

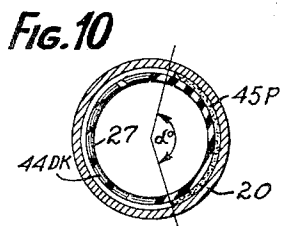
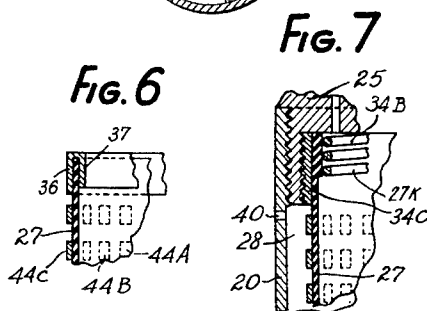
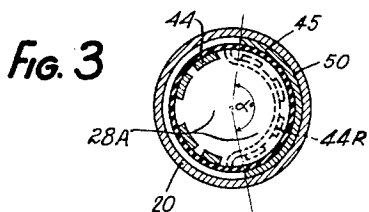
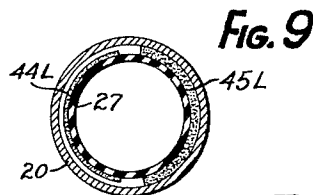
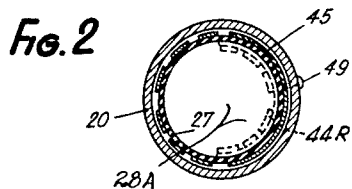
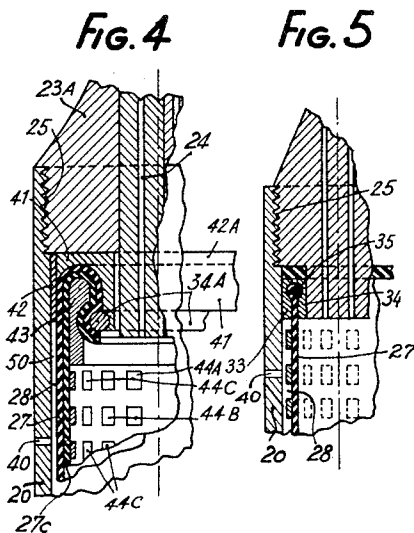
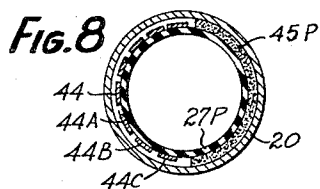
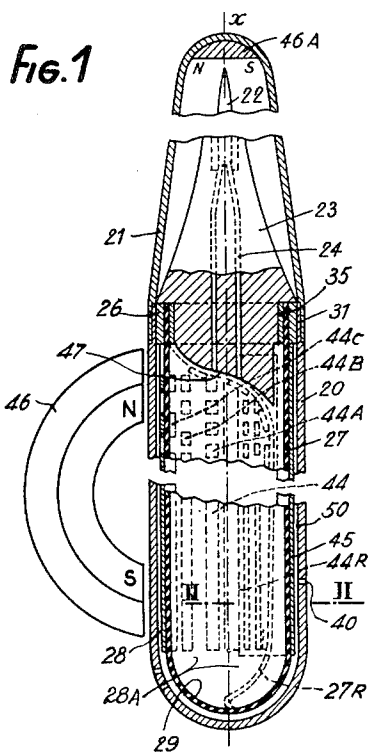
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3,168,889

FOUNTAIN PEN

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3,168,889

FOUNTAIN PEN

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In fountain pens of the type using a rubber ink reservoir, such ink reservoir obligatorily should have its walls thick enough and they should be made of such a rubber that after the reservoir is compressed by a lever and the lever is released, the elasticity of such rubber ink reservoir will be sufficient to soak in the ink and to acquire its normally expanded shape. An air pocket is always present in such a rubber reservoir and the structure is bulky, the rubber has to be quite thick and the mechanism also occupies a lot of space. Such pens cannot overcome the difficulty of leakage because air is, from the very beginning, partially enclosed or in some quantity enclosed inside of the reservoir above the ink when the pen is in writing position and this quantity of air increases continuously when the reservoir is being emptied. Any atmospheric pressure or change of temperature has an influence on this air and through it upon the ink, and the pen leaks. These are the defects of present known types. In addition, their reservoirs only takes in a ridiculously small amount of ink and requires continuous refilling.

This invention provides a pen which will substantially not leak, either under atmospheric or normal heat change conditions and it will hold much more ink than any other type of fountain pen including piston pens and others.

In this specification and drawings like references refer to like meanings.

FIGURE 1 shows on an enlarged scale schematically a cross-sectional side-view of one embodiment of this invention.

FIGURE 2 shows a cross-sectional plan view of FIG. 1 along II-II.

FIG. 3 is a cross-sectional plan view of another embodiment of this invention.

FIGS. 4, 5 6 and 7 are cross-sectional side views with parts broken out of other embodiments of this invention.

FIGS. 8, 9 and 10 are cross-sectional side views of other embodiments of this invention. One of the main aspects of this invention comprises a fountain pen which, instead of using the common rubber ink receiver (which as described above must have sufficient resiliency) uses a very easily bendable and easily self-collapsible (when open) ink receiver, which expression will comprise any receiver made from easily-bendable and easily self-collapsing either elastic or nonelastic material, such as for instance but not limiting thereto from thin latex or rubber compositions, artificial or natural such as used in male contraceptives or fish skin bladders or any other artificial or natural plastic and or resins offering the same characteristics. When above it was stated that the latex can be elastic or non-elastic the word "elastic" in relation to this invention means that it will permit easy bending. According to this invention it is not necessary that the ink receiver has an elasticity necessary for pumping of ink, nor is it necessary that the ink receiver, according to this invention, could be expanded. Obviously, the ink receiver according to this invention could be stretched and expanded considerably as does latex, but such capacities or expansion are not used when the pen is in operation and only the bending and the self-collapsing capacities are used. The pressure of ink upon the walls of the ink-receiver is so minimal, that no expansion of the latex, rubber, etc. of which these walls are made is required.

In all figures this easily bendable, self-collapsible ink receiver 27 is shown as made of latex, but it could be made of any other suitable material.

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In FIGURE 1, the fountain pen casing 20 is shown with the cap 21 on an enlarged scale and diagrammatically and the easily bendable, self-collapsible ink receiver 27 could be mounted in the casing in any desirable manner, for instance as shown on FIG. 1, on a ring 35, which ring then could be mounted on a ring support 26 which itself is a ring, either screwed in or slidably mounted upon a recess (31, FIGURE 1) provided upon the casing 20. The pen-holding member 23 is shown as made of one piece but it could be made of several pieces as well known in the art and this member or one of its members could be provided with at least one channel 24 for the flow of ink from the ink receiver 27 to the pen 22 mounted on said member. The member 23 could be slidably mounted as shown by 31A on FIGURE 1. The ink receiver 27 could be of the same dimensions as the inner part of the casing 20, in which case there will be practically only a thin film of air interposed between the inner surface of the casing 20 and the outer surface of the ink receiver 27. This film of air 28 could in fact be very small (even zero) or, if desired, have a certain small dimension. When the ink receiver 27, after some writing was done, will diminish by its self-collapsing effect its volume of ink, it will automatically take the shape and place as shown in dotted lines by 27R. This is shown approximately because any shape could take place. If the casing would have been hermetically sealed, the space 28 when enlarged to the space 28A corresponding to the position 27R of the ink receiver could not exist unless it will be a vacuum, and according to this invention, the casing 20 is provided with at least one hole 40, and preferably several of them, to permit the atmospheric air to penetrate freely when required from the atmosphere into the space 28 thus maintaining in the space 28A the same pressure as in the atmosphere. This is an extremely important aspect of the invention and this is achieved only because the ink receiver 27 is easily collapsible. Thus it will automatically adapt itself to any condition of the atmosphere. Such openings 40 could be in fact very small, for instance $\frac{1}{2}$ mm. in diameter or even smaller, or they may be as big as desired and have any form and contour and to be at any angle to the symmetrical axis X.

The absence of air in the ink receiver subject of this invention is always maintained because the air simply cannot penetrate into the ink receiver through the channels 24 once the ink receiver has been filled with the ink because of the self-collapsing qualities of the ink receiver 27. The fact of not having any air pockets in the ink receiver 27 eliminates entirely the leakage of the pen due to the change of atmospheric conditions or temperature, etc. and this is a very important feature. Ordinary pens, when heated only by the heat of the hand, spill out ink because the air pocket inside of their receivers enlarge in its volume from the heat and squeezes out the ink. This invention does not have any of such defects.

On FIGS. 1, 4, 5, 6, 7 are shown types of affixing the open end of the easily bendable, self-collapsible ink receiver 27 to the pen casing 20.

On FIGURE 8 is shown a very economical mounting of the ink receiver 27, upon the casing 20 by means of pressing its upper open end part toward the inner wall of the casing 20 by means of a resilient spiral ring 34 which has one end overlapping another and may have one and a half or more spirals. On FIGURE 4 is shown another embodiment of this invention having for safety measures two concentric ink receivers 27 and 27C, each one mounted into another one. The use of such two independent ink receivers 27 and 27C give an additional safety in case the inner receiver will be broken which could be noticeable and could be remedied. The mounting of two receivers could be made in any desirable manner. If without spacing them the outer edges of the open

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end of the ink receivers 27 and 27C could be wrapped around a ring member 43 having a small groove in it to receive a tightening ring 34A. The outside surface of the outer ink receiver 27C could be protected by a ring 42 tightly inserted. In addition, another ring 41 could be provided to protect the wear of the curved ends of the ink receivers. FIGURES 6 and 7 show an ink-receiver 27 provided with second reinforcement means such as 44, 44A, 44B and 44C. On FIG. 6 the ink-receiver 27 is attached to an ink-receiver-supporting-ring consisting of two (parallel one to another and spaced one from another) ringwalls 36 and 37 in between which the open end of the ink-receiver is inserted. The pen-holding member 23A of FIG. 4, the pen-holding member 23B of FIG. 5 and FIG. 7 the pen-holding member 23C and the casing 20 are provided with threads 25 and thus could be screwed one into another. In FIG. 7, in addition another thread 25C is provided between the inner surface of the pen-holding member and the outer surface of the ink-receiver-holding ring 34C upon the outer surface of which the ink-receiver 27 is mounted by resilient spiral means 27K.

On FIGS. 1, 2 and 3 is shown important aspects of this invention which comprises providing one part of the ink receiver, for instance the part of the right side looking at FIGURE 1 and FIG. 3 with a long rigid and very thin member 45 which could occupy preferably less than 180° angle for instance some 160° or more or less part of the circumference of the walls of the ink receiver. This rigid, thin member could be made of very thin metal, preferably non-magnetic such as brass or aluminum or copper, etc. and could be rigidly affixed by adhesives or glue or by vulcanizing upon the part of the ink receiver which it contacts and this rigid member 45 could then be affixed by any known means or by adhesive or glue 50, FIGS. 1 and 3, etc. or by small screw or bolt, 49, FIGURE 2, etc. to the right side of the casing 20. The opposite left side of the ink receiver 27 is then, according to this invention, provided with at least one member 44 attached to the ink receiver 27 by any known means, adhesives, glue, vulcanization, etc. This member 44 should be made of such a material or metal which is attracted by a magnet, for instance from iron or steel, aluminum alloys, etc. This member 44 is not attached to the casing 20. It could be made in the form of one or more strips 44, FIGURES 1, 2 and 3. On FIGURES 1, 2 and 3 are shown six strips 44 extending longitudinally parallel to axis X in its lower part of the pen when looking upon the drawings. If desired, instead of strips 44 the upper part could be provided not with the strips but with small pieces 44 designated as 44A, 44B, and 44C, which could be for instance small pieces of easily attracted by magnets metal and have for instance a circular form from 1 to 5 mm. in diameter or be in a form of small squares having sides of 1 to 5 mm. Such pieces could be placed one at a distance from another, for instance from 1 to 5 mm. distance and will permit a very easy bending of that upper part of the ink receiver so that it could easily take the position as shown in dotted lines by 27R when the ink receiver is nearly totally collapsed. The dimensions for the members 44 and 44A, 44B, and 44C as well as for 45 are not limited to the given figures which were given as examples only, and the thickness of these members could be as desired, for instance $\frac{1}{20}$ of a mm. or less or more. Excellent results are obtained with a thickness of $\frac{1}{5}$ to $\frac{1}{4}$ mm.

All these beforementioned members 44, 44A, B, C and 45 could be as well embedded inside of the wall of the ink receiver, thus protecting them against corrosion, in which case such members will be covered on both sides with a latex or other material from which the ink receiver is made. The structure as shown in FIGURES 1, 2 and 3 permits a very easy filling of the fountain pen without taking off the pen-nib-holding member 23 or 23A and by using a simple magnet 46 shown schemati-

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cally on FIGURE 1 which when placed in the position as shown on FIG. 1 will then attract the strip 44-44A, B, C, together with the collapsed wall 27R of the ink receiver from its position on the right toward its normal position 27 as shown in plane lines. If the fountain pen is held with its nib held immersed in the ink, then the magnet will attract the parts 44 from their position 44R to the position 44 and will thus suck in the ink accordingly, without sucking any air (if the nib is properly immersed) and after it is filled it will be ready for use.

FIGURES 2 and 3 show in broken lines the places which are occupied by members 44 when they are collapsed and take the position of 44R and that is the reason why they should be made in the form of narrow strips to permit them to occupy the maximum collapsible position.

In all the drawings the thickness of the ink receiver 27 has been shown as being excessively thick, for illustration purposes only but according to this invention, it should be extremely thin for instance as thin as the latex used for male contraceptives, or any similar material, not limiting however this invention thereto, and any other suitably thin material could be used, if it provides the easily bending, self-collapsing characteristics in accordance with this invention.

Although this invention recommends the use of very thin-walled ink receiver, it is obvious that it as well covers all such fountain pens which will use a thicker wall thickness (for their ink receiver 27) than recommended by this invention, provided that this thicker wall thickness nevertheless will still be sufficient to perform the characteristics as herein described and claimed, i.e. to provide a substantially easily bendable and self-collapsible ink receiver sufficient to assure the working of this invention.

The magnet could be as well of any appropriate form and shape, for instance be wide enough to attract independently substantially in radial direction some of the metal strips and pieces 44, 44A, 44B, 44C, etc. FIG. 1 shows six rows of such strips or of such pieces. Only strips or only scattered pieces or combination of them could be used at any suitable place of the ink-receiver, and all of them will be attracted by the magnet from their position 27R into the position 27 when filling of the ink reservoir is performed. If the full pen should be required to be emptied, the magnet should be placed on the right side and then the parts 44, 44A, 44B, and 44C will be attracted from the position 27 into the position 27R shown in dotted lines and thus the ink will be expelled from the ink receiver.

When the part 45 is provided and is affixed to the casing, then when the ink receiver collapses it may occupy in its upper part a position shown by the curved contour of the member 47, FIG. 1, which for such a purpose could be specially provided with such a matching contour. This, however, is not at all indispensable and a simple flat bottom, such as shown in FIGURES 4 and 5, could as well be used with excellent efficiency.

In order to be sure that all air is evacuated from the ink receiver, it may be necessary to repeat a partial filling and evacuation process at least in part one or more times. An easy control proving the absence of air is achieved by checking the outflow of the ink when placing the fountain pen vertically with the nib up and then approaching the magnet slowly from the left side FIGURE 1 which will then cause the ink to flow out and as soon as the ink will start to flow out there will be proof that air is already expelled entirely from the ink receiver. Then such a pen could be immersed with the nib down into the ink bottle and the magnet placed on the right side and filling of the ink receiver completed.

A magnet could be provided separately or it could be attached to the safety cap 22 as shown by the magnet 46A, FIGURE 1, or the magnet could be attached to the stop-

per or cover of the ink bottle especially designed for the use with this invention.

According to this invention, when magnetic attraction is used, the proper side of the fountain pen where such magnet should be placed could be marked accordingly with a color or mark or plus and minus signs, one corresponding to the filling action and the other to the emptying action of the ink reservoir. If no signs are provided, then the plan view side of FIGURE 1 could be considered as the filling side and vice versa.

The magnetic aspect of this invention could be as well used for any conventional old-type fountain pen such as a Waterman pen which uses a rubber Waterman-type ink receiver, i.e. an elastic, non-collapsible and not easily bendable ink receiver, in which case such conventional old-type rubber ink receiver could have a little thinner wall thickness and if provided with the re-enforcement means 44 or 44A, 44B, and 44C on one side and 45 on the other side, it could then be operated magnetically according to this invention.

The reinforcement 45 of FIGURES 1, 2 and 3 permits to hold that area of the circumference of the ink receiver which it covers, for instance for 160° or 170° but preferably not more than 180° because if more than 180° the total collapsing will not be possible. Instead of using the reinforcement 45, it could be entirely avoided provided that the area in question of said beforementioned 160° or 170° about but not limiting thereto will be either entirely or in parts or along its contour affixed to the casing by adhesive or other means such as 45P, FIGURE 8, thus substituting the walls of the casing for the action of the reinforcement 45. Such an arrangement will be more economical but each time the ink receiver will have to be replaced it should be removed from the casing by means of destroying the adhesion means by which it was attached to it. The functioning of such partially sidely glued-on ink receiver, also provided with members 44 and/or 44A, and 44B, and 44C, is exactly the same as described for FIGURES 1, 2 and 3.

The ink receiver of FIGURES 1, 2 and 3, provided with the reinforcements 44 and/or 44A, 44B and 44C, and/or 45 (the latter 45 could be substituted by gluing means 45P FIG. 8 and FIG. 10 as above described) provides a new type of reinforced easily bendable in at least one direction and easily collapsible in at least one direction ink receiver which is an important aspect of this invention and could be used for any fountain pen in combination with the magnetic operation of it.

The member 45 could, if desired, also be made of several strips or composed of scattered around plurality of small pieces whichever is more convenient for an appropriate structure. If desired, instead of using metal reinforcements for the members 44, 44A, 44B, 44C, and 45 such reinforcements could be achieved by means of covering the respective area to be reinforced with appropriate varnishes or plastics in appropriate layer thicknesses as shown by 45L and/or 44L FIG. 9. The layer used for the substitution of the members 44, 44A, 44B, and 44C should be made of magnetically attachable substances, for instance with powdered iron or powdered aluminum alloys intermixed with suitable binders or latex, etc. and the like and such layers 45L and/or 44L FIG. 9 will then substitute for the reinforcements made of thin metal. Any such reinforcement members may be embedded into the thickness of the wall of the ink-receiver as shown by reinforcement means 44DK, FIG. 10.

In résumé, it could be said that this invention provides a new and highly economical fountain pen which will have the best characteristics against leakage due to changes of atmospheric conditions and heat conditions, and will comprise and hold the maximum possible of ink, and will give a perfect even flow of the ink at any condition, and the ink receiver will have no trouble-making air pockets in it.

What I claim is:

1. A fountain pen having a casing, a cap, a pen nib, a pen-nib-holding member easily removable rigidly mountable on said casing, said member having at least one ink-feeding channel, and an ink receiver made of very thin, easily bendable, easily self-collapsible material of the group of latex, rubber composition artificial or natural in particular such as used in male contraceptives, fish skin bladders, natural and artificial plastics and resins, whereby said ink receiver will collapse when emptied of ink stored therein, said ink receiver closed on its bottom side opposite to said pen nib and open on its upper side closest to said pen nib, said upper side of said ink receiver communicating with said ink-feeding channel, at least one small opening provided in the walls of said casing establishing a free passage for the air from the atmosphere to the free space provided inside of said casing between the inside surface of said casing and the outside surface of said ink receiver, whereby when said ink receiver changes its volume and its form due to its emptying of or filling with ink, the atmospheric air will freely enter into said free space and establish therein the same atmospheric conditions as outside of the casing, at least one part of said ink receiver being provided along at least a part of its longitudinal symmetry axis with at least one first thin reinforcement means attached accordingly at least partially to said ink receiver, said first thin reinforcement means being further attached by suitable attaching means to a corresponding part of said casing, the width of said first thin reinforcement means encircling partially said ink receiver, being preferably not more than 180° of the area of the circumference of the ink receiver contacted by it, at least one second thin reinforcement means made from a material easily attractable by a magnet being attached in that place of said ink receiver which is diametrically opposed to said area occupied by said first thin reinforcement means, said second thin reinforcement means being attached to the walls of said ink receiver at least in a part of said place but being not attached in respect to said casing and thus having a freedom of up and down collapsing movement at least in the radial direction towards the position of said first thin reinforcement means, whereby when the ink receiver is collapsed and emptied of ink and its pen nib immersed into an ink bottle, it could be filled with ink by the action of magnetic attraction force of a magnet provided therefor and to be placed at that area of the casing which corresponds to the place occupied by said second thin reinforcement means before collapsing of said ink receiver, said magnetic attraction force acting throughout the casing will attract magnetically said second thin reinforcement means from its collapsed position to the position when the ink receiver is filled with ink.
2. A fountain pen as set forth in claim 1, wherein the inner surface of said casing contacts substantially the outer surface of said ink receiver and of said second thin reinforcement means.
3. A fountain pen as set forth in claim 1, wherein the said width of said first thin reinforcement means is about from 160° to 175° of circumference of said ink-receiver and said second thin reinforcement means are made of a plurality of long strips spaced one from another and parallel one to another and parallel to the longitudinal symmetry axis.
4. A fountain pen as set forth in claim 1, wherein the said width of said first thin reinforcement means is about from 160° to 175° of circumference of said ink receiver and said second reinforcement means comprises a plurality of long strips parallel one to another and parallel to the longitudinal symmetry axis of said ink receiver and spaced between them and also comprising a plurality of small pieces scattered over said place of said ink receiver placed near the upper part closest to the pen nib of the ink receiver to permit its longitudinal flexibility when collapsing.

5. A fountain pen as set forth in claim 1, wherein said first thin reinforcement means are made from a layer of a reinforcement substance attached to said ink receiver and said casing.

6. A fountain pen as set forth in claim 1, wherein said first thin reinforcement means are provided by attaching said area occupied by them directly to said casing at least in part of said area of said casing being contacted by said beforementioned area of said ink receiver.

7. A fountain pen as set forth in claim 1, wherein either of said reinforcement means may be provided inside of said ink receiver thus being attached to the inner surface of the same.

8. A fountain pen as set forth in claim 1, wherein at least one of said reinforcement means is imbedded into the thickness of the wall of said ink receiver.

9. A fountain pen as set forth in claim 1, wherein at least one of said reinforcement means may be provided upon the outside surface of said ink receiver and accordingly attached to its wall.

10. A fountain pen as set forth in claim 1, wherein said upper side of said ink receiver is mounted in at least one ring-shaped support and said support is mounted accordingly beneath said pen-nib-holding member, sealing means provided to prevent the flowing out of ink through any other means than said ink-feeding channels.

11. A fountain pen as set forth in claim 1 wherein said first reinforcement means consist of an adhesive which attaches a part of the wall of said ink receiver to a part of the inner wall of such casing.

12. A fountain pen as set forth in claim 1 wherein said second reinforcement means consist of a magnetically attractable powdered material embedded in the walls of said ink-receiver.

13. A fountain pen as set forth in claim 1 wherein one part of the ink-receiver is attached longitudinally in respect to the casing and the opposite to it part of said ink-receiver is provided with at least one thin rigid reinforcement means made from a material which is easily attractable by a magnet.

14. A fountain pen as set forth in claim 1 wherein said second reinforcement means consists of a plurality of small elements each having a surface of not less than 1 mm. sq. and not more than 23 mm. sq.

15. A fountain pen having a casing and an easily bendable substantially self-collapsible thin walled ink-receiver placed inside of said casing substantially adjacent to its inner surface and having a pen-holding member secured within an end thereof, said member having ink-channels therethrough, said ink-receiver having an open end hermetically sealed to said member and communicating with said channels, said ink-receiver being subdivided longitudinally into two substantially half parts, a first non-movable part and a second movable part, said first non-movable part being provided with attaching reinforcing means which hold it unmovably in respect to the adjacent part of the inner surface of said casing, said second movable part being provided with magnetically attractable means attached to it but not attached to said inner surface of said casing, whereby when a magnet is placed outside of said casing substantially along said second movable part, said second movable part will be moved to-and-fro by the force of said magnet thus exercising respectively an action of pumping or of evacuating the ink into or from said ink-receiver.

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