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(54) TRANSFER APPARATUS AND TRANSFER METHOD THEREOF

TRANSFERVORRICHTUNG UND TRANSFERVERFAHREN DAFÜR

APPAREIL DE TRANSFERT ET PROCÉDÉ DE TRANSFERT CORRESPONDANT

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Description

Technical Field

[0001] The present invention is related to a transfer apparatus and a transfer method thereof in which a transfer material is transferred to a base material to be transferred using a plate cylinder and an impression cylinder.

Background art

[0002] EP 0 987 205 A1 describes a storage device for receiving a loop section of a flexible material web moving in a transport direction between a feed area upstream of the storage device and a downstream discharge area.

[0003] A transfer apparatus in which a transfer material is transferred to a base material to be transferred is disclosed in Japanese Patent No.3650197.

[0004] The transfer apparatus disclosed in Japanese Patent No.3650197 is provided with an embossing mechanism (corresponding to a transfer part of the present invention) constituted by a cylinder for embossing (corresponding to a plate cylinder of the present invention) and an impression cylinder, a carrying means for carrying wound foil for embossing (corresponding to a transfer material of the present invention), and a layer of material (corresponding to a base material to be transferred of the present invention) etc..

[0005] And the wound foil for embossing and the layer of material are advanced and passed between the cylinder for embossing and the impression cylinder while being stacked together, so that the wound foil is embossed (corresponding to "transferred" in the present invention) to the layer of material by a metal plate for embossing of the cylinder for embossing (corresponding to a transfer face of the present invention).

[0006] Still more, in a period until starting next embossing after finishing one embossing, the wound foil for embossing is moved backwardly while its carrying speed is decelerated by controlling the carrying means to reduce a distance between a precedingly embossed area and a subsequently embossed area in the wound foil, so that an amount of area in the wound foil for embossing which is carried while being unused for embossing is reduced, waste of the wound foil for embossing is thereby reduced.

[0007] According to the transfer apparatus disclosed in Japanese Patent No.3650197, an amount of area in the wound foil for embossing which is carried while being unused for embossing may be reduced to some extent, however such reduced amount of area is small and the waste of the wound foil for embossing can be hardly reduced.

[0008] Therefore, inventors of the present invention developed a transfer apparatus in which an amount of area of a transfer material which is carried while being untransferred can be reduced, so that the waste of the transfer material can be significantly reduced.

[0009] The transfer apparatus developed by the inventors will be described based on from Fig.8 to Fig.11.

[0010] Fig.8 is a schematic view of a transfer part of the transfer apparatus developed by the inventors, a transfer part 102 is comprised of a plate cylinder 100 and an impression cylinder 101. The plate cylinder 100 has a transfer face 103, the transfer face 103 is provided on an embossing plate 104. A face other than the transfer face 103 of the plate cylinder 100 is a non-transfer face 105.

[0011] The plate cylinder 100 is rotated in the counterclockwise direction at a fixed speed according to a transfer speed and is not rotated in the clockwise direction. The impression cylinder 101 is rotated in the clockwise direction at the same speed as the plate cylinder 100 and is not rotated in the counterclockwise direction.

[0012] A transfer material 106 and a base material to be transferred 107 are carried by step-back rollers (not shown) in the forward direction (direction of an arrow a) and backward direction (direction of an arrow b) respectively.

[0013] The transfer apparatus rotates the plate cylinder 100 and the impression cylinder 101 at the transfer speed in synchronization with each other, and carries the transfer material 106 and the base material to be transferred 107 in the forward direction by forwardly rotating the step-back rollers (not shown) to make them pass between the plate cylinder 100 and the impression cylinder 101 while being stacked each other. The transfer material 106 is transferred to the base material to be transferred 107 by the transfer face 103 of the plate cylinder 100 and a peripheral surface of the impression cylinder 101 while the plate cylinder 100 makes one rotation (revolution).

[0014] When transfer is finished, the transfer apparatus rotates the step-back rollers (not shown) in the backward direction, while the plate cylinder 100 makes one rotation, to perform (or take) step back of the transfer material 106 and the base material to be transferred 107 by carrying them in the backward direction by a prescribed distance, so that an area available for transfer of the transfer material 106 and an area of the base material to be transferred 107 where the transfer material 106 is to be transferred are adjusted. And the transfer apparatus carries the transfer material 106 and the base material to be transferred 107 in the forward direction by forwardly rotating the step-back rollers (not shown) again to perform transfer at the time of second rotation of the plate cylinder 100.

[0015] Note that, such step back control of the transfer material 106 and the base material to be transferred 107 includes acceleration and deceleration control while being backwardly carried. The step back control will be detailed later.

[0016] Now, carrying actions of the transfer material 106 and the base material to be transferred 107 to the plate cylinder 100 and a transfer operation by the transfer face 103 will be described based on Figs.9A to 9F.

[0017] In Figs.9A to 9F, frames each corresponding to a distance needed for transfer by the transfer face 103 are provided on the transfer material 106 and the base material to be transferred 107 to facilitate an understanding of the carrying action and the transfer operation. Note that, in an actual transfer apparatus, such frames are not provided on the transfer material 106 and the base material to be transferred 107. A framed hatched area of the base material to be transferred 107 indicates an area where the transfer is not performed (area for use in other purpose such as printing other than transfer), a framed blank area (hereinafter referred to a blank area) indicates an area where the transfer is to be performed.

[0018] A dot line indicates a transfer position 108 where the transfer material 106 and the base material to be transferred 107 are nipped by the transfer face 103 of the plate cylinder 100 and the peripheral surface of the impression cylinder 101.

[0019] Fig.9A shows a state before starting transfer, in which the transfer face 103 is displaced from the transfer position 108.

[0020] From such state, the plate cylinder 100 is rotated, and the transfer material 106 and the base material to be transferred 107 are carried in a forward direction (direction of the arrow a) at a same transfer speed in synchronization with each other.

[0021] As shown in Fig.9B, when the transfer face 103 is moved to the transfer position 108, the transfer face 103 transfers the transfer material 106 to the base material to be transferred 107. An area of the transfer material 106 which has been used for transfer is defined as (1), an area of the base material to be transferred 107 to which the transfer material 106 has been transferred is defined as (A) .

[0022] As shown in Fig.9C, when the non-transfer face 105 of the plate cylinder 100 passes through the transfer position 108, the step back is performed to carry the transfer material 106 backwardly (direction of the arrow b) by a prescribed distance, so that the transfer material 106 is returned by the prescribed distance. Thereafter, as shown in Fig.9D, the transfer face 103 is brought to the transfer position 108 by carrying forwardly the transfer material 106 at the time of second rotation of the plate cylinder 100.

[0023] At this time, an area (2) of the transfer material 106 is matched with the transfer position 108, so that the area (2) is used for transfer by the transfer face 103. The area (2) of the transfer material 106 is an area adjacent to and on an upstream side of the area (1) of the transfer material 106 in a carrying direction, the area (1) having been used for transfer at the time of first rotation of the plate cylinder 100.

[0024] The step back of the base material to be transferred 107 is performed to carry backwardly and return it by a prescribed distance in a state shown in Fig.9C. A return distance of the base material to be transferred 107 is different from a return distance of the transfer material 106. Thereafter, the base material to be transferred 107 is forwardly carried in synchronization with the transfer material 106, so that a blank area (B) of the base material to be transferred 107 is matched with the transfer position 108, when the transfer face 103 is moved to the transfer position 108 at the time of second rotation of the plate cylinder 100 as shown in Fig.9D, the transfer material 106 is transferred to the blank area (B).The blank area (B) of the base material to be transferred 107 is a blank area closest to and on the upstream side of the area (A) of the base material to be transferred 107 in the carrying direction, the area (A) to which the transfer material 106 has been transferred by the transfer face 103 at the time of first rotation of the plate cylinder 100.

[0025] As shown in Fig.9E, the step back of the transfer material 106 is performed to carry it backwardly by a prescribed distance and return the transfer material 106 by the prescribed distance, while the non-transfer face 105 of the plate cylinder 100 passes through the transfer position 108. Thereafter, the transfer material 106 is forwardly carried so that the transfer face 103 is brought to the transfer position 108 at the time of third rotation of the plate cylinder 100 as shown in Fig.9F.

[0026] At this time, an area (3) of the transfer material 106 is matched with the transfer position 108 so that the area (3) is used for transfer by the transfer face 103. The area (3) of the transfer material 106 is an area adjacent to and on the upstream side of the area (2) of the transfer material 106 in the carrying direction, the area (2) having been used for transfer at the time of second rotation of the plate cylinder 100.

[0027] The step back of the base material to be transferred 107 is performed (or taken) to carry backwardly and return it by the prescribed distance in a state shown in Fig.9E. Thereafter, the base material to be transferred 107 is forwardly carried in synchronization with the transfer material 106, so that a blank area (C) of the base material to be transferred 107 is matched with the transfer position 108 when the transfer face 103 is moved to the transfer position 108 at the time of third rotation of the plate cylinder 100 as shown in Fig.9F, and the transfer material 106 is transferred to the blank area (C). The blank area (C) of the base material to be transferred 107 is a blank area closest to and on the upstream side of the area (B) of the base material to be transferred 107 in the carrying direction, the area (B) to which the transfer material 106 has been transferred by the transfer face 103 at the time of second rotation of the plate cylinder 100.

[0028] Control for carrying action of the transfer material 106 will be described based on Fig.10 and Fig.11. Fig.10 is a schematic view of the control for carrying action of the transfer material at the time of first and second rotations of the plate cylinder of the transfer apparatus developed by the inventors, Fig.11 is a schematic view of the control for carrying action of the transfer material at the time of first rotation to sixth rotation of the plate cylinder of the transfer apparatus developed by the inventors.

[0029] As shown in Fig.10, a distance needed for transfer by the transfer face 103 is defined as L. L is a distance equivalent to a top-bottom size (a length in a rotational direction) of the transfer face 103 plus a minimum blank space needed for transfer.

[0030] A distance of the frame in a rotational direction of the plate cylinder 100 as shown in Figs.9, 10, 11 is L.

[0031] When the rotation of the plate cylinder 100 shifts from first rotation to second rotation, in other words, after finishing transfer by the transfer face 103 at the time of first rotation, the transfer material 106 forwardly carried at the transfer speed is decelerated and stopped. Thereafter, the step back of the transfer material 106 is performed, the step back is performed in the following manner.

[0032] The transfer material 106 at a stop is accelerated backwardly (in a return direction) up to a prescribed carrying speed so that it is carried at the prescribed carrying speed. Thereafter, to stop the step back, the prescribed carrying speed is decelerated, so that the carrying action in the backward direction is stopped at a prescribed distance. The carrying action for the prescribed distance in the backward direction including the acceleration and the deceleration is the step back. A distance until reaching at the prescribed carrying speed from stopping is defined as an acceleration distance during the step back, a distance until stopping from the carrying speed is defined as a deceleration distance during the step back. Note that, regarding the carrying action during the step back, it is possible to switch acceleration to deceleration immediately after accelerating to the prescribed carrying speed, without providing a distance over which the transfer material is carried at the prescribed carrying speed.

[0033] Moreover, the transfer material 106 at a stop is accelerated and carried at the transfer speed in the forward direction, until starting the transfer by the transfer face 103 at the time of second rotation of the plate cylinder 100.

[0034] A distance until stopping the transfer material 108 from a state that it is forwardly carried at the transfer speed by decelerating it (a deceleration distance after transferring) is defined as β. And, a distance until the transfer material 108 reaches at the transfer speed by forwardly accelerating it from a state that it is at a stop after performing the step back (an acceleration distance before transferring) is defined as α.

[0035] The deceleration distance β after transferring and the acceleration distance α before transferring are parameters determined depending on characteristics of a driving motor for rotationally driving the step-back rollers (not shown), the carrying speed, a return distance due to the step back, and a length of the non-transfer face 105 of the plate cylinder 100.

[0036] The deceleration distance β after transferring and the acceleration distance α before transferring are automatically determined by using a known control device which is recommendable from the characteristics of the driving motor.

[0037] Moreover, setting of the acceleration distance during the step back over which the transfer material 106 is carried in the backward direction (return direction), the deceleration distance during the step back and the carrying speed during the step back are also determined in the same way as the deceleration distance β after transferring and the acceleration distance α before transferring.

[0038] A distance over which the transfer material 106 is backwardly carried during one step back is defined as a return distance R10. The return distance R10 will be described below.

[0039] As shown in Fig.10, the area (2) of the transfer material 106 which is used for transfer by the transfer face 103 at the time of second rotation of the plate cylinder 100 is an area adjacent to and on the upstream side of the area (1) of the transfer material 106 in the carrying direction, the area (1) having been used for transfer by the transfer face 103 at the time of first rotation of the plate cylinder 100.

[0040] Therefore, since the transfer at the time of second rotation starts from a position on the upstream side of the area (1) in the carrying direction (an end position of transfer), the return distance R10 can be derived from $\alpha+\beta$.

[0041] In Fig.10, since $\alpha=2L$, $\beta=2L$, the return distance R10 is the distance of 4L. The carrying distance R in one rotation of the plate cylinder in the forward direction is the distance of 5L.

[0042] As shown in Fig.11, the area (3) of the transfer material 106 which is used for transfer at the time of third rotation of the plate cylinder 100 is an area adjacent to and on the upstream side of the area (2) in the carrying direction, the area (2) having been used for transfer at the time of second rotation.

[0043] The area (4) of the transfer material 106 which is used for transfer at the time of fourth rotation of the plate cylinder 100 is an area adjacent to and on the upstream side of the area (3) in the carrying direction, the area (3) having been used for transfer at the time of third rotation.

[0044] The area (5) of the transfer material 106 which is used for transfer at the time of fifth rotation of the plate cylinder 100 is an area adjacent to and on the upstream side of the area (4) in the carrying direction, the area (4) having been used for transfer at the time of fourth rotation.

[0045] The area (6) of the transfer material 106 which is used for transfer at the time of sixth rotation of the plate cylinder 100 is an area adjacent to and on the upstream side of the area (5) in the carrying direction, the area (5) having been used for transfer at the time of fifth rotation.

[0046] Moreover, when the rotation of the plate cylinder 100 shifts from second rotation to third rotation, when the rotation of the plate cylinder 100 shifts from third rotation to fourth rotation, when the rotation of the plate cylinder 100 shifts from fourth rotation to fifth rotation, when the rotation of the plate cylinder 100 shifts from fifth rotation to sixth rotation, the return distance R10 is the distance of 4L.

[0047] Note that, in Fig.11, in order to facilitate an understanding, drawing is simplified by assuming α and β as 0 (α=0, β=0).

[0048] The step back of return distance of R10=4L is also repeated in like manner at every rotation of the plate cylinder 100 at the time of sixth or later rotation of the plate cylinder 100, whereby the transfer can be always performed without wasting the transfer material 106.

[0049] According to the transfer apparatus developed by the inventors, since areas adjacent to and on the upstream side of areas in the carrying direction which have been used for transfer of the transfer material 106 are used for transfer in order, the transfer material 106 is effectively utilized without wasting.

Summary of the invention

Problems to be solved by the invention

[0050] When performing transfer using the transfer apparatus developed by the inventors, defects as follows may sometimes occur.

[0051] When the carrying direction of the transfer material 106 is switched to the forward direction or to the backward direction by performing the step back, a rotational direction and a rotational speed of the step-back rollers (not shown) are controlled. However, a rotational speed control and a stop position control of the step-back rollers (not shown) would sometimes become unstable due to a rotary inertia force of the step-back rollers (not shown), which may result in an unstable behavior of the transfer material 106.

[0052] Moreover, when switching the carrying direction of the transfer material 106, an inertia force may act on the transfer material 106 in the carrying direction before switching. Due to such inertia force, when the transfer material 106 has poor followability to a change of the forward or backward rotation of the step-back rollers (not shown) for carrying the transfer material 106, the transfer material 106 would likely be deformed or split so that the carrying action of the transfer material 106 would sometimes become unstable.

[0053] Due to instability in behavior and unstable carrying action of the transfer material 106, transfer failure would occur, and the yield would be degraded. This would occur whenever the step back of the transfer material 106 is performed.

[0054] The present invention has been made to solve abovementioned problems, and its object is to provide a transfer apparatus and transfer method thereof, in which a transfer material can be effectively utilized without wasting, and carrying action of the transfer material can be stabilized and the yield can be improved by reducing the number of times of the step back of transfer material. The abovementioned problems are thus resolved by a transfer apparatus and a transfer method as defined in the independent claims.

Means for solving the problems

[0055] A transfer apparatus of the present invention comprises a transfer part, a carrying part of a transfer material carrying the transfer material to the transfer part, a carrying part of a base material to be transferred carrying the base material to be transferred to the transfer part and a control part, wherein the transfer part has an impression cylinder and a plate cylinder, the plate cylinder has a transfer face which contacts with a peripheral surface of the impression cylinder and a non-transfer face which does not contact with the peripheral surface of the impression cylinder, wherein the transfer face is provided on an embossing plate which is shorter than the whole peripheral length of the plate cylinder, and wherein a face of the plate cylinder other than the transfer face is a non-transfer face; wherein the carrying part of the transfer material has step-back rollers and carries the transfer material forwardly by rotating forwardly the step-back rollers and the transfer material backwardly by rotating backwardly the step-back rollers, the carrying part of the base material to be transferred has step-back rollers and carries the base material to be transferred forwardly by rotating forwardly the step-back rollers and the base material to be transferred backwardly by rotating backwardly the step-back rollers, the step-back rollers of the carrying part of the transfer material and the step-back rollers of the carrying part of the base material to be transferred are forwardly rotated to carry forwardly the transfer material and the base material to be transferred, so that the transfer material is transferred to the base material to be transferred by the transfer face of the plate cylinder and the peripheral surface of the impression cylinder, and the step-back rollers of the carrying part of the transfer material and the step-back rollers of the carrying part of the base material to be transferred are backwardly rotated, so that step back of the transfer material and the base material to be transferred is performed to carry them backwardly through a gap between the non-transfer face of the plate cylinder and the peripheral surface of the impression cylinder. According to the invention the plate cylinder of the transfer part has only one transfer face and performs transfer once for one rotation of the plate cylinder, the control part continuously repeats multiple times a transfer operation of one cycle at which transfer is performed multiple times by rotating the plate cylinder any multiple times, while the transfer material is continuously and forwardly carried, and controls the step back to carry the transfer material backwardly, so that an area of the transfer material to be used for a first transfer at next cycle comes to an area adjacent to and on an upstream side of an area in the carrying direction, which has been used for a first transfer at the previous cycle, when performing transfer at the next cycle after finishing transfer at one cycle, and wherein the control part controls the step back for backwardly carrying the base material to be transferred for each rotation of the plate cylinder.

[0056] In an embodiment of the transfer apparatus, the control part judges whether an available area for transfer exists within a range of the transfer material which has been used for transfer up to the previous cycle, when performing transfer at the next cycle after finishing transfer at one cycle, controls the step back for backwardly carrying the transfer material so that the area of the transfer material to be used for the first transfer at the next cycle comes to the area adjacent to and on the upstream side of the area in the carrying direction, which has been used for the first transfer at the previous cycle, when it exists, and controls the step back for backwardly carrying the transfer material so that the area of the transfer material to be used for the first transfer at the next cycle comes to an area adjacent to and on the upstream side of an area in the carrying direction, which has been used for the last transfer at the previous cycle, when it does not exist.

[0057] In an embodiment of the transfer apparatus, the control part judges that the available area for transfer does not exist, when the number of times of repeated cycles is matched with an available number of times of transfer within a distance between transfer faces corresponding to a length of an outer periphery of the plate cylinder, and that the available area for transfer exists, when being not matched.

[0058] In a transfer method of a transfer apparatus comprising a transfer part to transfer a transfer material to a base material to be transferred comprising a plate cylinder having only one transfer face and an impression cylinder, wherein the transfer face is provided on an embossing plate which is shorter than the whole peripheral length of the plate cylinder, and wherein a face of the plate cylinder (other than the transfer face is a non-transfer face, step-back rollers for carrying the transfer material forwardly and backwardly by being rotated forwardly and backwardly, and step-back rollers for carrying the base material to be transferred forwardly and backwardly by being rotated forwardly and backwardly, the transfer method for performing transfer in which transfer is performed by continuously repeating multiple times transfer operation of one cycle at which transfer is performed multiple times by rotating the plate cylinder any multiple times, while the transfer material is continuously and forwardly carried comprising the steps of: judging whether the number of times of rotation of the plate cylinder is matched with the number of times of rotation of the plate cylinder at one cycle, every time when finishing a transfer operation at one rotation of the plate cylinder, carrying continuously and forwardly the transfer material to continue performing transfer at that cycle, when judged not to be matched, performing step back of the transfer material by rotating backwardly the step-back rollers to carry backwardly the transfer material for finishing transfer at that cycle and to perform transfer at the next cycle, when judged to be matched, wherein a distance over which the transfer material is carried backwardly is a distance making it possible that an area of the transfer material to be used for a first transfer at the next cycle comes to an area adjacent to and on an upstream side of an area in the carrying direction, which has been used for a first transfer at the previous cycle. According to the invention, the method further comprises the step of performing the step back for carrying the base material to be transferred backwardly by rotating the step-back rollers backwardly for each rotation of the plate cylinder.

[0059] In embodiments of the transfer method of the transfer apparatus of the present invention, the method further comprises the steps of: judging whether an available area for transfer exists within the range of the used transfer material for transfer until the previous cycle after finishing one cycle and when performing transfer at the next cycle, and performing the step back of the transfer material to carry it backwardly by rotating the step-back rollers backwardly, wherein the distance over which the transfer material is carried backwardly is a distance making it possible that the area of the transfer material to be used for the first transfer at the next cycle comes to the area adjacent to and on the upstream side of the area in the carrying direction, which has been used for the first transfer at the previous cycle, when judged that it exists, and, performing the step back of the transfer material to carry it backwardly by rotating the step-back rollers backwardly, wherein the distance over which the transfer material is carried backwardly is a distance making it possible that the area of the transfer material to be used for the first transfer at the next cycle comes to the area adjacent to and on the upstream side of an area in the carrying direction, which has been used for the last transfer at the previous cycle, when judged that it does not exist.

[0060] In an embodiment of the transfer method of the transfer apparatus of the present invention, the method further comprises the steps of: judging that the available area for transfer does not exist, when the number of times of repeated cycle is matched with an available number of times of transfer within a distance between transfer faces corresponding to a length of an outer periphery of the plate cylinder, and judging that the available area for transfer exists, when being not matched.

Advantageous Effects of the Invention

[0061] According to the transfer apparatus and its transfer method, the transfer material can be effectively utilized without wasting, and the number of times of step backs can be reduced so that the carrying action of the transfer material can be stabilized and the yield can be improved.

Brief Description of Drawings

[0062]

Fig.1 is a front view of the whole of one example of a transfer apparatus of an embodiment of the present invention.

Fig.2 is a schematic view of a plate cylinder of a transfer part of the present invention.

Fig.3A to 3H are views explaining a carrying action of a transfer material and a base material to be transferred and a transfer operation by a transfer face of the transfer apparatus of the present invention.

Fig.4 is a schematic view of control for carrying action of the transfer material at first cycle to second cycle of the plate cylinder of the embodiment.

Fig.5 is a schematic view of the control for carrying action of the transfer material at first cycle to eighth cycle of the plate cylinder of the embodiment.

Fig.6 is a diagraph comparably showing carrying states of the transfer material and the base material to be transferred in the transfer apparatus of the present invention and carrying states of a transfer material and a base material to be transferred in a transfer apparatus developed by the inventors.

Fig.7 is a flowchart of a control method of the transfer apparatus of the present invention.

Fig.8 is a schematic view of a transfer part of the transfer apparatus developed by the inventors.

Figs.9A to 9F are views explaining the carrying actions of the transfer material and the base material to be transferred and a transfer operation by a transfer face of the transfer apparatus developed by the inventors.

Fig.10 is a schematic view of a control for carrying action of the transfer material at the time of first and second rotations of a plate cylinder of the transfer apparatus developed by the inventors.

Fig.11 is a schematic view of the control for carrying action of the transfer material at the time of first to sixth rotation of the plate cylinder of the transfer apparatus developed by the inventors.

Preferred Embodiments of the Invention

[0063] A whole constitution of a transfer apparatus of the present invention will be described based on Fig.1. Fig.1 is a front view of the whole of one example of the transfer apparatus of an embodiment of the present invention.

[0064] A transfer apparatus 1 of the present invention comprises a transfer part 2, a supply part 3 of a transfer material, a collection part 4 of the transfer material, a control part 5, and a carrying part of a base material to be transferred (not shown), etc., and a carrying part of the transfer material is constituted by the supply part 3 of the transfer material and the collection part 4 of the transfer material. The transfer part 2, the supply part 3 of the transfer material, the collection part 4 of the transfer material, and the control part 5 are provided on a main body 1a of the apparatus. Note that, a portion on which the control part 5 is provided is not limited to the main body 1a of the apparatus, it may be provided on other portion than the main body 1a of the apparatus.

[0065] The transfer part 2 has a plate cylinder 20 and an impression cylinder 21.

[0066] As shown in Fig.2, the plate cylinder 20 has a transfer face 22, the transfer face 22 is provided on an embossing plate 23 which is shorter than the whole peripheral length of the plate cylinder 20. A face of the plate cylinder 20 other than the transfer face 22 is a non-transfer face 24. In other words, the plate cylinder 20 has only one transfer face 22.

[0067] As shown in Fig.1, the plate cylinder 20 and the impression cylinder 21 are synchronously rotated by one drive motor (not shown) at a fixed speed according to the transfer speed. The plate cylinder 20 is rotated in the counterclockwise direction and is not rotated in the clockwise direction. The impression cylinder 21 is rotated in the clockwise direction and is not rotated in the counterclockwise direction.

[0068] A transfer material 6 supplied from the supply part 3 of the transfer material and a base material to be transferred 7 carried by the carrying part of the base material to be transferred (not shown) are carried through a gap between the plate cylinder 20 and the impression cylinder 21. The transfer material 6 and the base material to be transferred 7 are nipped by the transfer face 22 of the plate cylinder 20 and a peripheral surface of the impression cylinder 21, the non-transfer face 24 of the plate cylinder 20 and the peripheral surface of the impression cylinder 21 have a gap there-between, the transfer material 6 and the base material to be transferred 7 are carried through the gap.

[0069] The transfer material 6 and the base material to be transferred 7 are nipped by the transfer face 22 of the plate cylinder 20 and the peripheral surface of the impression cylinder 21, so that the transfer material 6 is transferred to the base material to be transferred 7.

[0070] The control part 5 which is for example a CPU (Central Processing Unit) controls a carrying action of the transfer material 6 and the base material to be transferred 7 and rotations of the plate cylinder 20 and the impression cylinder 21.

[0071] A heating mechanism (not shown) is provided in the plate cylinder 20, therefore, the transfer part 2 of the embodiment is a heat transfer part to transfer the transfer material 6 to the base material to be transferred 7 by heating the transfer face 22 of the plate cylinder 20 at a temperature, for example, from about 150°C to 200°C. The transfer part in which the plate cylinder 20 is not heated may be configured as well. For the transfer part in which the plate cylinder 20 is not heated, a pasting device may be provided on the upstream side of the plate cylinder in the carrying direction, so that transfer is performed to the pasted base material to be transferred.

[0072] The supply part 3 of the transfer material carries the transfer material 6 toward the gap between the plate cylinder 20 and the impression cylinder 21 of the transfer part 2.

[0073] The supply part 3 of the transfer material has an unwinding shaft 30, a feed roller 31 on the supplying side provided on the downstream side of the unwinding shaft 30 in the supplying direction, a buffer device 32 on the supplying side provided on the downstream side of the feed roller 31 on the supplying side in the supplying direction, and a step-back roller 33 on the supplying side provided on the downstream side of the buffer device 32 on the supplying side in the supplying direction.

[0074] The transfer material 6 in a roll shape is fitted to the unwinding shaft 30.

[0075] The feed roller 31 on the supplying side is rotationally driven only in an unwinding direction (the counterclockwise direction) by a driving motor (not shown), and the transfer material 6 is wound around the outer peripheral surface of it. A nip roller 34 is provided at least at one position within a winding range of the transfer material 6 of the feed roller 31 on the supplying side, so that the transfer material 6 is held by the feed roller 31 on the supplying side and the nip roller 34.

[0076] The feed roller 31 on the supplying side is rotationally driven, so that the transfer material 6 in a roll shape which is fitted to the unwinding shaft 30 is unwound and carried toward the buffer device 32 on the supplying side.

[0077] The buffer device 32 on the supplying side is a loop-vacuum which holds the transfer material 6 downward in the shape of U in a box 35 using vacuum pressure.

[0078] The step-back roller 33 on the supplying side is rotated forwardly or backwardly by a driving motor (not shown), and around the outer peripheral surface of it, the transfer material 6 fed from the buffer device 32 on the supplying side is wound. A nip roller 36 is provided at least at one position within the winding range of the transfer material 6 of the step-back roller 33 on the supplying side, so that the transfer material 6 is held by the step-back roller 33 on the supplying side and the nip roller 36 and the transfer material 6 can be carried forwardly or backwardly.

[0079] The collection part 4 of the transfer material collects the transfer material 6 in other region than the region which has been used for transfer at the transfer part 2, in other words the transfer material 6 which has not been used for transfer.

[0080] The collection part 4 of the transfer material has a step-back roller 40 on the collecting side, a buffer device 41 on the collecting side provided on the downstream side of the step-back roller 40 on the collecting side in the collecting direction, a feed roller 42 on the collecting side provided on the downstream side of the buffer device 41 on the collecting side in the collecting direction, and a winding shaft 43 provided on the downstream side of the feed roller 42 on the collecting side in the collecting direction.

[0081] The step-back roller 40 on the collecting side is rotated forwardly and backwardly by a driving motor (not shown), and around the outer peripheral surface of it, the transfer material 6 which has not been used is wound.

[0082] A nip roller 44 is provided at least at one position within the winding range of the transfer material 6 of the step-back roller 40 on the collecting side, so that the transfer material 6 which has not been used for transfer can be carried while being held by the step-back roller 40 on the collecting side and the nip roller 44.

[0083] The buffer device 41 on the collecting side is a loop vacuum which holds the transfer material 6 which has not been used for transfer downward in the shape of U in a box 45 using vacuum pressure.

[0084] The feed roller 42 on the collecting side is rotationally driven only in the collecting direction (counterclockwise direction), around the outer peripheral surface of it, the transfer material which has not been used for transfer is wound

[0085] A nip roller 46 is provided at least at one position within the winding range of the transfer material 6 of the feed roller 42 on the collecting side, so that the transfer material 6 which has not been used for transfer is held by the feed roller 42 on the collecting side and the nip roller 46.

[0086] The transfer material 6 held in the buffer device 41 on the collection side having not been used for transfer is carried toward the winding shaft 43 by rotationally driving the feed roller 42 on the collecting side.

[0087] The winding shaft 43 is rotationally driven only in the winding direction (counterclockwise direction) by a driving motor (not shown) and collects the transfer material 6 which has not been used for transfer by winding it.

[0088] The step-back roller 33 on the supplying side and the step-back roller 40 on the collecting side are rotated forwardly in synchronization with each other when performing transfer, and forwardly carry the transfer material 6.

[0089] When a position of the area to be used for transfer of the transfer material 6 is adjusted, the step-back roller 33 on the supplying side and the step-back roller 40 on the collecting side are repeatedly rotated forwardly or backwardly in synchronization with each other, so that the transfer material 6 is intermittently carried while the transfer material 6 is carried alternatively forwardly or backwardly. This operation will be described later.

[0090] The buffer device 32 on the supplying side absorbs a change of tension generated in the transfer material 6 between the feed roller 31 on the supplying side and the step-back roller 33 on the supplying side, when the transfer material 6 is carried backwardly.

[0091] The buffer device 41 on the collecting side absorbs a change of tension generated in the transfer material 6 between the feed roller 42 on the collecting side and the step-back roller 40 on the collecting side, when the transfer material 6 is carried backwardly.

[0092] The base material to be transferred 7 is carried toward the transfer part 2 from a sheet feeding device of the carrying part of the base material to be transferred (not shown) provided at a distance from the transfer apparatus 1, and the base material to be transferred 7 to which the transfer material 6 is transferred at the transfer part 2 is collected by a sheet discharge device of the carrying part of the base material to be transferred (not shown) provided at a distance from the transfer apparatus 1.

[0093] It may be configured so that, a printing unit is provided between the transfer apparatus 1 and the sheet feeding device of the carrying part of the base material to be transferred (not shown), the base material to be transferred 7 is carried to the transfer part 2 after having been subject to printing and the transfer is performed to the printed base material to be transferred 7.

[0094] Moreover, it may be configured so that, a printing unit is provided between the transfer apparatus 1 and the sheet discharge device (not shown) of the carrying part of the base material to be transferred, printing is performed on the base material to be transferred 7 to which the transfer has been finished.

[0095] In order to adjust a position of the area where the base material to be transferred 7 is to be transferred with respect to the rotational position of the plate cylinder 20, a step-back roller on the upstream side (not shown) and a step-back roller on the downstream side (not shown) are respectively provided on the upstream side in the carrying direction and on the downstream side in the carrying direction separated at the transfer part 2 in the carrying path of the base material to be transferred, for example, at the sheet feeding device (not shown) and at the sheet discharge device(not shown) of the base material to be transferred.

[0096] The step-back roller on the upstream side (not shown) and the step-back roller on the downstream side (not shown) are forwardly (in the direction of the arrow a) and backwardly (in the direction of the arrow b) rotated in synchronization with each other, and forwardly and backwardly carry the base material to be transferred 7, so that the position of the area of the base material to be transferred 7 where the transfer material 6 is to be transferred is adjusted.

[0097] The transfer material 6 and the base material to be transferred 7 are intermittently carried by controlling the step-back roller 33 on the supplying side, the step-back roller 40 on the collecting side, the step-back roller on the upstream side (not shown) and the step-back roller on the downstream side (not shown) by the control part 5.

[0098] The transfer material 6 is mainly composed of 4 layers of a film layer, a releasing layer, a foil layer and a glue layer, gold foil and silver foil are available as foil. The transfer material 6 is not limited thereto.

[0099] As the base material to be transferred 7, a tack-seal paper composed of a surface substrate, an adhesive and a releasing paper is mainly used. The base material to be transferred 7 is not limited thereto.

[0100] The transfer by the transfer part 2 is performed in such manner as follows.

[0101] The transfer material 6 and the base material to be transferred 7 are carried to the gap between the plate cylinder 20 and the impression cylinder 21, while the glue layer of the transfer material 6 and the surface substrate of the base material to be transferred 7 are in contact and overlapped with each other, the transfer material 6 and the base material to be transferred 7 are nipped by a heated transfer face 22 of the plate cylinder 20 and the impression cylinder 21.

[0102] The glue layer is fused by the heated transfer face 22, so that the area of the transfer material 6 being brought into contact with the transfer face 22 is pasted to the surface substrate of the base material to be transferred 7. When the transfer material 6 and the base material to be transferred 7 are carried and freed from nipping of the heated transfer face 22, the temperature goes down and the glue is solidified.

[0103] After the glue has been solidified, the foil of the transfer material 6 is separated by a releasing roller (not shown) provided between the transfer part 2 and the step-back roller 40 on the collecting side into an area pasted to the surface substrate of the base material to be transferred 7 and an area unpasted to the surface substrate of the base material to be transferred 7.

[0104] The foil in the unpasted area is carried by the step-back roller 40 on the collecting side toward the winding shaft 43 together with the film layer and the releasing layer of the transfer material 6. When the foil in the unpasted area is separated, only glued foil remains on the base material to be transferred 7 and the transfer is finished.

[0105] While the transfer part 2 in which the plate cylinder 20 is not heated may be configured, for the transfer part in which the plate cylinder 20 is not heated, the transfer shall be performed through a method in which the transfer material is glued to the base material to be transferred by using the glue applied to the base material to be transferred on the upstream side of the transfer part, and shall be performed by nipping the base material to be transferred and the transfer material by the transfer face of the plate cylinder and the peripheral surface of the impression cylinder after the glue has been applied to the base material to be transferred. Therefore, when the transfer part in which the plate cylinder 20 is not heated is used, the gluing device shall be provided on the upstream side of the transfer part.

[0106] The carrying action of the transfer material 6 and the base material to be transferred 7 with respect to the plate cylinder 20 and a transfer operation by the transfer face 22 will be described based on Figs.3A to 3H.

[0107] In Figs. 3A to 3H, the transfer material 6 and the base material to be transferred 7 may be provided with frames each corresponding to a distance needed for transfer by the transfer face 22, so as to facilitate an understanding of the carrying action and the transfer operation. Note that, in an actual transfer apparatus, the transfer material 6 and the base material to be transferred 7 are not provided with the frames. The framed hatched area of the base material to be transferred 7 is an area where the transfer is not performed (an area used for other purpose than transfer e.g. printing), the framed blank area (herein after referred to as a blank area) is an area where the transfer is performed. The area of the base material to be transferred 7 where the transfer is not performed (the hatched area in Figs.3A to 3H) is determined depending on a design of a product to be manufactured by the transfer apparatus.

[0108] A broken line indicates a transfer position 25 where the transfer material 6 and the base material to be transferred 7 are nipped by the transfer face 22 of the plate cylinder 20 and the peripheral surface of the impression cylinder 21.

[0109] Fig.3A shows a state before starting of transfer in which the transfer face 22 is displaced from the transfer position 25.

[0110] From the state, the plate cylinder 20 is rotated, and the transfer material 6 and the base material to be transferred 7 are synchronously carried at the same transfer speed in the forward direction (direction of the arrow a).

[0111] As shown in Fig.3B, the transfer face 22 performs first transfer of the transfer material 6 to the base material to be transferred 7, when the transfer face 22 is moved to the transfer position 25 at the time of first rotation of the plate cylinder 20. An area used for transfer of the transfer material 6 is defined as (1), and an area of the base material to be transferred 7 to which the transfer material 6 has been transferred is defined as (A).

[0112] As shown in Fig.3C, when the non-transfer face 24 of the plate cylinder 20 passes through the transfer position 25 after finishing transfer at the time of first rotation of the plate cylinder 20, the base material to be transferred 7 is carried backwardly (in the direction of the arrow b),whereby the step back is performed. In other words, the base material to be transferred 7 is backwardly carried by a prescribed distance through the gap between the non-transfer face 24 of the plate cylinder 20 and the peripheral surface of the impression cylinder 21. This motion is the step back. Note that this step back includes controls of the acceleration and the deceleration of the base material to be transferred 7 while it is backwardly carried. The details of such step back control will be described later.

[0113] At this time, the transfer material 6 is continued to be forwardly carried.

[0114] After the base material to be transferred 7 has been carried backwardly by the prescribed distance, the base material to be transferred 7 is carried forwardly in synchronization with the transfer material 6. The distance over which the base material to be transferred 7 is, as shown in Fig. 3D, backwardly carried (the return distance due to the step back) is determined, so that a blank area (B) of the base material to be transferred 7 is matched with the transfer position 25, when the transfer face 22 is moved to the transfer position 25 at the time of second rotation of the plate cylinder 20. The blank area (B) of the base material to be transferred 7 is a blank area nearest to and on the upstream side of the area (A) of the base material to be transferred 7 in the carrying direction, to which the transfer material 6 has been transferred by the transfer face 22 at the time of first rotation of the plate cylinder 20.

[0115] As shown in Fig.3D, the transfer material 6 is transferred to the blank area (B) of the base material to be transferred 7, when the transfer face 22 is moved to the transfer position 25 at the time of second rotation of the plate cylinder 20. An area used for transfer of the transfer material 6 at this time is defined as (2).

[0116] As shown in Fig.3E, when the non-transfer face 24 of the plate cylinder 20 passes through the transfer position 25 after finishing transfer at the time of second rotation of the plate cylinder 20, the step back is performed to carry backwardly the base material to be transferred 7. At this time, the transfer material 6 is continued to be forwardly carried.

[0117] After the base material to be transferred 7 has been backwardly carried by the prescribed distance, the base material to be transferred 7 is forwardly carried in synchronization with the transfer material 6. The return distance due to the step back of the base material to be transferred 7 is the same as that described above, and determined, as shown in Fig.3F, so that a blank area (C) of the base material to be transferred is matched with the transfer position 25, when the transfer face 22 is moved to the transfer position 25 at the time of third rotation of the plate cylinder 20. The blank area (C) of the base material to be transferred 7 is the blank area nearest to and on the upstream side of the area (B) of the base material to be transferred 7 in the carrying direction, to which the transfer material 6 has been transferred by the transfer face 22 at the time of second rotation of the plate cylinder 20.

[0118] As shown in Fig.3F, the transfer material 6 is transferred to the blank area (C) of the base material to be transferred 7, when the transfer face 22 is moved to the transfer position 25 at the time of third rotation of the plate cylinder 20. An area used for transfer of the transfer material 6 at this time is defined as (3).

[0119] In other words, the plate cylinder 20 is rotated 3 times, while the transfer material 6 is continuously carried in the forward direction, the transfer material 6 is transferred 3 times in succession to the base material to be transferred 7 by performing the step back of the base material to be transferred 7 for each rotation of the plate cylinder 20. This operation is performed at one cycle.

[0120] As shown in Fig.3G, after finishing transfer at the time of third rotation of the plate cylinder 20(after finishing last transfer at one cycle), and when the non-transfer face 24 of the plate cylinder 20 passes through the transfer position 25, the step back is applied to the transfer material 6 and the base material to be transferred 7 to carry them in the backward direction, so that the transfer material 6 and the base material to be transferred 7 are respectively carried and returned by the prescribed distance through the gap between the non-transfer face 24 of the plate cylinder 20 and the peripheral surface of the impression cylinder 21 in the backward direction. The return distance of the transfer material 6 and the return distance of the base material to be transferred 7 are different. Thereafter, the transfer material 6 and the base material to be transferred 7 are synchronously carried in the forward direction (see Fig.3H).

[0121] The return distance of the base material to be transferred 7 due to the step back is the same as previously described and determined, as shown in Fig.3H, so that the blank area (D) of the base material to be transferred 7 is matched with the transfer position 25, when the transfer face 22 is moved to the transfer position 25 at the time of fourth rotation of the plate cylinder 20. The blank area (D) of the base material to be transferred 7 is the blank area closest to and on the upstream side of the blank area (C)of the base material to be transferred 7 in the carrying direction, to which the transfer material 6 has been transferred by the transfer face 22 at the time of third rotation of the plate cylinder 6.

[0122] As shown in Fig.3H, the return distance of the transfer material 6 due to the step back is determined so that an area (4) of the transfer material 6 is matched with the transfer position 25, when the transfer face 22 is moved to the transfer position 25 at the time of fourth rotation of the plate cylinder 20 (at the time of first transfer at second cycle) .The area (4) of the transfer material 6 is the area adjacent to and on the upstream side of the area (1) of the transfer material 6 in the carrying direction, the area (1) having been used for transfer by the transfer face 22 at the time of first rotation of the plate cylinder 20. The area (4) of the transfer material 6 is transferred to the blank area (D) of the base material to be transferred 7 by the transfer face 22.

[0123] The transfer operation at one cycle is performed by the control part 5 as follows.

[0124] The control part 5 counts the number of times of rotation of the plate cylinder 20, and judges whether count number of times of rotation of the plate cylinder 20 agrees with the number of times of rotation of the plate cylinder at one cycle.

[0125] When the control part 5 judges that they do not agree, since the transfer operation at one cycle has not been finished yet, the transfer material 6 is continued to be carried in the forward direction to continue transfer.

[0126] When the control part 5 judges that they agree, since the transfer operation at one cycle has been finished, the transfer material 6 which is carried at the transfer speed in the forward direction is decelerated to stop, then the step back of the transfer material 6 is performed. After having been performed the step back, the transfer material 6 is accelerated up to the transfer speed and transfer at the next cycle is started.

[0127] The step back of the transfer material 6 is performed as follows.

[0128] For example, the step-back roller 33 on the supplying side and the step-back roller 40 on the collecting side are backwardly rotated in synchronization with each other to carry the transfer material 6 in the backward direction (direction of the arrow b) by the prescribed distance.

[0129] To stabilize the carrying action of the transfer material 6, the rotational speed of the step-back roller on the downstream side is controlled to be faster than the rotational speed of the step-back roller on the upstream side in the carrying direction. By this control, such condition would be maintained that sufficient tension capable of carrying the transfer material 6 always acts between the step-back roller 33 on the supplying side and the step-back roller 40 on the collecting side, so that the transfer material 6 is stably carried. Note that, the step-back rollers for carrying the base material to be transferred 7 (not shown) as well may be similarly controlled.

[0130] At this time, tension of the transfer material 6 between the step-back roller 33 on the supplying side and the feed roller 31 on the supplying side and tension of the transfer material 6 between the step-back roller 40 on the collecting side and the feed roller 42 on the collecting side may change respectively, but such changes of tension may be absorbed by the buffer device 32 on the supplying side and the buffer device 41 on the collecting side respectively.

[0131] After the transfer material 6 has been returned by the prescribed distance by being carried in the backward direction, the step-back roller 33 on the supplying side and the step-back roller 40 on the collecting side are forwardly and synchronously rotated to carry the transfer material 6 in the forward direction.

[0132] The step back of the base material to be transferred 7 is performed by controlling the step-back roller (not shown) on the upstream side and the step-back roller (not shown) on the downstream side of the carrying part of the base material to be transferred (not shown), in the same manner as that previously described with respect to the step-back roller 33 on the supplying side and the step-back roller 40 on the collecting side.

[0133] The control for carrying action of the transfer material 6 will be described based on Fig.4 and Fig.5. Fig.4 is a schematic view of the control for carrying action of the transfer material at the time of first rotation (first cycle) to sixth rotation (second cycle) of the plate cylinder of the embodiment, and Fig.5 is a schematic view of the control for carrying action of the transfer material at the time of first rotation (first cycle) to fourth rotation (eighth cycle) of the plate cylinder of the embodiment.

[0134] As shown in Fig.4, a distance needed for transfer by the transfer face 22 is defined as L. L is a distance equivalent to top and bottom size (a length in the rotational direction) of the transfer face 22 plus the minimum blank space needed for transfer.

[0135] A distance between the transfer faces, that is, an outer peripheral length of the plate cylinder 20 (a distance from a position where the transfer face starts to transfer at the time of first rotation of the plate cylinder to a subsequent position where the transfer face starts to transfer at the time of second rotation of the plate cylinder) is defined as M.

[0136] The outer peripheral length of the plate cylinder 20 is a length of an outer periphery of a virtual circle having a radius of distance from the rotation center of the plate cylinder 20 to the transfer face 22.

[0137] The number of times of rotation of the plate cylinder 20 at one cycle (the number of times of transfer at one cycle) is defined as S. In this description, the number of times of rotation at one cycle S of the plate cylinder 20 is 3.

[0138] The available number of times of transfer within the distance between transfer faces is defined as N. N can be derived from the distance M between the transfer faces and the distance L needed for transfer by the transfer face 22. That is, N=M÷L.

[0139] The distance L needed for transfer by the transfer face 22 is determined based on accuracy of the top-and-bottom size of the transfer face 22 and of the carrying action of the transfer material 6, the distance M between the transfer faces (length of the outer periphery of the plate cylinder) is determined based on the size of the plate cylinder 20, and as the available number of times of transfer N within the distance between the transfer faces can be derived from L and M, N can be also determined based on a size of the plate cylinder 20 etc..

[0140] In this embodiment, N is 6, there are 5 frames between areas used for transfer of the transfer material 6 at the 1 cycle, for example between the area (1) and the area (2). In other words, the available number of times of transfer within the distance between the transfer faces includes the first transfer.

[0141] Moreover, in the transfer material 6 after finishing the transfer at the first cycle in Fig.4, a blank area between the area (1) and the area (2), and a blank area between the area (2) and the area (3) are unused areas generated at the first cycle.

[0142] In other words, the available number of times of transfer in the unused areas is N-1.

[0143] N is an integral number in the embodiment, but when M is not an integer multiple of L, a remainder is left in N. The remainder in N means that there exists an area left unused which has a distance less than the distance L needed for transfer by the transfer face 22 and is thereby unavailable for transfer, when performing the transfer in the unused area as shown in Figs.3(A to H) to Fig.5. In the following description, N is assumed to be an integral number in which the remainder is cut off.

[0144] As shown in Fig.4,at the first cycle, the area (1) of the transfer material 6 is used for transfer by the transfer face 22 at the time of first rotation of the plate cylinder 20, the area (2) of the transfer material 6 is used for transfer by the transfer face 22 at the time of second rotation of the plate cylinder 20, and the area (3) of the transfer material 6 is used for transfer by the transfer face 22 at the time of third rotation of the plate cylinder 20.

[0145] When the cycle shifts from first cycle to second cycle, in other words, after finishing the last transfer at the first cycle, the transfer material 6 which is carried at the transfer speed in the forward direction is decelerated and stopped. Thereafter, the step back of the transfer material 6 is performed. Such step back is performed in the following manner.

[0146] The transfer material 6 at a stop is accelerated to the prescribed carrying speed in the backward direction (return direction) and carried at the prescribed carrying speed. Thereafter, to stop the step back, the transfer material 6 is decelerated from the prescribed carrying speed, and the carrying action is stopped at a prescribed distance in the backward direction. The carrying action for prescribed distance in the backward direction including the acceleration and the deceleration is the step back. A distance until reaching at the prescribed carrying speed from stopping is defined as an acceleration distance during the step back. A distance until stopping from the carrying speed is defined as a deceleration distance during the step back. Note that, the carrying speed during the step back may be decelerated immediately after having been accelerated to the prescribed carrying speed, without providing the distance over which the transfer material 6 is carried at the prescribed carrying speed.

[0147] Moreover, the transfer material 6 at a stop is accelerated and carried at the transfer speed in the forward direction, until starting the transfer by the transfer face 22 at the second cycle.

[0148] A distance until stopping the transfer material 6 from a state that it is forwardly carried at the transfer speed by decelerating it (a deceleration distance after transferring) is defined as β. And, a distance until the transfer material 6 reaches at the transfer speed by forwardly accelerating it from a state that it is at a stop after performing the step back (an acceleration distance before transferring) is defined as α.

[0149] The deceleration distance β after transferring and the acceleration distance α before transferring are parameters determined by characteristics of the driving motor for rotationally driving the step-back roller 33 on the supplying side and the step-back roller 40 on the collecting side as shown in Fig.1, the carrying speed, the return distance due to the step back, and the length of the non-transfer face 24 of the plate cylinder 20.

[0150] The deceleration distance β after transferring and the acceleration distance α before transferring are automatically determined by using a known control device which is recommendable from the characteristics of the driving motor.

[0151] Moreover, settings of the acceleration distance during the step back over which the transfer material 6 is carried in the backward direction (return direction), the deceleration distance during the step back, and the carrying speed during the step back are also determined in the same way as the deceleration distance β after transferring and the acceleration distance α before transferring.

[0152] A distance over which the transfer material 6 is carried by one step back in the backward direction is defined as a return distance R1, the return distance R1 will be described in the followings.

[0153] As shown in Fig.4, the area (4) of the transfer material 6 which is used for transfer by the transfer face 22 at the time of first rotation of the plate cylinder 20 at the second cycle is an area adjacent to and on the upstream side of the area (1) of the transfer material 6 in the carrying direction, the area (1) having been used for transfer by the transfer face 22 at the time of first rotation of the plate cylinder 20 at the first cycle.

[0154] The area (5) of the transfer material 6 which is used for transfer by the transfer face 22 at the time of second rotation of the plate cylinder 20 at the second cycle is an area adjacent to and on the upstream side of the area (2) of the transfer material 6 in the carrying direction, the area (2) having been used for transfer by the transfer face 22 at the time of second rotation of the plate cylinder 20 at the first cycle.

[0155] The area (6) of the transfer material 6 which is used for transfer by the transfer face 22 at the time of third rotation of the plate cylinder 20 at the second cycle is an area adjacent to and on the upstream side of the area (3) of the transfer material 6 in the carrying direction, the area (3) having been used for transfer by the transfer face 22 at the time of third rotation of the plate cylinder 20 at the first cycle.

[0156] Therefore, the return distance R1 can be derived from the following formula (1).

$$R1 = M \times (S-1) + \alpha + \beta \cdots \text{formula (1)}$$

[0157] Since the number of times of rotation S of the plate cylinder 20 at one cycle is 3 and the distance M between the transfer faces is 6 times of L as shown in Fig.4, from the formula (1), the return distance R1 is $6L \times 2 + \alpha + \beta$, and as α and β each have the distance of 2L, the return distance R1 is the distance of 16L. Moreover, the carrying distance R in the forward direction at one cycle is the distance of 17L.

[0158] As shown in Fig.4, when the cycle shifts from first cycle to second cycle, the transfer material 6 has only to be carried in backward direction by the distance of 16L.

[0159] As shown in Fig.5, the return distance R1 when the second cycle shifts from second cycle to third cycle, the return distance R1 when third cycle shifts to fourth cycle, the return distance R1 when fourth cycle shifts to fifth cycle, and the return distance R1 when fifth cycle shifts to sixth cycle are each the distance of 16L. Note that, in Fig.5, to facilitate an understanding, α and $\beta$are assumed as 0 (α=0, β=0) and the drawing is simplified.

[0160] The area (7) of the transfer material 6 which is used for transfer by the transfer face 22 at the time of first rotation of the plate cylinder 20 at the third cycle is an area adjacent to and on the upstream side of the area (4) in the carrying direction, the area (4) having been used for transfer by the transfer face 22 at the time of first rotation of the plate cylinder 20 at the second cycle.

[0161] The area (8) of the transfer material 6 which is used for transfer by the transfer face 22 at the time of second rotation of the plate cylinder 20 at the third cycle is an area adjacent to and on the upstream side of the area (5) in the carrying direction, the area (5) having been used for transfer by the transfer face 22 at the time of second rotation of the plate cylinder 20 at the second cycle.

[0162] The area (9) of the transfer material 6 which is used for transfer by the transfer face 22 at the time of third rotation of the plate cylinder 20 at the third cycle is an area adjacent to and on the upstream side of the area (6) in the carrying direction, the area (6) having been used for transfer by the transfer face 22 at the time of third rotation of the plate cylinder 20 at the second cycle.

[0163] The area (10) of the transfer material 6 which is used for transfer by the transfer face 22 at the time of first rotation of the plate cylinder 20 at the fourth cycle is an area adjacent to and on the upstream side of the area (7) in the carrying direction, the area (7) having been used for transfer by the transfer face 22 at the time of first rotation of the plate cylinder 20 at the third cycle.

[0164] The area (11) of the transfer material 6 which is used for transfer by the transfer face 22 at the time of second rotation of the plate cylinder 20 at the fourth cycle is an area adjacent to and on the upstream side of the area (8) in the carrying direction, the area (8) having been used for transfer by the transfer face 22 at the time of second rotation of the plate cylinder 20 at the third cycle.

[0165] The area (12) of the transfer material 6 which is used for transfer by the transfer face 22 at the time of third rotation of the plate cylinder 20 at the fourth cycle is an area adjacent to and on the upstream side of the area (9) in the carrying direction, the area (9) having been used for transfer by the transfer face 22 at the time of third rotation of the plate cylinder 20 at the third cycle.

[0166] The area (13) of the transfer material 6 which is used for transfer by the transfer face 22 at the time of first rotation of the plate cylinder 20 at the fifth cycle is an area adjacent to and on the upstream side of the area (10) in the carrying direction, the area (10) having been used for transfer by the transfer face 22 at the time of first rotation of the plate cylinder 20 at the fourth cycle.

[0167] The area (14) of the transfer material 6 which is used for transfer by the transfer face 22 at the time of second rotation of the plate cylinder 20 at the fifth cycle is an area adjacent to and on the upstream side of the area (11) in the carrying direction, the area (11) having been used for transfer by the transfer face 22 at the time of second rotation of the plate cylinder 20 at the fourth cycle.

[0168] The area (15) of the transfer material 6 which is used for transfer by the transfer face 22 at the time of third rotation of the plate cylinder 20 at the fifth cycle is an area adjacent to and on the upstream side of the area (12) in the carrying direction, the area (12) having been used for transfer by the transfer face 22 at the time of third rotation of the plate cylinder 20 at the fourth cycle.

[0169] The area (16) of the transfer material 6 which is used for transfer by the transfer face 22 at the time of first rotation of the plate cylinder 20 at the sixth cycle is an area adjacent to and on the upstream side of the area (13) in the carrying direction, the area (13) having been used for transfer by the transfer face 22 at the time of first rotation of the plate cylinder 20 at the fifth cycle.

[0170] The area (17) of the transfer material 6 which is used for transfer by the transfer face 22 at the time of second rotation of the plate cylinder 20 at the sixth cycle is an area adjacent to and on the upstream side of the area (14) in the carrying direction, the area (14) having been used for transfer by the transfer face 22 at the time of second rotation of the plate cylinder 20 at the fifth cycle.

[0171] The area (18) of the transfer material 6 which is used for transfer by the transfer face 22 at the time of third rotation of the plate cylinder 20 at the sixth cycle is an area adjacent to and on the upstream side of the area (15) in the carrying direction, the area (15) having been used for transfer by the transfer face 22 at the time of third rotation of the plate cylinder 20 at the fifth cycle.

[0172] As shown in Fig.5, when the cycle shifts from sixth cycle (the same number of times of cycle as the available number of times of transfer N within the distance between transfer faces) to seventh cycle (a cycle of available number of times of transfer N+1 within the distance between transfer faces), if the transfer is performed by using the return distance R1 derived from the formula (1), the area (19) to use for transfer by the transfer face 22 at the time of first rotation of the plate cylinder 20 at the seventh cycle will be an area adjacent to and on the upstream side of the area (16) in the carrying direction, the area (16) having been used for transfer by the transfer face 22 at the time of first rotation of the plate cylinder 20 at the sixth cycle, the area(16) has been already used for transfer.

[0173] In other words, when transfer at the sixth cycle is finished, since all areas on the downstream side of the area (18) in the carrying direction, the area (18) having been used for transfer at the end of sixth cycle, have been already used for transfer (within a used range), a new area available for transfer is needed.

[0174] Therefore, the return distance R1 shall be the distance derived from the formula (2) and an area of the transfer material 6 used for transfer by the transfer face 22 at the time of first rotation of the plate cylinder 20 in the seventh cycle is defined as (19) adjacent to and on the upstream side of the area (18) in the carrying direction, the area (18) having been used for transfer by the transfer face 22 at the time of third rotation of the plate cylinder 20 at the sixth cycle, when the sixth cycle shifts to seventh cycle, after finishing transfer by the transfer face 22 at the time of third rotation of the plate cylinder 20 at the sixth cycle.

[0175] This area (19) is a new area.

$$R1=\alpha+\beta\cdots\text{formula (2)}$$

[0176] This is performed by the control part 5. For example, the control part 5 counts the number of times of cycle (hereinafter referred to a cycle number), when the counted cycle number is not matched with the available number of times of transfer N within the distance between the transfer faces, the control part 5 judges that there exists an area available for transfer within the used range and determines the return distance R1 due to the step back of the transfer material 6 as the distance ($M\times(S-1)+\alpha+\beta$) derived from the formula (1).

[0177] When the counted cycle number is matched with the available number of times of transfer N within the distance between the transfer faces, the control part 5 judges that there does not exist any area available for transfer within the used range, and determines the return distance R1 due to the step back of the transfer material 6 as the distance ($\alpha+\beta$) derived from the formula (2).

[0178] The area (20) of the transfer material 6 to be used for transfer by the transfer face 22 at the time of second rotation of the plate cylinder 20 at the seventh cycle and the area (21) of the transfer material 6 to be used for transfer by the transfer face 22 at the time of third rotation of the plate cylinder 20 at the seventh cycle are new areas.

[0179] When the cycle shifts from seventh cycle to eighth cycle, the return distance R1 shall be the distance derived from the formula (1).

[0180] The area (22) of the transfer material 6 to be used for transfer by the transfer face 22 at the time of first rotation of the plate cylinder 20 at the eighth cycle is an area adjacent to and on the upstream side of the area (19) in the carrying direction, the area (19) having been used for transfer by the transfer face 22 at the time of first rotation of the plate cylinder 20 at the seventh cycle.

[0181] The area (23) of the transfer material 6 to be used for transfer by the transfer face 22 at the time of second rotation of the plate cylinder 20 at the eighth cycle is an area adjacent to and on the upstream side of the area (20) in the carrying direction, the area (20) having been used for transfer by the transfer face 22 at the time of second rotation of the plate cylinder 20 at the seventh cycle.

[0182] The area (24) of the transfer material 6 to be used for transfer by the transfer face 22 at the time of third rotation of the plate cylinder 20 at the eighth cycle is an area adjacent to and on the upstream side of the area (21) in the carrying direction, the area (21) having been used for transfer by the transfer face 22 at the time of third rotation of the plate cylinder 20 at the seventh cycle.

[0183] In other words, the return distance R1 of the transfer material 6 due to the step back at the time of shifting of cycle shall be the distance derived from the former formula (1) until the cycle number reaches the available number of times of transfer N within the distance between the transfer faces. In the embodiment, it is the distance of 16L.

[0184] The return distance R1 of the transfer material 6 due to the step back when the cycle shifts from sixth cycle (the same number of times of cycle as the available number of times of transfer N within the distance between transfer faces) to the seventh cycle (the cycle of available number of times of transfer N+1 within the distance between transfer faces) shall be the distance derived from the formula (2). In the embodiment, it is the distance of 4L.

[0185] According to the transfer apparatus 1 of the embodiment, all unused areas of the transfer material 6 generated at the first cycle can be used for transfer at the sixth cycle.

[0186] Therefore, the transfer material 6 can be effectively used without wasting.

[0187] In the above description, since the distance M between transfer faces 20 is assumed to be 6L, the available number of times N of transfer within the distance between the transfer faces is 6, but the return distance R1 can be determined as follows when N is changed by values of M, L.

[0188] Where a natural number (a positive integer) is defined as k, the transfer cycle is defined as P, the return distance R1 due to the step back at the P-th cycle shall be the distance derived from the former formula (2) when P satisfies the following formula (3), and the distance derived from the former formula (1) when P does not satisfy the following formula (3).

$$P = k \times N \cdots \text{formula}(3)$$

[0189] When P satisfies the formula (3) means that the transfer cycle is an integral multiple of N, and when P does not satisfy the formula (3) means that the transfer cycle is not the integral multiple of N.

[0190] When comparing the number of times of step back of the transfer material 6 according to the transfer apparatus 1 of the embodiment with the number of times of step back of the transfer material 106 according to the transfer apparatus developed by the inventors of the present invention, the result is as follows.

[0191] According to the transfer apparatus 1 of the embodiment, the step back of the transfer material 6 is performed for each cycle during which the plate cylinder 20 is rotated several times, whereas, according to the transfer apparatus developed by the inventors, the step back of the transfer material 106 is performed for each rotation of the plate cylinder 100, therefore, with respect to the number of times of step back of the transfer material 6,106, it is smaller in the transfer apparatus 1 of the embodiment.

[0192] Therefore, by reducing the number of times of step back , an effect of rotary inertia force acting on the step-back rollers 33, 40 when being decelerated after transferring, when being accelerated before transferring and when being accelerated and decelerated during the step back can be reduced, thus the rotational speed control and stop position control of the step-back rollers 33, 40 are prevented from being unstable due to the rotary inertia force of the step-back rollers 33, 40 which would make the behavior of the transfer material 6 unstable, the carrying action of the transfer material 6 can be thereby stabilized. Moreover, the effect of inertia force acting on the transfer material 6 when being decelerated after transferring, when being accelerated before transferring and when being accelerated and decelerated during step the back can be reduced, the carrying action of the transfer material 6 can be thereby stabilized. From those, the yield can be improved.

[0193] Fig.6 provides a diagraph comparably showing a carrying state of the transfer material 6 and a carrying state of the base material to be transferred 7 in the transfer apparatus 1 of the embodiment, and a carrying state of the transfer material 106 and a carrying state of the base material to be transferred 107 in the transfer apparatus developed by the inventors.

[0194] Fig.6 is the diagraph comparably showing carrying states of the transfer material and the base material to be transferred, a horizontal axis indicates the number of times of rotation of the plate cylinder, a vertical axis indicates normalized values of values provided by dividing carrying distances of the transfer material and the base material to be transferred with the distance L needed for transfer by the transfer face 22. In short, one scale is L. Change toward a negative direction with respect to the vertical axis indicates the carrying action in the backward direction due to the step back.

[0195] The carrying state of the base material to be transferred 7 in the transfer apparatus 1 of the embodiment and the carrying state of the base material to be transferred 107 in the transfer apparatus developed by the inventors are shown by the same solid line X, and it can be confirmed that the base material to be transferred 7 in the transfer apparatus 1 of the embodiment and the base material to be transferred 107 in the transfer apparatus developed by the inventors are carried in an identical manner and each position of areas where the base materials to be transferred 7,107 are transferred is controlled by performing the step back at every rotation of the plate cylinders.

[0196] The carrying state of the transfer material 6 in the transfer apparatus 1 of the embodiment is indicated by a broken line Y, it can be confirmed that step back is performed for each 3 times of rotation (one cycle) of the plate cylinder 20 and the position of area to be used for transfer of the transfer material 6 is controlled.

[0197] The carrying state of the transfer material 106 in the transfer apparatus developed by the inventors is indicated by a dashed line Z, it can be confirmed that the step back is performed for each rotation of the plate cylinder 100 and the position of area to be used for transfer of the transfer material 106 is controlled.

[0198] As mentioned above, as the vertical axis indicates the carrying distance, the change toward the negative direction indicates the step back, then the return distance R1 of the transfer material 6 and the return distance R10 of the transfer material 106 are corresponding to the absolute values of the distances while changing toward negative, it can be confirmed that the return distance R1 of the transfer material 6 in the transfer apparatus 1 of the embodiment is the distance of 16L, and the return distance R10 of the transfer material 106 in the transfer apparatus developed by the inventors is 4L.

[0199] Moreover, it can be confirmed that the step back of the transfer material 106 in the transfer apparatus developed by the inventors is performed 3 times, while the step back of the transfer material 6 in the transfer apparatus 1 of the embodiment is performed once.

[0200] Moreover, the carrying distance r1 over which the base material to be transfer 7 in the transfer apparatus 1 of the embodiment is carried forwardly during one rotation of the plate cylinder 20 is 5L, and the carrying distance r1 over which the base material to be transferred 107 in the transfer apparatus developed by the inventors is carried forwardly during one rotation of the plate cylinder 100 is also 5L, the carrying distance r1 in the forward direction of the two are identical.

[0201] As mentioned above, since the step back of the transfer material 106 in the transfer apparatus developed by the inventors is performed 3 times, while the step back of the transfer material 6 in the transfer apparatus 1 of the embodiment is performed once, the carrying distances R over which the transfer material 6 in the transfer apparatus 1 of the embodiment is carried forwardly when performing transfer operation is the distance of 17L, the carrying distance R over which the transfer material 106 in the transfer apparatus developed by the inventors is carried forwardly when performing transfer operation is the distance of 5L, the carrying distances R in the forward direction of the two are different.

[0202] Moreover, it would be understood from the dotted line Y in Fig.6 that the number of times of step back of the transfer material 6 becomes smaller, the larger the number of times of rotation S of the plate cylinder 20 at one cycle becomes.

[0203] Though the number of times of rotation S of the plate cylinder 20 at one cycle can be freely set, the maximum value is determined by the distance M between the transfer faces (the length of the outer periphery of the plate cylinder 20) and characteristics of the driving motor (not shown) for controlling a rotational drive of the step-back rollers 33,40.

[0204] In this embodiment, the maximum value is used as the number of times of rotation S of the plate cylinder 20 at one cycle, so that the number of times of step back of the transfer material 6 becomes the least value.

[0205] A control method of the transfer apparatus 1 of the embodiment will be described based on a flowchart shown in Fig.7.

[0206] Such parameters as L, M, S required for transfer and such parameters as the carrying speed which are used in a usual transfer apparatus or a usual printing apparatus are entered to the control part 5 of the transfer apparatus. Step 1 (S1).

[0207] Start of the transfer operation is selected. Step 2 (S2) .

[0208] Settings of the return distance R1(($M\times$(S-1)+α+β), (α+β)), etc. are performed according to the entered parameters, and the carrying action of the transfer material 6 and the base material to be transferred 7 is started, at this time, a count variable i for counting the number of times of cycle of transfer is 0, a count variable j for counting the number of times of rotation (the number of times of transfer)of the plate cylinder 20 is 0 (i=0, j=0). Step 3 (S3).

[0209] The transfer material 6 and the base material to be transferred 7 are synchronously carried at the fixed transfer speed, meanwhile the transfer is performed for one rotation of the plate cylinder 20, then, 1 is added to the count variable j for counting the number of times of rotation of the plate cylinder 20 (j=j+1). Step 4 (S4).

[0210] The step back of the base material to be transferred 7 is performed for each rotation of the plate cylinder 20. Step 5 (S5).

[0211] It is judged whether the count variable j of the number of times of rotation of the plate cylinder 20 is (j=S), in other words, whether transfer for one cycle is finished, processes of step 4 and step 5 are repeated until the condition is satisfied. Step 6 (S6).

[0212] The variable j is returned to 0 (j=0), when the condition of j=S is satisfied and the transfer for one cycle is finished. In other words, a count of number of rotation of the plate cylinder 20 is reset, and at the same time, 1 is added to the count variable i for counting the number of times of cycle of transfer (i=i+1). Step 7 (S7).

[0213] It is judged whether unused area which has not been used for transfer exists based on a condition of i=N after finishing the transfer for one cycle, and the setting value of step back of the transfer material 6 (return distance R1) is determined. Step 8 (S8).

[0214] Since the unused area exits within the range of used areas when the condition of i=N is not satisfied, the step back of the transfer material 6 is performed taking the distance ($M\times$(S-1)+α+β) derived from the formula (1) as the return distance R1. Step 9 (S9).

[0215] Since the whole of unused areas within the range of used areas are in used state for transfer when the condition of i=N is satisfied, the step back of the transfer material 6 is performed taking the distance (α+β) derived from the formula (2) as the return distance R1. Step 10 (S10).

[0216] At the same time, the variable i is returned to 0 (i=0), in other words, the count of the cycle number of transfer is reset. Step 11 (S11).

[0217] The processes from Step 4 (S4) to Step 11 (S11) are repeatedly performed to intermittently carry the transfer material 6 (the carrying action including the step back) so that unused areas generated in the transfer material 6 may be used for transfer.

[0218] Note that, as a finishing control of transfer is a known control in which transfer is finished according to a condition designated to the control part 5 in Step 1 or a stop operation by an operator of the transfer apparatus, which is the same as in the usual transfer apparatus or printing apparatus, it is omitted from the flowchart.

[0219] As is clear from the above description, the transfer apparatus 1 of the embodiment can reduce the number of times of step back of the transfer material 6 compared to the transfer apparatus developed by the inventors.

[0220] In the embodiment, while the distance L needed for transfer by the transfer face 22, the number of times of rotation of the plate cylinder 20 at one cycle, etc. are entered to the control part 5, in addition, the length C of a transferred base material to be transferred 7 generated during one rotation of the plate cylinder 20 is entered to the control part 5. The length C of the transferred base material to be transferred 7 generated during one rotation of the plate cylinder 20 is determined based on a design of a product to be manufactured. The maximum available value of the length C is the value in a range from 127.0 mm to 355.6 mm, the upper limit and the lower limit are determined according to the length of embossing plate 23 of the plate cylinder 20.

[0221] The distance L needed for transfer by the transfer face 22 is entered according to a pattern to be transferred. The distance L can be set at a value between 5 mm and 355.6 mm (the maximum value of C). The length C is the length of the transferred base material to be transferred 7 which is generated during one rotation of the plate cylinder 20, and the length C is longer than the distance L needed for transfer by the transfer face 22.

[0222] Therefore, as L is needed to satisfy $C \geqq L$, the possible maximum value of L is the maximum value of C.

[0223] Moreover, the distance M between the transfer faces is the outer peripheral length of the plate cylinder 20. Since the plate cylinder 20 is not exchanged in the embodiment, M is a specific value according to the structure of transfer apparatus 1.

[0224] As mentioned above, in the present invention, the maximum value of the number of times of rotation S at one cycle of the plate cylinder 20 is determined according to the distance M between transfer faces (the outer peripheral length of the plate cylinder 20) and the characteristics of the driving motor for controlling the rotational drive of the step-back rollers 33, 40. The value S of the embodiment can be set up to 20.

[0225] In the embodiment, when the values of L, S, C entered to the control part 5 are out of said setting range and when $L>C$, the condition enabling transfer is not satisfied. When the condition enabling transfer is not satisfied, the control part 5 judges it as an error, the transfer operation is not performed. At the same time, the error is displayed by a means (not shown).

[0226] The maximum and minimum values of L, S, C shown here are one of examples. The maximum and minimum values of L, S, C are determined based on the structure of the transfer apparatus 1 such as the outer peripheral length of the plate cylinder 20.

[0227] Moreover, the return distance due to the step back of the base material to be transferred 7 is determined based on the length C of the transferred base material to be transferred 7 generated during one rotation of the plate cylinder 20.

Claims

1. A transfer apparatus (1) comprising: a transfer part (2; 102), a carrying part of a transfer material carrying the transfer material (6; 106) to the transfer part (2; 102), a carrying part of a base material to be transferred carrying the base material to be transferred (7;107) to the transfer part (2; 102) and a control part (5) ,

   wherein the transfer part(2; 102) has an impression cylinder (21; 101) and a plate cylinder (20; 100), the plate cylinder (20; 100) has a transfer face (22; 103) which contacts with a peripheral surface of the impression cylinder (21; 101) and a non-transfer face (24; 105) which does not contact with the peripheral surface of the impression cylinder (21; 101), wherein the transfer face (22; 103) is provided on an embossing plate (23;104) which is shorter than the whole peripheral length of the plate cylinder (20;100), and wherein a face of the plate cylinder (20;100) other than the transfer face is a non-transfer face (24; 105);

   the carrying part of the transfer material has step-back rollers and carries the transfer material (6; 106) forwardly by rotating forwardly the step-back rollers and the transfer material (6; 106) backwardly by rotating backwardly the step-back rollers,

   the carrying part of the base material to be transferred (7; 107) has step-back rollers and carries the base material to be transferred (7; 107) forwardly by rotating forwardly the step-back rollers and the base material to be transferred (7; 107) backwardly by rotating backwardly the step-back rollers,

   the step-back rollers of the carrying part of the transfer material and the step-back rollers of the carrying part of the base material to be transferred are forwardly rotated to carry forwardly the transfer material (6; 106) and the base material to be transferred (7; 107), so that the transfer material (6; 106) is transferred to the base material to be transferred (7; 107) by the transfer face (22; 103) of the plate cylinder (20; 100) and the peripheral surface of the impression cylinder (21; 101), and

   the step-back rollers of the carrying part of the transfer material and the step-back rollers of the carrying part of the base material to be transferred are backwardly rotated, so that step back of the transfer material (6; 106) and the base material to be transferred (7; 107) is performed to carry them backwardly through a gap between the non-transfer face (24; 105) of the plate cylinder (20; 100) and the peripheral surface of the impression cylinder (21; 101), and the plate cylinder (20; 100) of the transfer part (2; 102) has only one transfer face (103) and performs transfer once for one rotation of the plate cylinder (20; 100),

characterized in that

the control part (5) continuously repeats multiple times a transfer operation of one cycle at which transfer is performed multiple times by rotating the plate cylinder (20; 100) any multiple times, while the transfer material (6; 106) is continuously and forwardly carried, and controls the step back to carry the transfer material (6; 106) backwardly, so that an area of the transfer material to be used for a first transfer at the next cycle comes to an area adjacent to and on an upstream side of an area in the carrying direction, which has been used for a first transfer at the previous cycle, when performing transfer at the next cycle after finishing transfer at one cycle, and

wherein the control part (5) controls the step back for backwardly carrying the base material to be transferred (7; 107) for each rotation of the plate cylinder (20; 100).

2. The transfer apparatus (1) according to claim 1, wherein the control part (5) judges whether an available area for transfer exists within a range of the transfer material (6; 106) which has been used for transfer up to the previous cycle, when performing transfer at the next cycle after finishing transfer at one cycle, controls the step back for backwardly carrying the transfer material (6; 106) so that the area of the transfer material to be used for the first transfer at the next cycle comes to the area adjacent to and on the upstream side of the area in the carrying direction, which has been used for the first transfer at the previous cycle, when it exists, and controls the step back for backwardly carrying the transfer material (6; 106) so that the area of the transfer material (6; 106) to be used for the first transfer at the next cycle comes to an area adjacent to and on the upstream side of an area in the carrying direction, which has been used for the last transfer at the previous cycle, when it does not exist.

3. The transfer apparatus (1) according to claim 2, wherein the control part (5) judges that the available area for transfer does not exist, when the number of times of repeated cycles is matched with an available number of times of transfer within a distance between transfer faces (103) corresponding to a length of an outer periphery of the plate cylinder (20; 100), and that the available area for transfer exists, when being not matched.

4. A transfer method of a transfer apparatus (1) comprising a transfer part(2; 102) to transfer a transfer material (6; 106) to a base material to be transferred (7; 107) comprising a plate cylinder (20; 100) having only one transfer face (103) and an impression cylinder (21; 101), wherein the transfer face (22; 103) is provided on an embossing plate (23;104) which is shorter than the whole peripheral length of the plate cylinder (20;100), and wherein a face of the plate cylinder (20;100) other than the transfer face is a non-transfer face (24; 105),

step-back rollers for carrying the transfer material (6; 106) forwardly and backwardly by being rotated forwardly and backwardly, and step-back rollers for carrying the base material to be transferred (7; 107) forwardly and backwardly by being rotated forwardly and backwardly,

the transfer method for performing transfer in which transfer is performed by continuously repeating multiple times transfer operation of one cycle at which transfer is performed multiple times by rotating the plate cylinder (20; 100) any multiple times, while the transfer material (6; 106) is continuously and forwardly carried comprising the steps of:

judging whether the number of times of rotation of the plate cylinder (20; 100) is matched with the number of times of rotation of the plate cylinder (20; 100) at one cycle, every time when finishing a transfer operation at one rotation of the plate cylinder (20; 100),

carrying continuously and forwardly the transfer material (6; 106) to continue performing transfer at that cycle, when judged not to be matched,

performing step back of the transfer material (6; 106) by rotating backwardly the step-back rollers to carry backwardly the transfer material (6; 106) for finishing transfer at that cycle and to perform transfer at the next cycle, when judged to be matched,

wherein a distance over which the transfer material (6; 106) is carried backwardly is a distance making it possible that an area of the transfer material to be used for a first transfer at the next cycle comes to an area adjacent to and on an upstream side of an area in the carrying direction, which has been used for a first transfer at the previous cycle,

the method further comprising the step of:

performing the step back for carrying the base material to be transferred (7; 107) backwardly by rotating the step-back rollers for carrying the base material to be transferred (7; 107) backwardly for each rotation of the plate cylinder (20; 100).

5. The transfer method of the transfer apparatus (1) according to claim 4, the method further comprising the steps of:

judging whether an available area for transfer exists within the range of the used transfer material (6; 106) for transfer until the previous cycle after finishing one cycle and when performing transfer at the next cycle, and
performing the step back of the transfer material (6; 106) to carry it backwardly by rotating the step-back rollers backwardly, wherein the distance over which the transfer material (6; 106) is carried backwardly is a distance making it possible that the area of the transfer material (6; 106) to be used for the first transfer at the next cycle comes to the area adjacent to and on the upstream side of the area in the carrying direction, which has been used for the first transfer at the previous cycle, when judged that it exists, and,
performing the step back of the transfer material (6; 106) to carry it backwardly by rotating the step-back rollers backwardly, wherein the distance over which the transfer material (6; 106) is carried backwardly is a distance making it possible that the area of the transfer material (6; 106) to be used for the first transfer at the next cycle comes to the area adjacent to and on the upstream side of an area in the carrying direction, which has been used for the last transfer at the previous cycle, when judged that it does not exist.

6. The transfer method of the transfer apparatus (1) according to claim 5, the method further comprises the steps of:

judging that the available area for transfer does not exist, when the number of times of repeated cycle is matched with an available number of times of transfer within a distance between transfer faces (103) corresponding to a length of an outer periphery of the plate cylinder (20; 100), and
judging that the available area for transfer exists, when being not matched.

Patentansprüche

1. Übertragungsvorrichtung (1), umfassend: ein Übertragungsteil (2; 102), ein Förderteil eines Übertragungsmaterials, das das Übertragungsmaterial (6; 106) zum Übertragungsteil (2; 102) fördert, ein Förderteil eines zu übertragenden Grundmaterials, das das zu übertragende Grundmaterial (7; 107) zu dem Übertragungsteil (2; 102) fördert, und ein Steuerteil (5),

wobei das Übertragungsteil (2; 102) einen Druckzylinder (21; 101) und einen Plattenzylinder (20; 100) aufweist, der Plattenzylinder (20; 100) eine Übertragungsfläche (22; 103), die mit einer Umfangsfläche des Druckzylinders (21; 101) in Berührung steht, und eine Nichtübertragungsfläche (24; 105), die nicht mit der Umfangsfläche des Druckzylinders (21; 101) in Berührung steht, aufweist, wobei die Übertragungsfläche (22; 103) auf einer Prägeplatte (23; 104) vorgesehen ist, die kürzer als die gesamte Umfangslänge des Plattenzylinders (20; 100) ist, und wobei eine Fläche des Plattenzylinders (20; 100), die nicht die Übertragungsfläche ist, eine Nichtübertragungsfläche (24; 105) ist;
das Förderteil des Übertragungsmaterials Pilgerschrittwalzen aufweist und das Übertragungsmaterial (6; 106) durch Vorwärtsdrehen der Pilgerschrittwalzen vorwärts fördert und das Übertragungsmaterial (6; 106) durch Rückwärtsdrehen der Pilgerschrittwalzen rückwärts fördert,
das Förderteil des zu übertragenden Grundmaterials (7; 107) Pilgerschrittwalzen aufweist und das zu übertragende Grundmaterial (7; 107) durch Vorwärtsdrehen der Pilgerschrittwalzen vorwärts fördert und das zu übertragende Grundmaterial (7; 107) durch Rückwärtsdrehen der Pilgerschrittwalzen rückwärts fördert,
die Pilgerschrittwalzen des Förderteils des Übertragungsmaterials und die Pilgerschrittwalzen des Förderteils des zu übertragenden Grundmaterials vorwärts gedreht werden, um das Übertragungsmaterial (6; 106) und das zu übertragende Grundmaterial (7; 107) vorwärts zu fördern, so dass das Übertragungsmaterial (6; 106) von der Übertragungsfläche (22; 103) des Plattenzylinders (20; 100) und der Umfangsfläche des Druckzylinders (21; 101) zu dem zu übertragenden Grundmaterial (7; 107) übertragen wird, und
die Pilgerschrittwalzen des Förderteils des Übertragungsmaterials und die Pilgerschrittwalzen des Förderteils des zu übertragenden Grundmaterials rückwärts gedreht werden, so dass der Pilgerschritt des Übertragungsmaterials (6; 106) und des zu übertragenden Grundmaterials (7; 107) ausgeführt wird, um diese rückwärts durch einen Spalt zwischen einer Nichtübertragungsfläche (24; 105) des Plattenzylinders (20; 100) und der Umfangsfläche des Druckzylinders (21; 101) zu fördern, und
der Plattenzylinder (20; 100) des Übertragungsteils (2; 102) nur eine Übertragungsfläche (103) aufweist und eine Übertragung einmalig bei einer Drehung des Plattenzylinders (20; 100) aus-

führt,

dadurch gekennzeichnet, dass

das Steuerteil (5) mehrmals kontinuierlich einen Übertragungsvorgang eines Zyklus wiederholt, in dem eine Übertragung mehrmals durch Drehen des Plattenzylinders (20; 100) eine beliebige Anzahl von mehreren Malen ausgeführt wird, während das Übertragungsmaterial (6; 106) kontinuierlich und vorwärts gefördert wird, und den Pilgerschritt steuert, um das Übertragungsmaterial (6; 106) rückwärts zu fördern, so dass ein Bereich des Übertragungsmaterials, der für eine erste Übertragung im nächsten Zyklus zu verwenden ist, zu einem Bereich angrenzend an einen und auf einer stromaufwärtigen Seite eines Bereichs in der Förderrichtung gelangt, der im vorherigen Zyklus für eine erste Übertragung verwendet wurde, wenn eine Übertragung im nächsten Zyklus nach Abschluss der Übertragung in einem Zyklus ausgeführt wird, und wobei das Steuerteil (5) den Pilgerschritt zum Fördern des zu übertragenden Grundmaterials (7; 107) rückwärts bei jeder Drehung des Plattenzylinders (20; 100) steuert.

2. Übertragungsvorrichtung (1) nach Anspruch 1, wobei das Steuerteil (5) beurteilt, ob ein verfügbarer Bereich zur Übertragung innerhalb eines Bereichs des Übertragungsmaterials (6; 106) besteht, der bis zum vorherigen Zyklus zur Übertragung verwendet wurde, wenn die Übertragung im nächsten Zyklus nach Abschluss der Übertragung in einem Zyklus ausgeführt wird, den Pilgerschritt zum Fördern des Übertragungsmaterials (6; 106) rückwärts steuert, so dass der Bereich des Übertragungsmaterials, der für die erste Übertragung im nächsten Zyklus zu verwenden ist, zu dem Bereich angrenzend an und auf der stromaufwärtigen Seite des Bereichs in der Förderrichtung gelangt, der im vorherigen Zyklus für die erste Übertragung verwendet wurde, wenn dieser besteht, und den Pilgerschritt zum Fördern des Übertragungsmaterials (6; 106) rückwärts steuert, so dass der Bereich des Übertragungsmaterials (6; 106), der im nächsten Zyklus für die erste Übertragung zu verwenden ist, zu einem Bereich angrenzend an und auf der stromaufwärtigen Seite eines Bereichs in der Förderrichtung gelangt, der für die letzte Übertragung im vorherigen Zyklus verwendet wurde, wenn dieser nicht besteht.

3. Übertragungsvorrichtung (1) nach Anspruch 2, wobei das Steuerteil (5) beurteilt, dass der verfügbare Bereich zur Übertragung nicht besteht, wenn die Anzahl der Male an wiederholten Zyklen an eine verfügbare Anzahl von Malen der Übertragung innerhalb eines Abstands zwischen Übertragungsflächen entsprechend einer Länge eines Außenumfangs des Plattenzylinders (20; 100) angepasst ist, und dass der verfügbare Bereich zur Übertragung besteht, wenn diese nicht angepasst sind.

4. Übertragungsverfahren einer Übertragungsvorrichtung (1), umfassend ein Übertragungsteil (2; 102) zum Übertragen eines Übertragungsmaterials (6; 106) auf ein zu übertragendes Grundmaterial (7; 107), umfassend einen Plattenzylinder (20; 100) mit nur einer Übertragungsfläche (103) und einen Druckzylinder (21; 101), wobei die Übertragungsfläche (22; 103) auf einer Prägeplatte (23; 104) vorgesehen ist, die kürzer als die gesamte Umfangslänge des Plattenzylinders (20; 100) ist, und wobei eine Fläche des Plattenzylinders (20; 100), die nicht die Übertragungsfläche ist, eine Nichtübertragungsfläche (24; 105) ist,

Pilgerschrittwalzen zum Fördern des Übertragungsmaterials (6; 106) vorwärts und rückwärts, indem sie vorwärts und rückwärts gedreht werden, und Pilgerschrittwalzen zum Fördern des zu übertragenden Grundmaterials (7; 107) vorwärts und rückwärts, indem sie vorwärts und rückwärts gedreht werden,

das Übertragungsverfahren zum Ausführen einer Übertragung, wobei das Übertragen durch kontinuierliches mehrmaliges Wiederholen eines Übertragungsvorgangs eines Zyklus ausgeführt wird, in dem eine Übertragung mehrmals durch Drehen des Plattenzylinders (20; 100) eine beliebige Anzahl von mehreren Malen ausgeführt wird, während das Übertragungsmaterial (6; 106) kontinuierlich und vorwärts gefördert wird, umfassend die folgenden Schritte:

Beurteilen, ob die Anzahl an Malen der Drehung des Plattenzylinders (20; 100) an die Anzahl der Male der Drehung des Plattenzylinders (20; 100) in einem Zyklus angepasst ist, jedes Mal, wenn ein Übertragungsvorgang bei einer Drehung des Plattenzylinders (20; 100) abgeschlossen ist,

Fördern des Übertragungsmaterials (6; 108) kontinuierlich und vorwärts, um das Ausführen der Übertragung in diesem Zyklus fortzuführen, wenn beurteilt wird, dass diese nicht angepasst sind,

Ausführen des Pilgerschritts des Übertragungsmaterials (6; 106) durch Rückwärtsdrehen der Pilgerschrittwalzen zum Rückwärtsfördern des Übertragungsmaterials (606) zum Abschließen der Übertragung in diesem Zyklus und zum Ausführen einer Übertragung im nächsten Zyklus, wenn beurteilt wird, dass diese angepasst sind,

wobei ein Abstand, über den das Übertragungsmaterial (6; 106) rückwärts gefördert wird, ein Abstand ist, der es ermöglicht,

dass ein Bereich des Übertragungsmaterials, der im nächsten Zyklus für eine erste Übertragung zu verwenden ist, in einen Bereich angrenzend an einen und auf einer stromaufwärtigen Seite eines Bereichs in der Förderrichtung gelangt, der im vorherigen Zyklus für eine erste Übertragung verwendet wurde,
wobei das Verfahren ferner den folgenden Schritt umfasst:
Ausführen des Pilgerschritts zum Fördern des zu übertragenden Grundmaterials (7; 107) rückwärts durch Drehen der Pilgerschrittwalzen zum Fördern des zu übertragenden Grundmaterials (7; 107) rückwärts bei jeder Drehung des Plattenzylinders (20; 100).

5. Übertragungsverfahren der Übertragungsvorrichtung (1) nach Anspruch 4, wobei das Verfahren ferner die folgenden Schritte umfasst:

Beurteilen, ob ein verfügbarer Bereich zur Übertragung innerhalb des Bereichs des verwendeten Übertragungsmaterials (6; 106) zur Übertragung bis zum vorherigen Zyklus nach Abschluss eines Zyklus und beim Ausführen der Übertragung im nächsten Zyklus besteht, und
Ausführen des Pilgerschritts des Übertragungsmaterials (6; 106), um es rückwärts zu fördern, durch Drehen der Pilgerschrittwalzen rückwärts, wobei der Abstand, über den das Übertragungsmaterial (6; 106) rückwärts gefördert wird, ein Abstand ist, der es ermöglicht, dass der Bereich des Übertragungsmaterials (6; 106), der im nächsten Zyklus für die erste Übertragung zu verwenden ist, in den Bereich angrenzend an einen und auf einer stromaufwärtigen Seite des Bereichs in der Förderrichtung gelangt, der im vorherigen Zyklus für die erste Übertragung verwendet wurde, wenn beurteilt wird, dass er nicht besteht.
Ausführen des Pilgerschritts des Übertragungsmaterials (6; 106), um es rückwärts zu fördern, durch Drehen der Pilgerschrittwalzen rückwärts, wobei der Abstand, über den das Übertragungsmaterial (6; 106) rückwärts gefördert wird, ein Abstand ist, der es ermöglicht, dass der Bereich des Übertragungsmaterials (6; 106), der im nächsten Zyklus für die erste Übertragung zu verwenden ist, in den Bereich angrenzend an einen und auf einer stromaufwärtigen Seite eines Bereichs in der Förderrichtung gelangt, der im vorherigen Zyklus für die letzte Übertragung verwendet wurde, wenn beurteilt wird, dass er nicht besteht.

6. Übertragungsverfahren der Übertragungsvorrichtung (1) nach Anspruch 5, wobei das Verfahren ferner die folgenden Schritte umfasst:

Beurteilen, dass der verfügbare Bereich zur Übertragung nicht besteht, wenn die Anzahl an Malen des wiederholten Zyklus an eine verfügbare Anzahl an Malen der Übertragung innerhalb eines Abstands zwischen Übertragungsflächen (103) entsprechend einer Länge eines Außenumfangs des Plattenzylinders (20; 100) angepasst ist, und
Beurteilen, dass der verfügbare Bereich zur Übertragung besteht, wenn diese nicht angepasst sind.

Revendications

1. Appareil de transfert (1) comprenant : une partie de transfert (2 ; 102), une partie de transport d'un matériau de transfert transportant le matériau de transfert (6 ; 106) vers la partie de transfert (2 ; 102), une partie de transport d'un matériau de base à transférer transportant le matériau de base à transférer (7 ; 107) vers la partie de transfert (2 ; 102) et une partie de commande (5),

dans lequel la partie de transfert (2 ; 102) a un cylindre d'impression (21 ; 101) et un cylindre porte-plaque (20 ; 100), le cylindre porte-plaque (20; 100) a une face de transfert (22 ; 103) qui est en contact avec une surface périphérique du cylindre d'impression (21 ; 101) et une face de non-transfert (24 ; 105) qui n'est pas en contact avec la surface périphérique du cylindre d'impression (21 ; 101), dans lequel la face de transfert (22 ; 103) est prévue sur une plaque de gaufrage (23 ; 104) qui est plus courte que toute la longueur périphérique du cylindre porte-plaque (20 ; 100), et dans lequel une face du cylindre porte-plaque (20; 100) autre que la face de transfert est une face de non-transfert (24 ; 105) ;
la partie de transport du matériau de transfert a des rouleaux de recul et transporte le matériau de transfert (6 ; 106) vers l'avant en faisant tourner vers l'avant les rouleaux de recul et le matériau de transfert (6 ; 106) vers l'arrière en faisant tourner vers l'arrière les rouleaux de recul,
la partie de transport du matériau de base à transférer (7 ; 107) a des rouleaux de recul et transporte le matériau de base à transférer (7 ; 107) vers l'avant en faisant tourner vers l'avant les rouleaux de recul et le matériau de base à transférer (7 ; 107) vers l'arrière en faisant tourner vers l'arrière les rouleaux de recul,
les rouleaux de recul de la partie de transport du matériau de transfert et les rouleaux de recul

de la partie de transport du matériau de base à transférer sont entraînés à tourner vers l'avant pour transporter vers l'avant le matériau de transfert (6 ; 106) et le matériau de base à transférer (7 ;107), de sorte que le matériau de transfert (6 ; 106) est transféré sur le matériau de base à transférer (7 ; 107) par la face de transfert (22 ; 103) du cylindre porte-plaque (20 ; 100) et la surface périphérique du cylindre d'impression (21 ; 101), et

les rouleaux de recul de la partie de transport du matériau de transfert et les rouleaux de recul de la partie de transport du matériau de base à transférer sont entraînés à tourner vers l'arrière, de sorte que le recul du matériau de transfert (6 ; 106) et du matériau de base à transférer (7 ; 107) est effectué pour les transporter vers l'arrière à travers un espace entre la face de non transfert (24 ; 105) du cylindre porte-plaque (20 ; 100) et la surface périphérique du cylindre d'impression (21 ; 101), et

le cylindre porte-plaque (20 ; 100) de la partie de transfert (2 ; 102) présente une seule face de transfert (103) et effectue un transfert une fois pendant une rotation du cylindre porte-plaque (20 ; 100),

caractérisé en ce que

la partie commande (5) répète en continu plusieurs fois une opération de transfert d'un cycle au cours duquel un transfert est effectué plusieurs fois en faisant tourner le cylindre porte-plaque (20 ; 100) plusieurs fois, tandis que le matériau de transfert (6 ; 106) est transporté en continu et vers l'avant, et commande le recul pour transporter le matériau de transfert (6 ; 106) vers l'arrière, de sorte qu'une zone du matériau de transfert à utiliser pour un premier transfert au cours du cycle suivant arrive dans une zone adjacente à et d'un côté amont d'une zone dans la direction de transport, qui a été utilisée pour un premier transfert au cours du cycle précédent, lors de la réalisation du transfert au cours du cycle suivant après avoir terminé le transfert au cours d'un cycle, et

dans lequel la partie de commande (5) commande le recul pour transporter vers l'arrière le matériau de base à transférer (7 ; 107) pour chaque rotation du cylindre porte plaque (20 ; 100).

2. Appareil de transfert (1) selon la revendication 1, dans lequel la partie de commande (5) évalue si une zone disponible pour le transfert existe dans une plage du matériau de transfert (6 ; 106) qui a été utilisée pour le transfert jusqu'au cycle précédent, lors de la réalisation du transfert au cycle suivant après avoir terminé le transfert au cours d'un cycle, commande le recul pour transporter vers l'arrière le matériau de transfert (6 ; 106) de sorte que la zone du matériau de transfert à utiliser pour le premier transfert au cours du cycle suivant arrive dans la zone adjacente à et du côté amont de la zone dans la direction de transport, qui a été utilisée pour le premier transfert au cours du cycle précédent, lorsqu'elle existe, et commande le recul pour transporter vers l'arrière le matériau de transfert (6 ; 106) de sorte que la zone du matériau de transfert (6 ; 106) à utiliser pour le premier transfert au cours du cycle suivant arrive dans une zone adjacente à et du côté amont d'une zone dans la direction de transport, qui a été utilisée pour le dernier transfert au cours du cycle précédent, lorsqu'elle n'existe pas.

3. Appareil de transfert (1) selon la revendication 2, dans lequel la partie de commande (5) évalue que la zone disponible pour le transfert n'existe pas, lorsque le nombre d'occurrences de cycles répétés correspond à un nombre disponible d'occurrences de transfert au sein d'une distance entre les faces de transfert (103) correspondant à une longueur d'une périphérie externe du cylindre porte-plaque (20 ; 100), et que la zone disponible pour le transfert existe, lorsqu'il ne correspond pas.

4. Procédé de transfert d'un appareil de transfert (1) comprenant une partie de transfert (2 ; 102) pour transférer un matériau de transfert (6 ; 106) vers un matériau de base à transférer (7 ; 107) comprenant un cylindre porte-plaque (20 ; 100) ayant une seule face de transfert (103) et un cylindre d'impression (21 ; 101), dans lequel la face de transfert (22 ; 103) est prévue sur une plaque de gaufrage (23 ; 104) qui est plus courte que toute la longueur périphérique du cylindre porte-plaque (20 ; 100), et dans lequel une face du cylindre porte-plaque (20 ; 100) autre que la face de transfert est une face de non-transfert (24 ; 105), des rouleaux de recul pour transporter le matériau de transfert (6; 106) vers l'avant et vers l'arrière en étant entraînés en rotation vers l'avant et vers l'arrière, et des rouleaux de recul pour transporter le matériau de base à transférer (7 ; 107) vers l'avant et vers l'arrière en étant entraînés en rotation vers l'avant et vers l'arrière,

le procédé de transfert pour réaliser un transfert dans lequel le transfert est réalisé en répétant en continu plusieurs fois l'opération de transfert d'un cycle au cours duquel le transfert est réalisé plusieurs fois en faisant tourner le cylindre porte-plaque (20 ; 100) plusieurs fois, tandis que le matériau de transfert (6 ; 106) est transporté en continu et vers l'avant, comprenant les étapes de :

évaluation si le nombre d'occurrences de rotation du cylindre porte-plaque (20 ; 100) correspond au nombre d'occurrences de rotation du cylindre porte-plaque (20 ; 100) au cours d'un cycle, chaque fois après avoir terminé une opé-

ration de transfert au cours d'une rotation du cylindre porte-plaque (20 ; 100),
transport en continu et vers l'avant du matériau de transfert (6 ; 106) pour réaliser en continu le transfert au cours de ce cycle, lorsqu'il est jugé qu'il ne correspond pas,
réalisation d'un recul du matériau de transfert (6 ; 106) par rotation vers l'arrière des rouleaux de recul pour transporter vers l'arrière le matériau de transfert (6 ; 106) pour terminer le transfert au cours de ce cycle et pour réaliser le transfert au cours du cycle suivant, lorsqu'il est jugé qu'il correspond,
dans lequel une distance sur laquelle le matériau de transfert (6; 106) est transporté vers l'arrière est une distance permettant qu'une zone du matériau de transfert à utiliser pour un premier transfert au cours du cycle suivant arrive dans une zone adjacente à et d'un côté amont d'une zone dans la direction de transport, qui a été utilisée pour un premier transfert au cours du cycle précédent, le procédé comprenant en outre l'étape de :
réalisation du recul pour transporter le matériau de base à transférer (7 ; 107) vers l'arrière par rotation des rouleaux de recul pour transporter le matériau de base à transférer (7 ; 107) vers l'arrière pour chaque rotation du cylindre porte-plaque (20 ; 100).

5. Procédé de transfert de l'appareil de transfert (1) selon la revendication 4, le procédé comprenant en outre les étapes de :

évaluation si une zone disponible pour le transfert existe dans la plage du matériau de transfert utilisé (6 ; 106) pour le transfert jusqu'au cycle précédent après avoir terminé un cycle et lors de la réalisation du transfert au cours du cycle suivant, et
réalisation du recul du matériau de transfert (6; 106) pour le transporter vers l'arrière par rotation des rouleaux de recul vers l'arrière, dans lequel la distance sur laquelle le matériau de transfert (6 ; 106) est transporté vers l'arrière est une distance permettant que la zone du matériau de transfert (6 ; 106) à utiliser pour le premier transfert au cours du cycle suivant arrive dans la zone adjacente à et du côté amont de la zone dans la direction de transport, qui a été utilisée pour le premier transfert au cours du cycle précédent, lorsqu'il est jugé qu'elle existe, et, réalisation du recul du matériau de transfert (6; 106) pour le transporter vers l'arrière par rotation des rouleaux de recul vers l'arrière, dans lequel la distance sur laquelle le matériau de transfert (6 ; 106) est transporté vers l'arrière est une distance permettant que la zone du matériau de transfert (6 ; 106) à utiliser pour le premier transfert au cours du cycle suivant arrive dans la zone adjacente à et du côté amont d'une zone dans la direction de transport, qui a été utilisée pour le dernier transfert au cours du cycle précédent, lorsqu'il est jugé qu'elle n'existe pas.

6. Procédé de transfert de l'appareil de transfert (1) selon la revendication 5, le procédé comprend en outre les étapes de :

évaluation que la zone disponible pour le transfert n'existe pas, lorsque le nombre d'occurrences de cycle répété correspond à un nombre disponible d'occurrences de transfert au sein d'une distance entre les faces de transfert (103) correspondant à une longueur d'une périphérie externe du cylindre porte-plaque (20 ; 100), et
évaluation que la zone disponible pour le transfert existe, lorsqu'il ne correspond pas.

FIG. 1

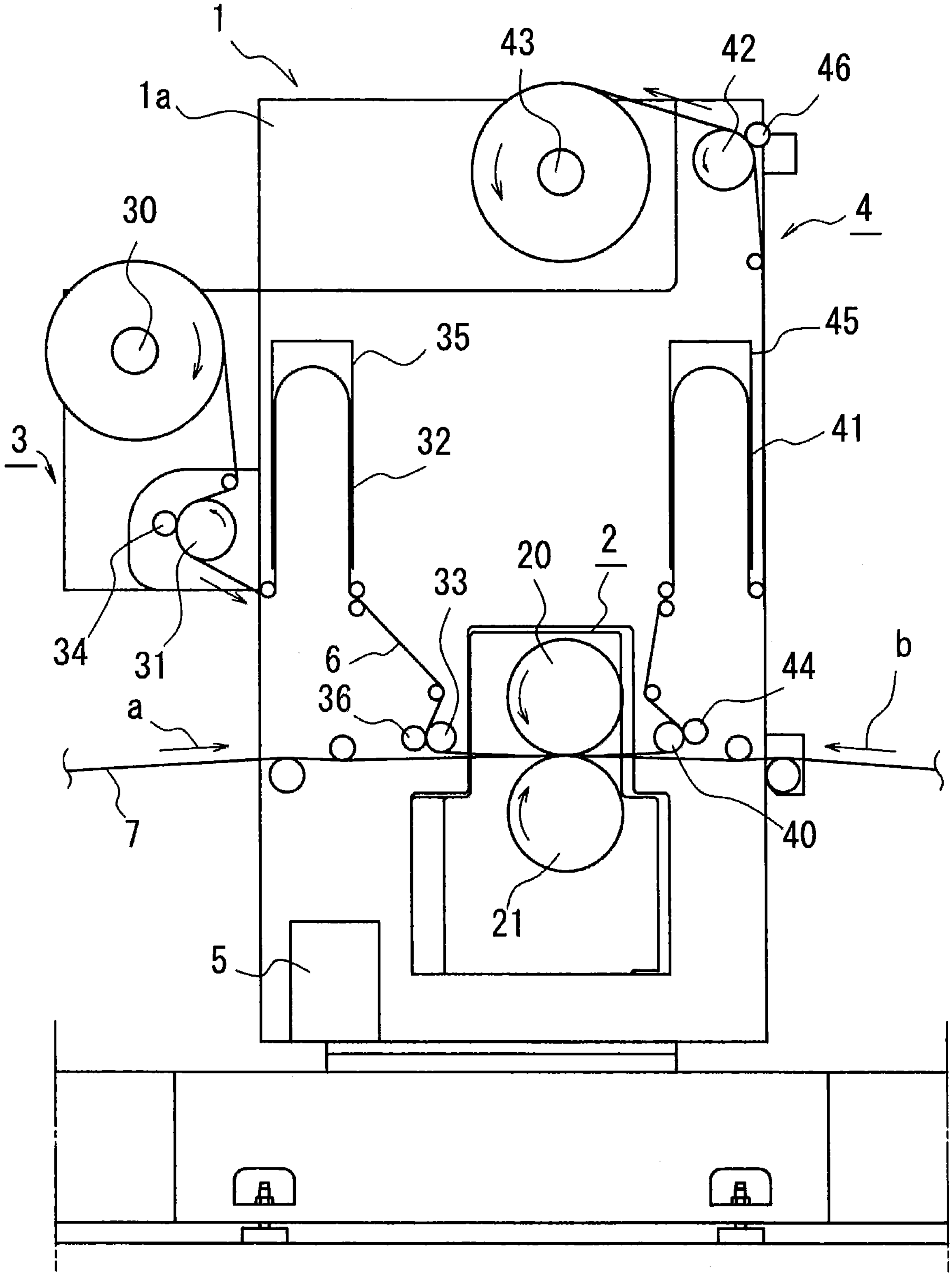


FIG. 2

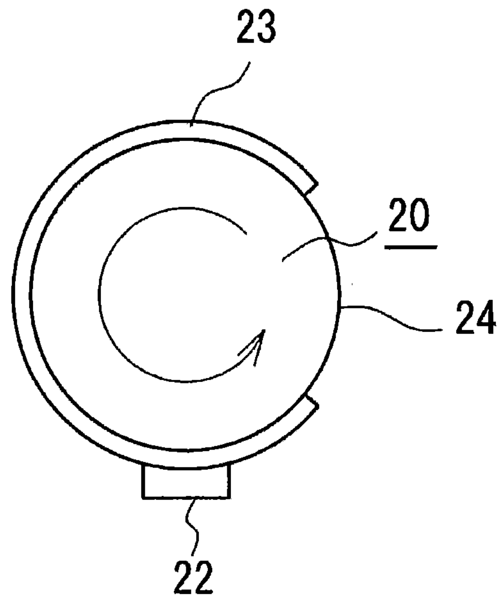


FIG. 3A

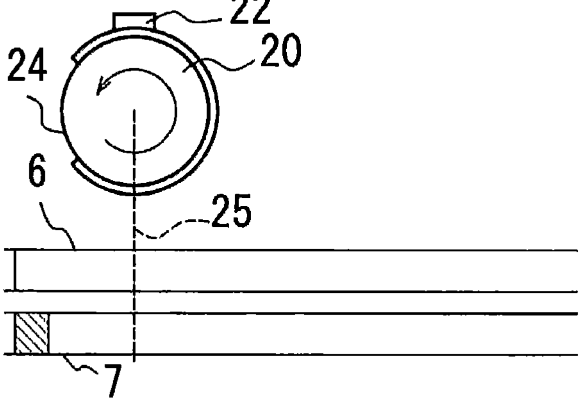


FIG. 3B

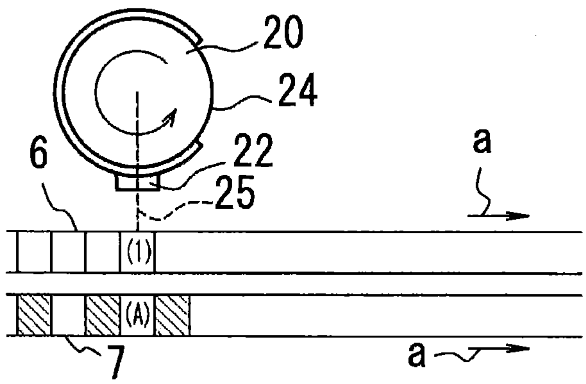


FIG. 3C

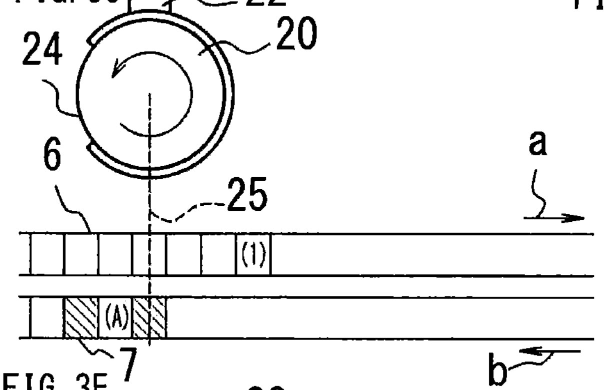


FIG. 3D

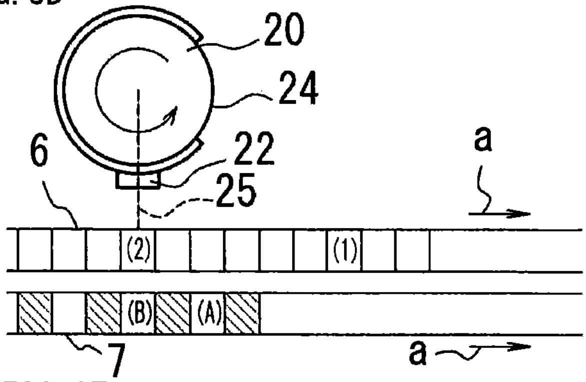


FIG. 3E

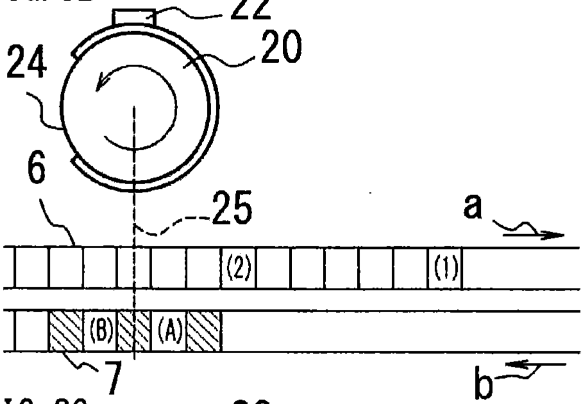


FIG. 3F

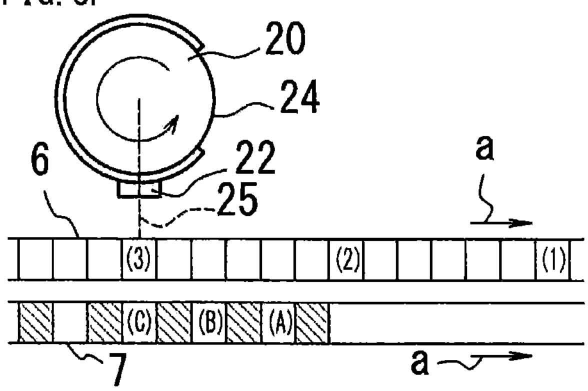


FIG. 3G

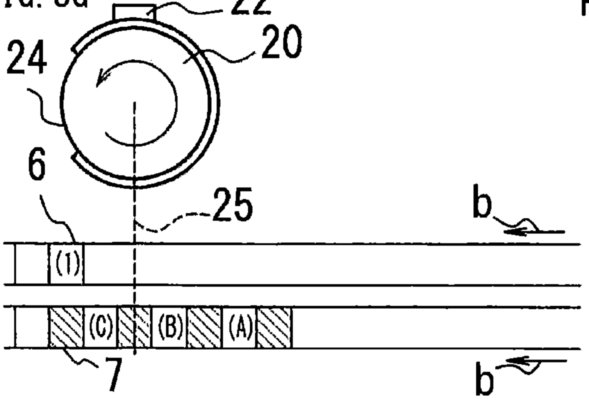


FIG. 3H

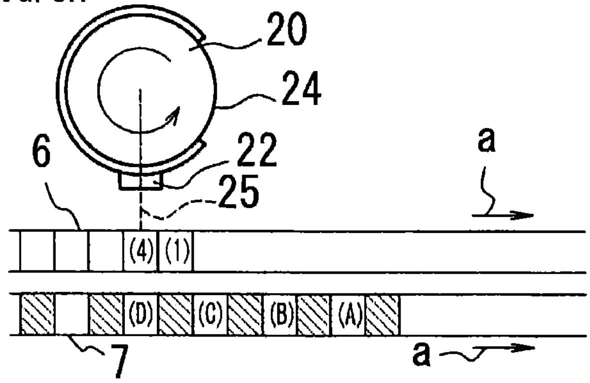


FIG. 4

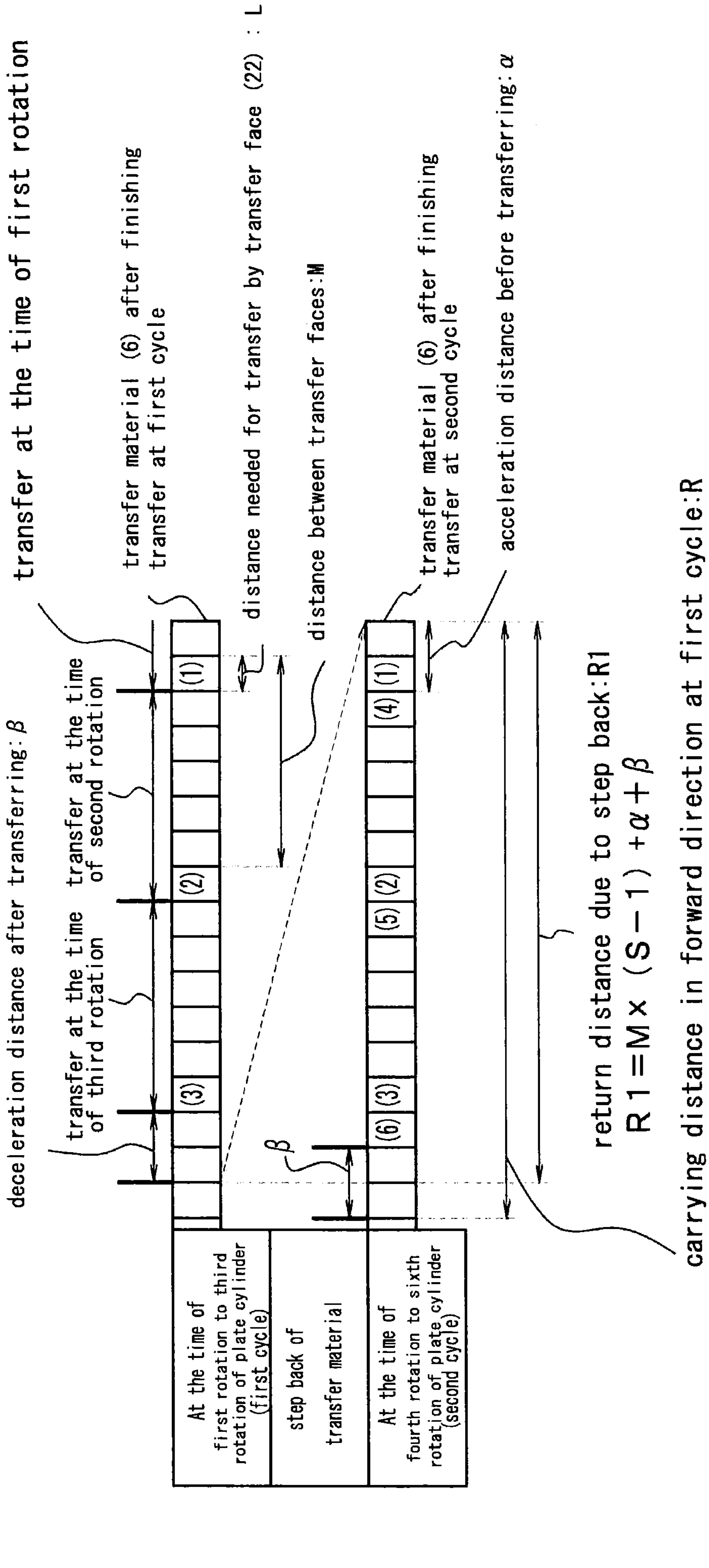

transfer at the time of first rotation
transfer material (6) after finishing transfer at first cycle
distance needed for transfer by transfer face (22) : L
distance between transfer faces:M
transfer material (6) after finishing transfer at second cycle
acceleration distance before transferring: α
deceleration distance after transferring: β
transfer at the time of third rotation
transfer at the time of second rotation
(1)
(2)
(3)
(4)
(5)
(6)
β
At the time of first rotation to third rotation of plate cylinder (first cycle)
step back of transfer material
At the time of fourth rotation to sixth rotation of plate cylinder (second cycle)
return distance due to step back:R1
R1=M×(S−1)+α+β
carrying distance in forward direction at first cycle:R

FIG. 5

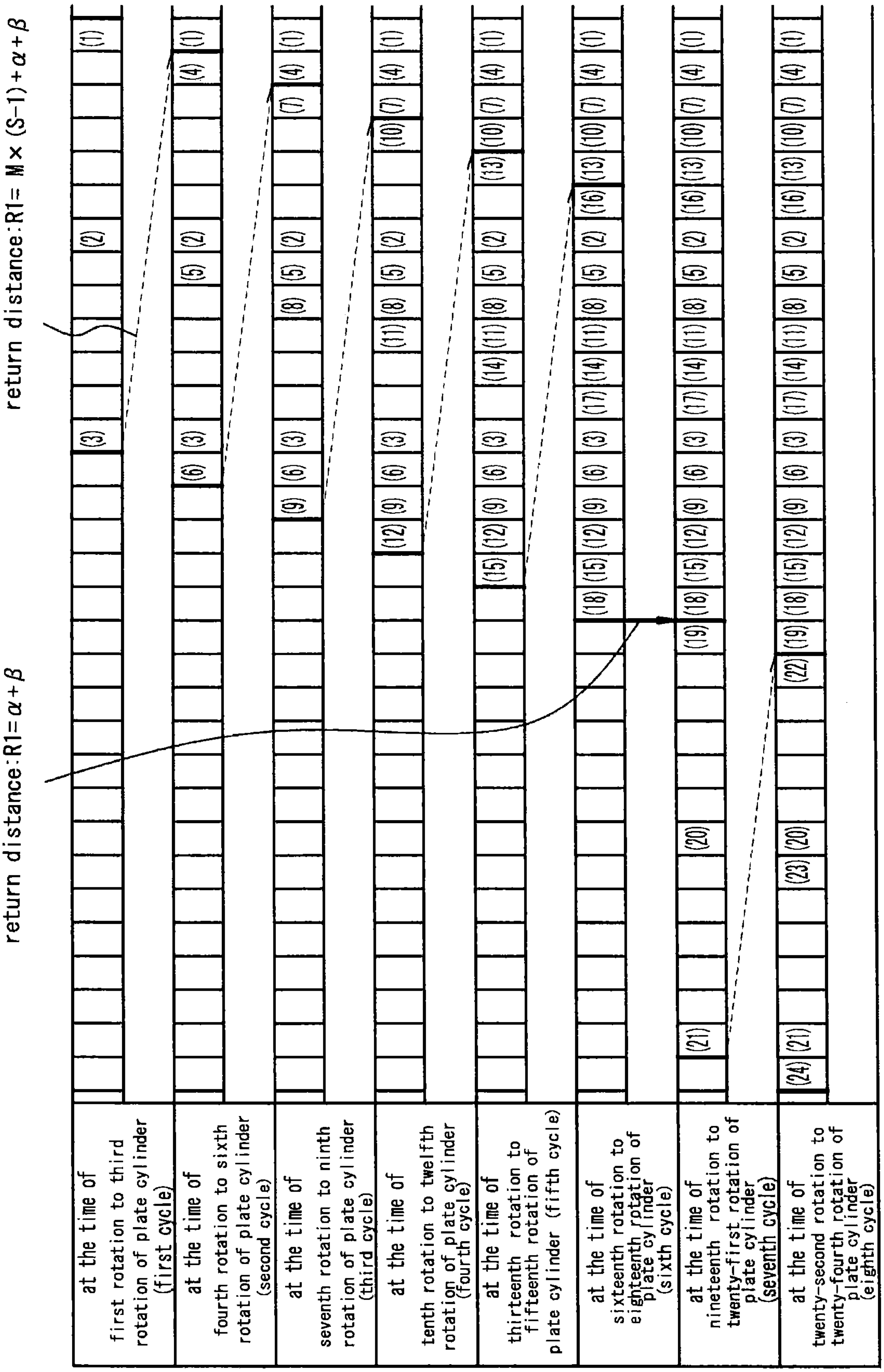

return distance:R1= M × (S-1) + α + β
return distance:R1= α + β
at the time of first rotation to third rotation of plate cylinder (first cycle)
at the time of fourth rotation to sixth rotation of plate cylinder (second cycle)
at the time of seventh rotation to ninth rotation of plate cylinder (third cycle)
at the time of tenth rotation to twelfth rotation of plate cylinder (fourth cycle)
at the time of thirteenth rotation to fifteenth rotation of plate cylinder (fifth cycle)
at the time of sixteenth rotation to eighteenth rotation of plate cylinder (sixth cycle)
at the time of nineteenth rotation to twenty-first rotation of plate cylinder (seventh cycle)
at the time of twenty-second rotation to twenty-fourth rotation of plate cylinder (eighth cycle)

FIG. 6

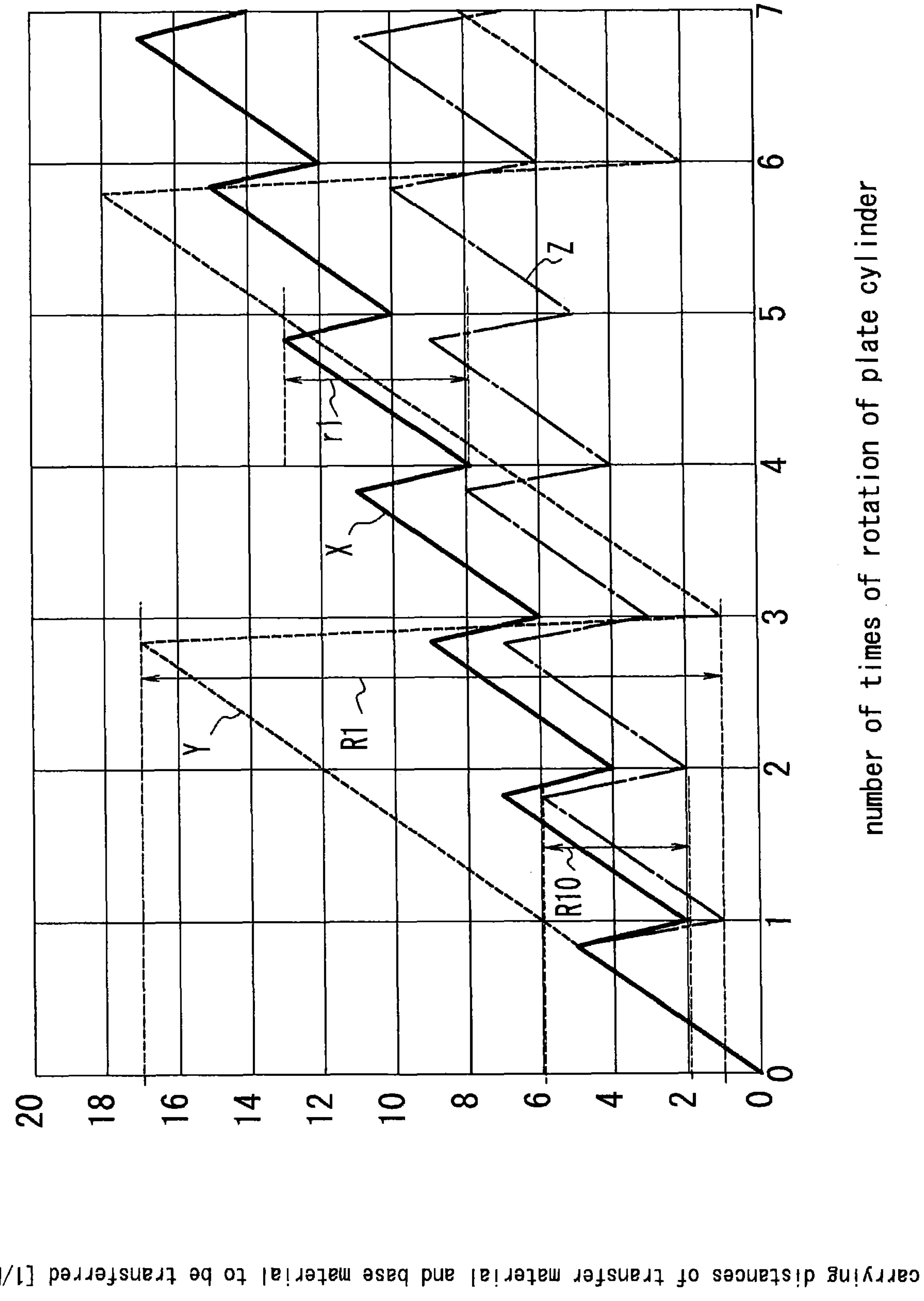

number of times of rotation of plate cylinder
carrying distances of transfer material and base material to be transferred [1/L]
0
1
2
3
4
5
6
7
0
2
4
6
8
10
12
14
16
18
20
X
Y
Z
R1
r1
R10

FIG. 7

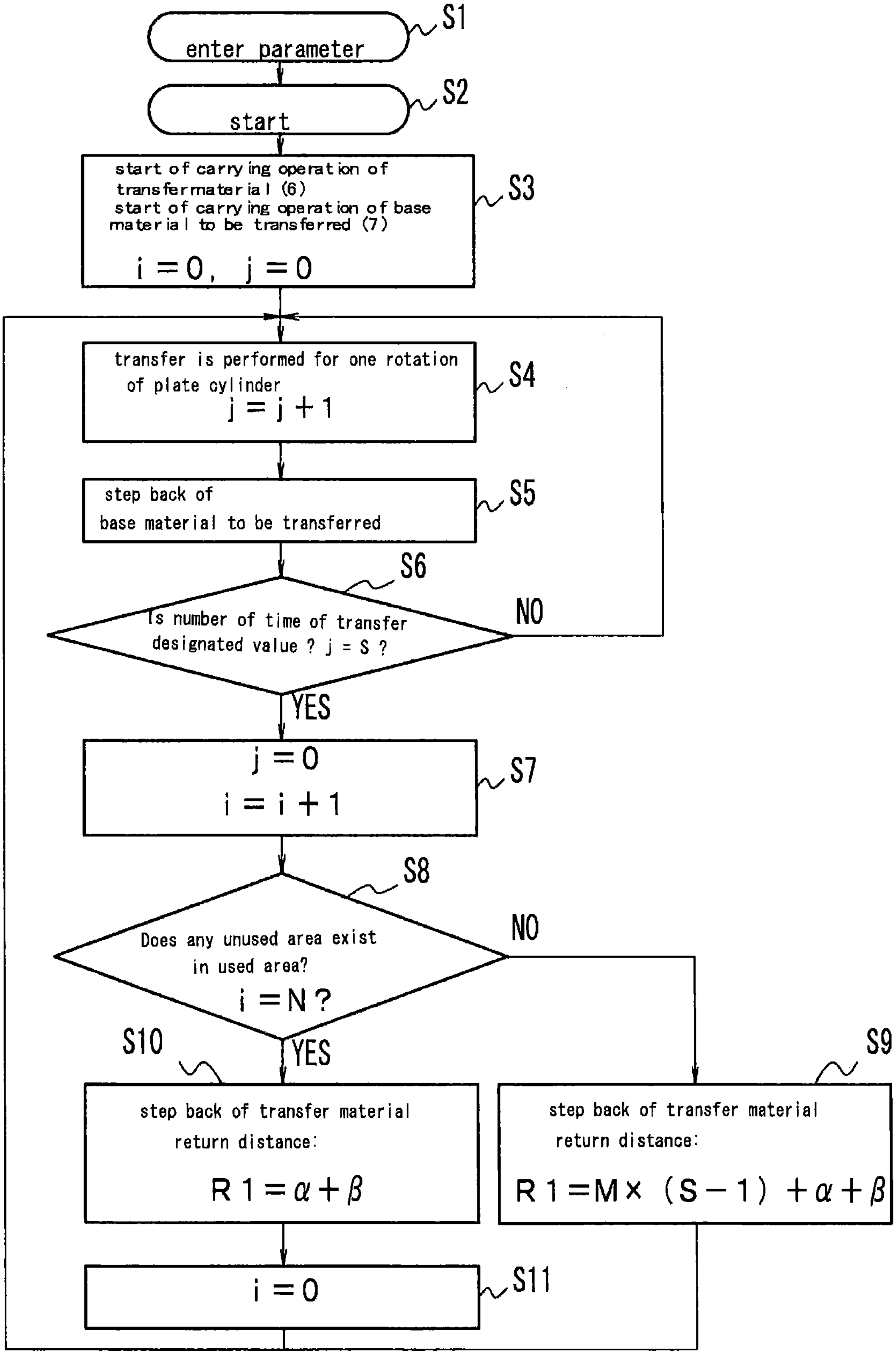

S1
enter parameter
S2
start
start of carrying operation of transfer material (6)
start of carrying operation of base material to be transferred (7)
i = 0, j = 0
S3
transfer is performed for one rotation of plate cylinder
j = j + 1
S4
step back of base material to be transferred
S5
S6
Is number of time of transfer designated value ? j = S ?
NO
YES
j = 0
i = i + 1
S7
S8
Does any unused area exist in used area?
i = N ?
NO
YES
S10
step back of transfer material
return distance:
R1 = α + β
S9
step back of transfer material
return distance:
R1 = M × (S − 1) + α + β
i = 0
S11

FIG. 8

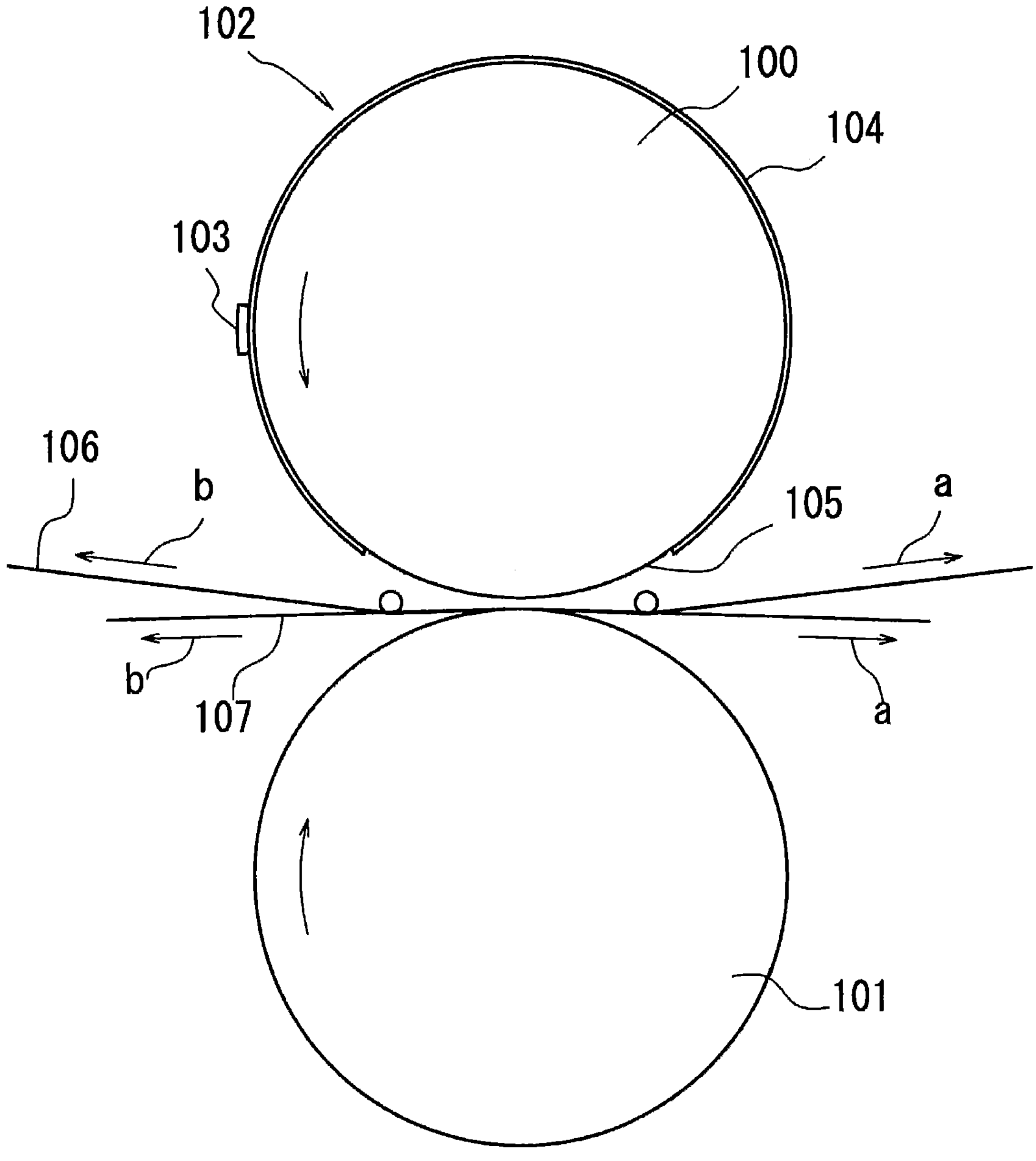


FIG. 9A

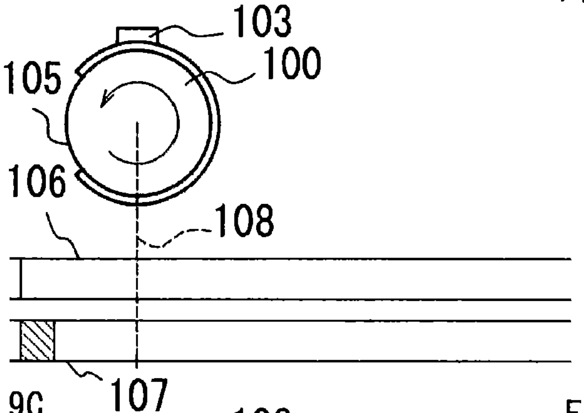


FIG. 9B

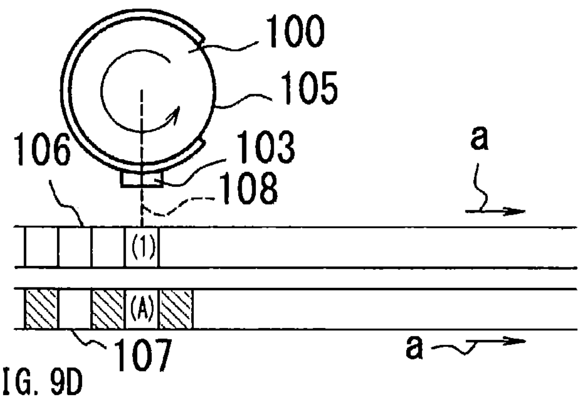


FIG. 9C

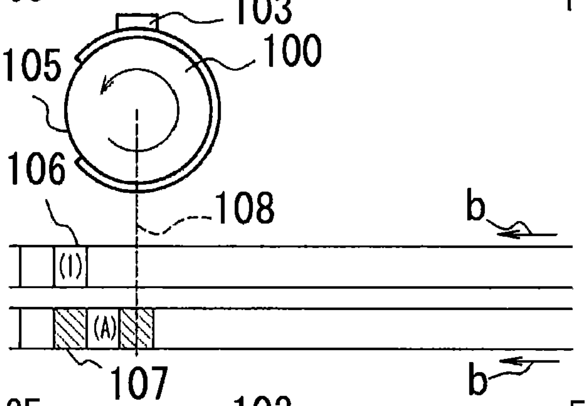


FIG. 9D

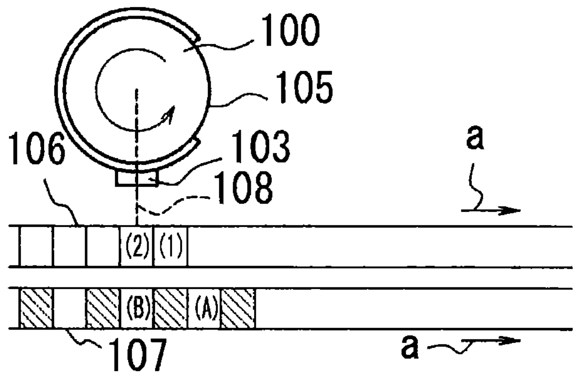


FIG. 9E

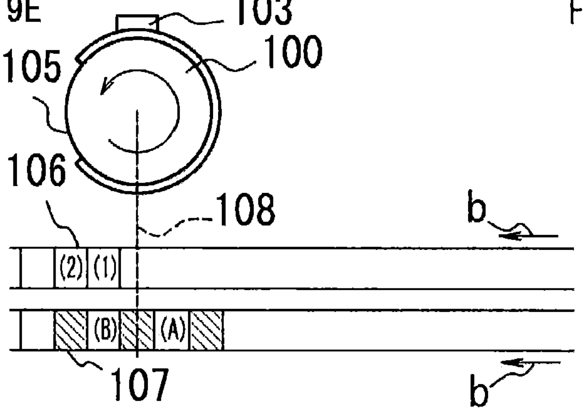


FIG. 9F

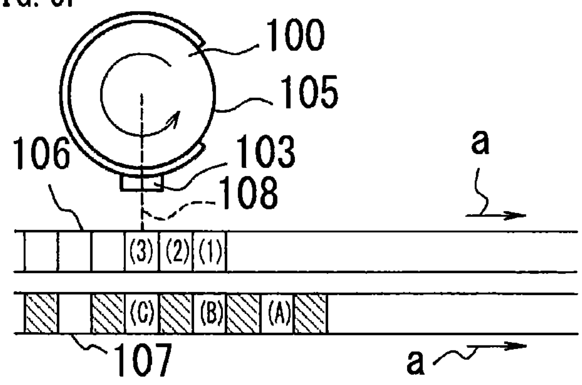


FIG. 10

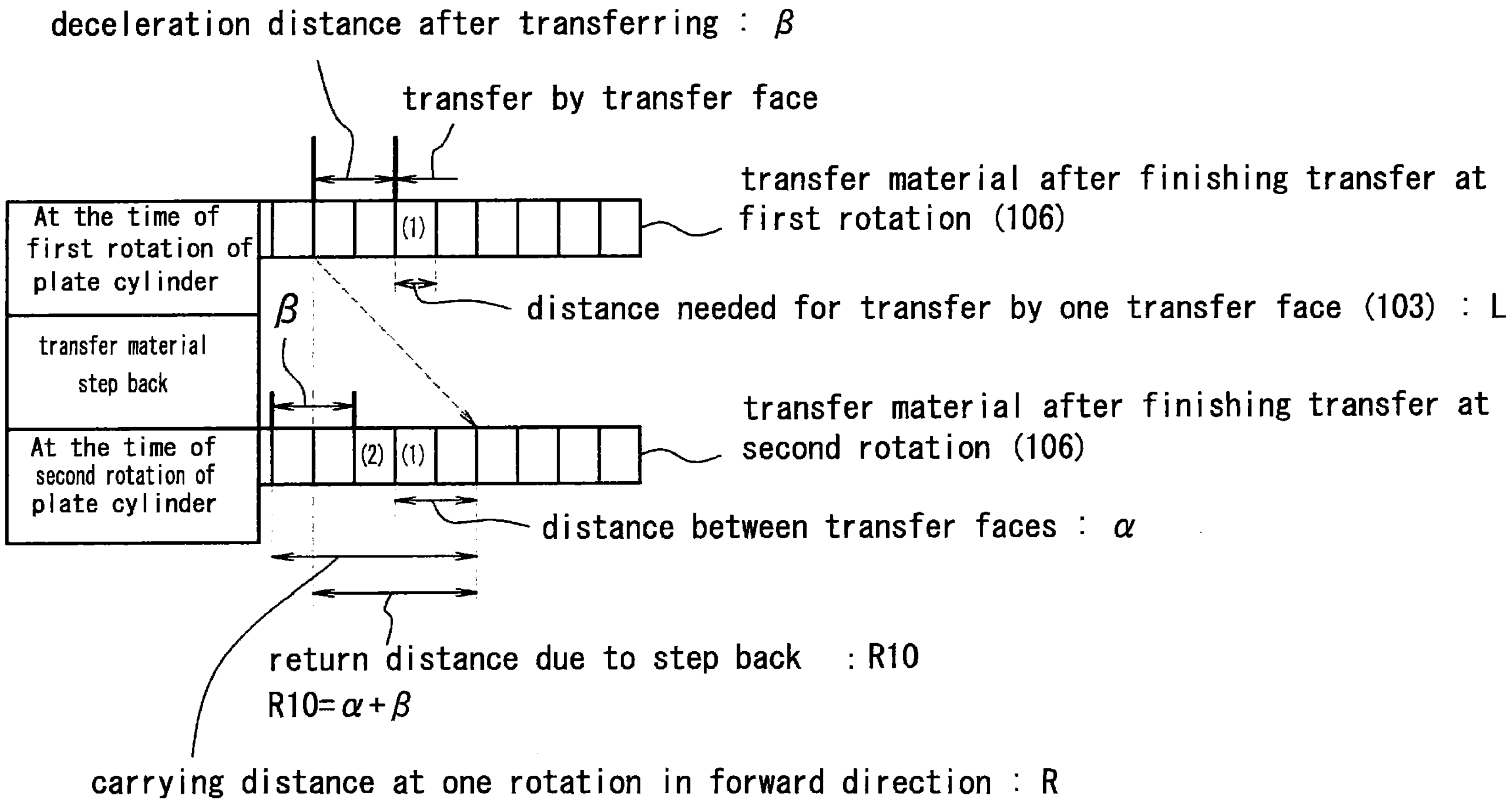
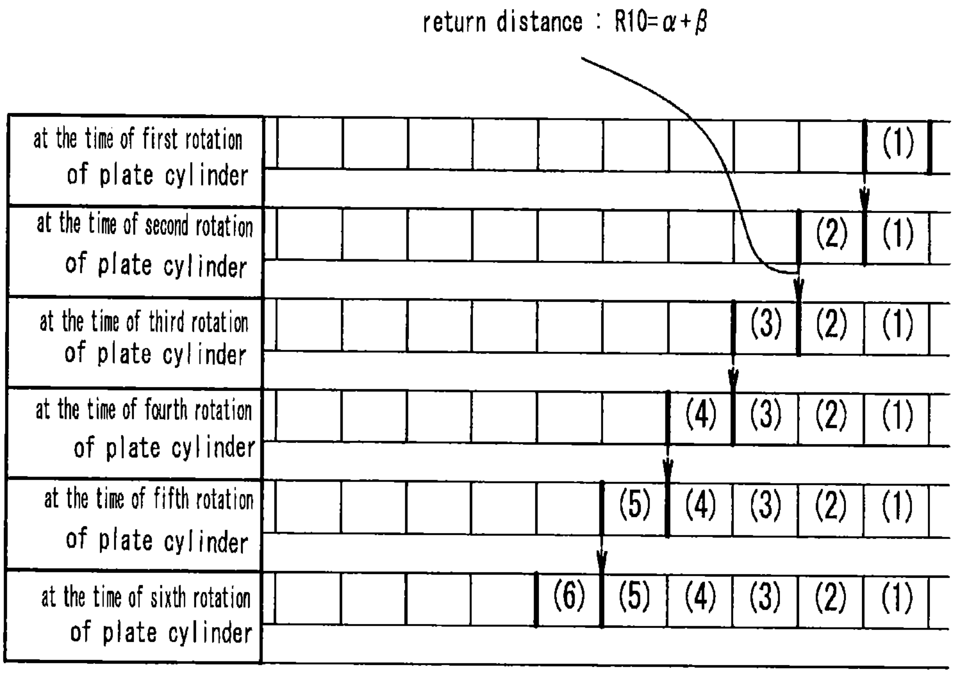

deceleration distance after transferring : β
transfer by transfer face
transfer material after finishing transfer at first rotation (106)
At the time of first rotation of plate cylinder
(1)
distance needed for transfer by one transfer face (103) : L
β
transfer material step back
transfer material after finishing transfer at second rotation (106)
At the time of second rotation of plate cylinder
(2)
(1)
distance between transfer faces : α
return distance due to step back : R10
R10=α+β
carrying distance at one rotation in forward direction : R

FIG. 11


return distance : R10=α+β
at the time of first rotation of plate cylinder
at the time of second rotation of plate cylinder
at the time of third rotation of plate cylinder
at the time of fourth rotation of plate cylinder
at the time of fifth rotation of plate cylinder
at the time of sixth rotation of plate cylinder
(1)
(2)
(3)
(4)
(5)
(6)

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- EP 0987205 A1 **[0002]**
- JP 3650197 B **[0003] [0004] [0007]**