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(54) A fluid sealable container for an ink tank cartridge

(57) A fluid-sealable container in combination with
an ink tank cartridge, wherein said ink tank cartridge is
packed in the container under a low pressure so that a

space is maintained in said container.

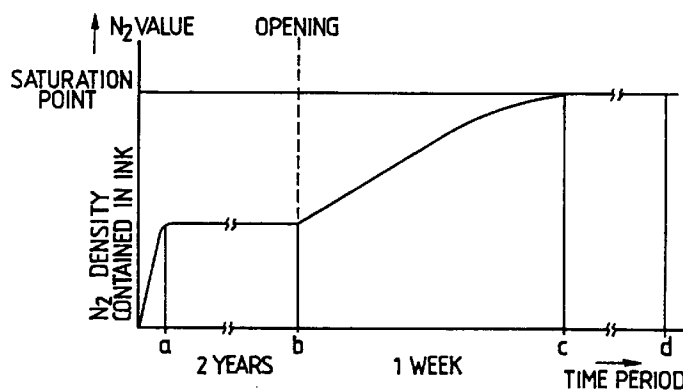


FIG.6

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Description

The present invention relates generally to a fluid sealable container for an ink tank cartridge for use in an ink-jet type recording apparatus for ejecting ink droplets onto a recording medium and more particularly to a structure of an ink tank cartridge for use in the ink-jet type recording apparatus.

Generally, according to the recording apparatus of this type, an ink is supplied to a recording head from an ink tank constructed as a cartridge.

It is advantageous to maintain an ink supply pressure (negative pressure) from an ink tank to a recording head within a range from -30 to -100 mmAq (i.e. a waterhead) so as to achieve a stable ink ejection of the recording head of the ink-jet type recording apparatus. However, it is difficult to control the ink supply pressure using a height differential at which the ink tank is installed, particularly in the case of an ink-jet recording apparatus of an on-carriage type in which a recording head and an ink tank cartridge are mounted on a carriage. Unexamined Japanese Patent Application (OPI) No. Hei. 2-187364 proposes that a porous member is housed within an ink tank (cartridge) thereby to generate a negative pressure between the ink tank and the recording head owing to capillary action of the porous member.

However, since the Japanese Patent Application Hei. 2-187364 is directed to one type of recording apparatus by which both an ink tank and a recording head are formed unitarily and both these components are replaced with a new one when ink contained in the ink tank becomes empty, it does not address the other problems or difficulties, such as undesired air flow to the recording head or leakage of ink which may occur when only the ink tank is selectively removed from the head.

Moreover, this later reference does not consider the problems of storage and replacement of an ink tank cartridge.

Japanese Patent No. Hei. 3-61592 teaches using 20 Torr as an example of the negative pressure to be applied during the packing of the ink tank cartridge, which pressure is much higher than the pressure under which the ink is filled within the tank. However, this may cause a problem since the ink tank cartridge is subject to atmospheric pressure because the location for the ink-filling process and that for the packaging process are usually spaced far from each other. Thus air which penetrates into the ink becomes free to produce air bubbles when the larger negative pressure is applied during the packaging process. As a result, undesirable ink-leakage may occur and, further, the air bubbles generated in the porous member may obstruct the ink current flowing from the ink tank cartridge to the recording head which would cause an ink-failure during printing.

The present invention is made in view of the foregoing problems or difficulties accompanying the conventional ink-jet type recording apparatus employing a cartridge type ink tank structure. Accordingly, an object

of the present invention is to provide a fluid-sealable container in combination with an ink tank cartridge, wherein said ink tank cartridge is packed in the container under a low pressure so that a space is maintained in said container.

Also the present invention is directed to a fluid sealable container in combination with an ink tank cartridge, wherein said ink tank cartridge is packed in the container under a negative pressure which is closer to atmospheric pressure than the pressure under which the ink is filled in the ink tank cartridge.

Embodiments of the present invention will now be described with reference to the accompanying drawings, of which:

Fig. 1 is a schematic perspective view showing an example of an ink-jet type recording apparatus to which an ink tank cartridge according to the present invention is applied;

Fig. 2 is a cross-section along the line A-A of figure 1,

Fig. 3 is an enlarged cross-section of an ink supply needle and peripheral parts shown in Fig. 2;

Fig. 4 is a circuit diagram of an ink near-end detecting circuit;

Fig. 5 shows one example of the bag packing therein the ink tank cartridge according to the present invention;

Fig. 6 shows the variation of an amount of nitrogen against the time after opening the packaging bag;

Fig. 7 shows an arrangement of packing the ink tank cartridge according to the present invention;

Fig. 8 shows an arrangement of the ink tank cartridge having a flange with respect to a finger;

Figs. 9-I and 9-II are cross-sections showing ink tank cartridges;

Figs. 10A-1 to 5 are enlarged cross-sections of sealing members and sealing members stopping member shown in Figs. 9-I or 9-II;

Fig. 10B is a cross-section cut along the line B-B of Figs. 10A-1 to 5;

Fig. 11 is a cross-section showing part of an ink tank cartridge;

Fig. 12 shows an ink supply needle; and

Figs. 13A and 13B are cross-sections of the ink supply needle being applied to the ink supply cartridge.

Fig. 1 is a schematic perspective view showing an example of an ink-jet type recording apparatus to which an ink tank cartridge according to the present invention is applied. As shown in Fig. 1, the ink-jet type recording apparatus is provided with a carriage 1 slidably mounted on guide shafts 2 with respect to a longitudinal axis of a platen 3. On the carriage there is installed an ink-jet recording head 4 for ejecting ink droplets in accordance with a print signal and an ink tank cartridge 5 for supplying ink to the recording head. A capping apparatus 6 is disposed outside a printing region which

engages with a front surface of the recording head 4 to prevent nozzle openings from drying when printing has stopped. The nozzle openings are sealed by the capping apparatus 6 and forced to eject ink by a negative pressure generated by a vacuum pump 7 immediately after the ink tank cartridge 5 is replaced with a new one or an ink ejection ability is lowered during continuous printing. The ejected ink is introduced to an ink storage tank 9 through a pipe 8 and stored therein.

The apparatus further includes a transmission cable 10 for transmitting printing signals to the recording head 4.

Fig. 2 is a cross-section of the ink tank cartridge which is applied to the recording apparatus. The ink tank cartridge is provided with a housing 11 constituting an ink tank cartridge body, which has an opening 12 at the top and an ink supply port 15 formed unitarily therewith at a bottom surface 13 with which a hollow ink supply needle 14 resiliently engages. The housing 11 is tapered in such a manner that the bottom surface 13 is smaller in diameter than the top surface. However, the housing need not be tapered but a cylindrical shape having a straight wall may be employed.

The ink supply port 15 is pipe-like shaped and projects from a bottom surface of the housing 11 both inwardly and outwardly. A mesh filter 17 having a pore size of 20 to 100 μm is fuse bonded onto an upper opening 16 of the ink supply port 15 projecting towards inside the housing 11. The filter may be formed of a high polymer material or an anti-corrosion metal such as stainless steel. A step portion 18 is formed at an inner central portion of the ink supply port 15. A packing member 19 for resiliently contacting the ink supply needle 14 to the inside of the supply port 15 is disposed inside the ink supply port 15 at a lower side of the step portion 18 for providing a liquid seal.

The packing member 19 is formed of a rubber ring, a so called O-ring. A sealing film 20 is fuse bonded onto a lower opening of the ink supply port 15. The film 20 may preferably be formed of a sealing material such as a high polymer film or a high polymer film with metal layer laminated on the film so that the film 20 demonstrates a high sealability while not capable of being torn by an external force such as contact by a finger.

A porous member 21 has a width which is a little bit larger than that of the opening 12 of the housing 11 and a height which is a little bit higher than the housing, so that the porous member 21 is compressed within the housing 11. Further, the lower end portion of the porous member 21 facing the filter 17 of the ink supply port 15 is compressed by the ink supply port 15 protruding inside the housing. A lid 22 covers the opening 12 of the housing 11 and includes a plurality of ribs 25 projecting towards the inside of the housing 11 to compress the porous member 21 and keep respective spaces 24 within the ink tank cartridge between the lid 22 and the porous member 21.

An electrode 26 is provided in the ink supply port 15 while another electrode 27 is provided in the bottom

portion of the housing 11 to detect an ink near-end condition where the ink is almost empty in the tank and there is only ink in the ink supply port 15. As shown in Fig. 4, an AC voltage V_{cc} is applied to the electrodes 26, 27 through a resistor R, and the variation in voltage between the electrodes is detected by a differential circuit 30. A comparator 31 compares an output signal of the differential circuit 30 representing a voltage variation ratio with a preset value generated by a preset value supplying circuit 32. If the voltage variation ratio is larger than the preset value, that is, the ink impregnated in the porous member 21 becomes almost empty, an ink near-end signal is output and the ink near-end condition is therefore detected.

As shown in Fig. 3, the hollow ink supply needle 14 co-operating with the ink tank cartridge has a conical end, and a plurality of through holes 36 are formed in a tip end surface 34 of the ink supply needle 14 for communicating the ink contained within the ink supply port 15 with an ink supply path 35 formed inside the needle 14.

The ink is filled in the pores of the porous member 21 accommodated within the housing 11 of the ink tank cartridge under low pressure of about 0.2-0.4 atmospheric pressure. The filling of ink under low pressure is very useful as a means for keeping a good printing quality as taught in Unexamined Japanese Patent Application (OPI) No. Sho. 60-245560.

After filling ink into the porous member 21, the ink tank cartridge is packed up for shipping in a bag formed of a high sealable material such as, for example, a laminate film having aluminium layers.

Fig. 5 shows one example of the bag, packing therein the ink tank cartridge, according to the present invention. The ink tank cartridge is wrapped by a pair of laminate films 37 formed of aluminium which provide a very high sealability, decompressing air in the bag and then fuse-bonding at flange portions 38 of the films 37.

Under these circumstances, the present inventors found that it is most preferable that the ink tank cartridge is packed under a negative pressure which is only a little bit larger (closer to atmospheric pressure) than the pressure under which the ink is filled within the tank.

When using ink comprising dyes which would generate free gas (due to the resolution), if low pressure is maintained within the packaged bag the amount of gas to be impregnated in the ink is lowered. Accordingly, deterioration of the print quality due to this free gas can be effectively prevented. Further, even when using an ink which is not subject to deaeration, the presence of the low pressure space within the bag helps the ink to deaerate while stocked and, moreover, the ink is prevented from leaking from the bag to the outside.

Next, the value of the low pressure during the packaging process and the deaeration rate of ink under the low pressure condition after a stocking period will be described with reference to an amount of nitrogen as a main part of air as a parameter.

Following experimentation, the deaeration rate of

the ink contained within the ink tank cartridge can be controlled by varying the pressure during the packaging process. Table 1 shows the packaging pressure (negative gauge pressure) when the nitrogen density during the packaging process is set to be the saturation value of 13-14 ppm and the nitrogen density impregnating into the ink contained in the ink tank cartridge when the packaging bag is opened.

TABLE 1

Low pressure value (atmospheric pressure)	Amount of Nitrogen (ppm)
0.5	7.5-9.0
0.35	7.0-8.5
0.2	6.0-7.5

The description will now describe the variation of the deaeration of ink contained in the ink tank cartridge after opening the bag with reference to an amount of nitrogen contained in the ink as a parameter. Fig. 6 shows a variation of an amount of nitrogen after opening the packaging bag. Since the ink tank cartridge has a space kept by the ribs projecting from the lid, a constant amount of air corresponding to the pressure exists within the bag from immediately after the packaging process. Accordingly, within a short period (point a), the density of nitrogen within the ink rapidly rises as shown in Fig. 6, and after that, the density is constant because of the high sealability of the bag. The constant period continues for about two years from manufacture. After opening the bag (point b), the amount of nitrogen contained in the ink increases and reaches a saturation point (point c) about one week after opening. Even when saturated, the printing quality does not deteriorate within about one to four weeks (b to d) after opening within which one cartridge is normally used for printing.

It is more preferable that the space maintained in the packaged bag is substantially 15% of the total inside volume of the bag after packing.

The effect of deaeration of ink will now be described. When the ink tank cartridge is removed from and attached to the ink supply needle, an amount of air entering from the hollow needle is normally extremely small. According to experimentation, when the diameter of the hollow needle is about 0.8 mm, the amount of air entering was below 0.4 mm³ at most which corresponds approximately to a meniscus of ink. The ink once entering the ink supply port flows towards the recording head and is trapped by a filter (not shown) mounted in a filter chamber. The air trapped by the filter would not easily pass through the filter because the pore size of the filter is very fine. According to experimentation, employing a filter having a diameter of 4 mm and a thickness (height of filter chamber) of 0.3 to 0.5 mm, after removing and attaching the ink tank cartridge to the needle as much

as ten times or more, the air did not pass through the filter while the recording apparatus is operated.

Accordingly, during the period from the point b to c of Fig. 6, the deaerated ink is apparently supplied to the recording head, and even if the ink tank cartridge is removed and attached to the ink supply needle and air enters in the ink supply port from the needle, the air is impregnated into the ink and, accordingly, the recording apparatus does not suffer from any problem.

On the other hand, when the ink tank cartridge is removed from the apparatus and left for a while, air enters from the ink supply needle. As is known, air destroys the siphon phenomenon and causes an undesired ink-failure. To prevent such a problem, the ink-jet type recording apparatus is provided with a vacuum pump for forcibly ejecting ink from ink nozzles by applying a negative pressure to a recording head. In this operation, we have found that recovering from ink-failure depends on a deaeration rate of ink following experimentation. When using ink one to four weeks after the bag is opened, no problem occurs when the air contained in the filter chamber is ejected by the operation of the vacuum pump. On the other hand, however, after that time period if the amount of air contained in the ink is completely saturated or may even be excessively saturated due to a variation in temperature, fine air bubbles may be generated by an action of negative pressure during the ink-failure preventing operation, which causes the problem in obstructing ink flow.

Fig. 7 shows an arrangement of packing the ink tank cartridge in which a cartridge is surrounded by an absorbing member, such as sponge grains 40, and accommodated in a packaging bag 41, and then subjected to a decompression process. According to this arrangement, since the sponge grains 40 form a space inside the packaging bag, the low pressure during the packing process can be continued for a long time even if the ink is filled in the porous member 21 as much as possible, for example, about 95% volume of the porous member accommodated in the ink tank cartridge. Therefore, the print quality and efficiency of the ink-filling can be improved.

When the ink tank cartridge packed as described above is actually to be used, the packaging bag is opened and the tank cartridge is taken from the bag. The tank cartridge is mounted on a carriage of the recording apparatus in such a manner that the end opening of the ink supply port 15 is positioned just above the ink supply needle 14 and then depressed towards and parallel to the direction of the needle 14. The ink supply needle 14 penetrates the sealing member (film) 20 and reaches the packing member (O-ring) 19. In this condition, the tip of the ink supply needle 14 is kept in a liquid seal with respect to the ink supply port 15 by the packing member (O-ring) 19 while communicating with ink contained within the ink supply port 15.

When the ink supply needle 14 penetrates the sealing member 20, the sealing member 20 deforms to become shaped like the end contour of the needle 14; to

large extent because of the resiliency of the sealing member 20.

Since the through holes 36 formed at the tip of the ink supply needle 14 have a diameter below 0.1 to 0.4 mm, the through holes 36 keep a meniscus when the cartridge is exchanged. Accordingly, air is prevented from entering from the ink supply needle 14 to the recording head. Further, since there is a plurality of through holes, the fluid resistance applied to the ink flowing therethrough is very small and, therefore, a sufficient amount of ink for printing can be supplied to the recording head 4.

Further, since the porous member 21 is resiliently deformed and compressed by the ink supply port 15 projecting inward of the tank housing, the pore size of the porous member at a region in the vicinity of the ink supply port is smaller than that of the other region so that the capillary force is large relative to the other region. Owing to this structure, the ink is concentrated at the compressed portion of the porous member, and further the ink can be supplied to the recording head right up until the last droplet.

In the above embodiment, the sealing member 20 disposed at the ink supply port 15 is exposed. However, it is more preferable to form a flange 45 surrounding the sealing member 20 for avoiding unintentional touch by a finger F to the sealing member 20 as shown in Fig. 8. This arrangement of the flange 45 is advantageous in that not merely the sealing member is prevented from being torn but also the flange can be used as a guide member for easily positioning the ink supply needle 14 to the correct point.

Figs. 9-I and 9-II are cross-sections showing an ink tank cartridge. The ink tank cartridge is provided with a housing 50 constituting an ink tank cartridge body having an opening 51 at the top thereof and a pipe-like ink supply port 53 projecting from a bottom surface 52 of the housing 50, which port engages with the ink supply needle 14 disposed on the recording apparatus side. The housing 50 is tapered so that a diameter of the bottom surface is smaller than that of the top surface. The ink supply port 53 is provided with an opening 54 onto which a filter 55 formed of high polymer or anti-corrosion metal is fuse bonded. A step portion 56 is formed at an inner centre of the ink supply port 53. A packing member (an O-ring) 57 is fitted at a lower side of the step portion 56 for maintaining a liquid seal by resiliently abutting the port 53 against the ink supply needle 14. Further, a sealing member (film) stopping member (an O-ring) 58 is also fitted at a lower side of the packing member 57. An opening 59 is sealed by a sealing member 60 having a high air-seal formed, for example, of a laminated film through which the ink supply needle easily penetrates. The opening 51 of the housing 50 is sealed by a lid 62 having a communication hole 62 for communicating with the atmosphere. An inner surface of the lid 62 is provided with a plurality of ribs 68 for defining spaces 63 between a porous member 64 and the lid 62. The ink tank cartridge is further provided with

electrodes 65a, 65b for detecting an ink near-end condition.

In Fig. 9-I the porous member accommodated in the tank housing 50 has two separate layers consisting of upper porous member 64a and lower porous members 64b. The upper porous member 64a is larger in pore size than the lower porous member 64b so that the capillary force is larger at the lower side in the vicinity of the ink supply port 53. The elements of the structure of the cartridge of this arrangement other than the porous member is the same as that shown in Fig. 9-I.

Although this arrangement has the two-layer structure of the porous member, the porous member may be divided into more than two layers if applicable as well as the lower layer having a small pore size than the upper layer.

With the ink tank cartridge described above, deaerated ink is filled within the porous member accommodated in the tank housing under low pressure, and packed in a package bag for stocking while maintaining a negative pressure a little bit higher (closer to the atmosphere) than that during the ink-filling process. When the ink tank cartridge is exchanged with a new one, the packaging bag is opened to take a new ink tank cartridge out of the bag, and the tank cartridge is mounted on the carriage of the recording apparatus in such a manner that the end opening of the ink supply port 53 is positioned just above the ink supply needle 14 and then depressed towards and parallel to the direction of the needle 14.

In this operation, the ink supply needle 14 penetrates the sealing member (film) 60 and reaches the packing member (O-ring) 57 through the sealing member stopping member 58. This enables the ink supply needle 14 to be kept in a liquid-tight condition with respect to the ink supply port 53 by the packing member (O-ring) 57 while communicating with ink contained within the ink supply port 53.

When the ink supply needle 14 penetrates the sealing member 60, the sealing member 60 may partially go into the ink supply port 53 with the ink supply needle 14. However, broken pieces 60a of the sealing member 60 are stopped to go further with the needle by the sealing member stopping member 58 as shown in Fig. 10B so that the broken pieces 60a do not reach the packing member 57. Accordingly, even if gaps 66 are formed between the needle 14 and the sealing member stopping member 58, the liquid seal can be maintained owing to the packing member 57 and, therefore, the ink is prevented from leaking out. Various modifications of the packing member 57 and the sealing member stopping member 58 are now described. The remaining elements of the structure, however, remain the same.

In Fig. 10A-2 the sealing member stopping member 58-2 is not an O-ring but an elastic sealing member while the sealing member 57 is an O ring.

In Fig. 10A-3 both the sealing member 58 and the sealing member stopping member 58 are not an O-ring but an elastic sealing member.

In Fig. 10A-4 the sealing member 57 and the sealing member stopping member 58 are unitarily formed and provided with a groove between the members.

In Fig. 10A-5 the sealing member 57 is not an O-ring but an elastic sealing member while the sealing member stopping member 58 is an O-ring.

Fig. 11 is a cross-section showing part of an ink tank cartridge. As shown in Fig. 11, a pipe-like ink supply port 71 is formed at the bottom surface 70 of the housing for accommodating a porous member for filling therein ink. A filter 72 is fixed to a top opening of the ink supply port 71 which resiliently abuts to compress the porous member for impregnating ink. A packing member 73 and a seal member stopping member 74 are press fitted in a centre inner portion of the ink supply port 71 and secured by a bushing 75. A lower opening 76 is sealed by a sealing member (film) 77.

The ink tank cartridge is further provided with a porous member 78 fitted in the ink supply port 71 between an electrode 80 disposed within an ink chamber 79 for detecting an ink near-end condition and the packing member 73. An upper portion of the porous member 78 engages with a step portion 81 formed inside the ink supply port 71 as shown in Fig. 11 to prevent the porous member 78 from moving even when the ink supply needle penetrates therethrough. The reference numeral 95 designates another electrode for detecting the ink near-end condition.

Fig. 12 shows the ink supply needle 90 preferably applied to the ink tank cartridge. The ink supply needle 90 is provided with a tip 91 having a conical shape and an inclined surface for easily penetrating the sealing member 77, stopping member 74 and packing member 73. A needle body 92 has generally parallel openings 94 communicating with an ink supply path 93.

When the sealing member 77 is positioned onto the ink supply needle 90 and mounted, the ink supply needle 90 penetrates the sealing member 77 and passes through the sealing member stopping member 74 and the packing member 73. Since the ink supply needle 90 has no hole at the tip 91, the variation in volume in the ink chamber 79 caused by a piston-effect during the mounting operation of the ink tank cartridge, is received by the tip 91 and the packing member 73. Whereas the variation is not applied to the through hole 94 as shown in Fig. 13A but to the upper side through the porous member 78 of the ink supply port 79. Thus, when the openings 94 pass through the packing member 73 pressure is generated when the cartridge is being mounted and so ink flows into the ink supply path 93 through the openings 94.

As described above, during the mounting operation of the ink tank cartridge, the undesirable variation in volume due to the piston effect applied to the recording head can be prevented since the ink supply path 93 does not communicate with the ink supply port 71, so that leakage of ink from the nozzle opening of the recording head is effectively avoided. Further, since it is not necessary to form through holes, the ink supply

needle has sufficient mechanical strength and, accordingly, the needle can be formed of a material other than metal such as, for example, a high polymer material. An ink supply needle formed of high polymer material is advantageous in that the manufacturing process can be simplified and further dangers raised because of metal can be avoided.

Furthermore, an inner diameter of the through holes 94 can be selected freely yet maintain the meniscus even if an outer diameter of the ink supply needle is designed to be large to thereby control an appropriate flow resistance. Therefore, the ink supply needle can maintain a mechanical strength sufficient for penetrating into the ink tank cartridge if the needle is formed of a high polymer material.

Preferably, the ink supply needle shown in Fig. 13B is so designed that, for example, an outer diameter R of the needle is within a range of 2-4mm and a length L of the ink supply port of the ink tank cartridge side when the ink tank cartridge is mounted onto the needle and the packing member is set to be below 2.5 mm. This arrangement is more preferable because the variation in volume when the ink tank cartridge is mounted on the ink supply needle is small and the undesirable piston effect can be minimised.

On the other hand, if the ink tank cartridge must be replaced when the tank is still full such as for maintenance, ink existing around the tip of the ink supply needle is sucked up into the porous member 78 located in the vicinity of the needle because of capillary action of the porous member filled within the tank cartridge for impregnating the ink. In this operation, since the porous member 78 has a capillary force which is substantially the same as that of the porous member filled in the tank cartridge, the ink remains in the ink chamber 79. Accordingly, air is prevented from entering inside the tank cartridge body. Further, if the ink tank cartridge is removed, the electrodes do not output a signal representing the ink near-end condition. As a result, it is ready to start printing again merely by mounting the once removed ink tank cartridge again onto the ink supply needle.

The foregoing describes the needle having parallel through holes. However, the needle having through holes in the end surface as shown in Fig. 3 may be employed if the piston effect during mounting of the cartridge is small.

Further, the ink tank cartridge utilises stopping members for preventing the packing member and the sealing member stopping member from falling off. However, these stopping members may be omitted if the mechanical strength of the sealing member is relatively large.

As described above, the ink tank cartridge housing is removable with respect to the ink supply needle and is provided with the ink supply port projecting from the bottom surface of the housing both inwardly and outwardly. The porous member for impregnating ink is resiliently accommodated in the housing through the filter

secured to the end of the ink supply port. The packing member is disposed at the end opening of the ink supply port for resiliently abutting against the periphery of the ink supply needle and the sealing member for sealing the end opening of the ink supply port, through which the ink supply needle penetrates. Accordingly, the ink tank cartridge is advantageous in that the ink supply needle does not require a sharp tip, air is prevented from entering the ink supply path of the recording apparatus, and a tight air-seal between the ink supply needle and the ink tank can be maintained.

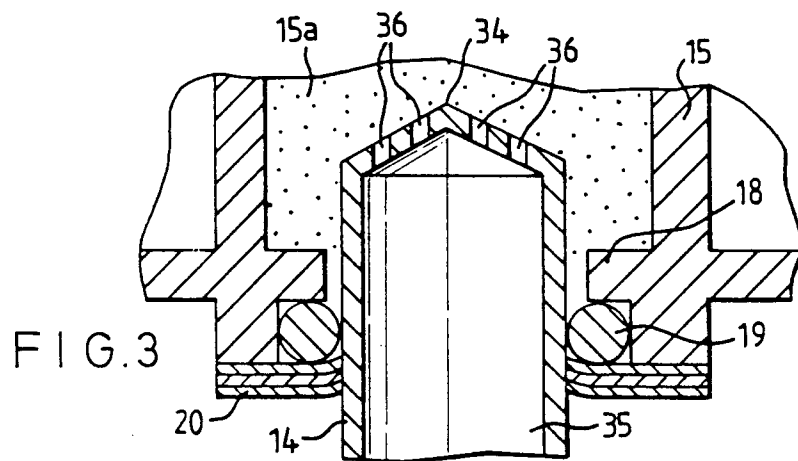
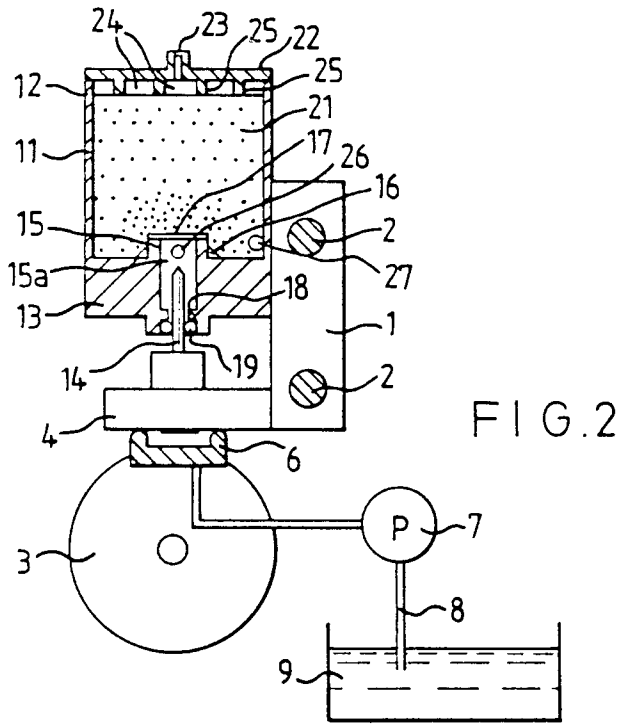
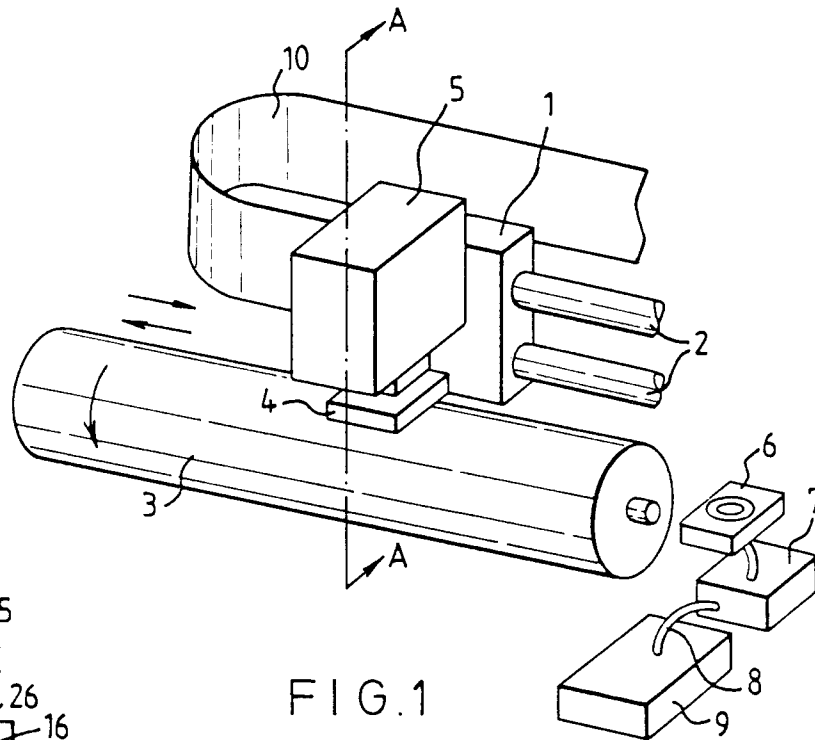
Embodiments of the present invention have been described and it will be appreciated by a person skilled in the art that modifications may be made without departing from the scope of the present invention as defined in the appended claims.

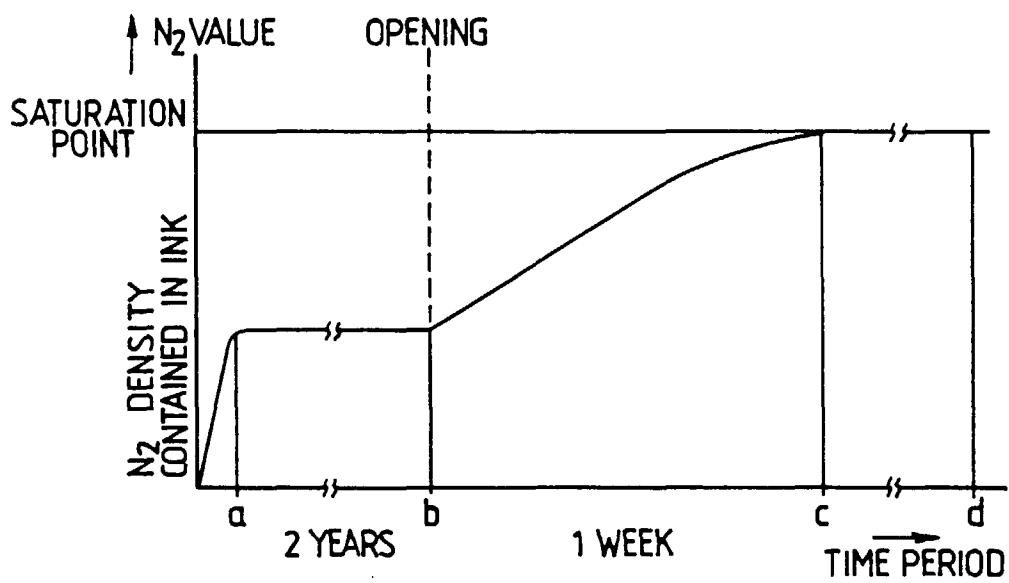
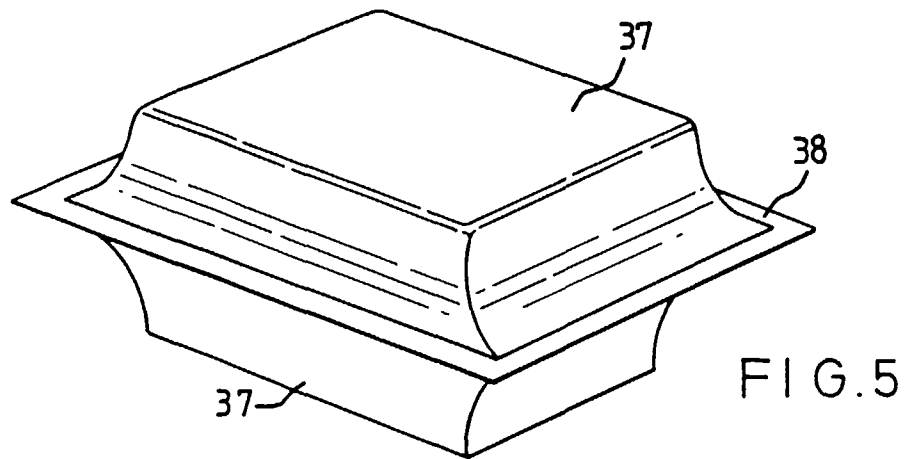
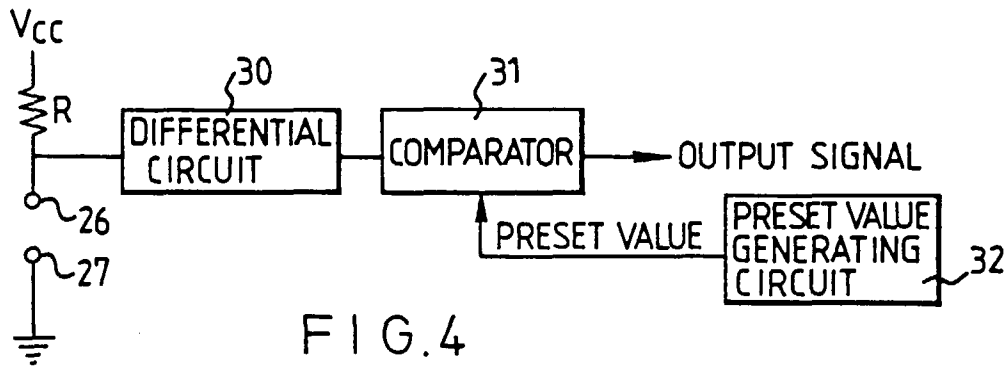
Claims

1. A fluid-sealable container in combination with an ink tank cartridge, wherein said ink tank cartridge is packed in the container under a low pressure so that a space is maintained in said container.
2. A container as claimed in claim 1, wherein said space is at least 15% of the total internal volume of said container when empty.
3. A container as claimed in claim 1 or 2, wherein said space is maintained to communicate with an air hole in said ink tank cartridge.
4. A container as claimed in any one of claims 1 to 3, wherein said space is maintained by absorbing members (40) packed with said cartridge.
5. A fluid sealable container in combination with an ink tank cartridge, wherein said ink tank cartridge is packed in the container under a negative pressure which is closer to atmospheric pressure than the pressure under which the ink is filled in the ink tank cartridge.
6. A container as claimed in any one of claims 1 to 5, wherein said container comprises a laminate film.
7. A container as claimed in claim 6, wherein said laminate film comprises aluminium.

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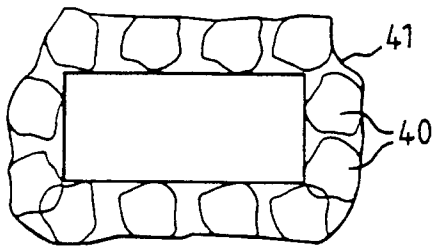


FIG. 7

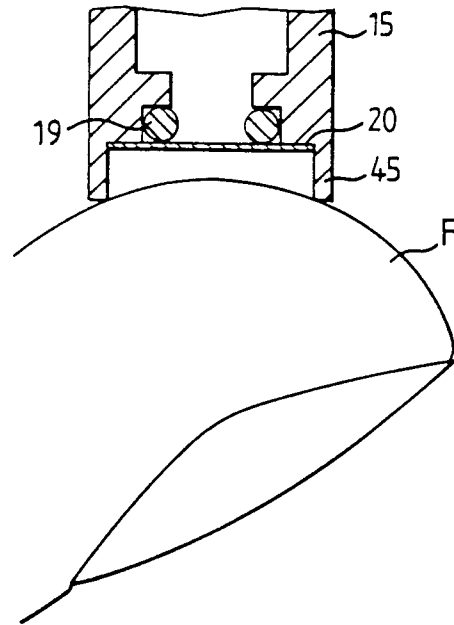


FIG. 8

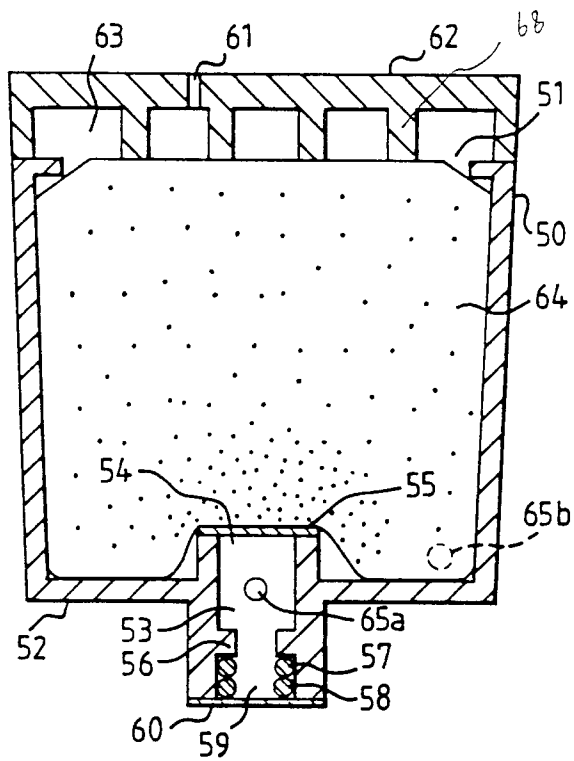
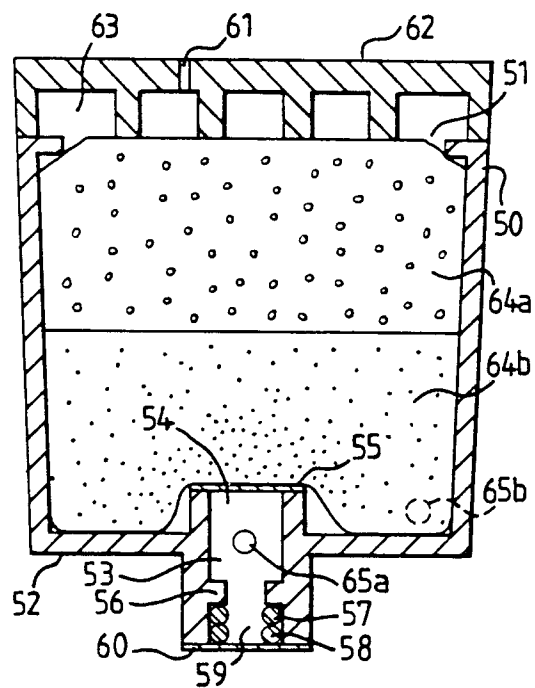


FIG. 9-I

FIG. 9-II



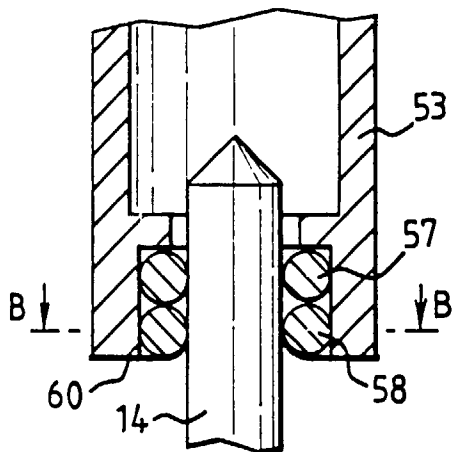


FIG. 10A-1

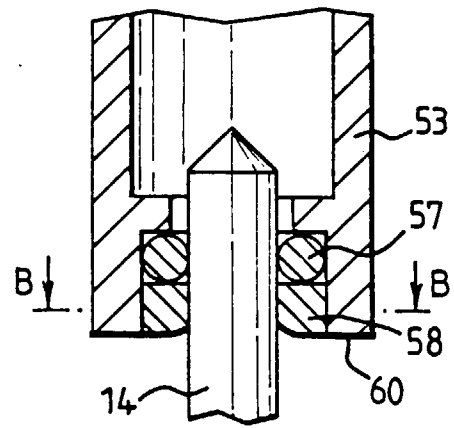


FIG. 10A-2

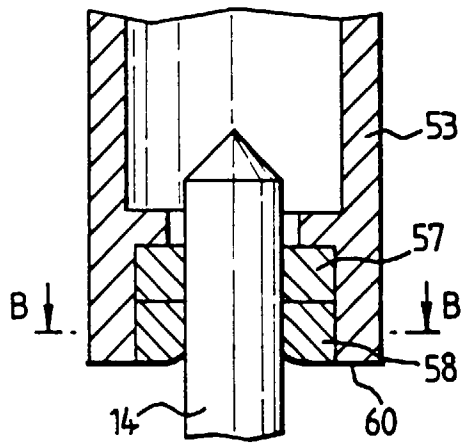


FIG. 10A-3

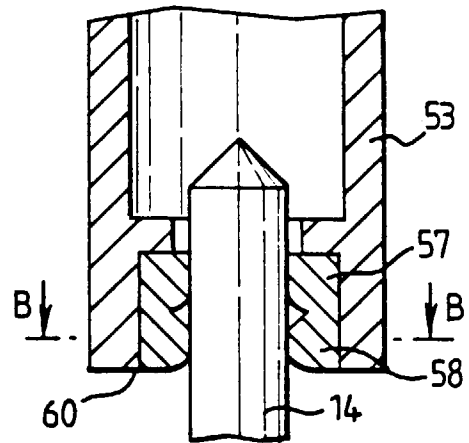


FIG. 10A-4

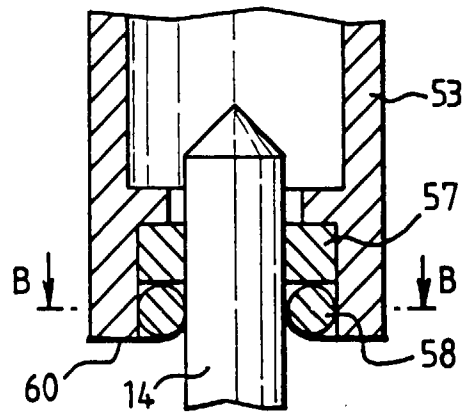


FIG. 10A-5

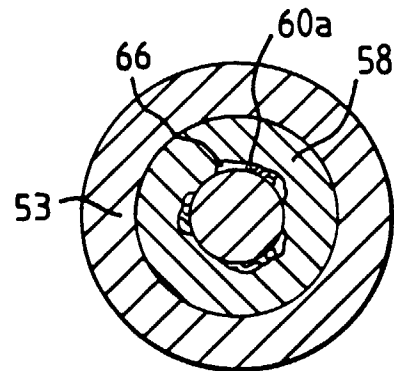


FIG. 10B

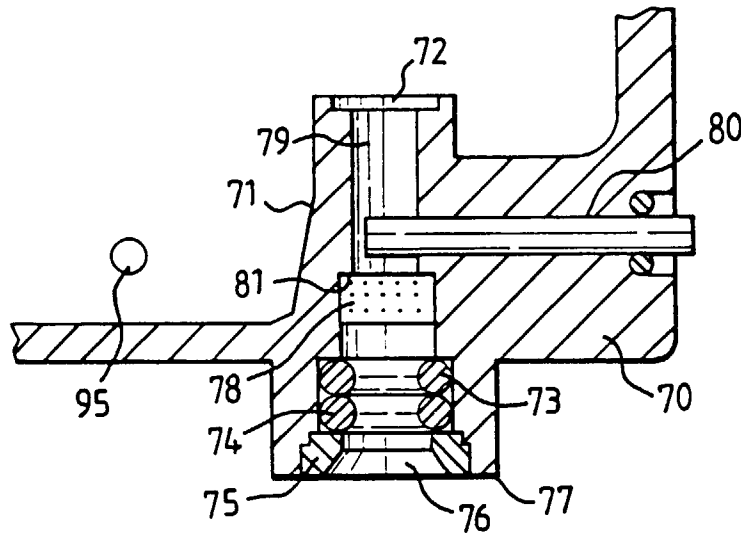


FIG. 11

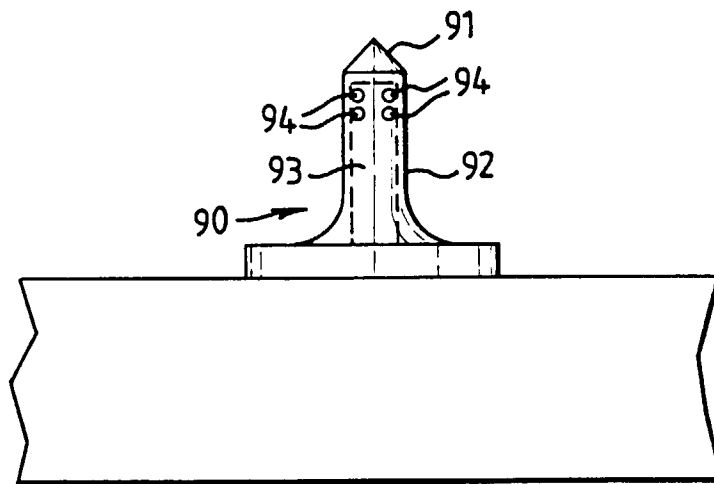


FIG. 12

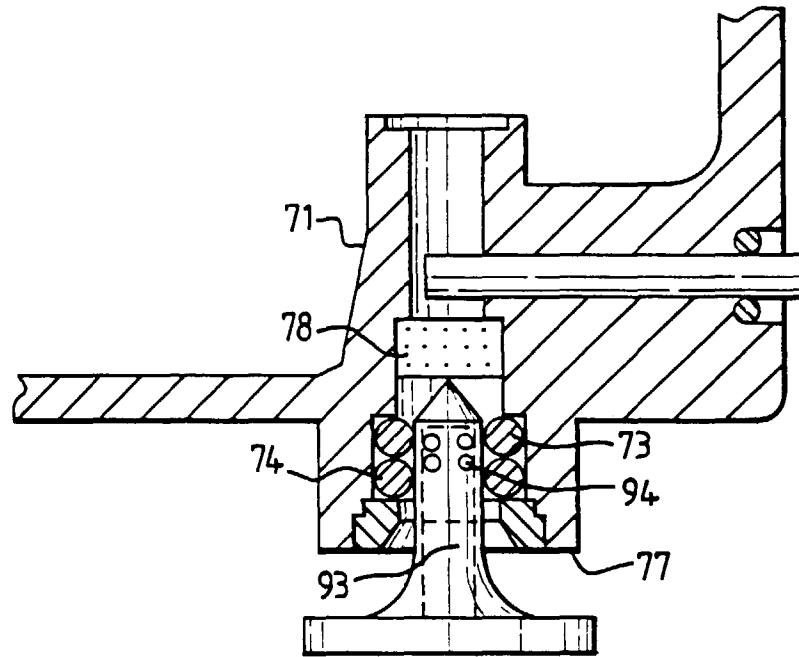


FIG. 13A

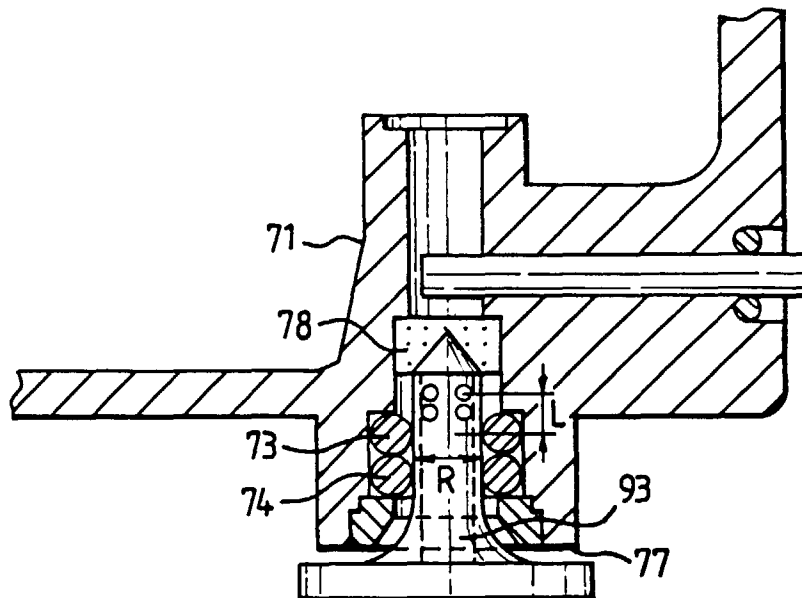


FIG. 13B



European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 96 12 0032

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The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
THE HAGUE		13 March 1997	Adam, E
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