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(54) **Replaceable ink container for an inkjet printing system**

Auswechselbarer Tintenbehälter für ein Tintenstrahldrucksystem

Conteneur d'encre remplaçable pour un système d'impression à jet d'encre

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(73) Proprietor: **Hewlett-Packard Company,**
A Delaware Corporation
Palo Alto, CA 94304 (US)

(72) Inventors:
• **Steinmetz, Charles R.**
Corvallis, Oregon 97330 (US)

- **Sturgeon, Scott D.**
Vancouver, Washington 98683 (US)
- **Johnson, David C.**
Portland, Oregon 97212 (US)
- **Hendricks, Jeffrey T.**
Camas, Washington 98607 (US)

(74) Representative: **Schoppe, Fritz, Dipl.-Ing. et al**
Patentanwälte
Schoppe, Zimmermann, Stöckeler & Zinkler
Postfach 246
82043 Pullach bei München (DE)

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- **PATENT ABSTRACTS OF JAPAN vol. 1997, no.**
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Description**BACKGROUND OF THE INVENTION**

[0001] The present invention relates to ink containers for providing ink to inkjet printers. More specifically, the present invention relates to a method and apparatus for ensuring that the ink containers inserted into a receiving station within an inkjet printer are compatible with the inkjet printer.

[0002] Inkjet printers frequently make use of an inkjet printhead mounted within a carriage that is moved relative to a print media, such as paper. As the printhead is moved relative to the print media, a control system activates the printhead to deposit or eject ink droplets onto the print media to form images and text. Ink is provided to the printhead by a supply of ink that is either integral with the printhead, as in the case of a disposable print cartridge, or by a supply of ink that is replaceable separate from the printhead.

[0003] One type of previously used printing system makes use of the ink supply that is carried with the carriage. This ink supply has been formed integral with the printhead, whereupon the entire printhead and ink supply are replaced when ink is exhausted. Alternatively, the ink supply can be carried with the carriage and be separately replaceable from the printhead. For the case where the ink supply is separately replaceable, the ink supply is replaced when exhausted. The printhead is then replaced at the end of printhead life. Regardless of where the ink supply is located within the printing system, it is critical that the ink supply provide a reliable supply of ink to the inkjet printhead.

[0004] There is an ever present need for inkjet printing systems that make use of replaceable ink containers that are easy to install and remove. The installation of the ink container should produce reliable fluidic connection to the printer. These ink containers should have some means of co-operating with a supply station within the printing system for preventing the insertion of ink supplies that are incompatible with the printing system. Finally, these ink containers should be relatively easy to manufacture, thereby tending to reduce the ink supply cost as well as per page printing costs.

SUMMARY OF THE INVENTION

[0005] EP0816098-A discloses an ink container including a latch feature indicative of an ink parameter of a plurality of ink parameters. This latch feature is provided adjacent the leading edge of the ink container relative to an insertion direction of the ink container to a receiving station. The latch feature is configured to engage a supply station latch surface when mounting the ink container into a supply station arranged to receive ink containers containing ink having appropriate parameters.

[0006] JP-08-276601-A discloses a replaceable ink

tank for an ink cartridge. At the leading edge of the ink tank relative to an insertion direction of the ink tank into a receiving station of a printer, there is provided a slanted surface which matches the slant surface of the receiving station. These slant surfaces are configured so as to prevent the wrong kind of ink container from being inserted into the receiving station of the printer.

[0007] In accordance with one aspect of the present invention, there is provided an inkjet printing system in accordance with claim 1.

[0008] In accordance with another aspect of the present invention, there is provided a replaceable ink container in accordance with claim 13.

[0009] In accordance with a further aspect of the present invention, there is provided a method for inserting a replaceable ink container into a receiving station of an inkjet printing system in accordance with claim 25.

[0010] In accordance with another aspect of the present invention, there is provided a method of manufacturing a replaceable ink container configured for insertion into a receiving station of an inkjet printing system in accordance with claim 27.

BRIEF DESCRIPTION OF THE DRAWINGS**[0011]**

Fig. 1 is one exemplary embodiment of an ink jet printing system of the present invention shown with a cover opened to show a plurality of replaceable ink containers of the present invention.

Fig. 2 is a greatly enlarged perspective view of a portion of a scanning carriage showing the replaceable ink containers of the present invention positioned in a receiving station that provides fluid communication between the replaceable ink containers and one or more printhead.

Fig. 3 is a side plan view of a portion of the scanning carriage showing guiding and latching features associated with each of the replaceable ink container and the receiving station for securing the replaceable ink container, thereby allowing fluid communication with the printhead.

Fig. 4 depicts a receiving station shown in isolation for receiving one or more replaceable ink containers of the present invention.

Figs. 5a, 5b, 5c, and 5d are isometric views of a three-color replaceable ink container of the present invention shown in isolation.

Fig. 6 is a perspective view of a single color replaceable ink container of the present invention.

Fig. 7a, 7b, and 7c depict the method for inserting the replaceable ink container into the supply station.

Fig. 8a and 8b depict the passage of the replaceable ink container over an upstanding fluid inlet on the receiving station viewed from a side view and an end view, respectively.

Figs. 9a, 9b, and 9c depict a method for removing

the replaceable ink container from the receiving station.

Figs. 10a through 10j depict top plan views, in breakaway, of various arrangements of keying portions for the ink container shown spaced from the corresponding keyed portions associated with the receiving station.

Fig. 11 is a representation of the ink container of Fig. 10a shown fully inserted into a corresponding receiving station shown from a top plan view.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0012] Fig. 1 is a perspective view of one exemplary embodiment of a printing system 10 shown with its cover open, that includes at least one replaceable ink container 12 that is installed in a receiving station 14. With the replaceable ink container 12 properly installed into the receiving portion 14, ink is provided from the replaceable ink container 12 to at least one inkjet printhead 16. The inkjet printhead 16 is responsive to activation signals from a printer portion 18 to deposit ink on print media. As ink is ejected from the printhead 16, the printhead 16 is replenished with ink from the ink container 12. In one preferred embodiment the replaceable ink container 12, receiving station 14, and inkjet printhead 16 are each part of a scanning carriage that is moved relative to a print media 22 to accomplish printing. The printer portion 18 includes a media tray for receiving the print media 22. As the print media 22 is stepped through a print zone, the scanning carriage 20 moves the printhead 16 relative to the print media 22. The printer portion 18 selectively activates the printhead 16 to deposit ink on print media 22 to thereby accomplish printing.

[0013] The scanning carriage 20 is moved through the print zone on a scanning mechanism which includes a slide rod 26 on which the scanning carriage 20 slides as the scanning carriage 20 moves through a scan axis. A positioning means (not shown) is used for precisely positioning the scanning carriage 20. In addition, a paper advance mechanism (not shown) is used to step the print media 22 through the print zone as the scanning carriage 20 is moved along the scan axis. Electrical signals are provided to the scanning carriage 20 for selectively activating the printhead 16 by means of an electrical link such as a ribbon cable 28.

[0014] An important aspect of the present invention is the method and apparatus for ensuring that the ink containers 12 that are inserted into the receiving station 14 are compatible with the receiving station 14. The ink containers 12 may contain a number of different ink types or a number of different ink colors. These different ink types may have different chemical or physical properties such as different ink viscosity or different solubility in water to name a few. Inkjet printheads 16 that are designed to work with ink of a particular ink type will malfunction if a different ink type is used. The ink color re-

lates to one of four colors that are typically used in color printing and combined on the printing medium to yield the sought-after color output. The ink receiving station 14 is in fluid communication with the printhead 16 for providing ink to the printhead 16. Because each printhead or printhead portion 16 is associated with an ink color then the receiving station 14 is limited for use with the same colors and, therefore, these colors must not be contaminated with ink of any other color.

[0015] The ink container 12 of the present invention includes features formed thereon to provide indicia of the particular ink type or ink color of the ink contained in the reservoir. Similar features are provided in the receiving station 14. These features on the ink container 12 and in the receiving station 14 are the primary components of a system that prevents insertion of any ink containers 12 into a receiving station 14, except for the single ink supply container 12 that has a complementary feature for mating with corresponding features of the receiving station 14.

[0016] The method and apparatus of the present invention, as will be discussed with respect to Figs. 2 through 11, depict those features which allow the replaceable ink container 12 to be inserted into the receiving station 14 in such a manner that reliable fluidic connection is established between the replaceable ink container 12 and the receiving station 14. Prior to establishing the fluidic connection the method and apparatus of the present invention ensures that the replaceable ink container 12 is compatible with the particular bay within the receiving station 14 to ensure an ink path within the receiving station 14 and printhead 16 is not contaminated with ink of a different type or of a different color.

[0017] Fig. 2 is a perspective view of a portion of the scanning carriage 20 showing a pair of replaceable ink containers 12 properly installed in the receiving station 14. An inkjet printhead 16 is in fluid communication with the receiving station 14. In the preferred embodiment, the inkjet printing system 10 shown in Fig. 1 includes a tri-color ink container containing three separate ink colors and a second ink container containing a single ink color. In this preferred embodiment, the tri-color ink container contains cyan, magenta, and yellow inks, and the single color ink container contains black ink for accomplishing four-color printing. The replaceable ink containers 12 can be partitioned differently to contain fewer than three ink colors or more than three ink colors if more are required. For example, in the case of high fidelity printing, frequently six or more colors are used to accomplish printing.

[0018] The receiving station 14 shown in Fig. 2 is shown fluidically coupled to a single printhead 16 for simplicity. In the preferred embodiment, four inkjet printheads 16 are each fluidically coupled to the receiving station 14. In this preferred embodiment, each of the four printheads are fluidically coupled to each of the four colored inks contained in the replaceable ink containers. Thus, the cyan, magenta, yellow and black printheads

16 are each coupled to their corresponding cyan, magenta, yellow and black ink supplies, respectively. Other configurations which make use of fewer printheads than four are also possible. For example, the printhead 16 can be configured to print more than one ink color by properly partitioning the printhead 16 to allow a first ink color to be provided to a first group of ink nozzles and a second ink color to be provided to a second group of ink nozzles, with the second group of ink nozzles different from the first group. In this manner, a single printhead 16 can be used to print more than one ink color allowing fewer than four printheads 16 to accomplish four-color printing. The fluidic path between each of the replaceable ink containers 12 and the printhead 16 will be discussed in more detail with respect to Fig. 3.

[0019] Each of the replaceable ink containers 12 include a latch 30 for securing the replaceable ink container 12 to the receiving station 14. The receiving station 14 in the preferred embodiment includes a set of keyed features 32 that interact with corresponding keying features (not shown) on the replaceable ink container 12. The keying features on the replaceable ink container 12 interact with the keyed features 32 on the receiving station 14 to ensure that the replaceable ink container 12 is compatible with the receiving station 14.

[0020] Fig. 3 is a side plan view of the scanning carriage portion 20 shown in Fig. 2. The scanning carriage portion 20 includes the ink container 12 shown properly installed into the receiving station 14, thereby establishing fluid communication between the replaceable ink container 12 and the printhead 16.

[0021] The replaceable ink container 12 includes a reservoir portion 34 for containing one or more quantities of ink. In the preferred embodiment, the tri-color replaceable ink container 12 has three separate ink containment reservoirs, each containing ink of a different color. In this preferred embodiment, the monochrome replaceable ink container 12 is a single ink reservoir 34 for containing ink of a single color.

[0022] In the preferred embodiment, the reservoir 34 has a capillary storage member (not shown) disposed therein. The capillary storage member is a porous member having sufficient capillarity to retain ink to prevent ink leakage from the reservoir 34 during insertion and removal of the ink container 12 from the printing system 10. This capillary force must be sufficiently great to prevent ink leakage from the ink reservoir 34 over a wide variety of environmental conditions such as temperature and pressure changes. In addition, the capillarity of the capillary member is sufficient to retain ink within the ink reservoir 34 for all orientations of the ink reservoir as well as a reasonable amount of shock and vibration the ink container may experience during normal handling.

[0023] Once the ink container 12 is properly installed into the receiving station 14, the ink container 12 is fluidically coupled to the printhead 16 by way of fluid interconnect 36. Upon activation of the printhead 16, ink is ejected from the ejection portion 38 producing a nega-

tive gauge pressure, sometimes referred to as backpressure, within the printhead 16. This negative gauge pressure within the printhead 16 is sufficient to overcome the capillary force, retaining within the capillary member disposed within the ink reservoir 34. Ink is drawn by this backpressure from the replaceable ink container 12 to the printhead 16. In this manner, the printhead 16 is replenished with ink provided by the replaceable ink container 12.

[0024] The fluid interconnect 36 is preferably an up-standing ink pipe that extends upwardly into the ink container 12 and downwardly to the inkjet printhead 16. The fluid interconnect 36 is shown greatly simplified in Fig. 3. In the preferred embodiment, the fluid interconnect 36 is a manifold that allows for offset in the positioning of the printheads 16 along the scan axis, thereby allowing the printhead 16 to be placed offset from the corresponding replaceable ink container 12. In the preferred embodiment, the fluid interconnect 36 extends into the reservoir 34 to compress the capillary member, thereby forming a region of increased capillarity adjacent the fluid interconnect 36. This region of increased capillarity tends to draw ink toward the fluid interconnect 36, thereby allowing ink to flow through the fluid interconnect 36 to the printhead 16. As will be discussed, it is crucial that the ink container 12 be properly positioned within the receiving station 14 such that proper compression of the capillary member is accomplished when the ink container 12 is inserted into the receiving station. Proper compression of the capillary member is necessary to establish a reliable flow of ink from the ink container 12 to the printhead 16.

[0025] The replaceable ink container 12 further includes a guide feature 40, an engagement feature 42, a handle 44 and a latch feature 30 that allow the ink container 12 to be inserted into the receiving station 14 to achieve reliable fluid interconnection with the printhead 16 as well as to form reliable electrical interconnection between the replaceable ink container 12 and the scanning carriage 20 as will be discussed with respect to Figs. 7a through 7c and 8a through 8b.

[0026] The receiving station 14 includes a guide rail 46, an engagement feature 48 and a latch engagement feature 50. The guide rail 46 cooperates with the guide rail engagement feature 40 and the replaceable ink container 12 to guide the ink container 12 into the receiving station 14. Once the replaceable ink container 12 is fully inserted into the receiving station 14, the engagement feature 42 associated with the replaceable ink container engages the engagement feature 48 associated with the receiving station 14, securing a front end or a leading end of the replaceable ink container 12 to the receiving station 14. The ink container 12 is then pressed downward to compress a spring biasing member 52 associated with the receiving station 14 until a latch engagement feature 50 associated with the receiving station 14 engages a hook feature 54 associated with the latch member 30 to secure a back end or trailing end of the

ink container 12 to the receiving station 14. It is the cooperation of the features on the ink container 12 with the features associated with the receiving station 14 that allow proper insertion and functional interfacing between the replaceable ink container 12 and the receiving station 14. The receiving station 14 will now be discussed in more detail with respect to Fig. 4.

[0027] Fig. 4 is a front perspective view of the ink receiving station 14 shown in isolation. The receiving station 14 shown in Fig. 4 includes a monochrome bay 56 for receiving an ink container 12 containing a single ink color and a tri-color bay 58 for receiving an ink container having three separate ink colors contained therein. In this preferred embodiment, the monochrome bay 56 receives a replaceable ink container 12 containing black ink, and the tri-color bay receives a replaceable ink container containing cyan, magenta, and yellow inks, each partitioned into a separate reservoir within the ink container 12. The receiving station 14 as well as the replaceable ink container 12 can have other arrangements of bays 56 and 58 for receiving ink containers containing different numbers of distinct inks contained therein. In addition, the number of receiving bays 56 and 58 for the receiving station 14 can be fewer or greater than two. For example, a receiving station 14 can have four separate bays for receiving four separate monochrome ink containers 12 with each ink container containing a separate ink color to accomplish four-color printing.

[0028] Each bay 56 and 58 of the receiving station 14 includes an aperture 60 for receiving the upright fluid interconnect 36 that extends therethrough. The fluid interconnect 36 is a fluid inlet for ink to exit a corresponding fluid outlet associated with the ink container 12. An electrical interconnect 62 is also included in each receiving bay 56 and 58. The electrical interconnect 62 includes a plurality of electrical contacts 64. In the preferred embodiment, the electrical contacts are an arrangement of four spring-loaded electrical contacts with proper installation of the replaceable ink container 12 into the corresponding bay of the receiving station 14. Proper engagement with each of the electrical connectors 62 and fluid interconnects 36 must be established in a reliable manner.

[0029] The guide rails 46 disposed on either side of the fluid interconnects within each bay 56 and 58 engage the corresponding guide feature 40 on either side of the ink container 12 to guide the ink container into the receiving station. When the ink container 12 is fully inserted into the receiving station 14, the engagement features 48 disposed on a back wall 66 of the receiving station 14 engage the corresponding engagement features 42 shown in Fig. 3 on the ink container 12. The engagement features 48 are disposed on either side of the electrical interconnect 62. A biasing means 52 such as a leaf spring is disposed within the receiving station 14. The leaf spring 52 provides a biasing force which tends to urge the ink container 12 upward from a bottom surface

68 of the receiving station 14. The leaf spring aids in the latching of the ink container 12 to the receiving station 14 as well as aiding the removal of the ink container 12 from the receiving station as will be discussed with respect to Figs. 8 and 9.

[0030] Figs. 5a, 5b, 5c, and 5d show front plan, side plan, back plan, and bottom plan views, respectively, of the replaceable ink container 12 of the present invention. As shown in Fig. 5a, the replaceable ink container 12 includes a pair of outwardly projecting guide rail engagement features 40. In the preferred embodiment, each of these guide rail engagement features extend outwardly in a direction orthogonal to upright side 70 of the replaceable ink container 12. The engagement features 42 extend outwardly from a front surface or leading edge of the ink container 72. The engagement features 42 are disposed on either side of an electrical interface 74 and are disposed toward a bottom surface 76 of the replaceable ink container 12. The electrical interface 74 includes a plurality of electrical contacts 78, with each of the electrical contacts 78 electrically connected to an electrical storage device 80.

[0031] Opposite the leading end 72 is a trailing end 82 shown in Fig. 5c. The trailing end 82 of the replaceable ink container 12 includes the latch feature 30 having an engagement hook 54. The latch feature 30 is formed of a resilient material which allows the latch feature to extend outwardly from the trailing end thereby extending the engagement feature outwardly toward the corresponding engagement feature associated with the receiving station 14. As will be discussed, as the latch member 30 is compressed inwardly toward the trailing end 82, the latch member exerts a biasing force outwardly in order to ensure the engagement feature 54 remains in engagement with the corresponding engagement feature 50 associated with the receiving station 14 to secure the ink container 12 into the receiving station 14.

[0032] The replaceable ink container 12 also includes keying features or keys 84 disposed on the trailing end of the replaceable ink container 12. The keys are preferably disposed on either side of the latch 30 toward the bottom surface 76 of the replaceable ink container 12. The keys 84, together with keyed features 32 on the receiving station 14, interact to ensure the ink container 12 is inserted in the correct bay 56 and 58 in the receiving station 14. In addition, the keys 84 and the keyed features 32 ensure that the replaceable ink container 12 contains ink that is compatible both in color and in chemistry or compatibility with the corresponding receiving bay 56 and 58 within the receiving station 14.

[0033] Also included in the ink container 12 is the handle portion 44 disposed on a top surface 86 at the trailing edge 82 of the replaceable ink container 12. The handle 44 allows the ink container 12 to be grasped at the trailing edge 82 while inserted into the appropriate bay of the receiving station 14.

[0034] Finally, the ink container 12 includes apertures

88 disposed on the bottom surface 76 of the replaceable ink container 12. The apertures 88 allow the fluid interconnect 36 to extend through the reservoir 34 to engage the capillary member disposed therein. In the case of the tri-color replaceable ink container 12, there are three fluid outlets 88, with each fluid outlet corresponding to a different ink color. In the case of the tri-color chamber, each of three fluid interconnects 36 extend into each of the fluid outlets 88 to provide fluid communication between each ink chamber and the corresponding print head for that ink color.

[0035] Fig. 6 is a perspective view of a monochrome ink container positioned for insertion into the monochrome bay 56 in the receiving station 14 shown in Fig. 4. The monochrome ink container shown in Fig. 6 is similar to the tri-color ink container shown in Figs. 5a through 5d except that only a single fluid outlet 88 is provided in the bottom surface 76. The monochrome replaceable ink container 12 contains a single ink color and therefore receives only a single corresponding fluid interconnect 36 for providing ink from the ink container 12 to the corresponding printhead.

[0036] Figs. 7a, 7b, and 7c are a sequence of figures to illustrate the technique of the present invention for inserting the replaceable ink container 12 into the receiving station 14 to form reliable electrical and fluidic connections with the receiving station 14.

[0037] Fig. 7a shows the ink container 12 partially inserted into the receiving station 14. In the preferred embodiment, the ink container 12 is inserted into the receiving station 14 by grasping the handle portion 44 and inserting the ink container into the receiving station with the leading edge or leading face 72 first. As the leading edge 72 enters the receiving station 14 the outwardly extending guide members 40 on the ink container engage each of the pair of guide rails 46. The guide rails 46 guide the ink container 12 in a horizontal or linear motion toward the back wall 66 of the receiving station 14. The guide rails 46 then guide the replaceable ink container in both a horizontal direction toward the back wall 66 and a vertical direction toward the bottom surface of the receiving station 14 such that the engagement feature 42 on the ink container 12 is received by a corresponding engagement feature 48 on the back wall 66 of the receiving station 14 as shown in Fig. 7b. The insertion of the ink container 12 requires only an insertion force to urge the ink container linearly along the guide rail 46. The gravitational force acting on the ink container 12 tends to cause the ink container to follow the guide rails 46 as the guide rails extend in a downward direction to allow engagement of engagement features 42 and 48. The guide rail engagement features 40 are preferably gently rounded surfaces to slide freely along the guide rails 46.

[0038] Fig. 7b shows the ink container 12 inserted into the receiving station 14 such that the engagement feature 42 is in engagement with the engagement feature 48 associated with the receiving station 14. A downward

force is applied to the ink container 12 as represented by arrows 90 to compress the leaf spring 52 and to urge the trailing end 82 of the ink container 12 downwardly toward the bottom surface 68 of the receiving station 14.

5 The keys 84 must properly correspond to the keyed feature 32 on the receiving station 14. If the keys 84 on the ink container 12 do not correspond to the keyed features 32, the keying system will prevent further insertion of the ink container 12 into the receiving station 14. This keying system made up of keys 84 and the keyed features 32 prevent ink containers that are not compatible with the receiving station 14 from further insertion into the receiving station 14. Further insertion of the ink container 12 into the receiving station 14 could result in contact of the fluid interconnect 36 with the capillary member within the ink container 12, thereby contaminating the fluid interconnect 36 with incompatible ink. Incompatible ink mixing in the fluid interconnect 36 can result in precipitation which can damage the printhead 16. In addition to inks of incompatible chemistries, the ink container can have an incompatible color which can result in color mixing, thereby reducing the output print quality.

[0039] The keys 84 on the ink container 12 and the keyed features 32 on the receiving station 14 allow for the complete insertion of the proper ink container 12 into the proper receiving station 14. The downward force applied to the trailing end 82 of the ink container 12 causes the ink container 12 to pivot about a pivot axis compressing the leaf spring 52, thereby moving the trailing edge 82 of the ink container 12 toward the bottom surface 68 of the receiving station 14. As the ink container 12 is urged downward into the receiving station 14, the resilient latch 30 is compressed slightly inward toward the trailing edge 82 of the ink container 12. Once the ink container 12 is urged downward sufficiently far, the engagement feature 54 on the latch 30 engages with a corresponding engagement feature 50 on the receiving station 14 to secure the ink container 12 to the receiving station 14 as shown in Fig. 7c.

40 **[0040]** With the ink container 12 properly secured in the receiving station 14 as shown in Fig. 7c the fluid interconnect 36 extends into the reservoir 34 to compress the capillary member, thereby forming a region of increased capillarity adjacent the fluid interconnect 36. This region of increased capillarity tends to draw ink toward the fluid interconnect 36, thereby allowing ink to flow through the fluid interconnect 36 to the printhead 16. In the preferred embodiment, the ink container 12 when inserted into the receiving station 14 is oriented in a gravitational frame of reference so that a gravitational force acts on ink within the ink container 12 tending to draw ink toward the bottom surface 76 of the ink container 12. Thus ink within the ink container 12 is drawn to the bottom surface 76 where this ink is drawn toward the fluid interconnect 36 by capillary attraction thereby tending to reduce or minimize stranding of ink within the ink container 12.

[0041] Figs. 8a and 8b illustrate a position in the in-

sertion process described with respect to Figs. 7a, 7b and 7c wherein the leading edge 72 of the ink container 12 is positioned over the fluid interconnect 36. Fig. 8a depicts a side view with Fig. 8b showing an end view. It can be seen from Figs. 8a and 8b that the guide feature 40 must be positioned on the ink container 12 low enough toward the bottom surface 76 of the ink container 12 such that the leading edge 72 of the ink container does not collide with the fluid interconnect 36 during insertion. Another constraint on the positioning of the guide member 40 is that the guide member 40 must be positioned sufficiently close to the top surface 86 of the ink container 12 to insure that the engagement feature 42 properly engages with the corresponding engagement feature 42 on the receiving station 14.

[0042] In addition, the outwardly extending guide members 40 on the ink container must extend outward sufficiently far to engage the guide rails 46. However, the outwardly extending guide members 40 should not extend too far outward such that the guide members 40 engage the upright sides in the receiving station 14, producing interference which produces friction and binding which resists insertion of the ink container 12 into the receiving station 14.

[0043] Figs. 9a, 9b, and 9c illustrate the technique for removing the ink container 12 from the receiving station 14. The technique for removing the ink container 12 of the present invention begins with the release of the engagement feature from the corresponding engagement feature 50 on the receiving station 14 by urging the latch 30 toward the trailing surface 82. Once the trailing edge of the ink container 12 is released, the spring 52 urges the trailing edge of the ink container upward as shown in Fig. 9b. The ink container 12 can be grasped by handle 44 to retrieve the ink container 12 in a direction opposite the insertion direction. As the ink container 12 is withdrawn from the receiving station 14, the guide member 40 follows the guide rails 46 to lift the ink container, thereby preventing interference between the fluid interconnect 36 and the fluid outlet on the bottom surface of the ink container 12.

[0044] The ink container 12 of the present invention is configured to engage and interact with the receiving station 14 to guide the ink container 12 into the receiving station and for a reliable fluid and electrical connection with the receiving station 14. The technique of the present invention allows this insertion process to be relatively simple and easy to prevent improper insertion of the ink container 12. The customer grasps the ink container 12 by the handle portion 44 and slides the ink container 12 horizontally into the receiving station 14. The guide rails 46 and guide features 40 cooperate to properly guide the ink container 12 into the receiving station 14. The ink container 12 is pressed downwardly to latch the ink container 12 and achieve operational interconnection both electrically and fluidically between the ink container 12 and the receiving station 14.

[0045] Figs. 10a through 10j are top plan representa-

tions showing the leading edge 72 of the ink container 12 positioned proximate a corresponding receiving station 14. The ink container 12 is positioned in a spaced relationship from the receiving station 14 in order to better illustrate the complementary relationship between the keys 84 on the ink container 12 and the keyed features 32 on the receiving station 14. With the ink container 12 properly inserted into the receiving station 14, the keys 84 are inserted into the keyed portion 32 as will be discussed with respect to Fig. 11.

[0046] In a preferred embodiment, the keys 84 and the keyed features 32 for the tri-color bay 58 shown in Fig. 4 as represented by Fig. 10a, are opposite arrangements or mirror images of the arrangement of the keys 84 and keyed features 32 on the monochrome bay 56. The arrangement of keys 84 and keying features 32 in mirror images or opposite pairs provides a benefit to the customer by providing a visual clue to aid the customer in positioning the ink container 12 in the proper bay within the receiving station 14. By arranging the keys 84 and keying features 32 as opposite pairs, it is more clear to the customer which bay 56, 58 in which to install the ink container 12. The arrangement of opposite pairs does not require the customer to carefully review individual key spacings, but instead the customer merely has to recognize the overall appearance of the keying arrangement to decide which bay is appropriate.

[0047] In addition, placement of the keys 84 on the trailing edge 72 of the ink container 12 allows the customer to view the arrangement of keys 84 as the ink container 12 is inserted into the receiving station 14. By positioning the keys 84 on the trailing edge 72, the customer can view both the keys 84 and the key portion 32 of the receiving station 14 to rapidly determine whether the ink container 12 is inserted into the proper bay 56, 58 of the receiving station 14. Finally, by positioning the keys 84 adjacent the bottom surface 76 of the ink container 12, the keys 84 and the key portions 32 cooperate to prevent insertion of non-compatible ink containers 12 into the receiving station 14 sufficiently to establish fluid communication between the ink container 12 and the receiving station 14. Thus, the positioning of the keys 84 ensures that ink of a different color or of a different ink type will not contaminate the fluidic path between the receiving station 14 and the printhead 16.

[0048] Additional opposite pairs of keying arrangements are shown in Figs. 10c and 10d, 10e and 10f, 10g and 10h, 10i and 10j. Each of these arrangements of keys and keyed portions 32 make use an arrangement whereby six evenly spaced keys are formed on the ink container 12, and three are removed to identify the ink type and ink color within the ink container 12. By molding six keys 84 and removing three of them, the greatest number of unique keyed permutations can be created. In addition, by using three keys 84, if any key is broken or is damaged, there are two other keys that are available to provide keying functions, thereby insuring that even a damaged ink container 12 will not be inserted

into the wrong receiving station 14.

[0049] The opposite pairs of keying arrangements shown in Figs. 10a through 10j are discussed with respect for use with black and tri-color ink containers 12 that are inserted into corresponding black and tri-color bays 56 and 58, respectively, on the receiving station 14. This opposite pair arrangement of keying features 84 can be used in other arrangements of ink containers 12 as well. For example, in the case of a seven-color printer, six different color inks and black ink is used to form images. For this type of printer the ink containers 12 can be arranged in two tri-color ink containers 12, and a black ink container 12. Each of the tri-color ink containers 12 can make use of opposite pairs of keying features 84 to prevent insertion of each of the tri-color ink containers 12 into the wrong bay of the receiving station 14.

[0050] A cut-out 88 is formed in the receiving station 14 to accommodate the latch feature 30 on the ink container 12. The latch feature 30 is shown in Figs 10a through 10j as partially removed for simplicity.

[0051] Fig. 11 is a top plan view of the ink container 12 installed into the receiving station 14. The ink container 12 is shown with the keying arrangement 84 and corresponding keyed features 32 as shown in Fig. 10a. The keys 84 and the keyed features 32 cooperate to ensure that the proper ink container 12 and corresponding proper ink type and color are inserted into the corresponding receiving station 14.

Claims

1. An inkjet printing system (10) comprising:

a receiving station (14) mounted to a scanning carriage (20), the receiving station (14) having a keyed portion (32) indicative of a replaceable ink container parameter of a plurality of replaceable ink container parameters; and a replaceable ink container (12) releaseably insertable into the receiving station (14) comprising:

a reservoir portion (34) having a leading end (72) and a trailing end (82) relative to the insertion direction of the replaceable ink container (12) into the receiving station (14), **characterized by** the replaceable ink container (12) further comprising:

a keying portion (84) disposed on the trailing end (82) of the reservoir portion (34) of the replaceable ink container (12) positioned so as to engage the keyed portion (32) of the receiving station (14) when the replaceable ink container (12) is inserted into the receiving

station (14), the keying portion (84) being configured to be complementary to the keyed portion (32) of the receiving station (14) thereby allowing the replaceable ink container (12) to be inserted fully into the receiving station (14).

2. The inkjet system (10) of claim 1 wherein the receiving station (14) has a back wall (66), a bottom surface (68) having a fluid inlet (36) disposed thereon and a front wall having the keyed portion (32) disposed thereon,

the replaceable ink container (12) further comprising:

a fluid outlet (88) configured for connection to the fluid inlet (36) associated with the receiving station (14),

the keying portion (84) of the replaceable ink container (12) being so disposed and arranged on the replaceable ink container (12) so that with the insertion of the replaceable ink container (12) in first a linear direction toward the back wall (66) to align the fluid outlet (88) with the fluid inlet (36), the keying portion (84) engages the keyed portion (32) allowing further insertion in a direction toward the bottom surface (68) if the keying portion (84) is complementary with the keyed portion (32), thereby allowing fluid communication between the replaceable ink container (12) and the receiving station (14).

3. The ink jet system of claim 2 wherein the replacement ink container (12) is such that further insertion in a direction toward the bottom surface (76) comprising pivoting the replaceable ink container (12) about a pivot axis if the keying portion (84) is compatible with the keyed portion (32) causes the fluid outlet (88) disposed on the reservoir portion (34) to engage with the fluid inlet (36) disposed on the receiving station.

4. The inkjet system (10) of claim 1 wherein the replaceable ink container (12) is operable to be inserted into the receiving station (14) in a horizontal direction where the keying portion (84) is positioned proximate the keyed portion (32), the replaceable ink container (12) then being arranged to be pivoted about a pivot axis if the keying portion (84) is compatible with the keyed portion (32) so as to engage a fluid outlet (88) disposed on the reservoir portion (34) with a fluid inlet (36) disposed on the receiving station (14).

5. The inkjet system (10) of any preceding claim wherein the keying portion (84) is indicative of an ink parameter of ink contained within the replacea-

ble ink container (12).

6. The inkjet system (10) of any preceding claim wherein the keying portion (84) comprises a plurality of tabs that extend outwardly from the reservoir portion (34). 5
7. The inkjet system (10) of claim 6 wherein the replaceable ink container (12) has a top surface (86) and a bottom surface (76) relative to an insertion orientation and wherein the tabs are disposed in a side by side relationship toward the bottom surface (76) of the trailing edge (82). 10
8. The inkjet system (10) of claim 6 or 7 wherein the keying portion (84) is configured to be complementary to the keyed portion (32) by selective removal of at least one of the plurality of tabs. 15
9. The inkjet system (10) of any preceding claim wherein the keying portion (84) is indicative of one of ink color and ink compatibility. 20
10. The inkjet system (10) of any preceding claim wherein the keying portion (84) and the keyed portion (32) are arranged when the replaceable ink container (12) is inserted into the receiving station (14) so as to co-operate to ensure the replaceable ink container (12) is compatible with the receiving station (14). 25 30
11. The inkjet system (10) of any preceding claim wherein the keying portion (84) and the keyed portion (32) are arranged when the replacement ink container (12) is inserted into the receiving station (14) so as to co-operate to prevent insertion of replaceable ink containers (12) that are not compatible with the receiving station (14). 35
12. The inkjet system (10) of any preceding claim wherein the keying portion (84) is disposed on the replaceable ink container (12) so as to engage the corresponding keyed portion (32) on the receiving station (14) when the replaceable ink container (12) is inserted into the receiving station (14) before fluid communication is established between the replaceable ink container (12) and the receiving station (14). 40 45
13. A replaceable ink container (12) for use with an ink jet printing system (10) of any preceding claim, the replaceable ink container (12) comprising: 50

a reservoir portion (34) having a leading end (72) and a trailing end (82) relative to the insertion direction of the replaceable ink container (12) into the receiving station (14) of an ink jet system; 55

the replaceable ink container (12) being

characterized by further comprising:

- a keying portion (84) disposed on the trailing end (82) of the reservoir portion (34) positioned so as to engage the keyed portion (32) of the receiving station (14) when the replaceable ink container (12) is inserted into the receiving station (14), the keying portion (84) being configured to be complementary to the keyed portion (32) of the receiving station (14) thereby allowing the replaceable ink container (12) to be inserted fully into the receiving station (14).
14. The replaceable ink container of claim 13 for use with an inkjet printing system (10) in accordance with claim 2, the replaceable ink container (12) comprising:
- a fluid outlet (88) configured for connection to the fluid inlet (36) associated with the receiving station (14) of the ink jet system (10), the keying portion (84) of the replaceable ink container (12) being disposed and arranged on the replaceable ink container (12) so that with the insertion of the replaceable ink container in first a linear direction toward the back wall (66) of the receiving station (14) aligning the fluid outlet (88) with the fluid inlet (36) of the receiving station (14), the keying portion (84) engages the keyed portion (32) of the receiving station (14) allowing further insertion in a direction toward the bottom surface (68) of the receiving station (14) if the keying portion (84) is complementary with the keyed portion (32), thereby allowing fluid communication between the replaceable ink container (12) and the receiving station (14).
15. The replaceable ink container of claim 14 wherein further insertion in a direction toward the bottom surface (76) of the receiving station (14) comprising pivoting the replaceable ink container (12) about a pivot axis if the keying portion (84) is compatible with the keyed portion (32) causes the fluid outlet (88) disposed on the reservoir portion (34) of the replaceable ink container (12) to engage with the fluid inlet (36) disposed on the receiving station (14).
16. The replaceable ink container of claim 13 wherein the replaceable ink container (12) is operable to be inserted into the receiving station (14) of an ink jet system (10) in a horizontal direction where the keying portion (84) of the receiving station (14) of the ink jet system (10) is positioned proximate the keyed portion (32) of the replaceable ink container (12), the replaceable ink container (12) then being arranged to be pivoted about a pivot axis if the key-

- ing portion (84) of the replaceable ink container (12) is compatible with the keyed portion (32) of the receiving station (14) so as to engage a fluid outlet (88) disposed on the reservoir portion (34) with a fluid inlet (36) disposed on the receiving station (14).
- 5
17. The replaceable ink container (12) of any of claims 13-16 wherein the keying portion (84) is indicative of an ink parameter of ink contained within the replaceable ink container (12).
- 10
18. The replaceable ink container (12) of any of claims 13-17 wherein the keying portion (84) comprises a plurality of tabs that extend outwardly from the reservoir portion (34).
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19. The replaceable ink container (12) of claim 18 wherein the replaceable ink container (12) has a top surface (86) and a bottom surface (76) relative to an insertion orientation and wherein the tabs are disposed in a side by side relationship toward the bottom surface (76) of the trailing edge (82).
- 20
20. The replaceable ink container of claim 17 or 18 wherein the keying portion (84) is configured to be complementary to the keyed portion (32) of the receiving station (14) of an inkjet system (10) by selective removal of at least one of the plurality of tabs.
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21. The replaceable ink container (12) of any of claims 13-20 wherein the keying portion (84) is indicative of one of ink color and ink compatibility.
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22. The replaceable ink container (12) of any of claims 13-21 wherein the keying portion (84) of the replaceable ink container (12) is disposed so as to cooperate with the keyed portion (32) of a receiving station (14) so as to ensure the replaceable ink container (12) is compatible with the receiving station (14).
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23. The replaceable ink container of any of claims 13-22 wherein the keying portion (84) of the replaceable ink container (12) is disposed so as to cooperate with the key portion (32) of a receiving station (14) to prevent insertion of replaceable ink containers (12) that are not compatible with the receiving station (14).
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24. The replaceable ink container of any of claims 13-23 wherein the keying portion (84) is disposed on the replaceable ink container (12) to engage the corresponding keyed portion (32) on a receiving station (14) before fluid communication is established between the replaceable ink container (12) and the receiving station (14) when the replaceable ink container (12) is inserted into the receiving station (14).
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25. A method for inserting a replaceable ink container (12) into a receiving station (14) of an inkjet printing system (10), the receiving station (14) disposed on a scanning carriage (20) and fluidically coupled to an ink ejection portion (16) mounted thereon, the method for inserting the ink container (12) comprising:
- urging the replaceable ink container (12) linearly toward a back wall (66) of the receiving station (14) such that a keying feature (84) on the replaceable ink container (12) is in alignment with a keyed feature (32) on the receiving station (14); and
- urging the replaceable ink container (12) downward toward a bottom surface (68) of the receiving station (14) so that the keying feature (84) and keyed feature (32) co-operate to allow further insertion of compatible replaceable ink containers (12) to operably couple a fluid outlet (88) on the replaceable ink container with a fluid inlet (36) proximate the bottom surface (68) of the receiving station (14).
26. The method of claim 25 wherein the keying feature (84) and keyed feature (32) co-operate to prevent further insertion of non-compatible replaceable ink containers thereby preventing coupling between the fluid outlet (88) on the replaceable ink container (12) and the fluid inlet (36).
27. A method of manufacturing a replaceable ink container (12) configured for insertion into a receiving station (14) of an inkjet printing system (10), the receiving station (14) having a keyed portion (32) corresponding to a compatible replaceable ink container type of a plurality of replaceable ink container types, the method for manufacturing comprising:
- forming a reservoir (34) having a bottom surface (76) having a fluid outlet (88) therein and a top surface (86), the reservoir (34) further including a leading end (72) and a trailing end (82) relative to a direction of insertion for the reservoir (34) into the receiving station (14), the trailing end (82) having a plurality of keying features (84) disposed toward the bottom surface (76); and
- removing at least one keying feature (84) to correspond with the compatible replaceable ink container type.
28. The method of manufacturing the replaceable ink container of claim 27 further including filling ink into the reservoir (34) wherein the ink corresponding to the compatible replaceable ink container type.

29. The method of manufacturing the replaceable ink container of claim 27 or 28 wherein the plurality of keying features (84) are a plurality of tabs extending outwardly from the ink reservoir (34).

Patentansprüche

1. Ein Tintenstrahldrucksystem (10), das folgende Merkmale aufweist:

eine Aufnahmestation (14), die an einem beweglichen Wagen (20) befestigt ist, wobei die Aufnahmestation (14) einen Schlüsselbildungsabschnitt (32) aufweist, der einen Parameter eines austauschbaren Tintenbehälters einer Mehrzahl von Parametern eines austauschbaren Tintenbehälters angibt; und

einen austauschbaren Tintenbehälter (12), der abnehmbar in die Aufnahmestation (14) einbringbar ist und folgendes Merkmal aufweist:

einen Reservoirabschnitt (34), der ein vorderes Ende (72) und ein hinteres Ende (82) relativ zu der Einbringungsrichtung des austauschbaren Tintenbehälters (12) in die Aufnahmestation (14) aufweist, **dadurch gekennzeichnet, dass** der austauschbare Tintenbehälter (12) ferner folgendes Merkmal aufweist:

einen Schlüsselabschnitt (84), der an dem hinteren Ende (82) des Reservoirabschnitts (34) des austauschbaren Tintenbehälters (12) angeordnet ist und positioniert ist, um den Schlüsselbildungsabschnitt (32) der Aufnahmestation (14) in Eingriff zu nehmen, wenn der austauschbare Tintenbehälter (12) in die Aufnahmestation (14) eingebracht wird, wobei der Schlüsselabschnitt (84) konfiguriert ist, um zu dem Schlüsselbildungsabschnitt (32) der Aufnahmestation (14) komplementär zu sein, wodurch ermöglicht wird, dass der austauschbare Tintenbehälter (12) vollständig in die Aufnahmestation (14) eingebracht wird.

2. Das Tintenstrahlsystem (10) gemäß Anspruch 1, bei dem die Aufnahmestation (14) eine Rückwand (66), eine untere Oberfläche (68) mit einem Fluideinlass (36), der an derselben angeordnet ist, und eine Vorderwand aufweist, die den Schlüsselbildungsabschnitt (32) an derselben angeordnet auf-

weist, wobei der austauschbare Tintenbehälter (12) ferner folgende Merkmale aufweist:

einen Fluidauslass (88), der für eine Verbindung mit dem Fluideinlass (36) konfiguriert ist, der der Aufnahmestation (14) zugeordnet ist,

wobei der Schlüsselabschnitt (84) des austauschbaren Tintenbehälters (12) so an dem austauschbaren Tintenbehälter (12) angeordnet und angebracht ist, so dass bei der Einbringung des austauschbaren Tintenbehälters (12) in zuerst eine lineare Richtung zu der Rückwand (66) hin, um den Fluidauslass (88) mit dem Fluideinlass (36) auszurichten, der Schlüsselabschnitt (84) den Schlüsselbildungsabschnitt (32) in Eingriff nimmt, was eine weitere Einbringung in eine Richtung zu der unteren Oberfläche (68) ermöglicht, falls der Schlüsselabschnitt (84) zu dem Schlüsselbildungsabschnitt (32) komplementär ist, wodurch eine Fluidkommunikation zwischen dem austauschbaren Tintenbehälter (12) und der Aufnahmestation (14) ermöglicht ist.

3. Das Tintenstrahlsystem gemäß Anspruch 2, bei dem der austauschbare Tintenbehälter (12) derart ist, dass eine weitere Einbringung in eine Richtung zu der unteren Oberfläche (76) hin, die ein Schwenken des austauschbaren Tintenbehälters (12) um eine Schwenkachse aufweist, falls der Schlüsselabschnitt (84) mit dem Schlüsselbildungsabschnitt (32) kompatibel ist, bewirkt, dass der Fluidauslass (88), der an dem Reservoirabschnitt (34) angeordnet ist, mit dem Fluideinlass (36), der an der Aufnahmestation angeordnet ist, in Eingriff gelangt.

4. Das Tintenstrahlsystem (10) gemäß Anspruch 1, bei dem der austauschbare Tintenbehälter (12) betreibbar ist, um in die Aufnahmestation (14) in eine horizontale Richtung eingebracht zu werden, wobei der Schlüsselabschnitt (84) in der Nähe des Schlüsselbildungsabschnitts (32) positioniert ist, wobei der austauschbare Tintenbehälter (12) dann angeordnet ist, um um eine Schwenkachse geschwenkt zu werden, falls der Schlüsselabschnitt (84) zu dem Schlüsselbildungsabschnitt (32) kompatibel ist, um einen Fluidauslass (88), der an dem Reservoirabschnitt (34) angeordnet ist, mit einem Fluideinlass (36), der an der Aufnahmestation (14) angeordnet ist, in Eingriff zu bringen.

5. Das Tintenstrahlsystem (10) gemäß einem der vorhergehenden Ansprüche, bei dem der Schlüsselbildungsabschnitt (34) einen Tintenparameter von Tinte angibt, die innerhalb des austauschbaren Tintenbehälters (12) enthalten ist.

6. Das Tintenstrahlsystem (10) gemäß einem der vorhergehenden Ansprüche, bei dem der Schlüsselabschnitt (84) eine Mehrzahl von Vorsprüngen aufweist, die sich von dem Reservoirabschnitt (34) nach außen erstrecken. 5
7. Das Tintenstrahlsystem (10) gemäß Anspruch 6, bei dem der austauschbare Tintenbehälter (12) eine obere Oberfläche (86) und eine untere Oberfläche (76) relativ zu einer Einbringungsrichtung aufweist und bei dem die Vorsprünge in einer Seiten-Seite-Beziehung zu der unteren Oberfläche (76) der hinteren Kante (82) hin angeordnet sind. 10
8. Das Tintenstrahlsystem (10) gemäß Anspruch 6 oder 7, bei dem der Schlüsselabschnitt (84) konfiguriert ist, um zu dem Schlüsselbildungsabschnitt (32) durch eine selektive Entfernung zumindest eines der Mehrzahl von Vorsprüngen komplementär zu sein. 15 20
9. Das Tintenstrahlsystem (10) gemäß einem der vorhergehenden Ansprüche, bei dem der Schlüsselabschnitt (84) entweder eine Tintenfarbe oder eine Tintenkompatibilität angibt. 25
10. Das Tintenstrahlsystem (10) gemäß einem der vorhergehenden Ansprüche, bei dem der Schlüsselabschnitt (84) und der Schlüsselbildungsabschnitt (32) angeordnet sind, um zusammenzuwirken, um sicherzustellen, dass der austauschbare Tintenbehälter (12) zu der Aufnahmestation (14) kompatibel ist, wenn der austauschbare Tintenbehälter (12) in die Aufnahmestation (14) eingebracht wird. 30 35
11. Das Tintenstrahlsystem (10) gemäß einem der vorhergehenden Ansprüche, bei dem der Schlüsselabschnitt (84) und der Schlüsselbildungsabschnitt (34) angeordnet sind, um zusammenzuwirken, um eine Einbringung von austauschbaren Tintenbehältern (12) zu verhindern, die nicht mit der AufnahmeStation (14) kompatibel sind, wenn der austauschbare Tintenbehälter (12) in die AufnahmeStation (14) eingebracht wird. 40 45
12. Das Tintenstrahlsystem (10) gemäß einem der vorhergehenden Ansprüche, bei dem der Schlüsselabschnitt (84) an dem austauschbaren Tintenbehälter (12) angeordnet ist, um den entsprechenden Schlüsselbildungsabschnitt (32) an der AufnahmeStation (14) in Eingriff zu nehmen, wenn der austauschbare Tintenbehälter (12) in die AufnahmeStation (14) eingebracht wird, bevor eine Fluidkommunikation zwischen dem austauschbaren Tintenbehälter (12) und der AufnahmeStation (14) eingerichtet ist. 50 55
13. Ein austauschbarer Tintenbehälter (12) zu einer Verwendung bei einem Tintenstrahldrucksystem (10) gemäß einem der vorhergehenden Ansprüche, wobei der austauschbare Tintenbehälter (12) folgendes Merkmal aufweist:
- einen Reservoirabschnitt (34), der ein vorderes Ende (72) und ein hinteres Ende (82) relativ zu der Einbringungsrichtung des austauschbaren Tintenbehälters (12) in die AufnahmeStation (14) eines Tintenstrahlsystems aufweist;
- wobei der austauschbare Tintenbehälter (12) **dadurch gekennzeichnet ist, dass** derselbe ferner folgendes Merkmal aufweist:
- einen Schlüsselabschnitt (84), der an dem hinteren Ende (82) des Reservoirabschnitts (34) des austauschbaren Tintenbehälters (12) angeordnet ist und positioniert ist, um den Schlüsselbildungsabschnitt (32) der AufnahmeStation (14) in Eingriff zu nehmen, wenn der austauschbare Tintenbehälter (12) in die AufnahmeStation (14) eingebracht wird, wobei der Schlüsselabschnitt (84) konfiguriert ist, um zu dem Schlüsselbildungsabschnitt (32) der AufnahmeStation (14) komplementär zu sein, wodurch ermöglicht wird, dass der austauschbare Tintenbehälter (12) vollständig in die AufnahmeStation (14) eingebracht wird.
14. Der austauschbare Tintenbehälter gemäß Anspruch 13 zu einer Verwendung mit einem Tintenstrahldrucksystem (10) gemäß Anspruch 2, wobei der austauschbare Tintenbehälter (12) folgendes Merkmal aufweist:
- einen Fluidauslass (88), der zu einer Verbindung mit dem Fluideinlass (36) konfiguriert ist, der der AufnahmeStation (14) des Tintenstrahldrucksystems (10) zugeordnet ist, wobei der Schlüsselabschnitt (84) des austauschbaren Tintenbehälters (12) an dem austauschbaren Tintenbehälter (12) angeordnet und angebracht ist, so dass bei der Einbringung des austauschbaren Tintenbehälters in zuerst eine lineare Richtung zu der Rückwand (66) der AufnahmeStation (14) hin, wobei der Fluidauslass (88) mit dem Fluidauslass (36) der AufnahmeStation (14) ausgerichtet wird, der Schlüsselabschnitt (84) den Schlüsselbildungsabschnitt (32) der AufnahmeStation (14) in Eingriff nimmt, was eine weitere Einbringung in eine Richtung zu der unteren Oberfläche (68) der AufnahmeStation (14) hin ermöglicht, falls der Schlüsselabschnitt (84) zu dem Schlüsselbildungsabschnitt (32) komplementär ist, wodurch eine Fluidkommunikation zwischen dem austauschbaren Tintenbehälter (12) und der Aufnahme-

mestation (14) ermöglicht wird.

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15. Der auswechselbare Tintenbehälter gemäß Anspruch 14, bei dem eine weitere Einbringung in eine Richtung zu der unteren Oberfläche (76) der Aufnahme-
station (14) hin, die ein Schwenken des auswechselbaren Tintenbehälters (12) um eine Schwenkachse aufweist, falls der Schlüsselabschnitt (84) zu dem Schlüsselbildungsabschnitt (32) kompatibel ist, bewirkt, dass der Fluidauslass (88), der an dem Reservoirabschnitt (34) des auswechselbaren Tintenbehälters (12) angeordnet ist, mit dem Fluideinlass (36) in Eingriff gelangt, der an der Aufnahme-
station (14) angeordnet ist.
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16. Der auswechselbare Tintenbehälter gemäß Anspruch 13, wobei der auswechselbare Tintenbehälter (12) betreibbar ist, um in die Aufnahme-
station (14) eines Tintenstrahlsystems (10) in eine horizontale Richtung eingebracht zu werden, wobei der Schlüsselabschnitt (84) der Aufnahme-
station (14) des Tintenstrahlsystems (10) in der Nähe des Schlüsselbildungsabschnitts (32) des auswechselbaren Tintenbehälters (12) positioniert ist, wobei der auswechselbare Tintenbehälter (12) dann angeordnet ist, um um eine Schwenkachse geschwenkt zu werden, falls der Schlüsselabschnitt (84) des auswechselbaren Tintenbehälters (12) zu dem Schlüsselbildungsabschnitt (32) der Aufnahme-
station (14) kompatibel ist, um einen Fluidauslass (88), der an dem Reservoirabschnitt (34) angeordnet ist, mit einem Fluideinlass (36) in Eingriff zu bringen, der an der Aufnahme-
station (14) angeordnet ist.
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- schnitt (84) konfiguriert ist, um durch eine selektive Entfernung von zumindest einem der Mehrzahl von Vorsprüngen zu dem Schlüsselbildungsabschnitt (32) der Aufnahme-
station (14) eines Tintenstrahlsystems (10) komplementär zu sein.
21. Der auswechselbare Tintenbehälter (12) gemäß einem der Ansprüche 13 bis 20, bei dem der Schlüsselabschnitt (84) entweder eine Tintenfarbe oder eine Tintenkompatibilität angibt.
22. Der auswechselbare Tintenbehälter gemäß einem der Ansprüche 13 bis 21, bei dem der Schlüsselabschnitt (84) des auswechselbaren Tintenbehälters (12) angeordnet ist, um mit dem Schlüsselbildungsabschnitt (32) einer Aufnahme-
station (14) zusammenzuwirken, um sicherzustellen, dass der auswechselbare Tintenbehälter (12) mit der Aufnahme-
station (14) kompatibel ist.
23. Der auswechselbare Tintenbehälter gemäß einem der Ansprüche 13 bis 22, bei dem der Schlüsselabschnitt (84) des auswechselbaren Tintenbehälters (12) angeordnet ist, um mit dem Schlüsselbildungsabschnitt (32) einer Aufnahme-
station (14) zusammenzuwirken, um eine Einbringung von auswechselbaren Tintenbehältern (12) zu verhindern, die nicht mit der Aufnahme-
station (14) kompatibel sind.
24. Der auswechselbare Tintenbehälter gemäß einem der Ansprüche 13 bis 23, bei dem der Schlüsselabschnitt (84) an dem auswechselbaren Tintenbehälter (12) angeordnet ist, um den entsprechenden Schlüsselbildungsabschnitt (32) an einer Aufnahme-
station (14) in Eingriff zu nehmen, bevor eine Fluidkommunikation zwischen dem auswechselbaren Tintenbehälter (12) und der Aufnahme-
station (14) eingerichtet ist, wenn der auswechselbare Tintenbehälter (12) in die Aufnahme-
station (14) eingebracht wird.
25. Ein Verfahren zum Einbringen eines auswechselbaren Tintenbehälters (12) in eine Aufnahme-
station (14) eines Tintenstrahldrucksystems (10), wobei die Aufnahme-
station (14) an einem beweglichen Wagen (20) angeordnet ist und fluidisch mit einem Tintenausstoßabschnitt (16) gekoppelt ist, der an derselben befestigt ist, wobei das Verfahren zum Einbringen des Tintenbehälters (12) folgende Schritte aufweist:
- Treiben des auswechselbaren Tintenbehälters (12) linear zu einer Rückwand (66) der Aufnahme-
station (14) hin, derart, dass ein Schlüsselmerkmal (84) an dem auswechselbaren Tintenbehälter (12) sich in Ausrichtung mit einem Schlüsselbildungsmerkmal (32) an der Aufnahme-
station (14) befindet; und

Treiben des auswechselbaren Tintenbehälters (12) nach unten zu einer unteren Oberfläche (68) der Aufnahmestation (14) hin, so dass das Schlüsselmerkmal (84) und das Schlüsselbildungsmerkmal (32) zusammenwirken, um eine weitere Einbringung des kompatiblen auswechselbaren Tintenbehälters (12) zu ermöglichen, um einen Fluidauslass (88) an dem auswechselbaren Tintenbehälter mit einem Fluid-einlass (36) in der Nähe der unteren Oberfläche (68) der Aufnahmestation (14) wirksam zu koppeln.

26. Das Verfahren gemäß Anspruch 25, bei dem das Schlüsselmerkmal (86) und das Schlüsselbildungsmerkmal (32) zusammenwirken, um eine weitere Einbringung von nichtkompatiblen auswechselbaren Tintenbehältern zu verhindern, wodurch eine Kopplung zwischen dem Fluidauslass (88) an dem auswechselbaren Tintenbehälter (12) und dem Fluideinlass (36) verhindert wird.

27. Ein Verfahren zum Herstellen eines auswechselbaren Tintenbehälters (12), der für eine Einbringung in eine Aufnahmestation (14) eines Tintenstrahl-drucksystems (10) konfiguriert ist, wobei die Aufnahmestation (14) einen Schlüsselbildungsabschnitt (32) aufweist, der einem kompatiblen auswechselbaren Tintenbehältertyp einer Mehrzahl von auswechselbaren Tintenbehältertypen entspricht, wobei das Verfahren zum Herstellen folgende Schritte aufweist:

Bilden eines Reservoirs (34), das eine untere Oberfläche (76) mit einem Fluidauslass (88) in derselben und eine obere Oberfläche (86) aufweist, wobei das Reservoir (34) ferner ein vorderes Ende (72) und ein hinteres Ende (82) relativ zu einer Einbringungsrichtung für das Reservoir (34) in die Aufnahmestation (14) umfasst, wobei das hintere Ende (82) eine Mehrzahl von Schlüsselmerkmalen (84) aufweist, die zu der unteren Oberfläche (76) hin angeordnet sind; und

Entfernen zumindest eines Schlüsselmerkmals (84), um dem kompatiblen auswechselbaren Tintenbehältertyp zu entsprechen.

28. Das Verfahren zum Herstellen des auswechselbaren Tintenbehälters gemäß Anspruch 27, das ferner ein Füllen von Tinte in das Reservoir (34) umfasst, wobei die Tinte dem kompatiblen auswechselbaren Tintenbehältertyp entspricht.

29. Das Verfahren zum Herstellen des auswechselbaren Tintenbehälters gemäß Anspruch 27 oder 28, bei dem die Mehrzahl von Schlüsselmerkmalen

(84) eine Mehrzahl von Vorsprüngen ist, die sich von dem Tintenreservoir (34) nach außen erstrecken.

Revendications

1. Système d'impression à jet d'encre (10) comprenant :

une station de réception (14) montée sur un chariot de balayage (20), la station de réception (14) possédant une partie clavetée (32) indicative d'un paramètre de conteneur d'encre remplaçable d'une pluralité de paramètres de conteneur d'encre remplaçable ; et un conteneur d'encre remplaçable (12) insérable de manière libérable dans la station de réception (14) comprenant :

une partie de réservoir (34) possédant une extrémité d'attaque (72) et une extrémité de fuite (82) par rapport à la direction d'insertion du conteneur d'encre remplaçable (12) dans la station de réception (14), **caractérisé en ce que** le conteneur d'encre remplaçable (12) comprend de plus :

une partie de clavetage (84) disposée sur l'extrémité de fuite (82) de la partie de réservoir (34) du conteneur d'encre remplaçable (12) positionnée afin de mettre en prise la partie clavetée (32) de la station de réception (14) lorsque le conteneur d'encre remplaçable (12) est inséré dans la station de réception (14), la partie de clavetage (84) étant configurée pour être complémentaire de la partie clavetée (32) de la station de réception (14) en permettant de ce fait au conteneur d'encre remplaçable (12) d'être inséré entièrement dans la station de réception (14).

2. Système à jet d'encre (10) selon la revendication 1, dans lequel la station de réception (14) possède une paroi arrière (66), une surface inférieure (68) possédant une entrée de fluide (36) disposée dessus et une paroi avant ayant la partie clavetée (32) disposée dessus,

le conteneur d'encre remplaçable (12) comprenant de plus :

une sortie de fluide (88) configurée pour être connectée à l'entrée de fluide (36) associée à la station de réception (14), la partie de clavetage (84) du conteneur d'encre remplaçable (12) étant ainsi disposée et

agencée sur le conteneur d'encre remplaçable (12) de telle sorte, qu'avec l'insertion du conteneur d'encre remplaçable (12) d'abord dans une direction linéaire vers la paroi arrière (66) pour aligner la sortie de fluide (88) avec l'entrée de fluide (36), la partie de clavetage (84) met en prise la partie clavetée (32) en permettant de plus une insertion dans une direction vers la surface inférieure (68) si la partie de clavetage (84) est complémentaire de la partie clavetée (32), en permettant de ce fait une communication de fluide entre le conteneur d'encre remplaçable (12) et la station de réception (14).

3. Système à jet d'encre selon la revendication 2, dans lequel le conteneur d'encre remplaçable (12) est tel que davantage d'insertion dans une direction vers la surface inférieure (76) comprenant le pivotement du conteneur d'encre remplaçable (12) autour d'un axe de pivot si la partie de clavetage (84) est compatible avec la partie clavetée (32), fait que la sortie de fluide (88) disposée sur la partie de réservoir (34) met en prise l'entrée de fluide (36) disposée sur la station de réception.
4. Système à jet d'encre (10) selon la revendication 1, dans lequel le conteneur d'encre remplaçable (12) est utilisable pour être inséré dans la station de réception (14) dans une direction horizontale où la partie de clavetage (84) est positionnée à proximité de la partie clavetée (32), le conteneur d'encre remplaçable (12) étant alors disposé pour être pivoté autour d'un axe de pivot si la partie de clavetage (84) est compatible avec la partie clavetée (32) afin de mettre en prise une sortie de fluide (88) disposée sur la partie de réservoir (34) avec une entrée de fluide (36) disposée sur la station de réception (14).
5. Système à jet d'encre (10) selon l'une quelconque des revendications précédentes, dans lequel la partie de clavetage (84) est indicative d'un paramètre d'encre de l'encre contenue à l'intérieur du conteneur d'encre remplaçable (12).
6. Système à jet d'encre (10) selon l'une quelconque des revendications précédentes, dans lequel la partie de clavetage (84) comprend une pluralité de pattes qui s'étendent vers l'extérieur à partir de la partie de réservoir (34).
7. Système à jet d'encre (10) selon la revendication 6, dans lequel le conteneur d'encre remplaçable (12) possède une surface supérieure (86) et une surface inférieure (76) par rapport à une orientation d'insertion et dans lequel les pattes sont disposées dans une relation côte à côte vers la surface inférieure (76) du bord de fuite (82).

8. Système à jet d'encre (10) selon l'une quelconque des revendications 6 ou 7, dans lequel la partie de clavetage (84) est configurée pour être complémentaire de la partie clavetée (32) par l'enlèvement sélectif d'au moins une patte de la pluralité de pattes.
9. Système à jet d'encre (10) selon l'une quelconque des revendications précédentes, dans lequel la partie de clavetage (84) est indicative de la couleur de l'encre ou de la compatibilité de l'encre.
10. Système à jet d'encre (10) selon l'une quelconque des revendications précédentes, dans lequel la partie de clavetage (84) et la partie clavetée (32) sont agencées lorsque le conteneur d'encre remplaçable (12) est inséré dans la station de réception (14) afin de coopérer pour garantir que le conteneur d'encre remplaçable (12) est compatible avec la station de réception (14).
11. Système à jet d'encre (10) selon l'une quelconque des revendications précédentes, dans lequel la partie de clavetage (84) et la partie clavetée (32) sont agencées lorsque le conteneur d'encre remplaçable (12) est inséré dans la station de réception (14) afin de coopérer pour éviter l'insertion de conteneurs d'encre remplaçables (12) qui ne sont pas compatibles avec la station de réception (14).
12. Système à jet d'encre (10) selon l'une quelconque des revendications précédentes, dans lequel la partie de clavetage (84) est disposée sur le conteneur d'encre remplaçable (12) afin de mettre en prise la partie clavetée (32) correspondante sur la station de réception (14) lorsque le conteneur d'encre remplaçable (12) est inséré dans la station de réception (14) avant qu'une communication de fluide soit établie entre le conteneur d'encre remplaçable (12) et la station de réception (14).
13. Conteneur d'encre remplaçable (12) destiné à être utilisé avec un système d'impression à jet d'encre (10) selon l'une quelconque des revendications précédentes, le conteneur d'encre remplaçable (12) comprenant :

une partie de réservoir (34) possédant une extrémité d'attaque (72) et une extrémité de fuite (82) par rapport à la direction d'insertion du conteneur d'encre remplaçable (12) dans la station de réception (14) d'un système à jet d'encre ;
le conteneur d'encre remplaçable (12) étant **caractérisé en ce qu'il** comprend de plus :

une partie de clavetage (84) disposée sur l'extrémité de fuite (82) de la partie de ré-

servoir (34) positionnée afin de mettre en prise la partie clavetée (32) de la station de réception (14) lorsque le conteneur d'encre remplaçable (12) est inséré dans la station de réception (14), la partie de clavetage (84) étant configurée pour être complémentaire de la partie clavetée (32) de la station de réception (14) en permettant de ce fait au conteneur d'encre remplaçable (12) d'être inséré entièrement dans la station de réception (14).

- 14.** Conteneur d'encre remplaçable selon la revendication 13 destiné à être utilisé avec un système d'impression à jet d'encre (10) selon la revendication 2, le conteneur d'encre remplaçable (12) comprenant :

une sortie de fluide (88) configurée pour être connectée à l'entrée de fluide (36) associée à la station de réception (14) du système à jet d'encre (10), la partie de clavetage (84) du conteneur d'encre remplaçable (12) étant disposée et agencée sur le conteneur d'encre remplaçable (12) de telle sorte qu'avec l'insertion du conteneur d'encre remplaçable d'abord dans une direction linéaire vers la paroi arrière (66) de la station de réception (14) en alignant la sortie de fluide (88) avec l'entrée de fluide (36) de la station de réception (14), la partie de clavetage (84) met en prise la partie clavetée (32) de la station de réception (14) en permettant davantage d'insertion dans une direction vers la surface inférieure (68) de la station de réception (14) si la partie de clavetage (84) est complémentaire de la partie clavetée (32), en permettant de ce fait une communication de fluide entre le conteneur d'encre remplaçable (12) et la station de réception (14).

- 15.** Conteneur d'encre remplaçable selon la revendication 14, dans lequel davantage d'insertion dans une direction vers la surface inférieure (76) de la station de réception (14) comprenant le pivotement du conteneur d'encre remplaçable (12) autour d'un axe de pivot si la partie de clavetage (84) est compatible avec la partie clavetée (32), fait que la sortie de fluide (88) disposée sur la partie de réservoir (34) du conteneur d'encre remplaçable (12) met en prise l'entrée de fluide (36) disposée sur la station de réception (14).
- 16.** Conteneur d'encre remplaçable selon la revendication 13, dans lequel le conteneur d'encre remplaçable (12) est utilisable pour être inséré dans la station de réception (14) d'un système à jet d'encre (10) dans une direction horizontale où la partie de clavetage (84) de la station de réception (14) du sys-

tème à jet d'encre (10) est positionnée à proximité de la partie clavetée (32) du conteneur d'encre remplaçable (12), le conteneur d'encre remplaçable (12) étant alors agencé pour être pivoté autour d'un axe de pivot si la partie de clavetage (84) du conteneur d'encre remplaçable (12) est compatible avec la partie clavetée (32) de la station de réception (14) afin de mettre en prise une sortie de fluide (88) disposée sur la partie de réservoir (34) avec une entrée de fluide (36) disposée sur la station de réception (14).

- 17.** Conteneur d'encre remplaçable (12) selon l'une quelconque des revendications 13 - 16, dans lequel la partie de clavetage (84) est indicative d'un paramètre d'encre de l'encre contenue à l'intérieur du conteneur d'encre remplaçable (12).
- 18.** Conteneur d'encre remplaçable (12) selon l'une quelconque des revendications 13 - 17, dans lequel la partie de clavetage (84) comprend une pluralité de pattes qui s'étendent vers l'extérieur à partir de la partie de réservoir (34).
- 19.** Conteneur d'encre remplaçable (12) selon la revendication 18, dans lequel le conteneur d'encre remplaçable (12) possède une surface supérieure (86) et une surface inférieure (76) par rapport à une orientation d'insertion et dans lequel les pattes sont disposées dans une relation côte à côte vers la surface inférieure (76) du bord de fuite (82).
- 20.** Conteneur d'encre remplaçable selon l'une quelconque des revendications 17 ou 18, dans lequel la partie de clavetage (84) est configurée pour être complémentaire de la partie clavetée (32) de la station de réception (14) d'un système à jet d'encre (10) par l'enlèvement sélectif d'au moins une patte de la pluralité de pattes.
- 21.** Conteneur d'encre remplaçable (12) selon l'une quelconque des revendications 13 - 20, dans lequel la partie de clavetage (84) est indicative de la couleur de l'encre ou de la compatibilité de l'encre.
- 22.** Conteneur d'encre remplaçable (12) selon l'une quelconque des revendications 13 - 21, dans lequel la partie de clavetage (84) du conteneur d'encre remplaçable (12) est disposée afin de coopérer avec la partie clavetée (32) d'une station de réception (14) afin de garantir que le conteneur d'encre remplaçable (12) est compatible avec la station de réception (14).
- 23.** Conteneur d'encre remplaçable (12) selon l'une quelconque des revendications 13 - 22, dans lequel la partie de clavetage (84) du conteneur d'encre remplaçable (12) est disposée afin de coopérer

avec la partie clavetée (32) d'une station de réception (14) afin d'éviter l'insertion de conteneurs d'encre remplaçables (12) qui ne sont pas compatibles avec la station de réception (14).

24. Conteneur d'encre remplaçable (12) selon l'une quelconque des revendications 13 - 23, dans lequel la partie de clavetage (84) est disposée sur le conteneur d'encre remplaçable (12) pour mettre en prise la partie clavetée (32) correspondante sur une station de réception (14) avant qu'une communication de fluide soit établie entre le conteneur d'encre remplaçable (12) et la station de réception (14) lorsque le conteneur d'encre remplaçable (12) est inséré dans la station de réception (14).

25. Procédé pour insérer un conteneur d'encre remplaçable (12) dans une station de réception (14) d'un système d'impression à jet d'encre (10), la station de réception (14) étant disposée sur un chariot de balayage (20) et couplée de manière fluïdique à une partie d'éjection d'encre (16) montée dessus, le procédé pour insérer le conteneur d'encre remplaçable (12) comprenant :

une poussée du conteneur d'encre remplaçable (12) de manière linéaire vers une paroi arrière (66) de la station de réception (14) de telle sorte qu'un dispositif de clavetage (84) situé sur le conteneur d'encre remplaçable (12) soit aligné avec un dispositif claveté (32) situé sur la station de réception (14) ; et

une poussée du conteneur d'encre remplaçable (12) vers le bas vers une surface inférieure (68) de la station de réception (14) de telle sorte que le dispositif de clavetage (84) et le dispositif claveté (32) coopèrent pour permettre davantage d'insertion des conteneurs d'encre remplaçables compatibles (12) afin de coupler de manière fonctionnelle une sortie de fluide (88) située sur le conteneur d'encre remplaçable avec une entrée de fluide (36) située à proximité de la surface inférieure (68) de la station de réception (14).

26. Procédé selon la revendication 25, dans lequel le dispositif de clavetage (84) et le dispositif claveté (32) coopèrent pour empêcher davantage d'insertion des conteneurs d'encre remplaçables non compatibles, en empêchant de ce fait un couplage entre la sortie de fluide (88) située sur le conteneur d'encre remplaçable (12) et l'entrée de fluide (36).

27. Procédé pour fabriquer un conteneur d'encre remplaçable (12) configuré pour être inséré dans une station de réception (14) d'un système d'impression à jet d'encre (10), la station de réception (14) possédant une partie clavetée (32) correspondant à un

type de conteneur d'encre remplaçable compatible d'une pluralité de types de conteneurs d'encre remplaçables, le procédé de fabrication comprenant :

le formage d'un réservoir (34) possédant une surface inférieure (76) possédant dedans une sortie de fluide (88) et une surface supérieure (86), le réservoir (34) comprenant de plus une extrémité d'attaque (72) et une extrémité de fuite (82) par rapport à une direction d'insertion du réservoir (34) dans la station de réception (14), l'extrémité de fuite (82) possédant une pluralité de dispositifs de clavetage (84) disposés vers la surface inférieure (76) ; et l'enlèvement d'au moins un dispositif de clavetage (84) pour correspondre au type de conteneur d'encre remplaçable compatible.

28. Procédé pour fabriquer le conteneur d'encre remplaçable selon la revendication 27, comprenant de plus un remplissage d'encre dans le réservoir (34), dans lequel l'encre correspond au type de conteneur d'encre remplaçable compatible.

29. Procédé pour fabriquer le conteneur d'encre remplaçable selon l'une quelconque des revendications 27 ou 28, dans lequel la pluralité de dispositifs de clavetage (84) est une pluralité de pattes qui s'étendent vers l'extérieur à partir du réservoir d'encre (34).

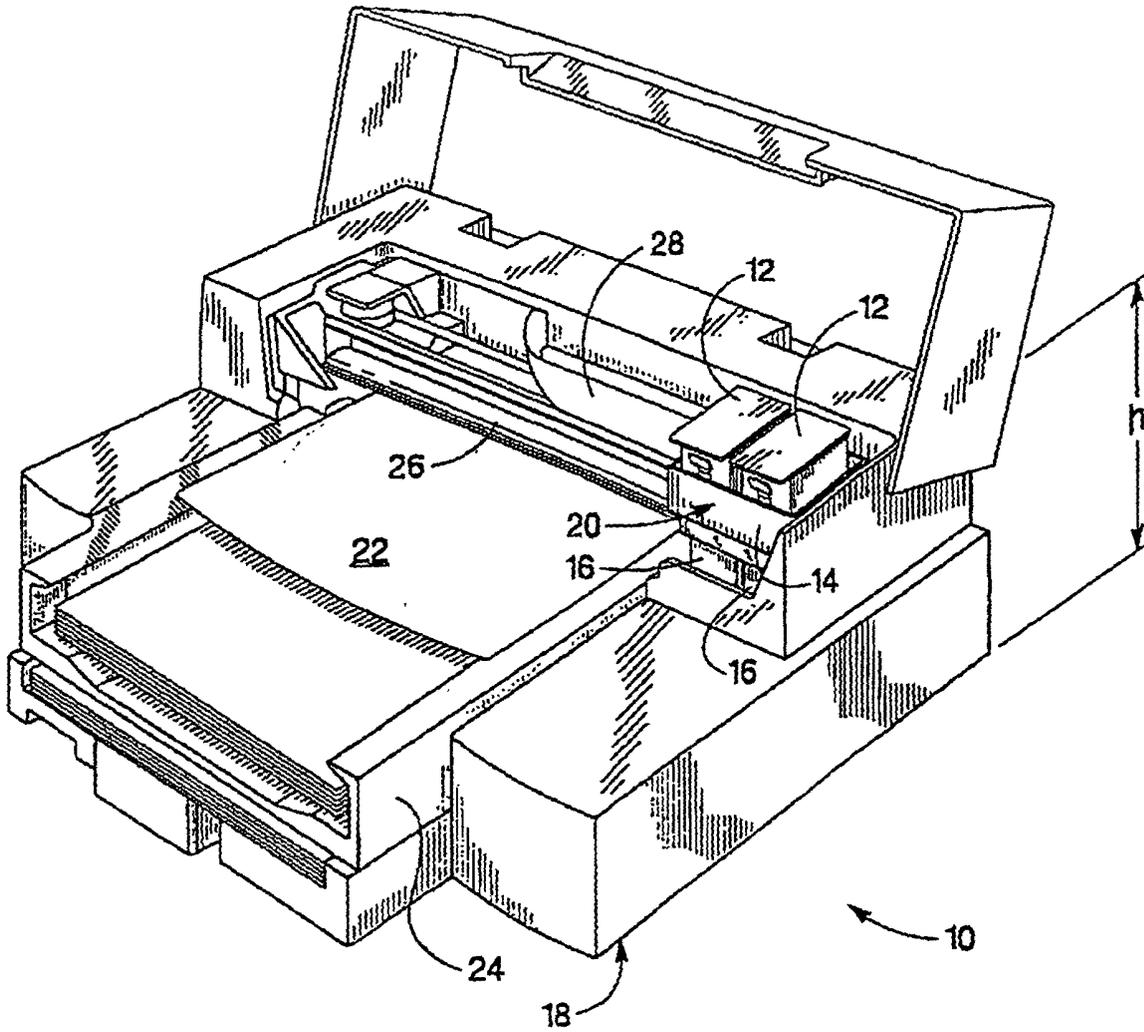


Fig. 1

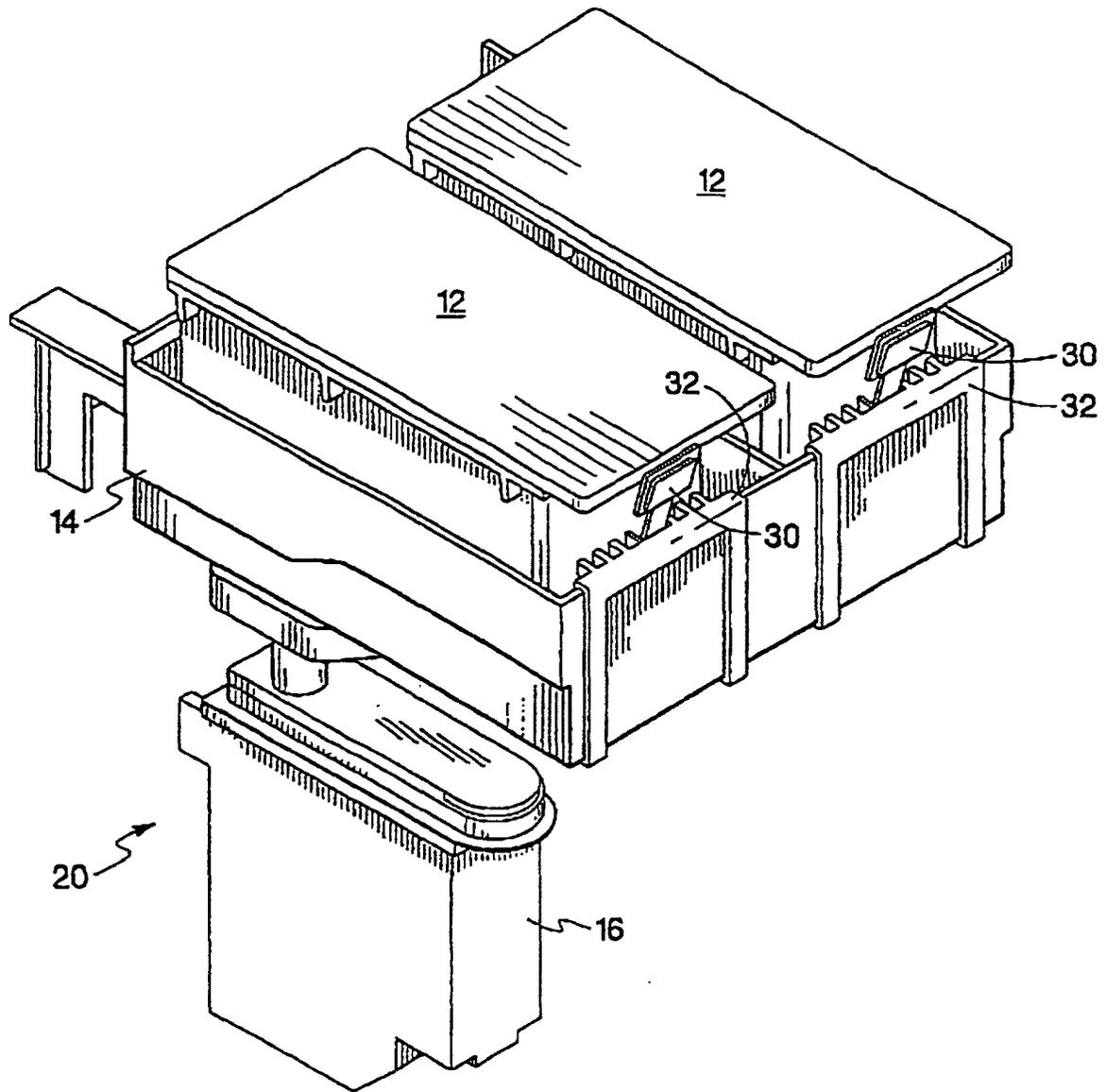


Fig. 2

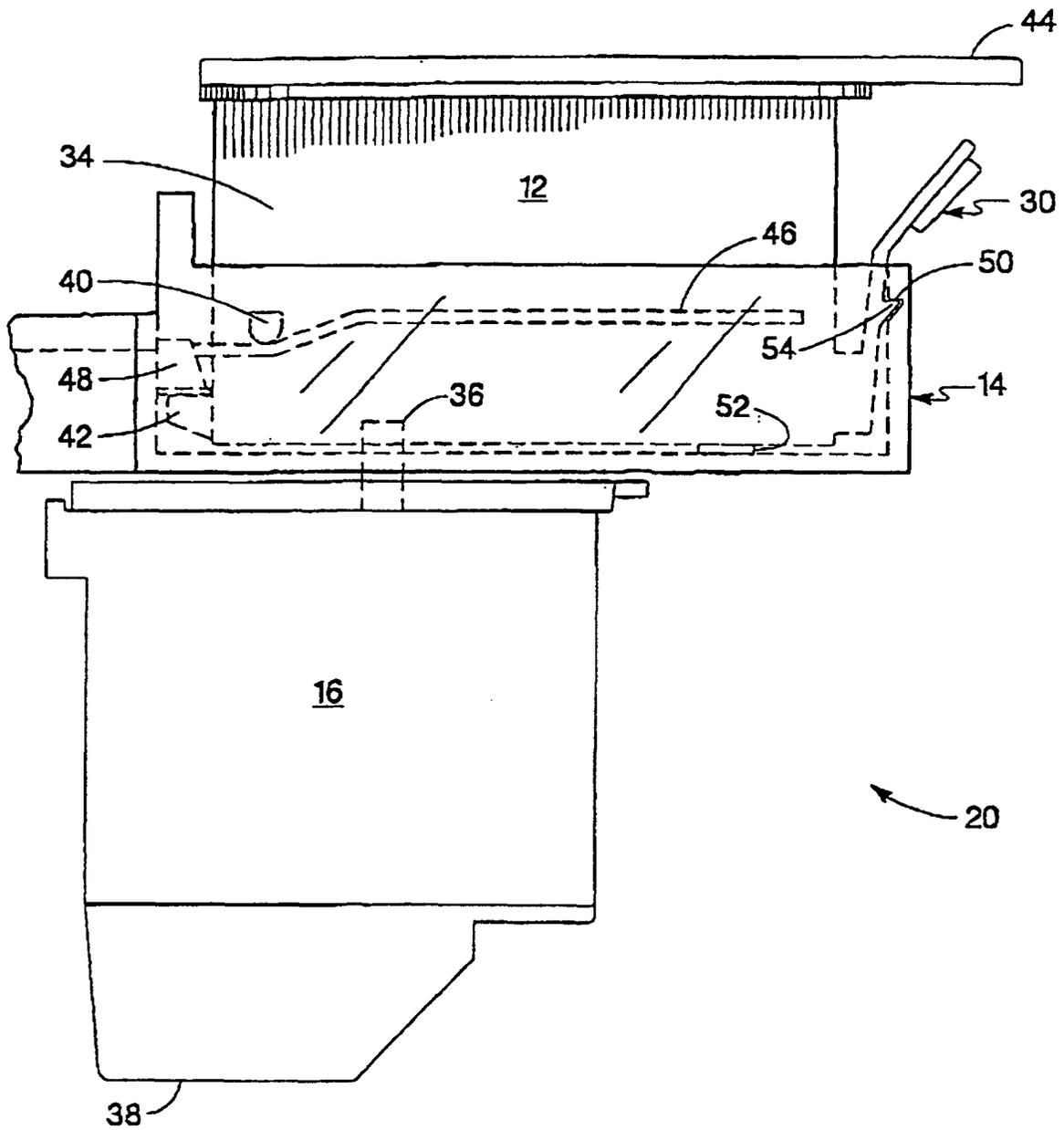


Fig. 3

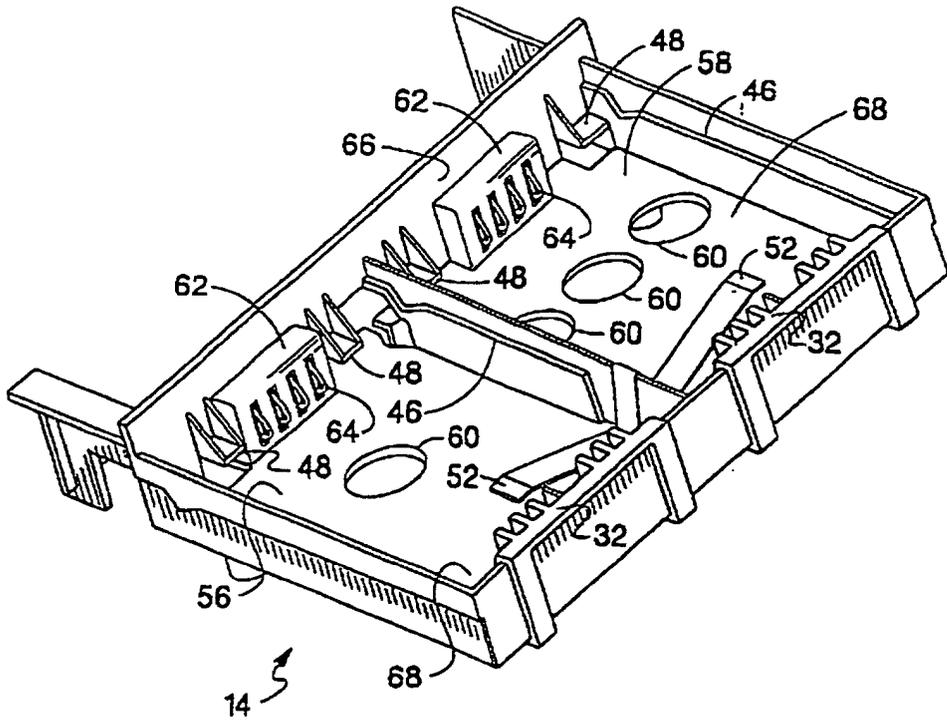


Fig. 4

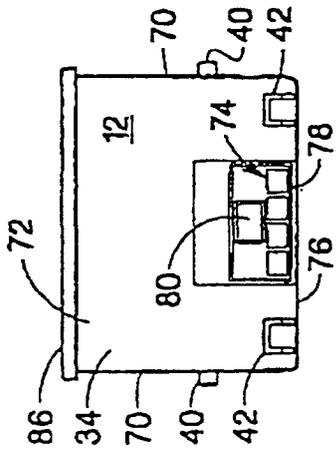


Fig. 5a

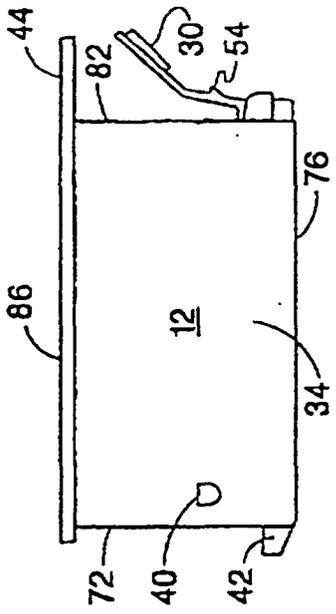


Fig. 5b

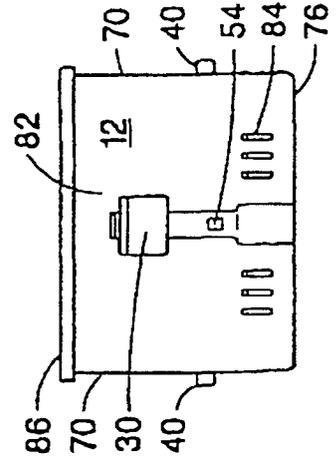


Fig. 5c

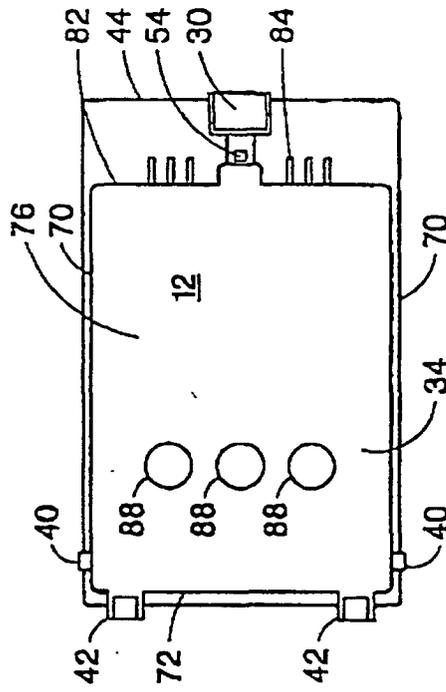


Fig. 5d

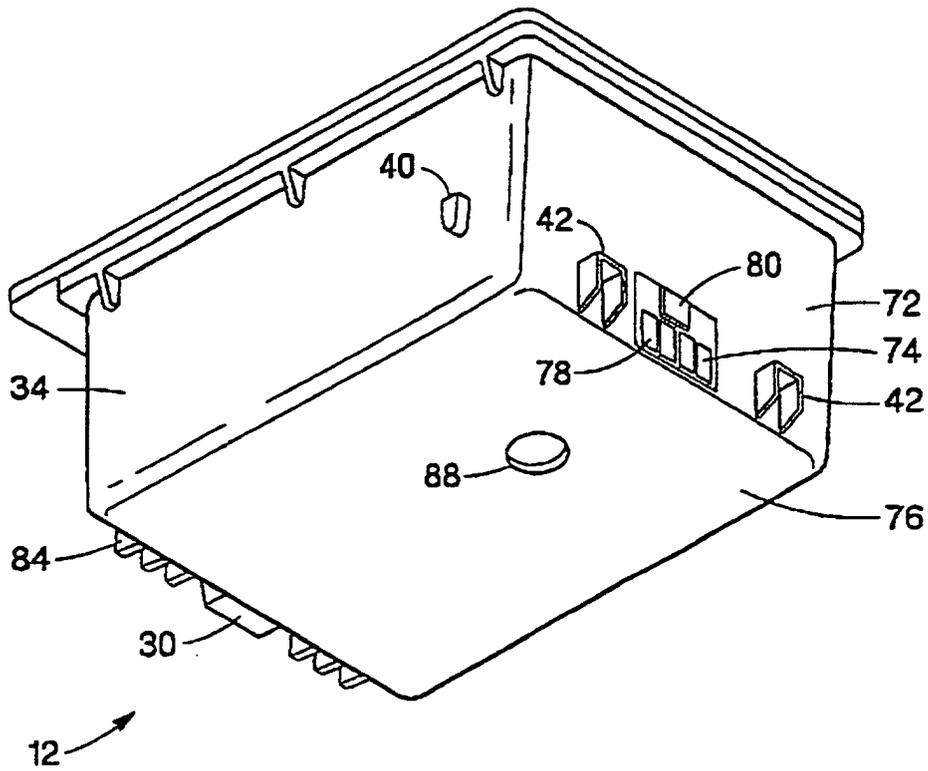


Fig. 6

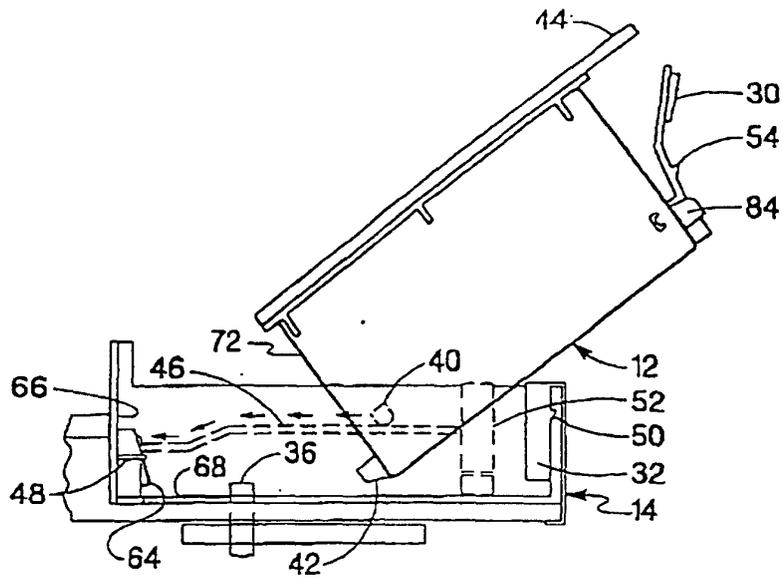


Fig. 7a

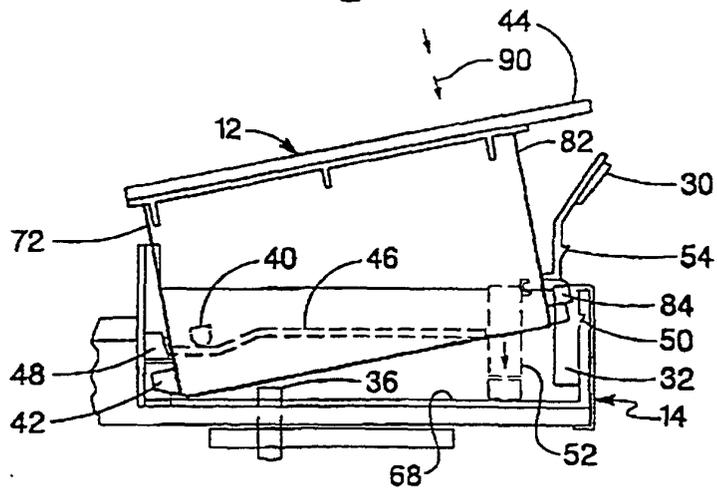


Fig. 7b

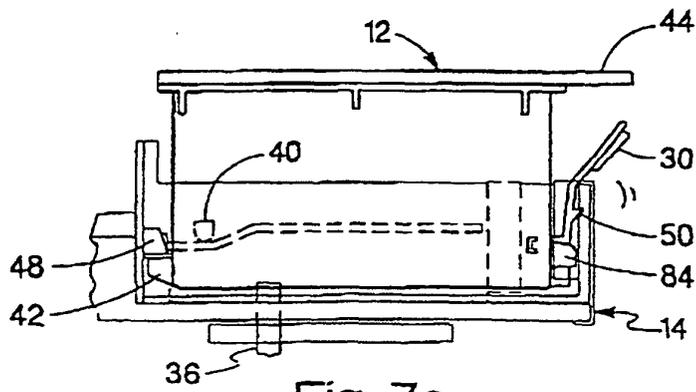


Fig. 7c

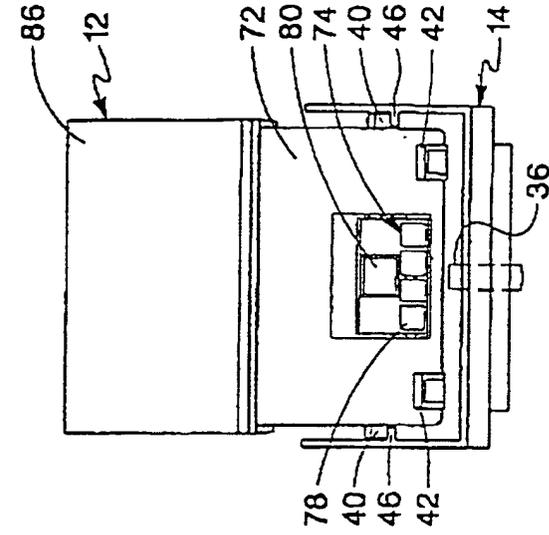


Fig. 8a

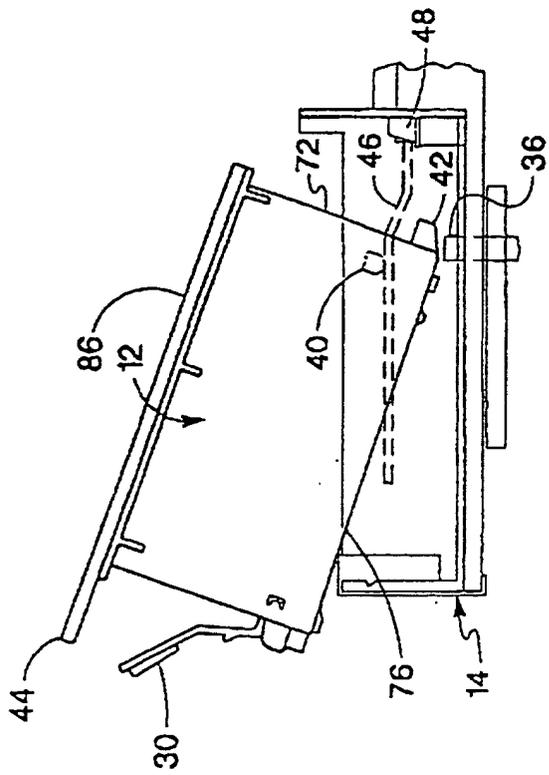


Fig. 8b

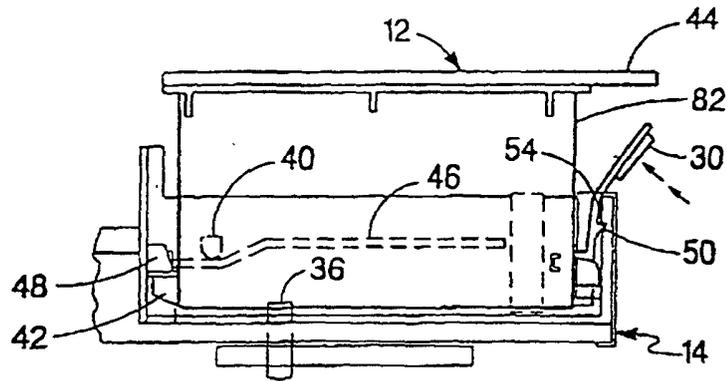


Fig. 9a

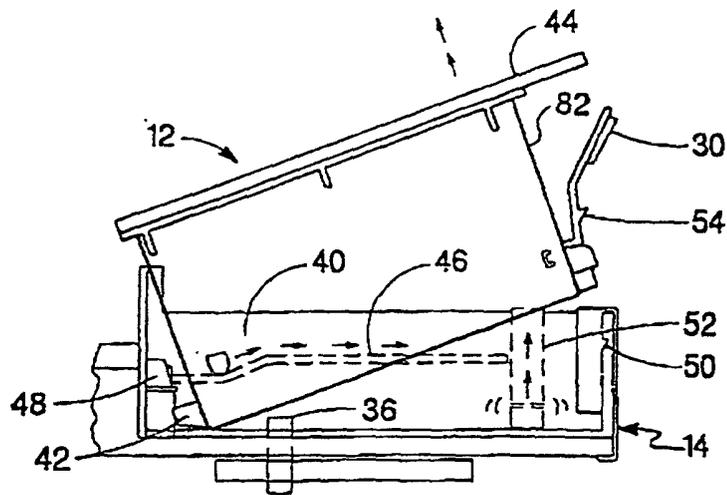


Fig. 9b

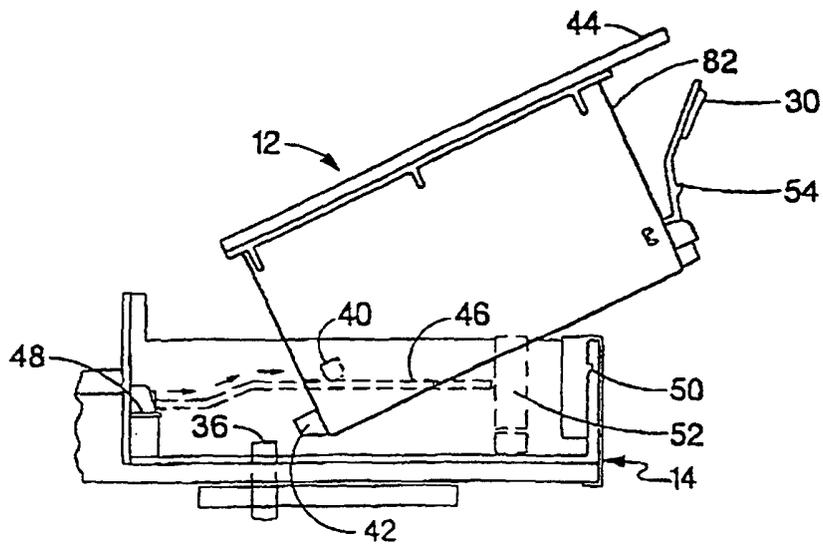


Fig. 9c

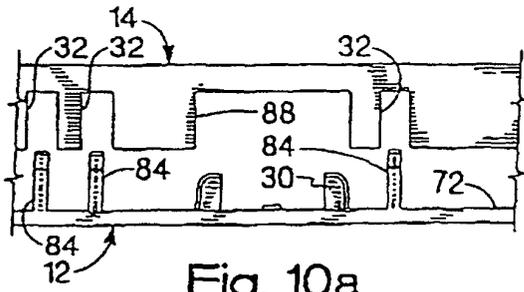


Fig. 10a

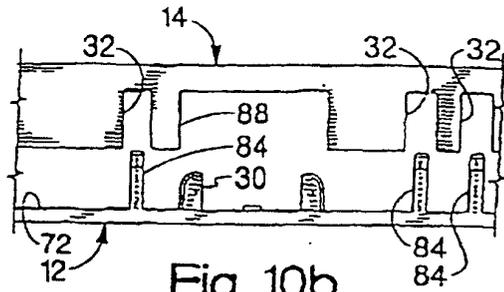


Fig. 10b

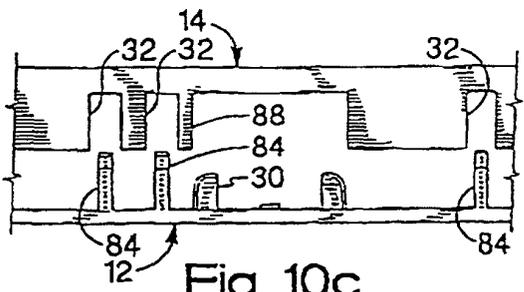


Fig. 10c

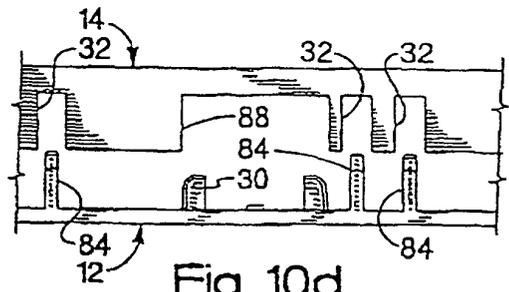


Fig. 10d

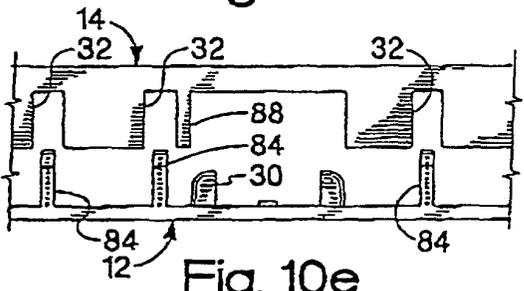


Fig. 10e

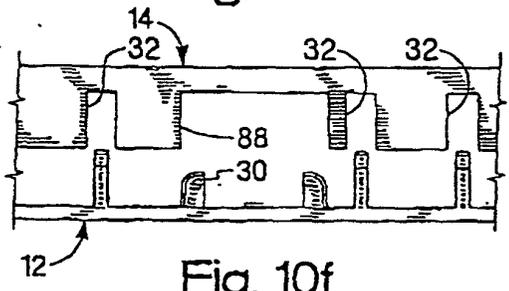


Fig. 10f

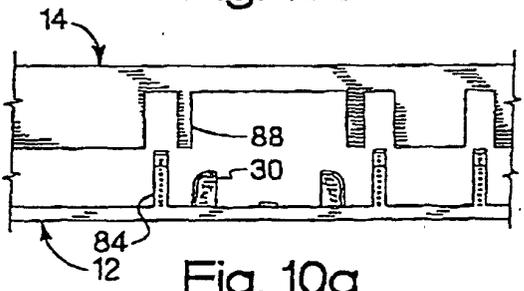


Fig. 10g

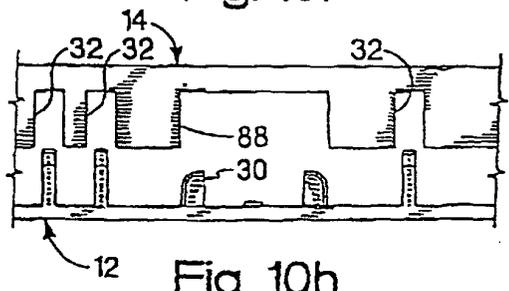


Fig. 10h

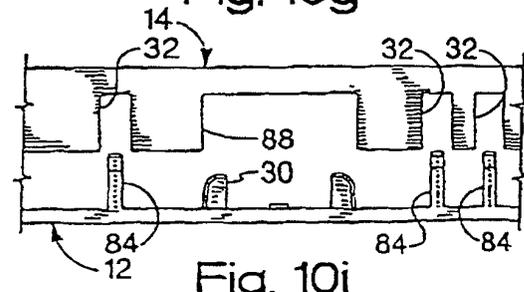


Fig. 10i

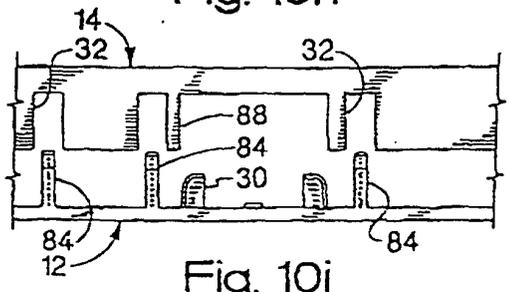


Fig. 10j

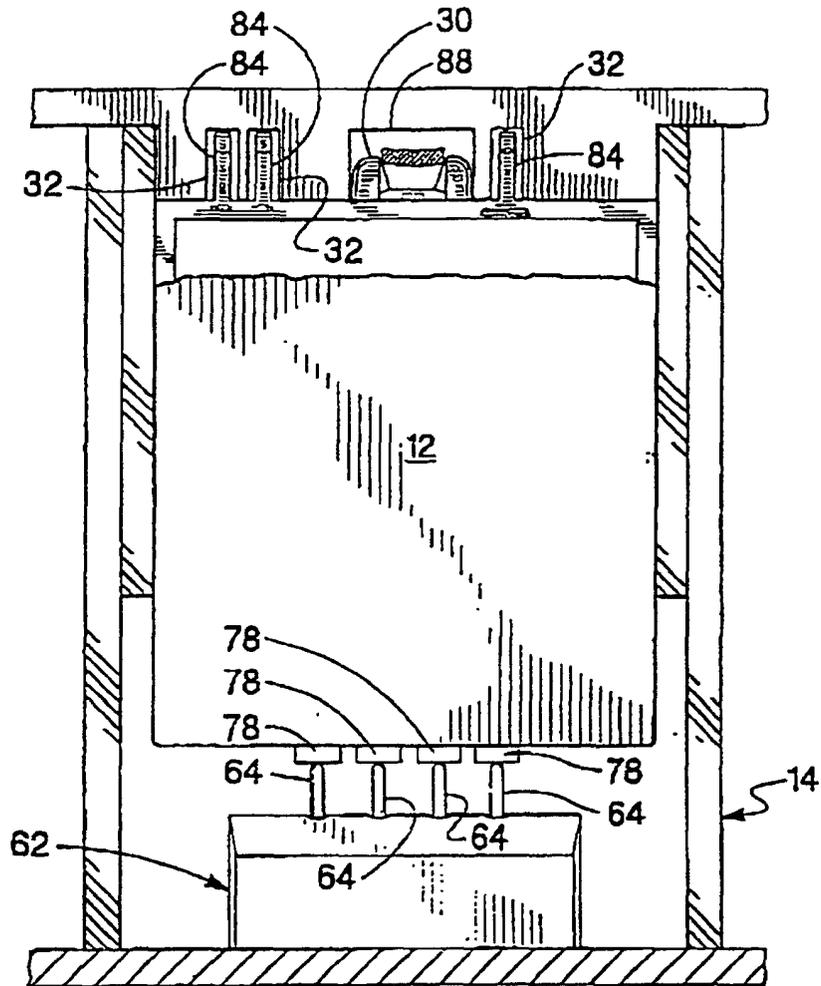


Fig. 11