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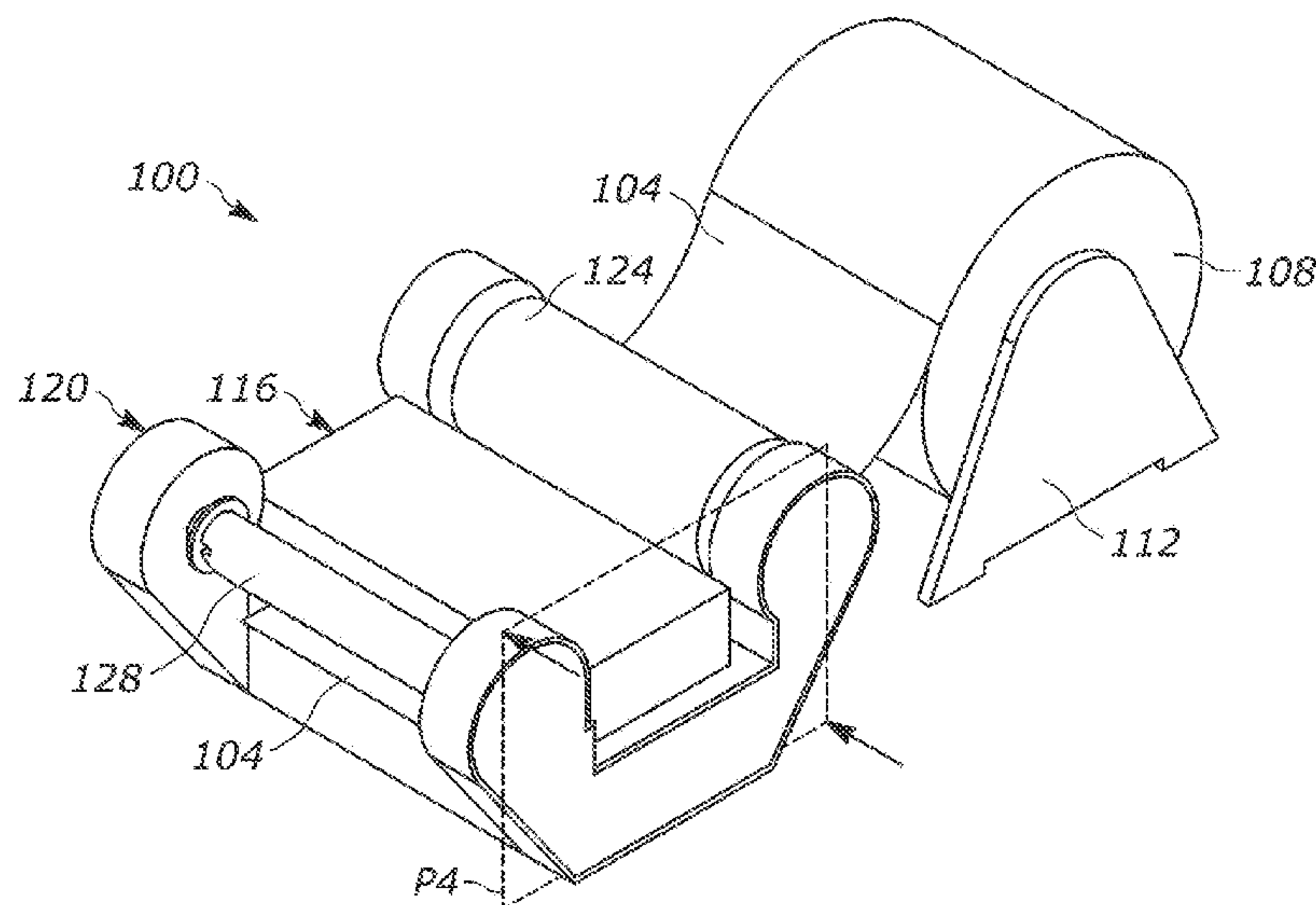


FIG. 1

(57) Abstract: An adapter for operation of a direct thermal printer in a thermal transfer mode includes: an upstream support member to carry a supply of ribbon; a downstream support member to carry a ribbon take-up roll; a drive assembly configured to transmit power to the ribbon take-up roll; an engagement assembly configured to removably couple the upstream support member to the direct thermal printer to dispense the ribbon into an inlet of the direct thermal printer; and the downstream support member to the direct thermal printer to receive ribbon from an outlet of the direct thermal printer; and the drive assembly to a power output of the direct thermal printer to drive rotation of the take-up roll.

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ADAPTER FOR DUAL-MODE OPERATION OF DIRECT THERMAL PRINTERS

BACKGROUND

5 [0001] Various printing processes can be employed to apply indicia to media such as paper, labels, and the like. Some printing processes, such as direct thermal (DT) printing, may enable the provision of relatively small, inexpensive printing devices. However, such printing processes may also suffer from reduced lifespan of printed media, reduced print quality, or the like.

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BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

[0002] The accompanying figures, where like reference numerals refer to identical or functionally similar elements throughout the separate views, together with the detailed description below, are incorporated in and form part of the specification, and serve to
15 further illustrate embodiments of concepts that include the claimed invention, and explain various principles and advantages of those embodiments.

[0003] FIG. 1 is a schematic of a dual-mode printing system.

[0004] FIG. 2 is an exploded view of the system of FIG. 1.

[0005] FIG. 3A is a bottom view of the adapter of the system of FIG. 1.

20 [0006] FIG. 3B is an isometric view of the adapter of the system of FIG. 1.

[0007] FIG. 4 is a cross sectional view of the system of FIG. 1 taken at the plane P4.

[0008] FIG. 5A is a cross sectional view taken at the line 5A-5A in FIG. 4.

[0009] FIG. 5B is a cross sectional view taken at the line 5B-5B in FIG. 4

25 [0010] FIG. 6A is a flowchart of a method of converting the system of FIG. 1 for operation in a thermal transfer mode.

[0011] FIG. 6B is a flowchart of a method of converting the system of FIG. 1 for operation in a direct thermal mode.

[0012] FIG. 7 is a diagram illustrating a conversion between modes of the system of FIG. 1.

[0013] FIG. 8 is a diagram illustrating another conversion between modes of the system of FIG. 1.

[0014] Skilled artisans will appreciate that elements in the figures are illustrated for simplicity and clarity and have not necessarily been drawn to scale. For example, the dimensions of some of the elements in the figures may be exaggerated relative to other elements to help to improve understanding of embodiments of the present invention.

[0015] The apparatus and method components have been represented where appropriate by conventional symbols in the drawings, showing only those specific details that are pertinent to understanding the embodiments of the present invention so as not to obscure the disclosure with details that will be readily apparent to those of ordinary skill in the art having the benefit of the description herein.

DETAILED DESCRIPTION

[0016] Examples disclosed herein are directed to an adapter for operation of a direct thermal printer in a thermal transfer mode, the adapter comprising: an upstream support member to carry a supply of ribbon; a downstream support member to carry a ribbon take-up roll; a drive assembly configured to transmit power to the ribbon take-up roll; an engagement assembly configured to removably couple: the upstream support member to the direct thermal printer to dispense the ribbon into an inlet of the direct thermal printer; and the downstream support member to the direct thermal printer to receive ribbon from an outlet of the direct thermal printer; and the drive assembly to a power output of the direct thermal printer to drive rotation of the take-up roll.

[0017] Additional examples disclosed herein are directed to a printing system, comprising: a direct thermal printer having: a printer body defining an inlet and an outlet; a platen roller and a print head forming a nip between the inlet and the outlet; and a power output coupled to the platen roller; and an adapter having: an upstream support member to carry a supply of ribbon; a downstream support member to carry a ribbon take-up roll; a drive assembly configured to transmit power to the ribbon take-up roll; an engagement assembly configured to removably couple: the upstream support member to the direct thermal printer to dispense the ribbon into the inlet; and

the downstream support member to the direct thermal printer to receive ribbon from the outlet; and the drive assembly to the power output, to drive rotation of the take-up roll.

5 [0018] FIG. 1 depicts a printing system 100 for applying indicia to media 104. The media 104 can include labels (e.g. on a backing web), paper, or the like. In the present example, the media 104 is dispensed from a media supply 108, which in the illustrated example is a spool rotatably supported on a spindle 112 or other suitable support.

10 [0019] The system 100 also includes a direct thermal (DT) printer 116, which may also be referred to as a “print bar” 116. As shown in FIG. 1, the printer 116 and the media supply (e.g. the spool 108 and the spindle 112) are distinct components of the system 100. That is, the printer 116 itself does not contain a supply of the media 104, enabling a reduction in the footprint of the printer 116.

15 [0020] As will be discussed in greater detail below, the printer 116 receives the media 104 at an inlet, and controls a platen roller to draw the media 104 through the printer 116 towards an outlet. Adjacent to the platen roller, the printer 116 includes a thermal print head, which the printer 116 controls to apply heat to the media 104 as the media 104 traverses a nip formed by the platen roller and the print head. When the printer 116 operates in a direct thermal mode, the media 104 itself can be thermochromic and therefore the application of heat by the print head can generate indicia on the media 20 104, before the media 104 exits the printer 116 via an outlet.

[0021] The system 100 also enables operation of the printer 116 in a thermal transfer mode. In the thermal transfer mode, the media 104 is non-thermochromic, and pigment is applied to the media 104 from a ribbon carrying ink. Specifically, the system includes an adapter 120 that is removably connectable to the printer 116. The 25 adapter 120 supports the above-mentioned ribbon. In the illustrated example, the adapter 120 includes a supply roll 124 and a take-up roll 128 carrying the ribbon. During operation of the printer 116 when the adapter 120 is installed, the ribbon travels from the supply roll 124, through the printer 116, to the take-up roll 128. Within the printer 116, the ribbon traverses the above-mentioned nip formed by the 30 platen roller and the print head together with the media 104. Heat applied by the print head causes ink from the ribbon to be deposited onto the media 104.

[0022] The adapter 120 therefore enables the printer 116 to be operated in a thermal transfer (TT) mode when installed, and in a DT mode when not installed. Operation in the TT mode may be employed to generate printed media with longer lifespans, greater print quality or the like. Operation in the DT mode may be employed to generate printed media with shorter lifespan and/or quality requirements. Further discussion of various structural features of the printer 116 and the adapter 120 is provided below.

[0023] Turning to FIG. 2, an exploded view of the system 100 is illustrated, in which the adapter 120 is removed from the printer 116. The printer 116 includes a lower housing portion 200 and an upper housing portion 204, connected to one another via a joint such as a hinge 208. The upper housing portion 204 is therefore rotatable relative to the lower housing portion 200 between an open position shown in FIG. 2, and a closed position shown in FIG. 1. In the open position, as will be described below, the printer 116 and the adapter 120 can be engaged with one another to convert the printer 116 to operation in the TT mode.

[0024] As illustrated in FIG. 2, the above-mentioned platen roller 212 is visible when the upper housing portion 204 is in the open position. The platen roller 212 can be driven by a motor, which may for example be contained within the lower housing portion 200. Power may be transmitted from the motor to the platen roller 212 via a drivetrain that terminates in an output gear 216. The output gear 216, in addition to being coupled to the platen roller 212 to drive rotation of the platen roller 212, is exposed to the exterior of the printer 116. In the illustrated example, the output gear 216 is exposed via cutouts 220a and 220b in the lower and upper housing portions 200 and 204, respectively. As will be discussed below in greater detail, exposure of the output gear 216 enables the printer 116 to supply power to the adapter 120 to drive rotation of the take-up roll 128 when the printer 116 is operated in the TT mode.

[0025] Also shown in FIG. 2 is the above-mentioned print head 224, disposed on the upper housing portion 204 opposite the platen roller 212. Thus, when the upper housing portion 204 is in the closed position, the print head 224 and the platen roller 212 are adjacent to one another to form a nip through which the media 104 is drawn by rotation of the platen roller. The media 104 is drawn from an inlet 228, through the above-mentioned nip for application of pigment to the media 104, and is dispensed at

an outlet 232. The printer 116 can also include a sensor 236 to detect the presence of the media 104 in the printer 116. For example, responsive to detecting the introduction of the media 104 into the printer 116 via the sensor 236, the printer 116 can control the platen roller 212 to advance the media 104 into the nip, and to then
5 await printing instructions (e.g. from a computing device, not shown, that is in communication with the printer 116).

[0026] The adapter 120 includes an upstream support member 240 to carry the supply roll 124 of ribbon, and a downstream support member 244 to carry the take-up roll 128. The terms “upstream” and “downstream” as used herein refer to the path that the
10 media 104 takes through the printer 116, from the inlet 228 (upstream) to the outlet 232 (downstream). Thus, the upstream support member 240, when the adapter 120 is installed on the printer 116, is located adjacent to the inlet 228. In fact, as will be apparent in the discussion below, the upstream support member 240 is upstream of the inlet 228 itself, because the upstream support member 240 is external to the printer
15 116. The downstream support member 240, meanwhile, is adjacent to the outlet 232 (and is in fact downstream of the outlet 232) when the adapter 120 is installed.

[0027] The adapter 120 also includes an engagement assembly 252 that removably couples the upstream support member 240 and the downstream support member 244 to the printer 116. Specifically, the engagement assembly 252 couples the upstream
20 support member 240 to the printer 116 to enable ribbon to be dispensed from the supply roll 124 to the inlet 228. A segment 248 of ribbon extending between the supply roll 124 and the take-up roll 128 is dispensed into the printer 116, traverses the nip formed by the platen roller 212 and the print head 224.

[0028] The engagement assembly 252 also removably couples the downstream
25 support member 244 to the printer 116 to receive the segment 248 of ribbon for spooling onto the take-up roller 128 when the segment 248 exits the printer 116 at the outlet 232. In addition, the engagement assembly 252 couples a drive assembly (not visible in FIG. 2) to a power output of the printer 116, which in the illustrated example is the output gear 216. The drive assembly, as will be discussed further
30 below, transmits power from the power output to the take-up roll 128 to pull the ribbon segment 248 through the printer 116.

[0029] In the present example, the engagement assembly 252 is an adapter housing that includes a side wall 258 connecting an upstream wall 262 and a downstream wall 266. The adapter housing is open at the side opposite the side wall 258. That is, the side wall 258 and the upstream and downstream walls 262 and 266 form a U-shaped opening into which the printer 116 is inserted to couple the adapter 120 with the printer 116.

[0030] The upstream and downstream support members 240 and 244 are integrally formed with the adapter housing in the present example. In other examples, the engagement assembly can include multiple distinct components, such as a first component to couple the upstream support member 240 to the printer 116, and a second component to couple the downstream support member 244 to the printer 116.

[0031] More specifically, in the illustrated example each of the upstream and downstream support members 240 and 244 include a pair of arms extending from the engagement assembly 252. That is, the upstream support member 240 includes first and second arms 270-1 and 270-2, while the downstream support member 244 includes first and second arms 274-2. The arms 270 and 274 include structural features adjacent to outer ends thereof to support the supply roll 124 and take-up roll 128, respectively. In addition, the arm 274-2 supports the above-mentioned drive assembly.

[0032] Turning to FIG. 3A, a bottom view of the adapter 120 is shown, illustrating the U-shaped opening 300 formed by the upstream and downstream walls 262 and 266 and the side wall 258. A portion of the drive assembly is also visible in FIG. 3A. In particular, the drive assembly includes an input shaft, which in the illustrated example includes an input gear 302 mounted thereon. FIG. 3B is an isometric view of the adapter 120 showing the opposite side of the adapter 120 from the side wall 258 than is illustrated in FIGS. 1 and 2. FIG. 3B further illustrates the position of the input gear 302.

[0033] The input gear 302 is exposed to the exterior of the adapter 120 through an aperture in the arm 274-2. In particular, as will be apparent from FIGS. 3A and 3B as well as FIG. 2, the position of the input gear 302 is such that when the adapter 120 is coupled to the printer 116, the input gear 302 engages with the output gear 216 of the printer 116 to provide power (mechanical power in the present example) to the input

gear 302 for transmission via a remainder of the drive assembly of the adapter 120 to rotate the take-up roll 128.

[0034] FIG. 4 illustrates a cross section of the system 100 taken at the plane P4 shown in FIG. 1. An example drive assembly 400 is illustrated as being housed within the arm 274-2 of the downstream support member 244. The drive assembly includes an input shaft 404 and a drivetrain to transmit power from the input shaft 404 to the take-up roll 128. In the present example, the drivetrain includes the input gear 302 mentioned earlier, which is mounted on the input shaft 404. As shown in FIG. 4, when the adapter 120 and the printer 116 are coupled, the input gear 302 of the adapter 120 and the output gear 216 of the printer 116 engage. Therefore, when the platen roller 212 is driven by the motor of the printer 116, the input gear 302 is also driven.

[0035] The drivetrain also includes an intermediate gear 408, and a take-up roll gear 412. In other examples, various configurations of gears, belts or other suitable power transmission components can be employed to implement the drivetrain. The components of the drivetrain are selected to rotate the take-up roll 124 at the same rate as the platen roller 212, to draw the ribbon 248 through the printer 116 at the same rate as the media 104. In the present example, the take-up roll gear 412 has the same size and number of teeth as the platen gear 216, while the input gear 302 and the intermediate gear 408 have the same module as the platen gear 216 and the take-up roll gear. In other examples, however, a wide variety of other drivetrain configurations can be employed.

[0036] FIG. 5A illustrates a cross section of the adapter 120 taken at the line 5A-5A illustrated in FIG. 4. In addition to the components of the drive assembly 400 mentioned above, FIG. 5A shows a set of components that support the take-up roll 128 between the arms 274. In particular, the arm 274-1 rotatably supports a first hub 500, which can be biased, e.g. by a bias member 504 such as a coil spring, towards the arm 274-2. The arm 274-2 rotatably supports a second hub 508, which can also be biased towards the arm 274-1, e.g. by a bias member 512 such as a coil spring. The hubs 500 and 508 engage opposing ends of the take-up roll 128, such that the take-up roll 128 rotates responsive to rotation of the hubs 500 and 508. The hub 508, in particular, is affixed to the take-up roll gear 412, e.g. via a fastener 516. Therefore,

rotation of the gear 412 (driven by the output gear 216 via the input gear 302 and the intermediate gear 408) drives rotation of the take-up roll 128.

[0037] FIG. 5B illustrates a cross section of the adapter 120 taken at the line 5B-5B illustrated in FIG. 4, and shows the internal structure of the arms 270-1 and 270-2.

5 The arms 270 rotatably support the supply roll 124, for example via a first hub 520 and a second hub 524, which are rotatably supported by the arms 270-2 and 270-1, respectively. The hubs 520 and 524 may also be biased toward each other by respective bias members 528 and 532, such as coil springs. As will be apparent from FIG. 5B, the supply roll 124 is passive (i.e. not driven). The supply roll 124 therefore
10 rotates responsive to the take-up roll 128 being driven.

[0038] Turning now to FIGS. 6A and 6B, respective methods 600 and 650 are illustrated for changing the mode of operation of the printer 116. Both methods 600 and 650, as illustrated, assume that no media is loaded into the printer 116 initially. In particular, the method 600 shown in FIG. 6A is a method of converting the printer
15 116 from the DT mode to the TT mode. At block 605, the printer 116 is opened, by moving the upper housing portion 204 to the open position shown in FIG. 2. At block 610, the printer 116 is inserted into the opening 300. FIG. 7 illustrates insertion of the printer 116 into the opening 300, e.g. by sliding the printer 116 through the open end of the adapter 120 towards the side wall 258. In other examples, with the printer 116
20 in the open position the adapter 120 can be engaged with the printer 116 by lowering the adapter 120 onto the printer 116, as shown in FIG. 8.

[0039] When the printer 116 abuts the side wall 258, the input gear 302 engages with the output gear 216 and the ribbon segment 248 lies over the platen roller 212, such that when the printer 116 is closed, the ribbon 248 is located between the platen roller
25 212 and the print head 224. At block 615a, the media 104 may be inserted into the printer 116, between the ribbon 248 and the platen roller 212. In other examples, block 615a can be omitted. At block 620, the printer 116 is closed (i.e. returned to the position shown in FIG. 1). When block 615a was omitted, at block 615b the media 104 is introduced into the printer 116 via the inlet 228. The sensor 236 can detect the
30 presence of the media, and cause the platen roller 212 to be driven to advance the media 104 into the printer 116. When block 615a is performed, block 615b is omitted.

[0040] To convert the printer 116 from operation in the TT mode to operation in the DT mode, the adapter 120 is removed according to the method 650. In particular, at block 655, the printer 116 is opened. At block 660, the printer 116 is removed from the opening 300, by sliding the printer in the opposite direction as that shown in FIG.

5 7. At block 665a, the media 104 (e.g. thermochromic media) can be inserted while the printer 116 is open, and at block 670, the printer 116 is closed. In other examples, block 665a is omitted, and the media 104 is instead inserted at block 665b. When block 665a is performed, block 665b is omitted.

[0041] In the foregoing specification, specific embodiments have been described.

10 However, one of ordinary skill in the art appreciates that various modifications and changes can be made without departing from the scope of the invention as set forth in the claims below. Accordingly, the specification and figures are to be regarded in an illustrative rather than a restrictive sense, and all such modifications are intended to be included within the scope of present teachings.

15 [0042] The benefits, advantages, solutions to problems, and any element(s) that may cause any benefit, advantage, or solution to occur or become more pronounced are not to be construed as a critical, required, or essential features or elements of any or all the claims. The invention is defined solely by the appended claims including any amendments made during the pendency of this application and all equivalents of those
20 claims as issued.

[0043] Moreover in this document, relational terms such as first and second, top and bottom, and the like may be used solely to distinguish one entity or action from another entity or action without necessarily requiring or implying any actual such relationship or order between such entities or actions. The terms "comprises,"
25 "comprising," "has", "having," "includes", "including," "contains", "containing" or any other variation thereof, are intended to cover a non-exclusive inclusion, such that a process, method, article, or apparatus that comprises, has, includes, contains a list of elements does not include only those elements but may include other elements not expressly listed or inherent to such process, method, article, or apparatus. An element
30 preceded by "comprises ...a", "has ...a", "includes ...a", "contains ...a" does not, without more constraints, preclude the existence of additional identical elements in the process, method, article, or apparatus that comprises, has, includes, contains the

element. The terms “a” and “an” are defined as one or more unless explicitly stated otherwise herein. The terms “substantially”, “essentially”, “approximately”, “about” or any other version thereof, are defined as being close to as understood by one of ordinary skill in the art, and in one non-limiting embodiment the term is defined to be within 10%, in another embodiment within 5%, in another embodiment within 1% and in another embodiment within 0.5%. The term “coupled” as used herein is defined as connected, although not necessarily directly and not necessarily mechanically. A device or structure that is “configured” in a certain way is configured in at least that way, but may also be configured in ways that are not listed.

10 [0044] It will be appreciated that some embodiments may be comprised of one or more specialized processors (or “processing devices”) such as microprocessors, digital signal processors, customized processors and field programmable gate arrays (FPGAs) and unique stored program instructions (including both software and firmware) that control the one or more processors to implement, in conjunction with
15 certain non-processor circuits, some, most, or all of the functions of the method and/or apparatus described herein. Alternatively, some or all functions could be implemented by a state machine that has no stored program instructions, or in one or more application specific integrated circuits (ASICs), in which each function or some combinations of certain of the functions are implemented as custom logic. Of course,
20 a combination of the two approaches could be used.

[0045] Moreover, an embodiment can be implemented as a computer-readable storage medium having computer readable code stored thereon for programming a computer (e.g., comprising a processor) to perform a method as described and claimed herein. Examples of such computer-readable storage mediums include, but are not limited to,
25 a hard disk, a CD-ROM, an optical storage device, a magnetic storage device, a ROM (Read Only Memory), a PROM (Programmable Read Only Memory), an EPROM (Erasable Programmable Read Only Memory), an EEPROM (Electrically Erasable Programmable Read Only Memory) and a Flash memory. Further, it is expected that one of ordinary skill, notwithstanding possibly significant effort and many design
30 choices motivated by, for example, available time, current technology, and economic considerations, when guided by the concepts and principles disclosed herein will be

readily capable of generating such software instructions and programs and ICs with minimal experimentation.

[0046] The Abstract of the Disclosure is provided to allow the reader to quickly ascertain the nature of the technical disclosure. It is submitted with the understanding
5 that it will not be used to interpret or limit the scope or meaning of the claims. In addition, in the foregoing Detailed Description, it can be seen that various features are grouped together in various embodiments for the purpose of streamlining the disclosure. This method of disclosure is not to be interpreted as reflecting an intention that the claimed embodiments require more features than are expressly recited in each
10 claim. Rather, as the following claims reflect, inventive subject matter lies in less than all features of a single disclosed embodiment. Thus the following claims are hereby incorporated into the Detailed Description, with each claim standing on its own as a separately claimed subject matter.

WHAT IS CLAIMED IS:

1. An adapter to enable a direct thermal printer to print in a thermal transfer mode, the adapter comprising:
 - 5 an upstream support member to carry a supply of ribbon;
 - a downstream support member to carry a ribbon take-up roll;
 - a drive assembly configured to transmit power to the ribbon take-up roll;
 - an engagement assembly configured to removably couple:
 - the upstream support member to the direct thermal printer to dispense
 - 10 the ribbon into an inlet of the direct thermal printer;
 - the downstream support member to the direct thermal printer to receive the ribbon from an outlet of the direct thermal printer; and
 - the drive assembly to a power output of the direct thermal printer to drive rotation of the ribbon take-up roll.
- 15 2. The adapter of claim 1, wherein the engagement assembly includes an adapter body defining an opening to receive the direct thermal printer.
3. The adapter of claim 2, wherein the adapter body includes an upstream wall, a
20 downstream wall and a side wall connecting the upstream wall and the downstream wall, and wherein the opening is defined between the upstream wall, the downstream wall and the side wall.
4. The adapter of claim 3, wherein the adapter body includes the upstream support
25 member having an upstream arm extending upstream from the upstream wall, and wherein the downstream support member having a downstream arm extending downstream from the downstream wall.
5. The adapter of claim 4, wherein the drive assembly is supported by the downstream
30 arm.

6. The adapter of claim 1, wherein the drive assembly includes an input shaft and a drivetrain connecting the input shaft with the ribbon take-up roll.
7. The adapter of claim 6, wherein the drivetrain includes an input gear mounted to the input shaft, and the input gear is configured to engage with the power output of the direct thermal printer.
8. The adapter of claim 7, wherein a downstream arm of an adapter body includes an aperture exposing the input gear to an exterior of the downstream arm for engagement with the power output of the direct thermal printer.
9. A printing system, comprising:
a direct thermal printer having:
an inlet and an outlet;
a platen roller and a print head forming a nip between the inlet and the outlet; and
a power output coupled to the platen roller; and
an adapter having:
an upstream support member to carry a supply of ribbon;
a downstream support member to carry a ribbon take-up roll;
a drive assembly configured to transmit power from the power output to the ribbon take-up roll when the adapter is removably coupled to the direct thermal printer.
10. The printing system of claim 9, wherein the engagement assembly includes an adapter body defining an opening to receive the direct thermal printer.
11. The printing system of claim 10, wherein the adapter body includes an upstream wall, a downstream wall and a side wall connecting the upstream wall and the downstream wall, and wherein the opening is defined between the upstream wall, the downstream wall and the side wall.

12. The printing system of claim 11, wherein the upstream support member includes an upstream arm extending upstream from the upstream wall, and the downstream support member includes a downstream arm extending downstream from the downstream wall.

5

13. The printing system of claim 12, wherein the drive assembly is supported by the downstream arm.

14. The printing system of claim 9, wherein the drive assembly includes an input shaft and a drivetrain connecting the input shaft with the ribbon take-up roll.

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15. The printing system of claim 14, wherein the drivetrain includes an input gear mounted to the input shaft, and the input gear is configured to engage with the power output of the direct thermal printer.

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16. The printing system of claim 14, wherein the downstream arm of an adapter body includes an aperture exposing the input gear to an exterior of the downstream arm for engagement with the power output of the direct thermal printer.

17. The printing system of claim 9, wherein the direct thermal printer includes a body having:

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a lower housing portion supporting the platen roller and the power output; and an upper housing portion coupled to the lower housing portion and supporting the print head, wherein the upper housing portion is rotatable between a closed position and an open position.

25

18. The printing system of claim 17, wherein the power output includes a gear coupled to the platen roller, and wherein at least one of the lower housing portion and the upper housing portion include a cutout to expose the gear to an exterior of the printer body for engagement with the drive assembly.

30

19. The printing system of claim 9, comprising an engagement assembly configured to removably couple:

the upstream support member to the direct thermal printer to dispense the ribbon into the inlet;

5 the downstream support member to the direct thermal printer to receive the ribbon from the outlet; and

the drive assembly to the power output to drive rotation of the ribbon take-up roll.

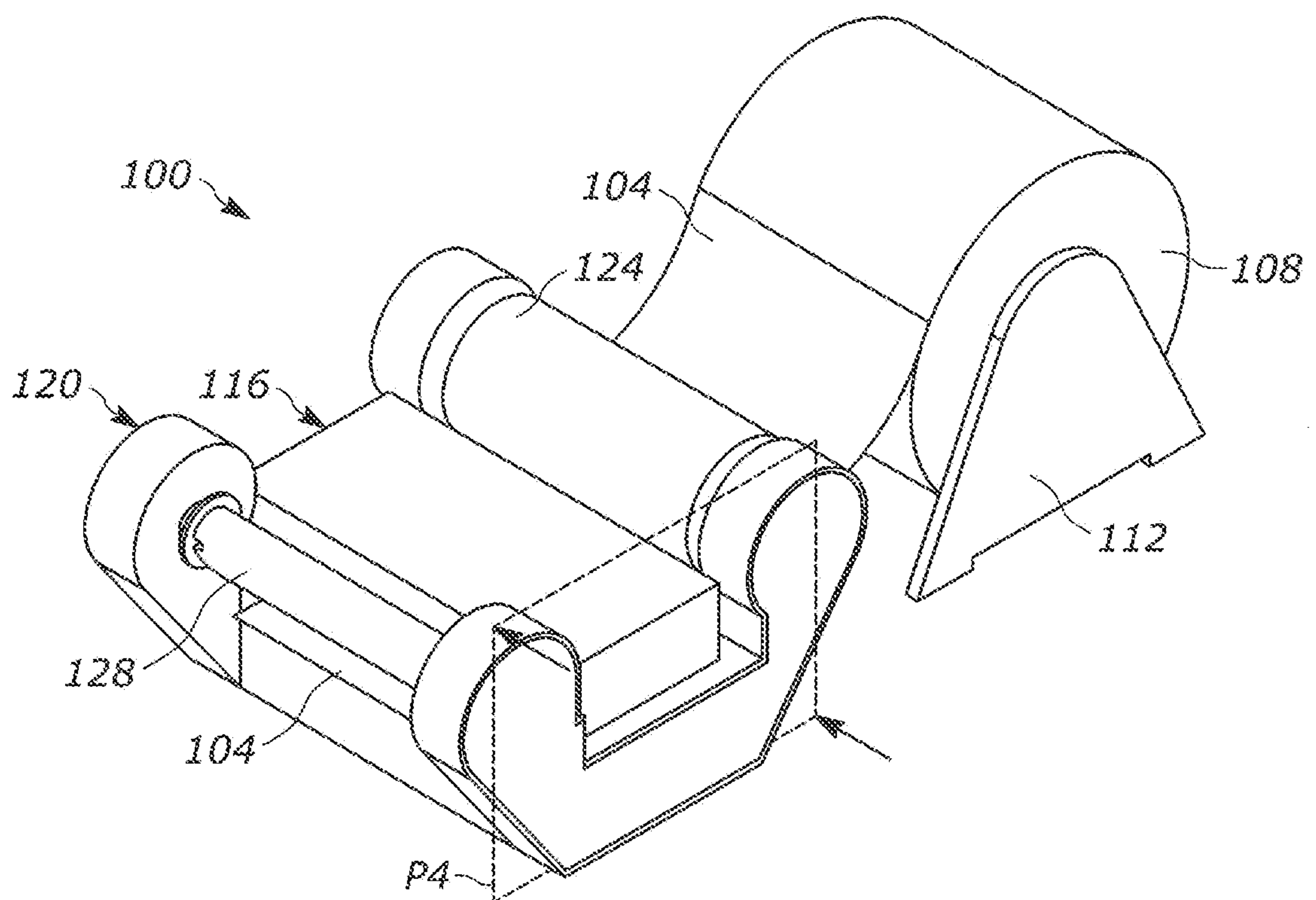


FIG. 1

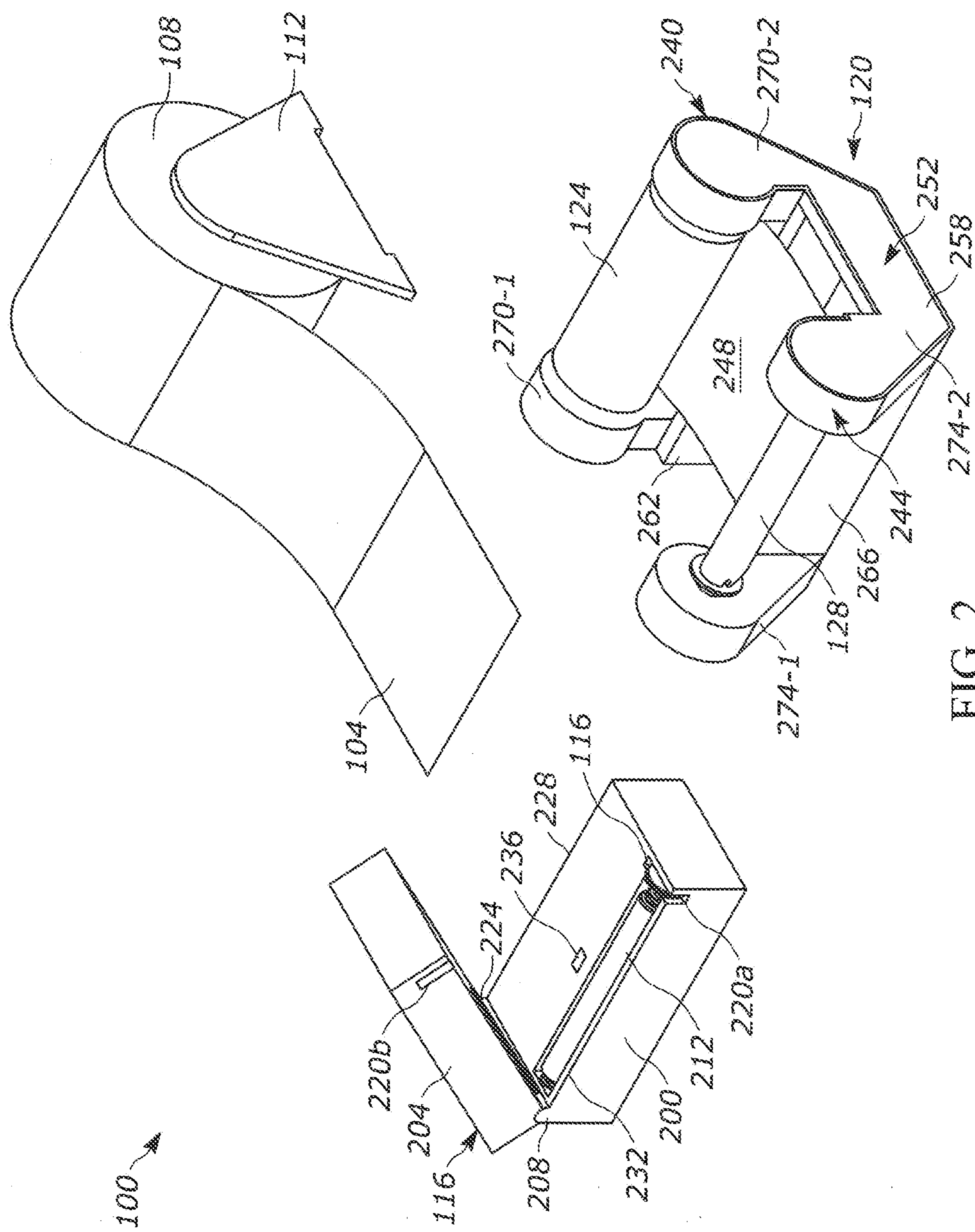


FIG. 2

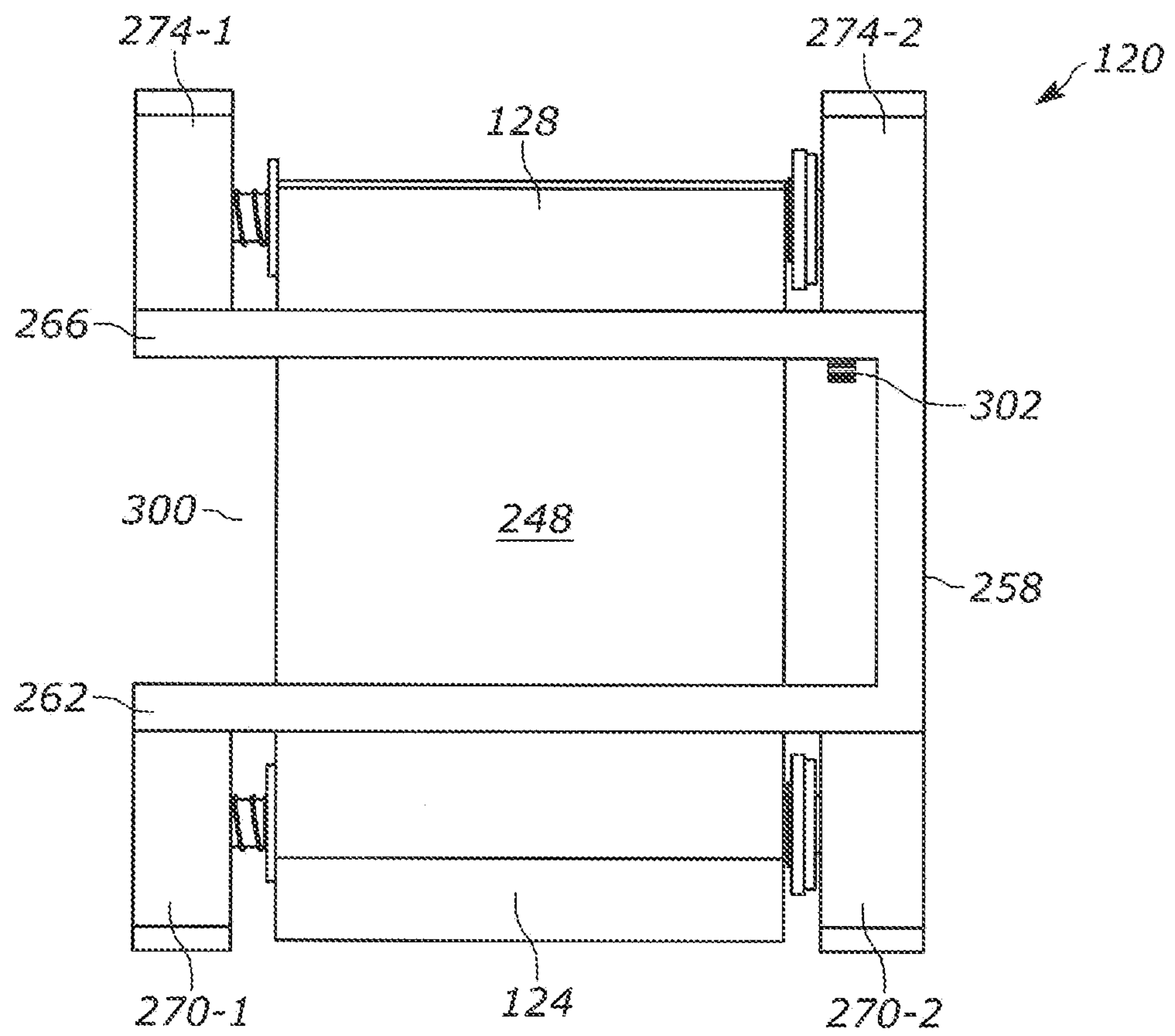


FIG. 3A

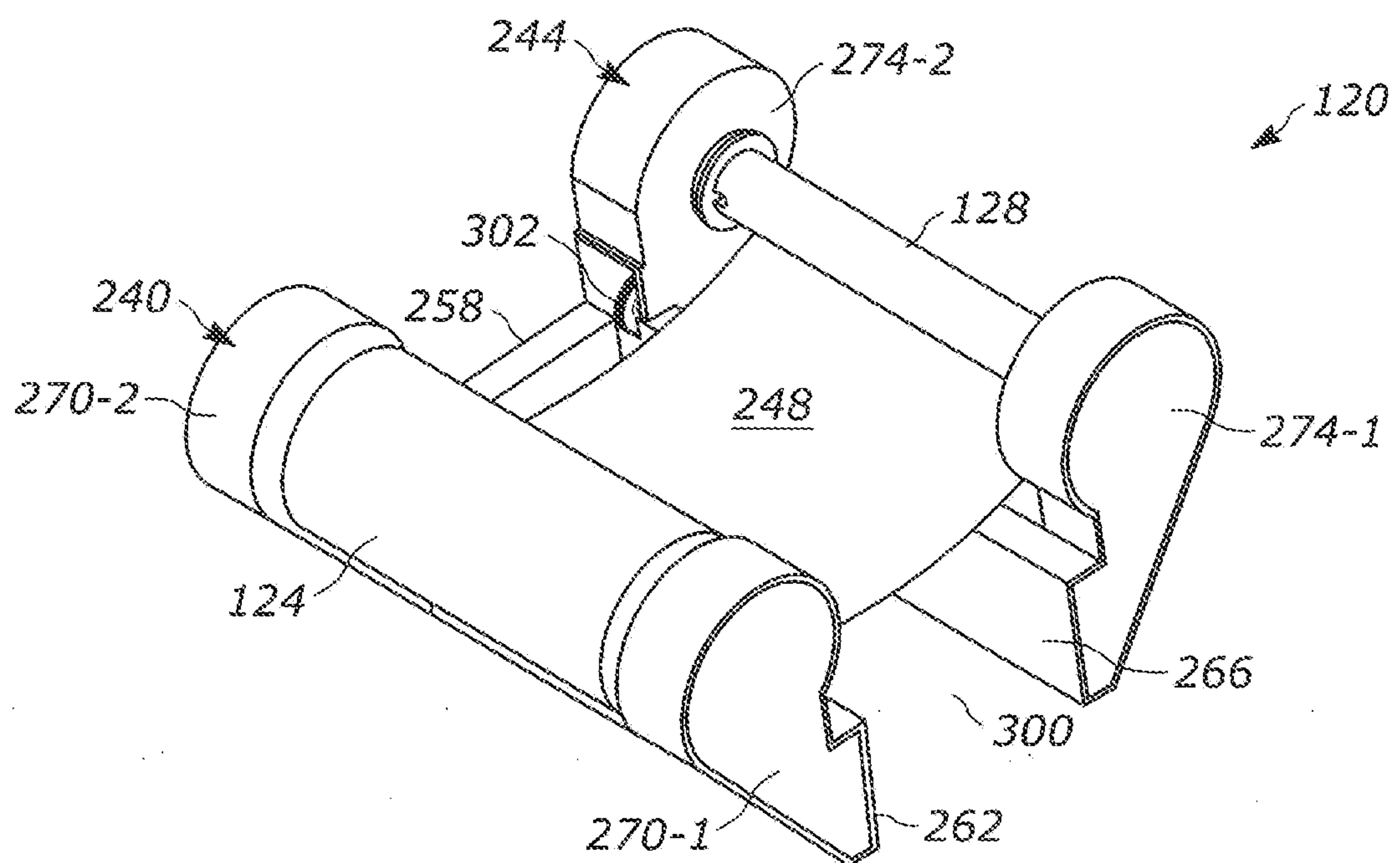


FIG. 3B

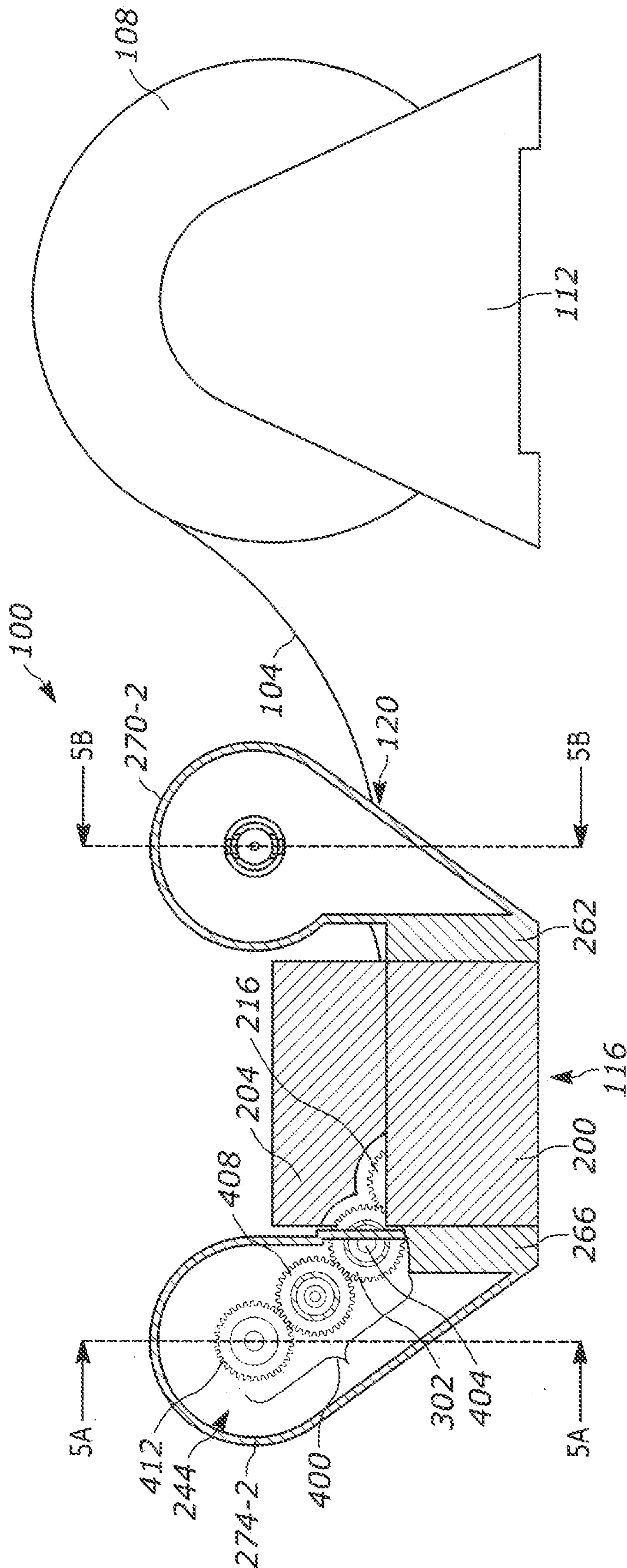


FIG. 4

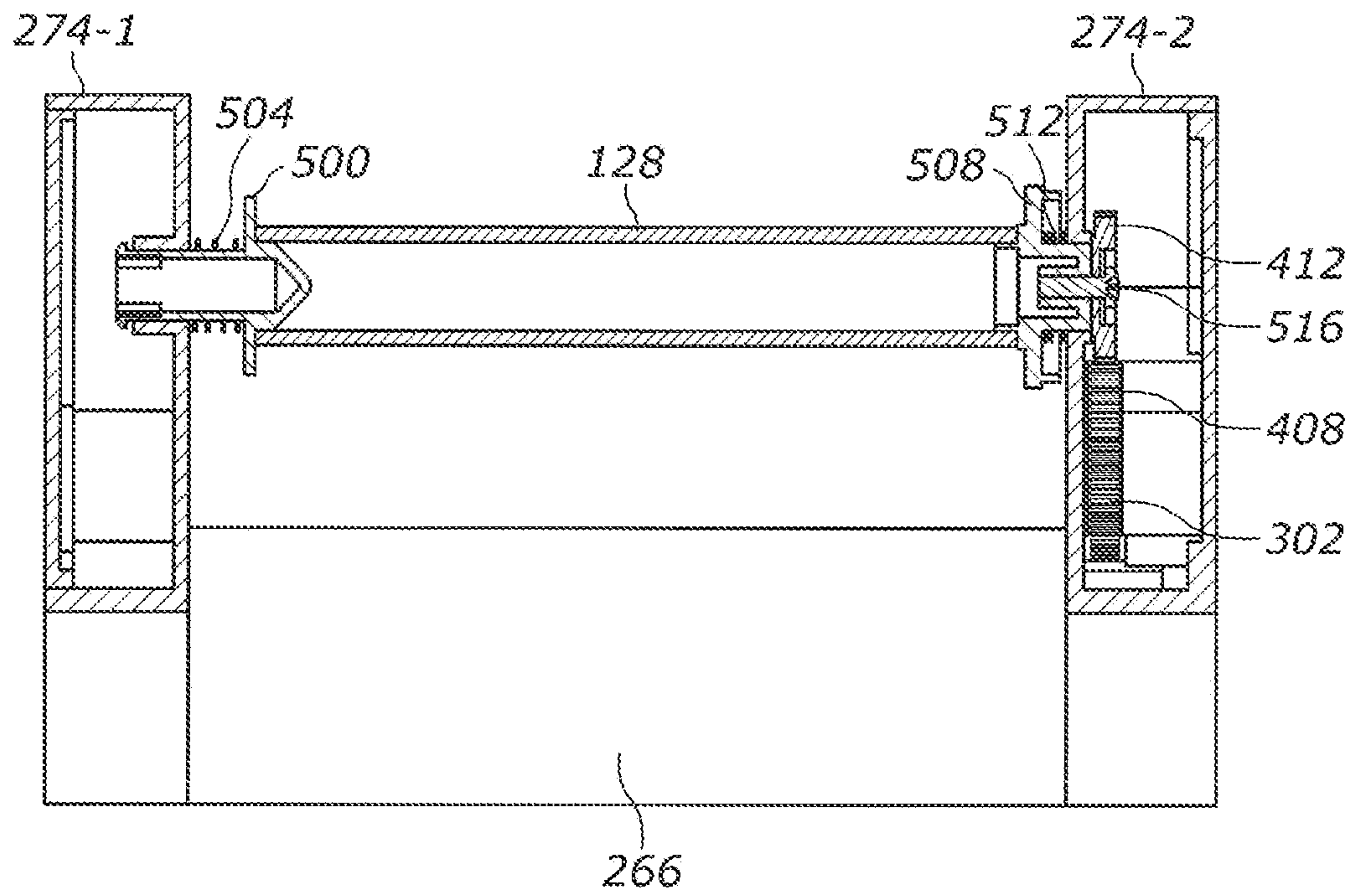


FIG. 5A

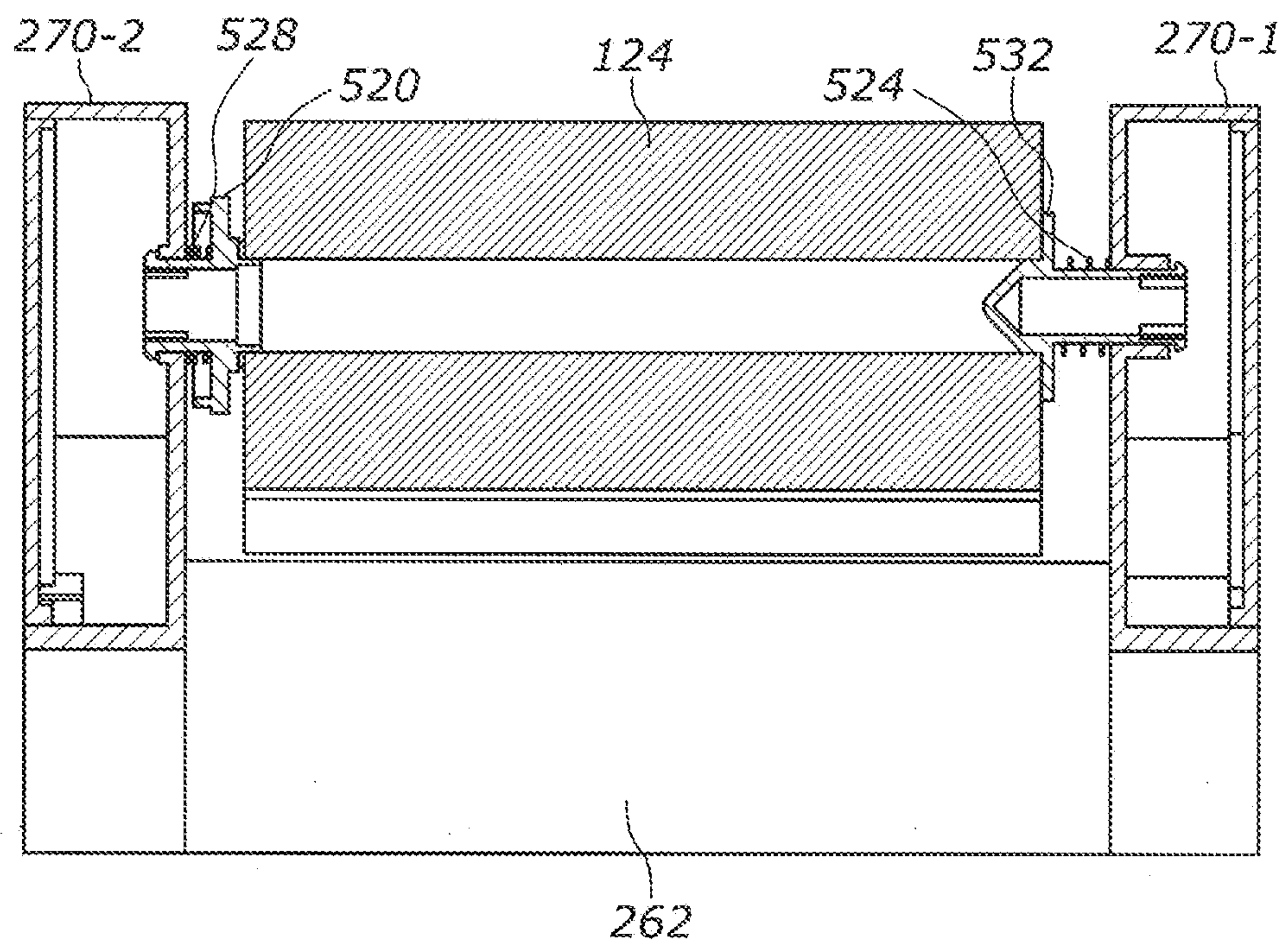


FIG. 5B

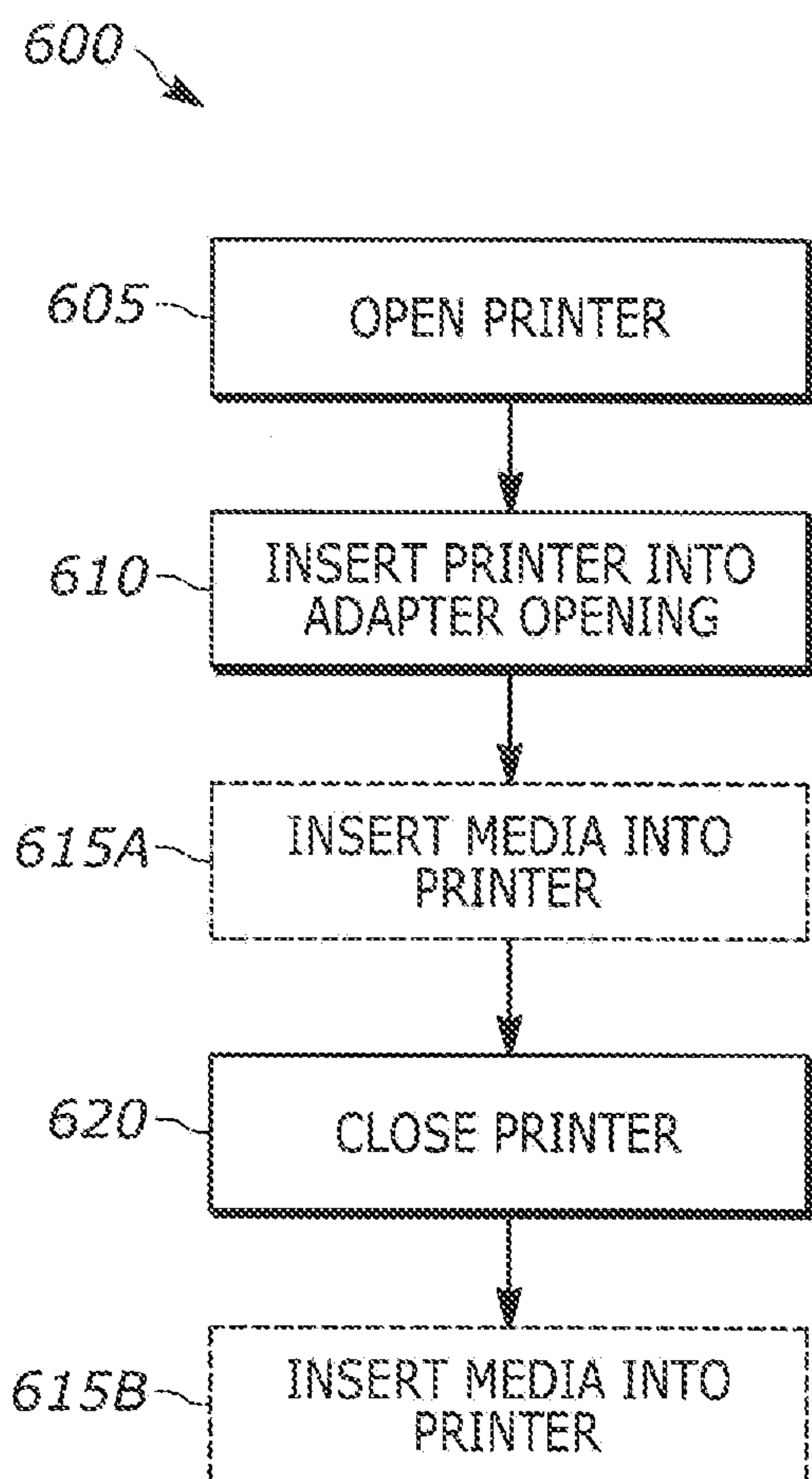


FIG. 6A

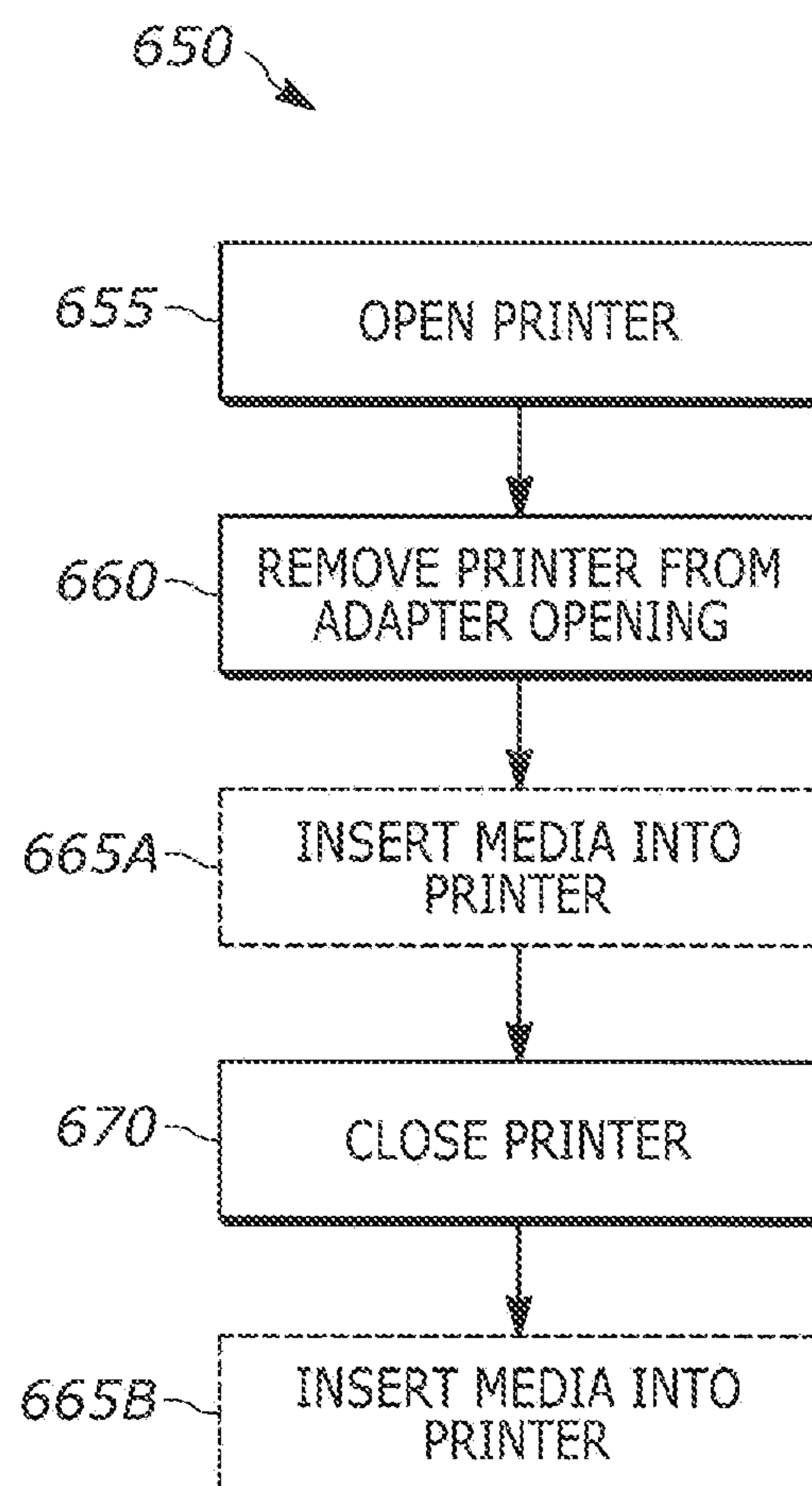


FIG. 6B

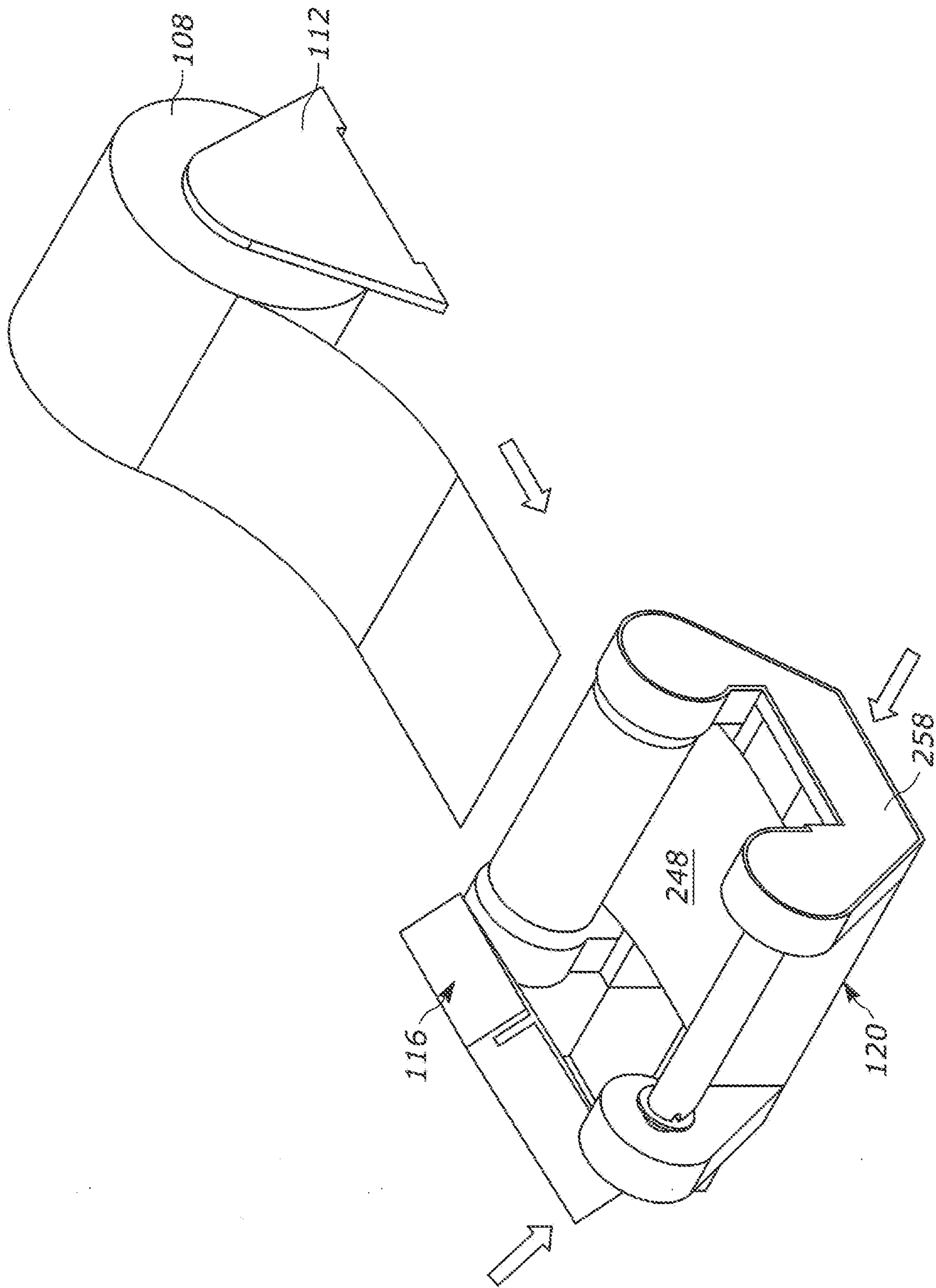


FIG. 7

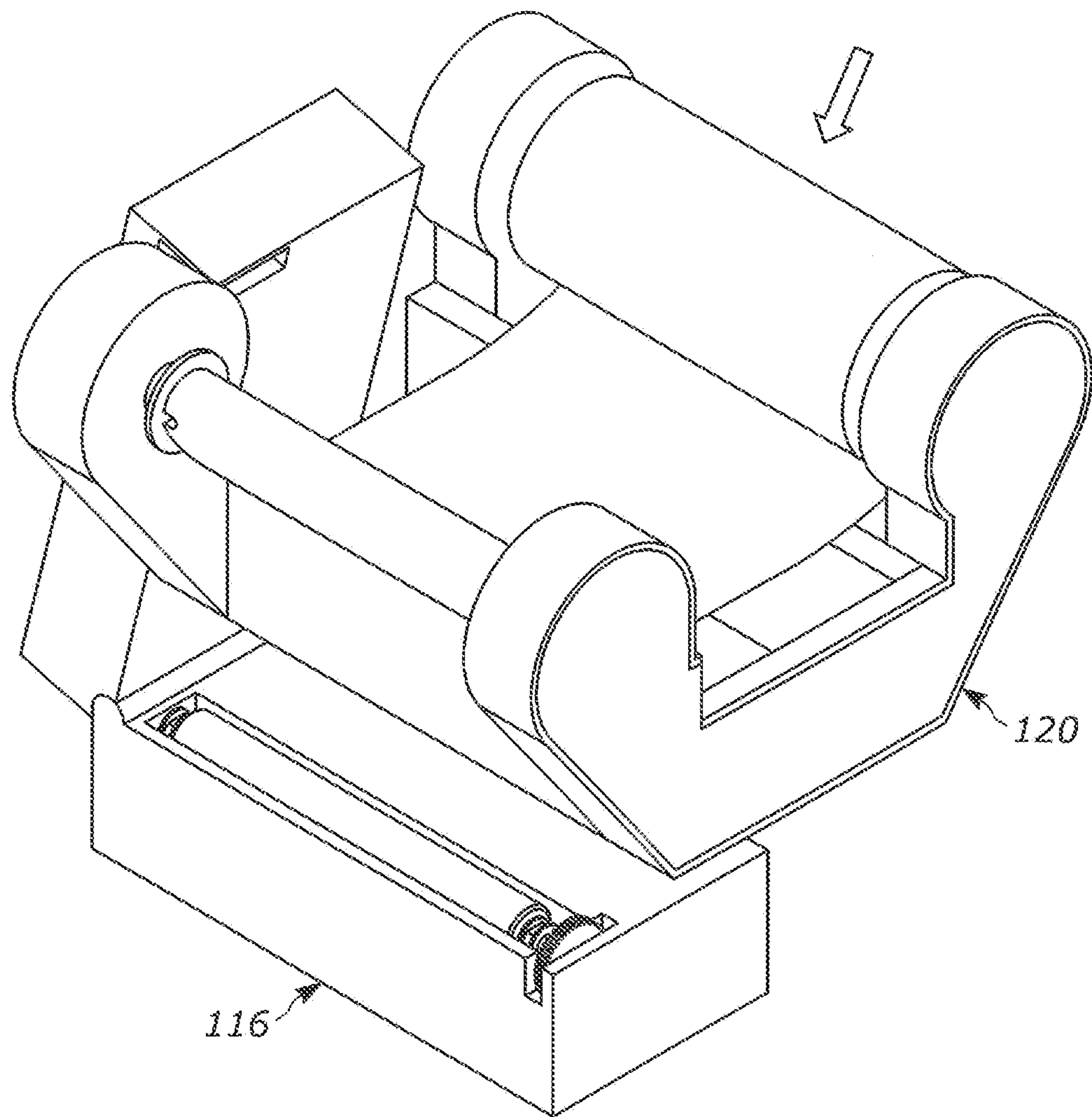


FIG. 8

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2019/125896

A. CLASSIFICATION OF SUBJECT MATTER

B41J 2/32(2006.01)i; B41J 3/407(2006.01)i

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

B41J

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

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

WPI, EPODOC, CNPAT, CNKI: thermal, printer, transfer, ribbon, roll, removably, drive, shaft, gear, adapter

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4949097 A (MINOLTA CAMERA KABUSHIKI KAISHA) 14 August 1990 (1990-08-14) description, columns 3-8, figures 1-5	1-19
A	CN 1744992 A (ESSELTE) 08 March 2006 (2006-03-08) the whole document	1-19
A	CN 101516629 A (DYMO) 26 August 2009 (2009-08-26) the whole document	1-19
A	US 6447181 B1 (PRIMERA TECHNOLOGY, INC.) 10 September 2002 (2002-09-10) the whole document	1-19
A	US 2007212142 A1 (ZIH CORP.) 13 September 2007 (2007-09-13) the whole document	1-19
A	US 2008079798 A1 (BRAUN, John F. et al.) 03 April 2008 (2008-04-03) the whole document	1-19
A	US 2014340458 A1 (WARD KRAFT, INC.) 20 November 2014 (2014-11-20) the whole document	1-19

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

* Special categories of cited documents: “A” document defining the general state of the art which is not considered to be of particular relevance “E” earlier application or patent but published on or after the international filing date “L” document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) “O” document referring to an oral disclosure, use, exhibition or other means “P” document published prior to the international filing date but later than the priority date claimed	“T” later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention “X” document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone “Y” document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art “&” document member of the same patent family
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Date of the actual completion of the international search

07 September 2020

Date of mailing of the international search report

24 September 2020

Name and mailing address of the ISA/CN

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Facsimile No. (86-10)62019451

Telephone No. 86-(10)-53961244

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2019/125896

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