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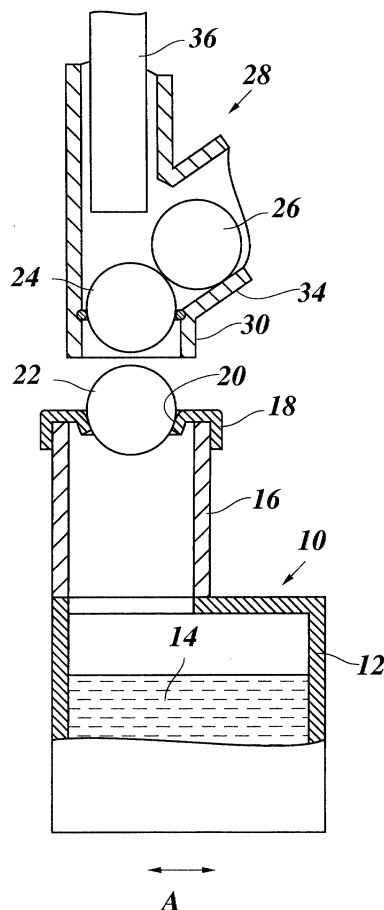
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(54) **Method and system for supplying hot melt ink to a printer**

(57) A method for supplying pellets (22, 24, 26) of hot melt ink to a printer comprising an ink reservoir (10) having an inlet port (20) through which the ink pellets can be supplied, and a closure member for sealingly closing the inlet port, characterized in that one (22) of the ink pellets is fitted in the inlet port (20) so as to serve as said closure member and, when the pellet (22) is to be supplied to the ink reservoir (10) it is pressed through the inlet port, and a new pellet (24) is fitted therein.

Fig. 1



Description

[0001] The invention relates to a method and a supply system for supplying pellets of hot melt ink to a printer comprising an ink reservoir having an inlet port through which the ink pellets can be supplied, and a closure member for sealingly closing said inlet port.

[0002] Ink jet printers operating with hot melt ink, i.e. with ink that is solid at room temperature, comprise an ink reservoir which can be heated in order to melt the ink and to keep it in the liquid state in which it can be supplied to the printhead. The ink can be supplied to this ink reservoir in the form of pellets which are then melted in the ink reservoir.

[0003] Would the inlet port of the ink reservoir be left open while the printer is operating, a vapor of melted and evaporated ink could escape from the ink reservoir, so that other components of the printer could become soiled with condensated ink. It is therefore convenient to provide a closure member for sealingly closing the inlet port. This, however, has the consequence that the process of filling ink pellets into the ink reservoir becomes more complicated and more difficult to be automated, because it is necessary to remove and to re-install the closure member each time an ink pellet is filled in.

[0004] EP-A-0 340 533 discloses a refill cartridge for hot melt ink in which a pellet of solidified ink is contained in a hood-shaped envelope which can be placed onto the inlet port of the ink reservoir with the open side facing downward. Then, by deforming the walls of the envelope, the ink pellet can be pressed out so that it is dropped into the ink reservoir.

[0005] US-A-4 864 330 discloses a refill cartridge in which a pellet of hot melt ink is connected to a handle. In this case, the pellet is held with the handle and placed into the inlet port of the ink reservoir. Since the pellet is held non-rotatably in this inlet port by a key structure, the handle can be broken away by turning the same, so that the pellet alone drops into the ink reservoir.

[0006] Although the ink pellets disclosed in these documents are temporarily held in the inlet port of the ink reservoir, there still remains the necessity to provide a closure member for sealing the inlet port during the time periods in which the printer is operating and no new pellet is filled in.

It is an object of the present invention to provide a method and a supply system for supplying pellets of hot melt ink to the printer in which the process of opening the inlet port of the ink reservoir, passing the ink pellet therethrough and re-sealing the inlet port is facilitated.

[0007] According to the invention, this object is achieved by a method in which one of the ink pellets is fitted in the inlet port so as to serve as said closure member, and, when the pellet is to be supplied to the ink reservoir, it is pressed through the inlet port and a new pellet is fitted therein.

[0008] Correspondingly, the ink supply system ac-

cording to the invention is characterized in that the closure member consists of an ink pellet held in the inlet port by friction, so that it can be pushed through into the ink reservoir.

[0009] Thus, when a new ink pellet is to be supplied into the ink reservoir, it is sufficient to handle the ink pellets themselves, and there is no necessity to handle any separate closure member.

[0010] Useful details of the invention are specified in the dependent claims.

[0011] Preferably, the inlet port is defined by a flexible membrane which can reversibly be deformed when an ink pellet is pressed through.

[0012] Depending on the size and configuration of the ink reservoir, the ink pellet held in fitting engagement in the inlet port will be subject to the heat of the melted ink in the ink reservoir to a smaller or larger extent. In a preferred embodiment the inlet port should therefore be thermally insulated from or shielded against the melted ink and/or the heating system of the ink reservoir at least to such an extent that the ink pellet serving as a plug for closing the inlet port will not be melted and become disintegrated before it is pressed into the ink reservoir and replaced by a new pellet. To this end, a heat shield may be provided inside of the ink reservoir, and/or a sufficient distance may be provided between the inlet port and the space accommodating the melted ink. If the walls of the ink reservoir are made of a material having a high heat conductivity for heating the ink or achieving an even temperature distribution, then the wall portions of the heat reservoir defining the inlet port may be made from a different material having a smaller heat conductivity.

[0013] Preferred embodiments of the invention will now be described in conjunction with the drawings, in which:

- Fig. 1 is a cross-sectional view of the essential parts of an ink supply system of an ink jet printer; and
- Fig. 2 is a view corresponding to figure 1 but showing the ink supply system in a different state; and
- Fig. 3 is a cross-sectional view of the essential parts of an ink supply system according to a second embodiment of the invention.

[0014] Figure 1 illustrates an ink reservoir 10 having walls 12 made of a thermally conductive material. As is generally known in the art, electric heating means (not shown) are in contact with or integrated in the walls 12 of the ink reservoir so that hot melt ink 14 contained in the ink reservoir is kept at a temperature of, for example, 120°C and in any case at a temperature above its melting point, so that the ink is kept in the liquid state and is ready to be supplied to an ink jet printhead (not shown) which is in fluid connection with the ink reservoir. As is also generally known in the art, the ink reservoir 10 and the printhead may be mounted on a reciprocating car-

riage of the printer, so that the ink reservoir 10 is moved back and forth in the direction of a double arrow A in figure 1 when the printer is operating.

[0015] The top side of the ink reservoir 10 has a tubular projection 16 the walls of which are made of a material which has a relatively small heat conductivity. A flexible membrane 18 is permanently fitted to the top end of the tubular projection 16 and defines a circular central opening which serves as an inlet port 20 for globular ink pellets 22, 24, 26 which consist of solidified hot melt ink and are to be supplied into the interior of the ink reservoir 10 on demand. As is shown in figure 1, the inlet port 20 is sealingly closed by an ink pellet 22 which is fitted into the opening of the membrane 18 like a plug and is held in position by frictional forces, with slight elastic deformation of the portions of the membrane 18 defining the edge of the inlet port.

[0016] The length and the material of the tubular extension 16 assures a sufficient thermal insulation between the pellet 22 and the heated walls 12 and the melted ink 14, even when the level of the melted ink 14 in the ink reservoir 10 is close to the maximum level. Thus, the ink forming the plug 22 will not melt, and the pellet will not become desintegrated, so that the inlet port 20 remains sealed permanently. Thus, the ink pellet 22 serves as a closure member which prevents vapors of melted ink from escaping out of the ink reservoir. Of course, this closure member also prevents dust and other contaminants from entering into the ink reservoir.

[0017] In the shown embodiment, a dispenser 28 for ink pellets is disposed above the path of travel of the ink reservoir 10 mounted on the reciprocating carriage. The dispenser 28 is held stationary in a position which is aligned with the tubular extension 16 of the ink reservoir 10 when the carriage stops in a predetermined home position. The dispenser 28 may be of any known construction suitable for dispensing ink pellets 24, 26 one-by-one. In the example shown, the dispenser forms a chute 30 for safely guiding the pellet being dispensed to the inlet port 20 of the ink reservoir. An elastic ring 32 is disposed inside of the chute 30 for frictionally holding the lowermost pellet 24 in position. The other pellets are supplied to the chute 30 via an inclined ramp 34, as is shown for the pellet 26 in figure 1. This pellet 26 abuts the pellet 24 in a position laterally offset from the chute 30. Thus, a pusher 36 which is reciprocally disposed above the chute 30 is ready to move downward past the pellet 26 and to engage the top side of the pellet 24 held in the chute.

[0018] Figure 3 illustrates a second embodiment of an ink supply system according to the invention. In this embodiment the projection 16 is formed into a so called pre-melt chamber, constituted of oblique and thermally conductive walls. The flexible membrane 18 is fitted to the top end of this pre-melt chamber.

In this embodiment the oblique walls are thermally connected with walls 12, which has the advantage that no additional heating means for heating the oblique walls

have to be present. When an ink pellet is fed into the ink reservoir via inlet port 20 it becomes engaged with the heated walls of projection 16 and melts. The melted ink flows along the oblique walls and enters the cavity surrounded by walls 12 via a small opening 40. From here, the fluid ink passes filter 41 and joins the liquid ink supply 14 held in the reservoir. In this embodiment the inlet port is also shielded against the melted ink and in particular against ink vapor originating from the liquid ink supply. This way the ink pellet serving as a plug for closing the inlet port will not be melted and become desintegrated before it is pressed into the ink reservoir and replaced by a new pellet.

[0019] When the printer has been operating for some time and a certain amount of liquid ink in the ink reservoir 10 has been consumed, it is necessary to supply another ink pellet into the ink reservoir 10 so that it may be heated and melted in order to increase the amount of liquid ink available in the ink reservoir. Then, the next time the carriage temporarily stops at the home position, the pusher 36 is moved downward, as is shown in figure 2. The lower end of the pusher 36 engages the pellet and presses the same through the ring 32, so that the pellet 24 falls onto the pellet 22 while still being guided in the chute 30. When the pusher 36 continues to move downward, the pellet 24 presses the lower pellet 22 deeper into the inlet port 20, so that the membrane 18 is elastically deformed. Finally, the pellet 22 is pressed through the inlet port 20 in its entirety and drops into the interior of the ink reservoir, while the configuration of the elastic membrane 18 is restored and the inlet port 20 is restrained again. Thus, the pellet 24 is caught by the membrane 18 and is then pressed into the inlet port by the pusher 36. The lower extreme position of the pusher 36 is set to assure that the pellet 24 is neither pushed through the membrane 18 nor repelled upward by the membrane but is firmly held in the inlet port 20 so as to serve as the new closure member.

[0020] When the pusher 36 is moved upward into the position shown in figure 1, the next pellet 26 is able to settle on the ring 32 of the chute 30, so that a new supply cycle may be started on demand.

[0021] It will be appreciated that the process of supplying a single pellet to the ink reservoir 10 as described above can be accomplished within very short time, without causing any substantial delay in the printing operation. As a result, it is not necessary to use ink pellets having a large volume in order to increase the intervals between the supply cycles. Since the pellets supplied into the ink reservoir have to be melted therein, a reduced volume of the ink pellets has the advantage that the fluctuation in the temperature and hence in the viscosity of the melted ink is greatly reduced, so that a uniform quality of the printed image can be achieved.

Claims

1. A method for supplying pellets (22, 24, 26) of hot melt ink to a printer comprising an ink reservoir (10) having an inlet port (20) through which the ink pellets can be supplied, and a closure member for sealingly closing the inlet port, characterized in that one (22) of the ink pellets is fitted in the inlet port (20) so as to serve as said closure member and, when the pellet (22) is to be supplied to the ink reservoir (10), it is pressed through the inlet port and a new pellet (24) is fitted therein. 5
2. Method according to claim 1, wherein the new ink pellet (24) is pressed against the pellet (22) forming the closure member so as to press the same through the inlet port (20). 10
3. Supply system for supplying pellets (22, 24, 26) of hot melt ink to a printer comprising an ink reservoir (10) having an inlet port (20) through which the ink pellets can be supplied, and a closure member for sealingly closing said inlet port, characterized in that the closure member consists of an ink pellet (22) held in the inlet port (20) by friction, so that it can be pushed through into the ink reservoir (10). 15
4. Supply system according to claim 3, wherein the inlet port (20) is formed by an opening in a reversibly deformable member (18). 20
5. Supply system according to claim 4, wherein said reversibly deformable member is an elastic membrane (18). 25
6. Supply system according to any of the claims 3 to 5, wherein the inlet port (20) is thermally shielded or insulated from a heated part (12, 14) of the ink reservoir (10). 30
7. Supply system according to any of the claims 3 to 6, comprising an ink pellet dispenser (28) disposed to be aligned with the inlet port (20) of the ink reservoir (10) when the latter is in a predetermined position. 35

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Fig. 1

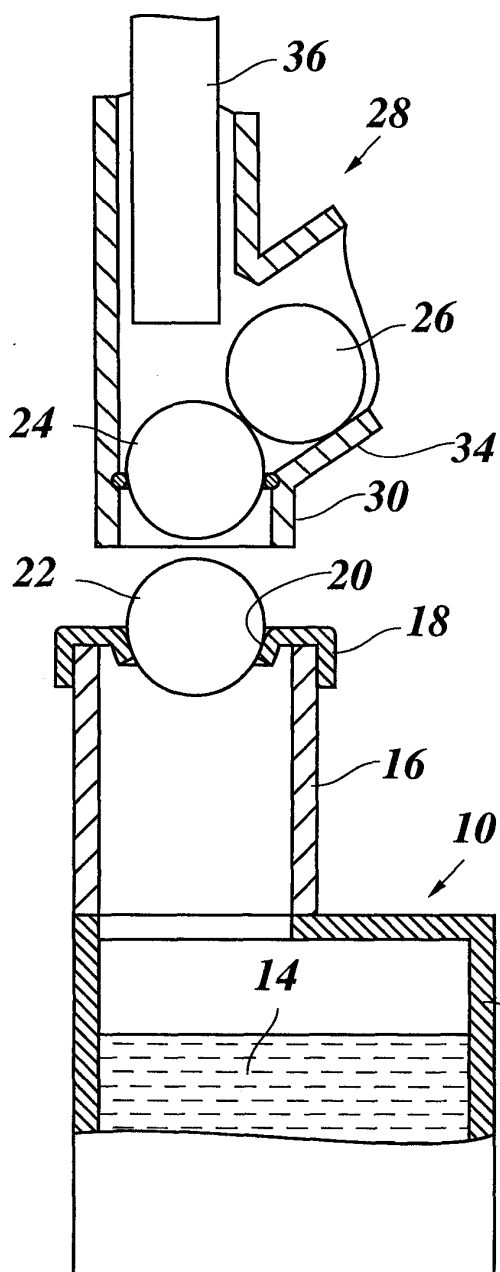
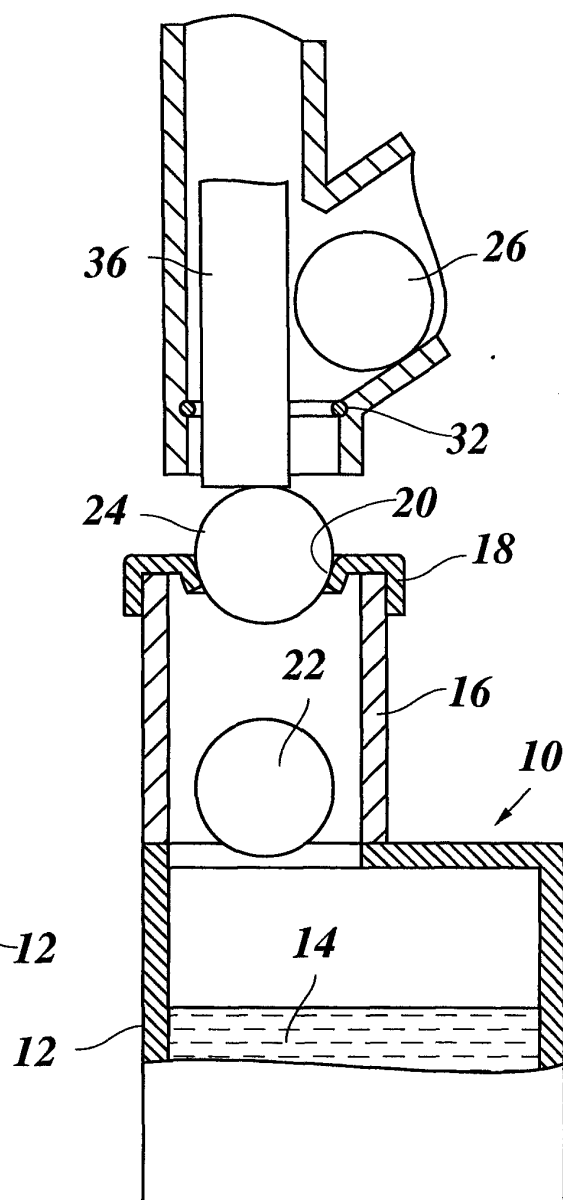
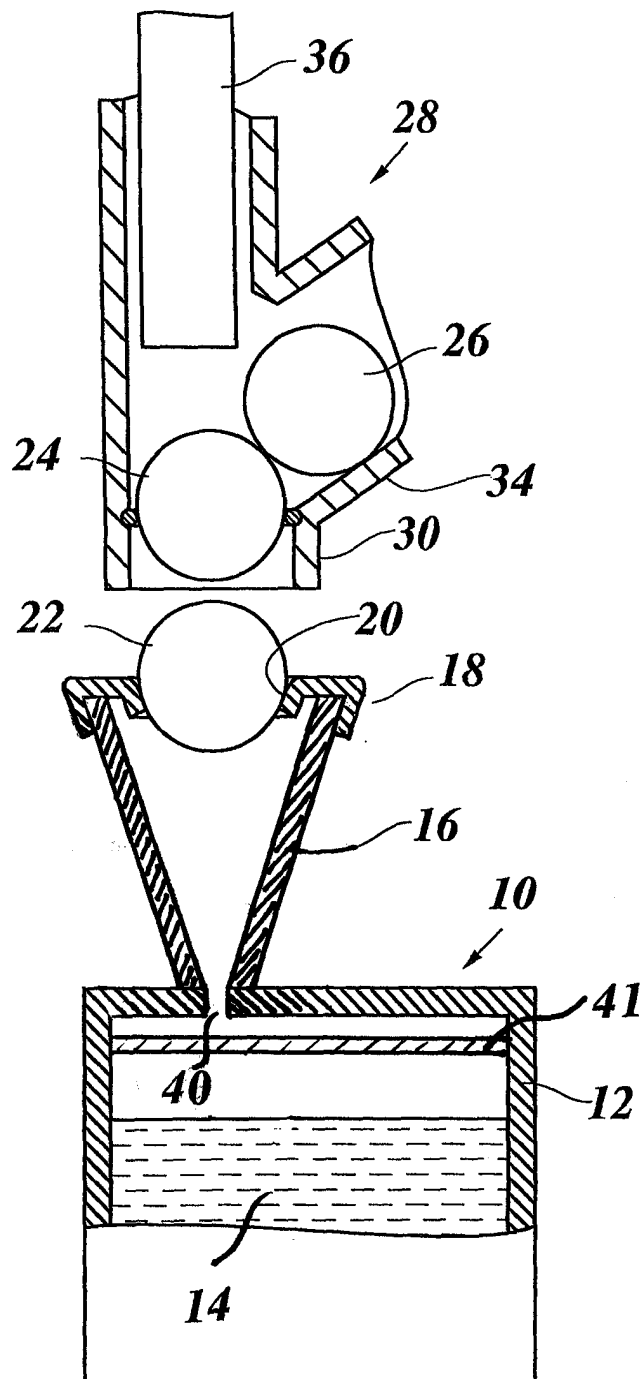


Fig. 2



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A

Fig. 3





European Patent
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Application Number
EP 00 20 4035

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Place of search THE HAGUE		Date of completion of the search 13 March 2001	Examiner Adam, E
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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The members are as contained in the European Patent Office EDP file on
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