	●
D	●

FIG.5

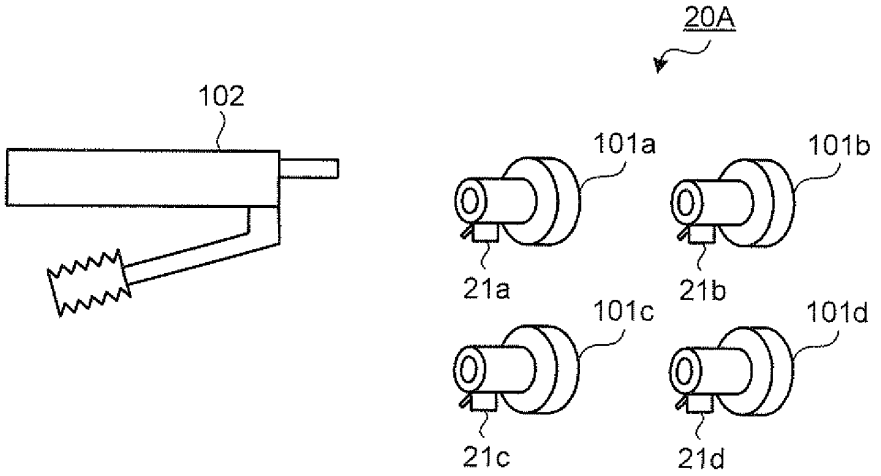

20A
102
101a
101b
21a
21b
101c
101d
21c
21d

FIG.6

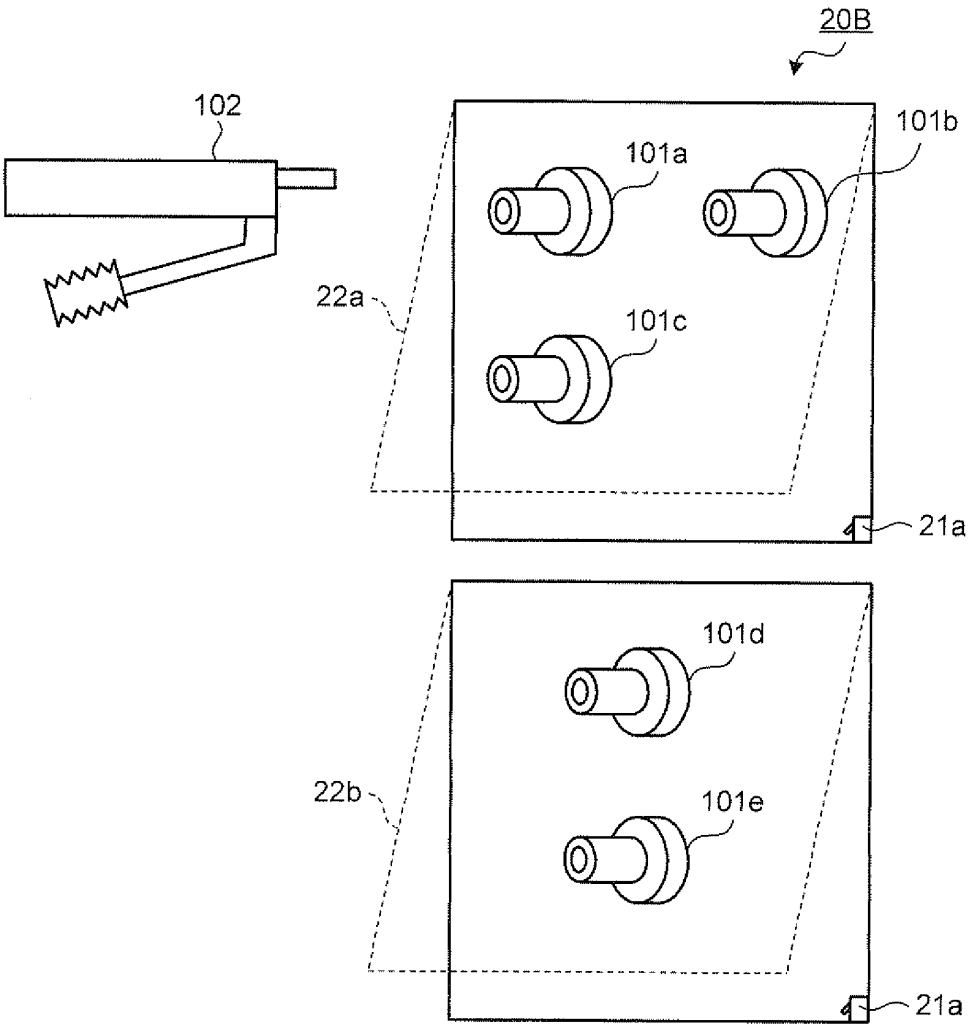

20B
102
101a
101b
22a
101c
21a
101d
22b
101e
21a

FIG.7

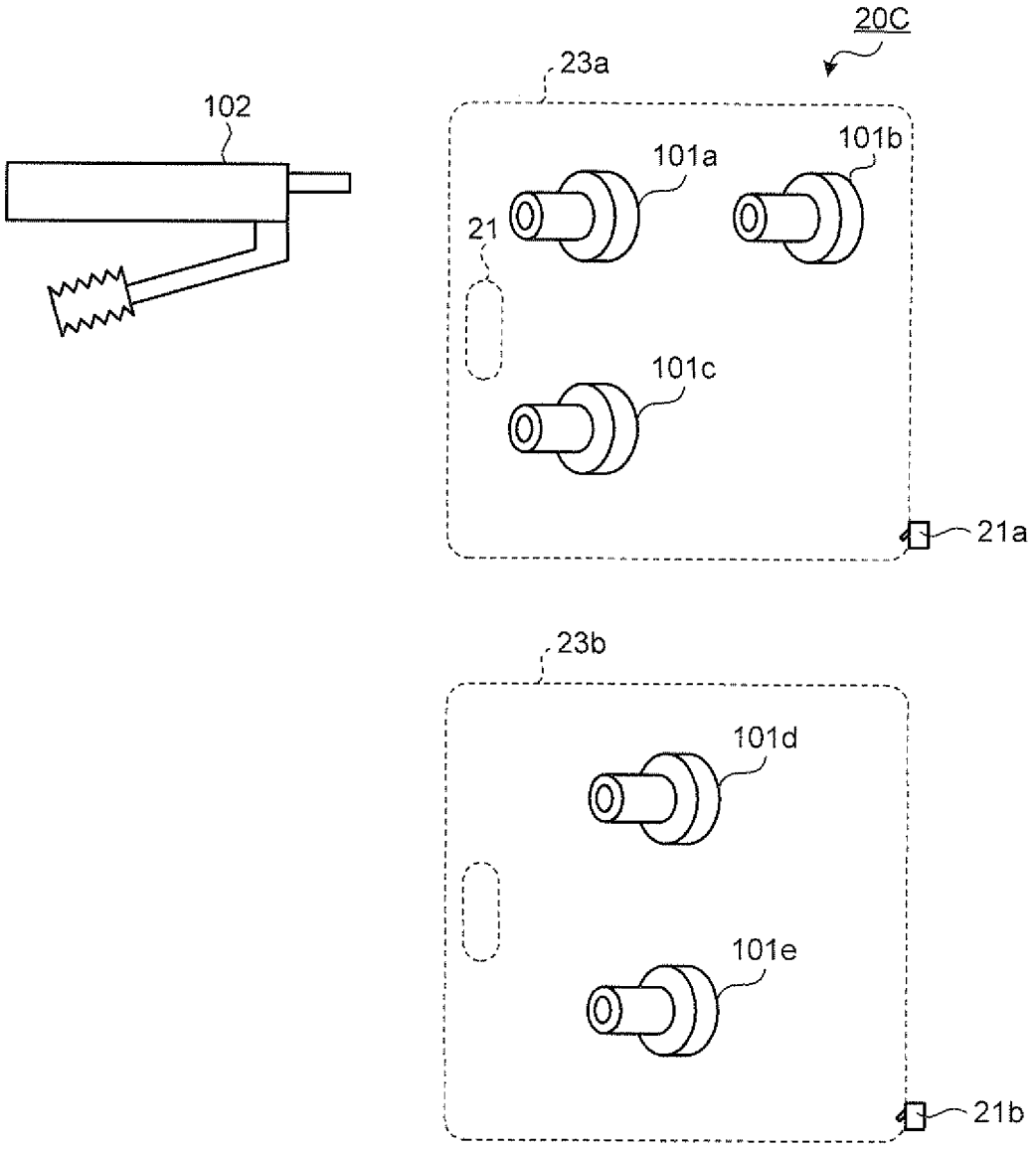


FIG.8

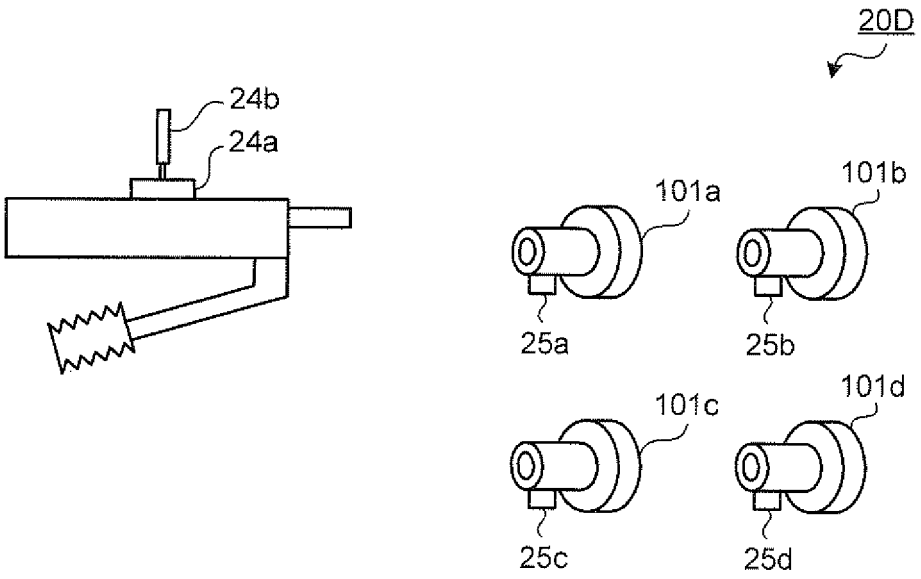


FIG.9

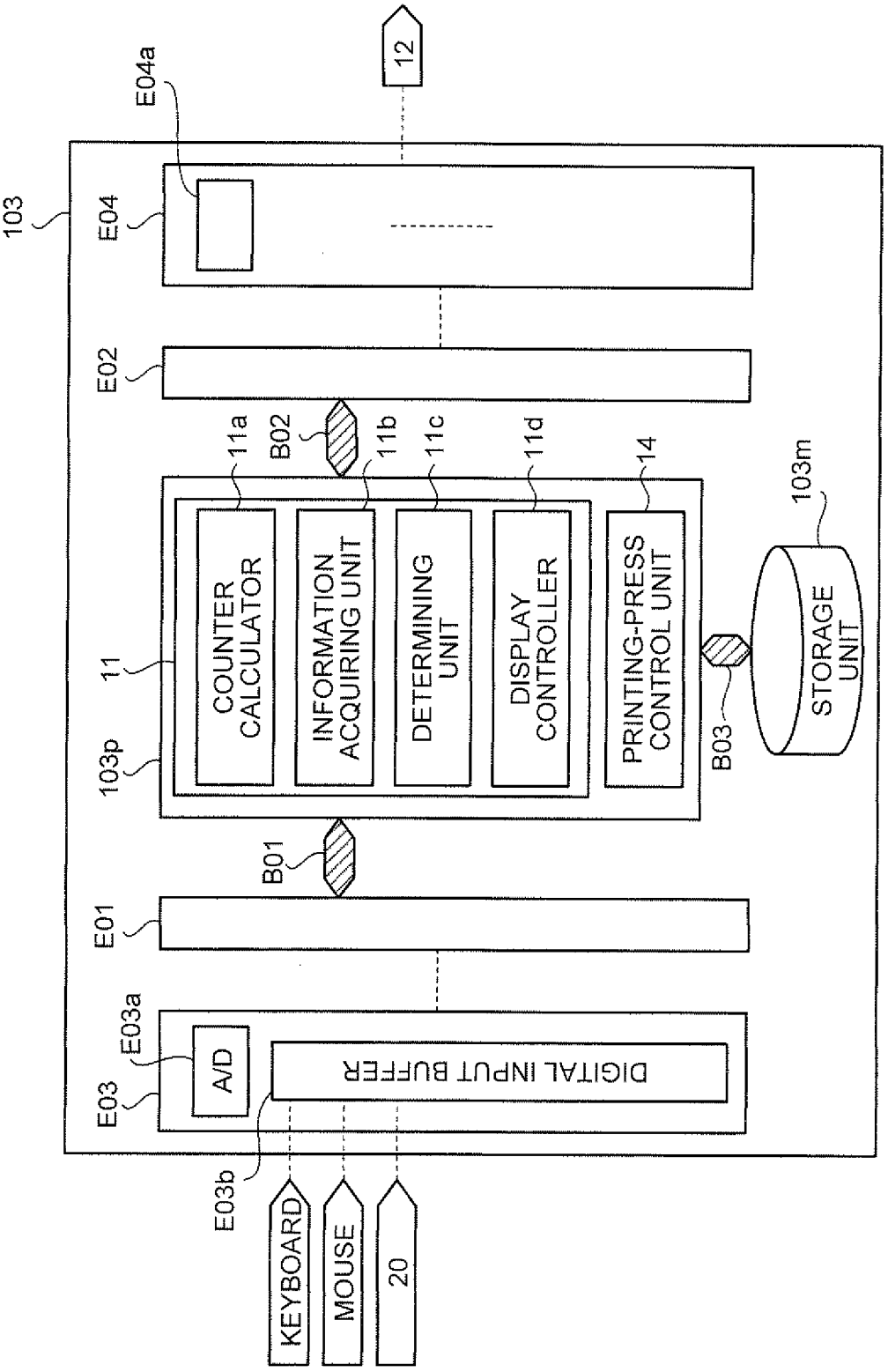

12
E04a
103
E04
E02
11a
B02
11b
11c
11d
14
103m
COUNTER CALCULATOR
INFORMATION ACQUIRING UNIT
DETERMINING UNIT
DISPLAY CONTROLLER
PRINTING-PRESS CONTROL UNIT
STORAGE UNIT
11
103p
B03
B01
E01
E03a
A/D
DIGITAL INPUT BUFFER
E03
E03b
KEYBOARD
MOUSE
20

FIG.10

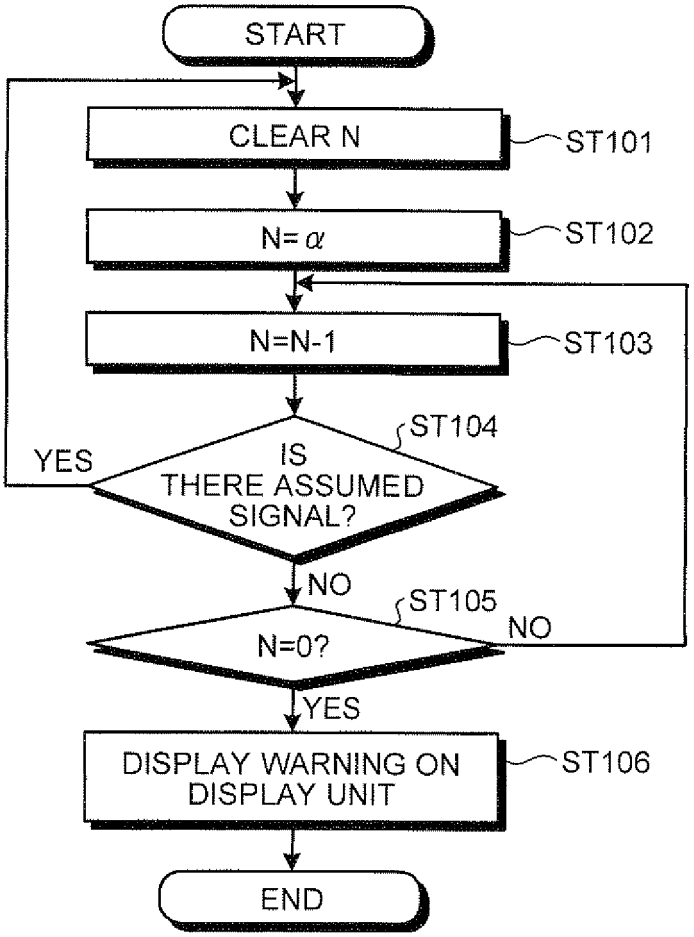

START
CLEAR N
ST101
N=α
ST102
N=N-1
ST103
ST104
IS THERE ASSUMED SIGNAL?
YES
NO
ST105
N=0?
NO
YES
DISPLAY WARNING ON DISPLAY UNIT
ST106
END

FIG.11

LUBRICATION PERIOD	LUBRICATION TARGET	ASSUMED SIGNAL GENERATOR
EVERY WEEK	DAMPENING SYSTEM	20B
EVERY TWO WEEKS	FIRST TRANSFER CYLINDER	20E
	IMPRESSION CYLINDER	20C
	DOUBLE-DIAMETER TRANSFER CYLINDER	20C
EVERY MONTH	SEPARATOR LIFTING SUCKER	20C
	SEPARATOR FORWARDING SUCKER	20C
	SEPARATOR FOOT	20B
	SIDE LAY (VACUUM ABSORPTION FEEDER TYPE)	20E
	SIDE-LAY PRESET DEVICE	20E
	FRONT LAY	20E
	INKING SYSTEM	20C
	DELIVERY CHAIN GRIPPER	20E
	VACUUM SLOW DOWN WHEEL	20C
EVERY THREE MONTHS	FEEDER	20C
	UP AND DOWN POSITIONING DEVICE	20E
	COCKING FRONT-LAY DEVICE AND SIDE-LAY PRESET DEVICE	20C
	PLATE CYLINDER AND BLANKET CYLINDER	20E
OTHERS	MAIN MOTOR	20B
	COMPRESSOR	20B

FIG.12

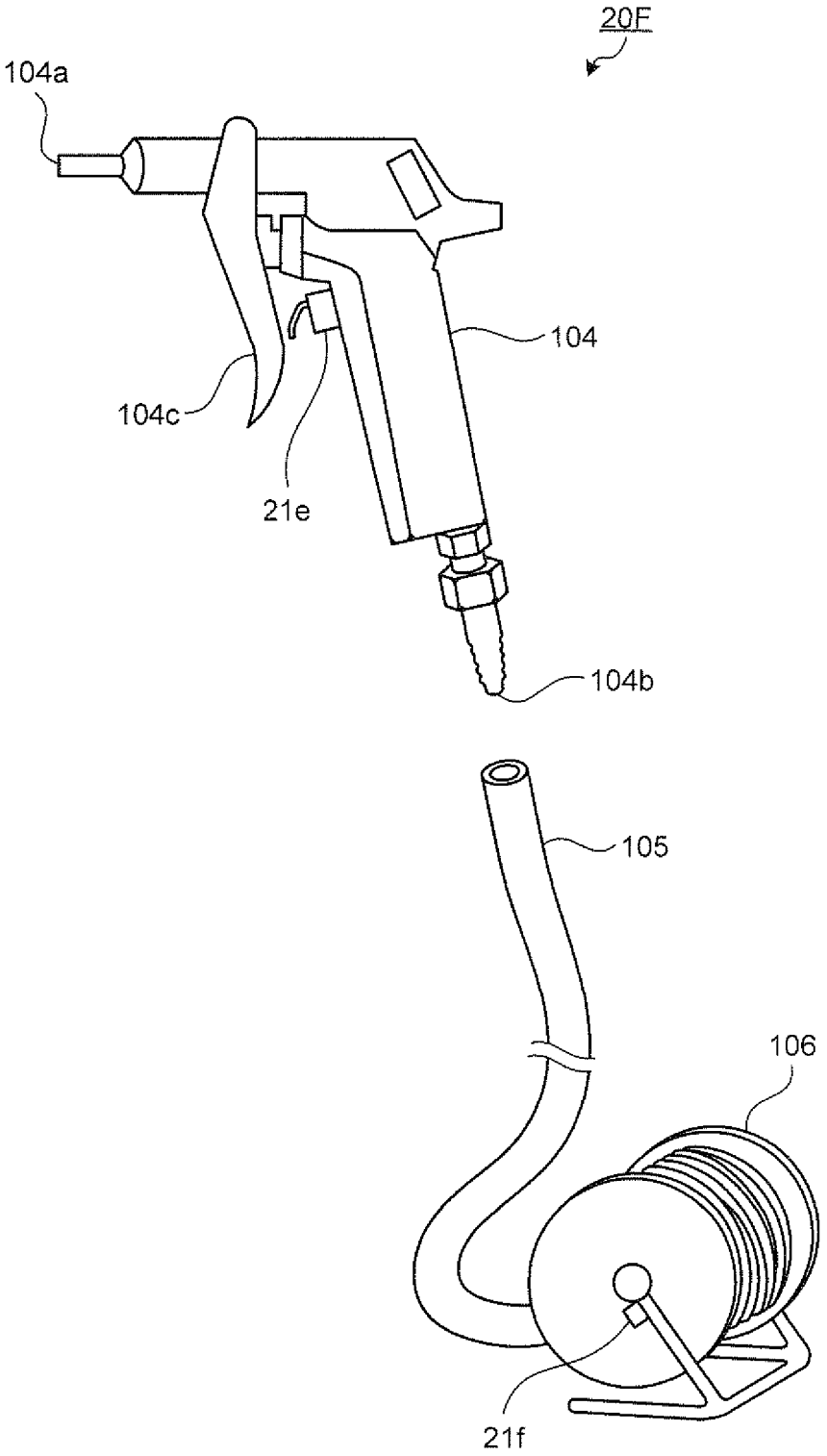


FIG.13

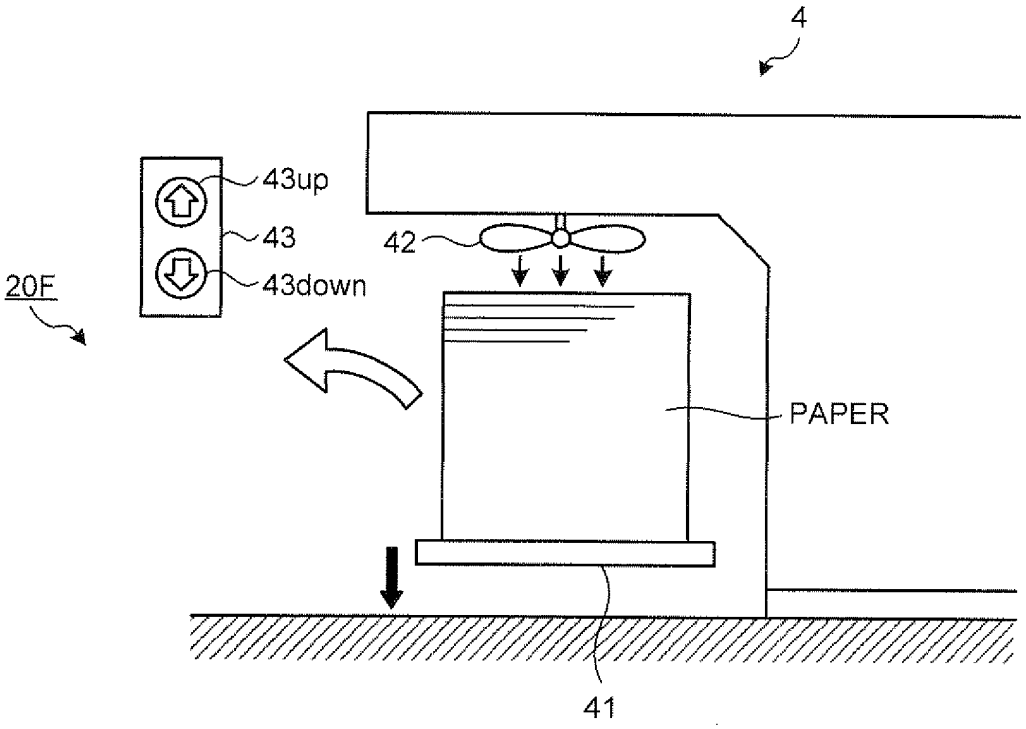

4
43up
43
43down
42
20F
PAPER
41

FIG.14

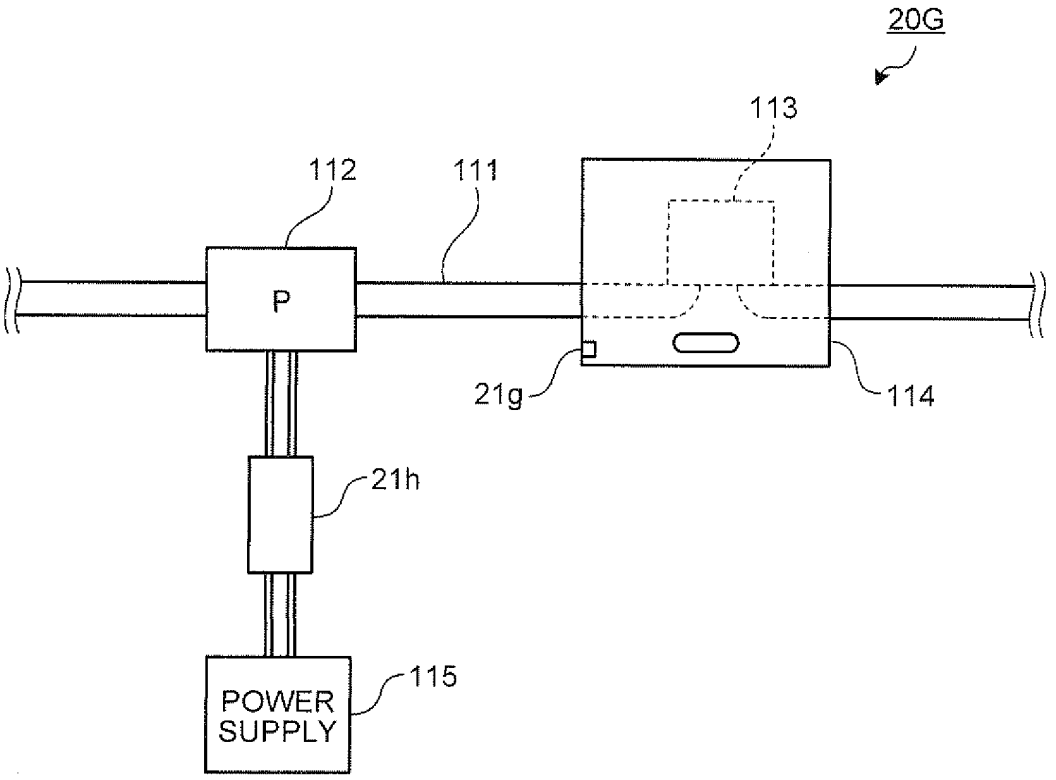

20G
113
112
111
P
21g
114
21h
115
POWER SUPPLY

FIG.11

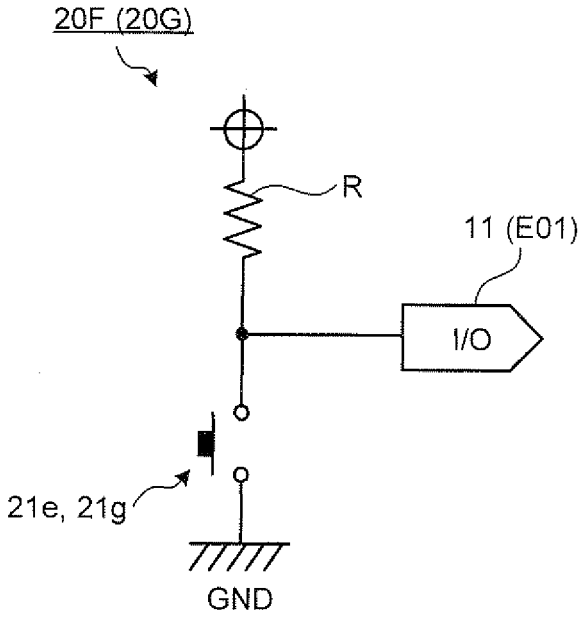
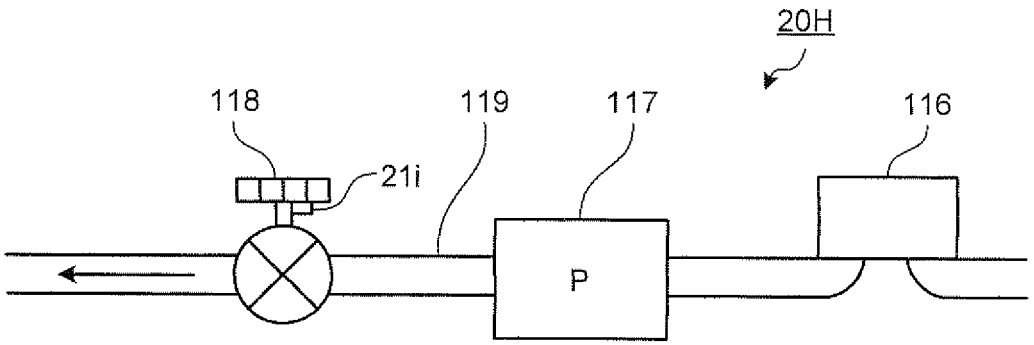


FIG.16



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2008/066849

A. CLASSIFICATION OF SUBJECT MATTER
B41F33/00(2006.01)i, *B41F33/14*(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)
B41F33/00, B41F33/14

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 1996-2008
Kokai Jitsuyo Shinan Koho 1971-2008 Toroku Jitsuyo Shinan Koho 1994-2008

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.
A	JP 63-249656 A (Komori Insatsu Kikai Kabushiki Kaisha), 17 October, 1988 (17.10.88), Full text (Family: none)	1-39
A	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 18665/1985(Laid-open No. 135648/1986) (Ryobi Ltd.), 23 August, 1986 (23.08.86), Full text; all drawings (Family: none)	1-39

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

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
14 October, 2008 (14.10.08)	28 October, 2008 (28.10.08)
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/JP2008/066849

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 2007-301997 A (M.A.N. Roland Druckmaschinen AG.), 22 November, 2007 (22.11.07), Full text; all drawings & EP 1854629 A1 & DE 10 2006 022 204 A1	1-39

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2001202225 A **[0003]**