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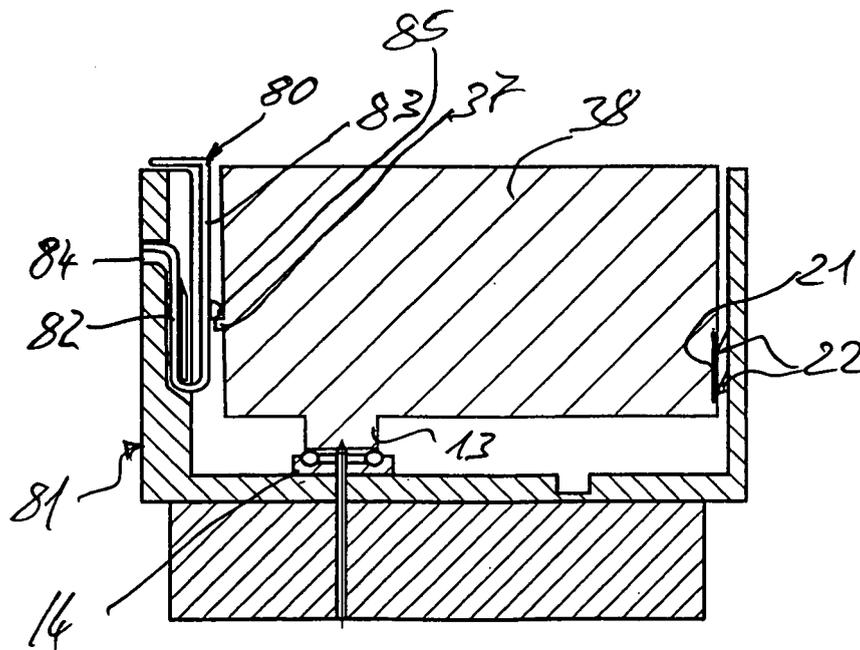
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**(54) Device for retaining an ink cartridge in a retainer of a recording apparatus**

(57) A device for retaining an ink cartridge (38) in a retainer (81) of an ink jet recording apparatus includes an intermediate element (80) which is handled independently from the ink cartridge (38) and is provided with at

least one holding element (82, 84) for being mounted in the retainer (81) and which is provided with at least one retaining element (83, 85) for retaining the ink cartridge (38).



*Fig. 9*

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## Description

**[0001]** The invention relates to a device for retaining an ink cartridge in a retainer of a recording apparatus which retainer is provided with an ink receiving element to which the ink cartridge has to be connected.

**[0002]** Known recording apparatuses which produce prints by means of ink jets have relatively complex formed retainers for the ink cartridges. The ink cartridges have corresponding complex forms including locking means which cooperate with counterparts of the retainer. The locking elements may be resilient levers or locking projections to which counterparts are assigned. Such locking elements, especially resilient locking levers have to be made from a material of high quality. Therefore, such ink cartridges are relatively expensive. Normally, such ink cartridges are thrown away after their content of ink is consumed. Therefore, it would be desirable if such ink cartridges could be produced in an less expensive manner.

**[0003]** It is known, for reducing the costs, to join two parts to an ink cartridge. One part is a frame which is adapted to the retainer of the apparatus, while the other parts is formed as an ink tank. However, the ink tank still includes locking or fixing means cooperating with counterparts of the retainer of the apparatus. Both parts are joined together and inserted into the retainer of the apparatus as one unit and are also removed as one unit after the ink is consumed. The ink tank can be separated from the other part so that only the ink tank has to be replaced by a new one while the other part could be used again. However, as disassembling and reassembling of the two parts is burdensome, it has to be expected that in many cases both parts will be thrown after the ink of the ink tank is consumed.

**[0004]** It is object of the present invention, to simplify the form of ink cartridges, so that their production may become less expensive.

**[0005]** This object is achieved by an intermediate element which is handled independently from the ink cartridge which intermediate element is provided with one holding element for mounting the intermediate element in the retainer of the apparatus and which is provided with at least one retaining element for retaining the ink cartridge.

**[0006]** According to the invention the holding elements which cooperate with the retainer of the apparatus are no longer part of the ink cartridge but belong to the intermediate element. Further, the intermediate element includes at least one retaining element for the ink cartridge. The ink cartridge itself may have a relatively simple form.

**[0007]** According to a preferred embodiment of the invention the intermediate element is an insert which is to be stationarily mounted by its holding element in the retainer of the apparatus. When replacing an empty ink cartridge the user of the apparatus has to input only once the intermediate element in the retainer of the apparatus. Thereafter, it is only necessary to exchange the ink car-

tridge alone after its ink is consumed. It is a very simple operation which in most cases is easier than the exchange of conventional ink cartridges. Joining or separating of parts outside of the apparatus before inserting the ink cartridge into the retainer of the apparatus or after taking it out from the retainer no longer is necessary.

**[0008]** Preferably, the retaining element of the intermediate element for retaining the ink cartridge is designed and/or arranged such that the ink cartridge is releasable independently from the holding element of the intermediate element. As there is no need for taking out the intermediate element the risk that this intermediate element is thrown away is reduced. Preferably, the holding element for holding the intermediate element in the retainer of the apparatus is accessible only when no ink cartridge is present. When exchanging an ink cartridge after consumption of its content the user has to remove the ink cartridge first. This reminds the user that it is not necessary to remove the intermediate element also so that in most cases only the ink cartridge will be exchanged.

**[0009]** According to a further embodiment of the invention the intermediate element forms a retainer for the ink cartridge and includes locking and/or clamping elements for the ink cartridge. This allows to design ink cartridges which have a form which is quite independent from the form of the retainer of the apparatus. This may permit the design of standard ink cartridges for a plurality of recording apparatuses.

**[0010]** According to a further embodiment of the invention the intermediate element is provided with a holder for a memory device (chip) which is assigned to electrical contacts of the apparatus arranged in its retainer. The use of such memory devices is quite common especially for controlling the remaining content of ink in the cartridge. With conventional ink cartridges such memory devices are also thrown away together with the ink cartridge after the ink is consumed.

**[0011]** Further features and advantages of the invention become more apparent from the following description of the embodiments shown in the accompanying drawings.

Fig. 1 shows a view in the direction of the arrow II on an intermediate element,

Fig. 2 a vertical section through the intermediate element of fig. 1 mounted in a retainer of an apparatus and retaining an ink cartridge,

Fig. 3 a side view on another embodiment on an intermediate element,

Fig. 4 a view on the intermediate element of Fig. 3 in the direction of arrow IV in figure 3,

Fig. 5 a vertical section through the intermediate element of fig. 3 and 4 mounted in a retainer of

- an apparatus and retaining an ink cartridge,
- Fig. 6 a vertical section similar to fig. 5 through a modified embodiment,
- Fig. 7 a vertical section similar to fig. 5 through a further modified embodiment,
- Fig. 8 a vertical section through a retainer of an apparatus provided with an intermediate element,
- Fig. 9 the retainer and the intermediate element of fig. 8 after inserting an ink cartridge,
- Fig. 10 a plan view on a further embodiment of an intermediate element,
- Fig. 11 a side view in the direction of arrow XI on the intermediate element of figure 10,
- Fig. 12 a vertical section through the intermediate element of fig. 10 and 11 mounted in a retainer and retaining an ink cartridge,
- Fig. 13 a plan view on a further embodiment of an intermediate element,
- Fig. 14 a side view in the direction of arrow XIV of the intermediate element of fig. 13,
- Fig. 15 a side view in the direction of arrow XV of the intermediate element of fig. 13,
- Fig. 16 a vertical section through the intermediate element of fig. 13 to 15 mounted in a retainer of an apparatus and retaining an ink cartridge,
- Fig. 17 a plan view on a further embodiment of an intermediate element,
- Fig. 18 a vertical section through the intermediate element of fig. 17 and
- Fig. 19 a vertical section through the intermediate element of fig. 17 and 18 after being mounted in a retainer of an apparatus and retaining an ink cartridge .

**[0012]** In the embodiment of fig. 1 and 2 an intermediate element 10 is locked in a retainer 11 of a recording apparatus and retains an ink cartridge 12 in this retainer 11. The ink cartridge 12 has an ink supply port 13 at its bottom. This ink supply port 13 has to be connected with an ink receiving device 14 of the retainer 11.

**[0013]** The intermediate element 10 has a general L-shape in the side view-The shorter leg 15 of the intermediate element is provided with a protrusion 16 which fits

into a recess of the retainer 11. The longer leg 17 of the intermediate element 10 extends vertically and parallel to the sidewalls of the retainer 11 of the apparatus. This longer leg 17 at its outside is provided with a notch 18 which cooperates with an edge 19 of a recess of the retainer. Further, the leg 17 is provided with a notch 20 at its inner surface which cooperates with the upper side of the ink cartridge 12.

**[0014]** The intermediate element 10 is inserted into the retainer 11 such that its protrusion 16 fits into the recess of the retainer. The notch 18 of the longer leg 17 is locked under the edge 19 of the retainer. For that purpose the longer leg 17 will be slightly bent for bringing the notch 18 under the edge 19. The width of the shorter leg 15 corresponds to the width of the retainer so that the intermediate element 10 is safely locked and positioned within the retainer. Thereafter, the ink cartridge 12 is inserted into the retainer 11. The longer leg 17 is resiliently bent to the outside so that the ink cartridge 12 may pass the notch 20. After insertion of the ink cartridge 12 the longer leg 17 is given free so that its notch 20 will lock the ink cartridge 12 within the retainer 11.

**[0015]** During insertion the ink cartridge 12 is positioned by guiding elements of the retainer 11 and guiding elements of the ink cartridge 12 such that its ink supply port 13 exactly fits into the ink receiving device 14 and further a memory device 21 (chip) is exactly positioned with its contacts to electrical contacts 22 arranged in the retainer 11.

**[0016]** For exchanging the ink cartridge 12 the longer leg 17 of the intermediate element 10 is bent away from the ink cartridge 12 such that the notch 20 releases the ink cartridge 12 and the ink cartridge may be removed. As long as the ink cartridge 12 is inserted within the retainer 11 it prevents any bending of the longer leg 17 of the intermediate element away from the edge 19 of the retainer. Therefore, it is not possible to remove the intermediate element 10 from the retainer 11 as long as an ink cartridge 12 is inserted.

**[0017]** The intermediate element 30 of the embodiment shown in figure 3 to 5 has a L-shape also. Its shorter leg 31 is placed on the bottom of the retainer 11. It is provided with a protrusion 32 which extends into a recess of the retainer. Its longer leg 33 is provided with a resilient arm 34 which functions as a locking element for locking the intermediate element 30 within the retainer 11. The resilient arm 34 is provided at its end with a notch 35 and fits under the edge 19 of the retainer.

**[0018]** The longer leg 33 of the intermediate element 10 does not extend beyond the retainer 11 after being inserted in the retainer 11. It is provided at its outer end on the inner surface with a rounded protrusion 36 which cooperates with a rib 37 on a front wall of the ink cartridge 38 when this ink cartridge is inserted into the retainer 11.

**[0019]** The intermediate element 30 has to be inserted into the retainer and locked there before an ink cartridge 38 may be inserted. As long as such an ink cartridge 38 is located within the retainer 11 the intermediate element

30 is not accessible so that the ink cartridge 38 has to be taken out of the retainer before the intermediate element 30 can be removed.

**[0020]** Fig. 6 shows an embodiment of an intermediate element 60 which also has a L-shape. Its shorter leg 61 abuts against the receiving device 14 of the retainer 11 and is positioned thereby. Its longer leg 62 which does not extend beyond the height of the retainer 11, is provided with a notch 18 at its outside which locks with the edge 19 of the retainer. This longer leg 62 is provided at its inner surface with a rounded protrusion 63 similar to the protrusion 36 of the intermediate element 30 of fig. 3 to 5. Preferably, the longer leg 62 is designed similar to the longer leg 17 of the embodiment of fig. 1 and 2, i.e., it has a central part which is separated from two side parts by means of slots. This allows the possibility to provide the center part of the longer leg 62 with the protrusion 63 and the two side parts with notches 18. Of course, one notch could also be placed on the center part and two protrusions 63 on the side parts.

**[0021]** The intermediate element 70 of fig. 7 holds the ink cartridge 71 by frictional forces only. The receiving device 14' of the retainer 11 is arranged at a place more remote from the edge 19 of the retainer. The lower leg 72 of the intermediate element 70 abuts against this receiving device 14' so that the lower leg 72 is relatively long. The upper leg 73 loads the ink cartridge 71 by frictional forces towards the electrical contacts 22 of the retainer 11.

**[0022]** Preferably, the upper leg 73 is designed by three sections according to fig. 1. The central or the two side parts are provided with one or two notches 18 which lock below the edge 19. The two side parts or the center part are provided with an convex inner surface which extends towards the ink cartridge 71 and loads it towards the electrical contacts 22 of the retainer 11.

**[0023]** If the lower leg 61 or 72 of the intermediate element 60 or 72 respectively are not provided with a protrusion and/or the bottom of the retainer 11 is not provided with a recess, it will be of advantage to fix the intermediate element by means of an adhesive. For example, the outside of the lower leg is provided with a double-sided adhesive tape so that the lower leg is safely held at the bottom of the retainer 11.

**[0024]** Fig. 8 and 9 show a further intermediate element 80 which is held by a sidewall of a retainer 81 of a recording apparatus. The intermediate element 80 has a generally U-shape, i.e., two legs 82, 83. One leg 82 is fixed to a sidewall of the retainer 81 whereas the other leg 83 functions as a retaining element for an ink cartridge 38. The leg 82 of the intermediate element 80 is inserted into an undercut groove of the sidewall of the retainer 81. Its end is bent by an angle of 90° and inserted into a recess 83 of the sidewall. The other leg 83 extends in parallel to the sidewall at a small distance thereto. The end of this upwardly directly leg 83 is bent by an angle of 90° to the outside so that it partly covers the upper side of the sidewall of the retainer 81. The leg 83 is pro-

vided with a notch extending into the retainer 81 for cooperating with a rib 37 or the like of an ink cartridge 38.

**[0025]** The intermediate element 80 preferably is made from plastic material. However, it also could be made from a resilient sheet metal.

**[0026]** In the embodiments of fig. 1 to 9 the intermediate elements 10, 30, 60, 70 and 80 are used for retaining only the ink cartridge 12, 38, 71 within the retainer. The positioning of the ink cartridge with respect to the electrical contacts 22 and with respect to the receiving device 14 is accomplished by guiding elements and counterparts of the ink cartridge and the retainer respectively. This means that the ink cartridge has to be adapted by its design to the design of the respective retainer. This is avoided by the intermediate elements of the embodiments of fig. 10 to 19. According to this embodiment the intermediate elements are adapted to the respective retainers so that they are adjusted and positioned within the retainer. However, these intermediate elements themselves position the respective ink cartridge which are not positioned by guiding elements and counterparts of the retainer. Therefore, it is possible to create an intermediate element which has an outer contour or shape which is adapted to the retainer of an respective recording apparatus whereas its inner shape or contour is always the same so that standard ink cartridges may be used for a lot of different recording apparatuses.

**[0027]** According to the embodiment of figures 10 to 12 the intermediate element 100 comprises a bottom 101 and three sidewalls 102, 103 and 104. The bottom 101 has an elongated hole 105 through which an ink supply port 13 of an ink cartridge 12 may extend and contact an ink receiving device 14 of a retainer 11 of a recording apparatus. The two sidewalls 102 and 104 and the front wall 103 position the ink cartridge 12 at a predetermined location. The intermediate element 100 is provided with guiding elements which cooperate with counterparts of the retainer so that the intermediate element 100 is exactly positioned within the retainer. Therefore, the ink supply port 13 and the contacts of the memory device 21 are exactly positioned with respect to their cooperating elements, i.e., the ink receiving device 14 and the contacts 22 of the retainer 11. For this purpose the bottom 101 of the intermediate element 100 is provided with a protrusion 105 which is inserted into a recess of the retainer 11. The front wall 103 is designed as a locking element for locking the intermediate element 100 within the retainer 11 and for retaining the ink cartridge 12 within the intermediate element 100 and the retainer 11. The front wall 103 is provided with a notch 1 or 6 at its outside which cooperates with an edge 19 of the retainer 11. The front wall 103 is further provided with a notch 107 which retains an ink cartridge 12 after it is inserted into the intermediate element 100.

**[0028]** As will be seen especially from fig. 11 the front wall 103 has two slots which define a central portion in the form of a resilient clip which is provided with the notches 18 and 20.

**[0029]** As can be seen especially from figure 12 it is not possible to remove the intermediate element 100 from the retainer 11 as long as an ink cartridge 12 is retained by the intermediate element 100.

**[0030]** Fig. 13 to 16 show an intermediate element 130 which has a bottom 131 and four walls 132, 133, 134 and 135 which are intended to completely surround an ink cartridge 12. The bottom 131 is provided with an elongated hole 136 through which an ink supply port 13 of the ink cartridge 12 may contact an ink receiving device 14 of the retainer 11 of an apparatus. The ink supply port 13 will be the only contact the ink cartridge will make with the retainer 11 of the apparatus.

**[0031]** The intermediate element 130 of fig. 13 to 16 is made as one piece. When manufacturing the intermediate element 130 as a plastic part, the front wall 135 extends in line with the bottom 131 to which it is connected by means of a film hinge 137. For inserting the intermediate element 130 into a retainer the front wall 135 is pivoted around the film hinge 137 in the upright position shown in fig. 13 and 16. Here it abuts against the side-walls 131 and 134. The front wall 135 has two slots which form a central part which can be used as a clip. This central part is provided with a notch 136 for locking the intermediate element in the retainer 11 behind an edge 19 of the retainer. At its inner surface it is provided with a notch 138 which is used for retaining the ink cartridge 13 within the intermediate element 130.

**[0032]** As can be seen especially in fig. 16 the notch 136 cannot be released from the edge 19 as long as an ink cartridge 12 is inside the intermediate element 130.

**[0033]** The intermediate element 130 is positioned within the retainer by cooperating guiding surfaces or projections of the intermediate element 130 and the retainer 11. In this shown embodiment the bottom 131 of the intermediate element 130 is provided with a protrusion 139 which fits into a recess in the bottom of the retainer 11. If, for example, the width of the intermediate element 130 corresponds to the width of the retainer 11, the intermediate element 130 is exactly positioned within the retainer 11 by means of the protrusion 139.

**[0034]** The intermediate element 130 and its front wall 133 which is opposite to the front wall 135 with the locking and retaining elements is provided with a memory device 140 (chip). Preferably, the chip is programmed such that it does a self-reset when the recording apparatus is switched into a mode for exchanging the ink cartridge 12. However, if the memory device 140 is not programmed for doing a self-reset it will be necessary to interrupt the connection between the contacts of the memory device 140 and the electrical contacts 22 of the retainer 11 when exchanging the ink cartridge 12.

**[0035]** According to the embodiment of fig. 13 to 16 the memory device 14 is arranged on a clip 141 which is part of the wall 133. The intermediate element 130 is manufactured such that this clip 141 is bent to the inside of the intermediate element 130 as shown in fig. 16 in dashed lines. When inserting an ink cartridge 12 into the

intermediate element 130 this clip 141 is deflected such that it becomes flush with the wall 133 and its electrodes come into contact with the electrical contacts 22 of the retainer. If the ink cartridge 12 is taken out the clip 141 springs back in the position shown by dashed lines in fig. 16 and, thereby, opens the contact with the electrical contacts 22 of the retainer.

**[0036]** In an alternative embodiment the intermediate element includes at least one switch which may interrupt the electrical connection between the memory device 140 and the electrical contacts 22. This switch is operated by the ink cartridge, i.e., closed when inserting an ink cartridge and opened when removing an ink cartridge. In an other alternative embodiment the intermediate element is provided with a source of electrical power, for example with a battery, connected to the memory device which may be turned on and off when exchanging the ink cartridge.

**[0037]** According to fig. 13 to 16 the intermediate element 130 is manufactured as one piece. In an alternative embodiment an intermediate element is manufactured in two or more pieces which are assembled to form one intermediate element. Preferably, the assembling is done by clip joints.

**[0038]** The intermediate element 170 of fig. 17 to 19 includes a bottom 171 and two front walls 172 and 173. The bottom 171 as an elongated hole 174 through which an ink cartridge 12 by its ink supply port 13 may be connected to an ink receiving device 14 of a retainer 11. The bottom 171 is provided with reinforcing ribs 175 and 176. The front wall 173 which is connected to the bottom 170 by means of a film hinge 177 is designed as a locking element for locking the intermediate element 170 within the retainer and as a retaining element for retaining an ink cartridge 12 within the intermediate element 170. The front wall 173 has on its outer surface a notch 178 which cooperates with the edge 19 when the intermediate element 170 is mounted within the retainer 11. For mounting the intermediate element 170 within the retainer 11 the front wall 173 is bent in its upright position. This front wall 173 is provided at its inner surface with a notch 179 for retaining an ink cartridge 12 within the intermediate element 170 after the intermediate element 170 is mounted within the retainer 11. The bottom 171 of the intermediate element 170 is provided with a protrusion 180 which is assigned to a recess within the bottom of the retainer 11.

**[0039]** The front wall 172 is provided with a resiliently held clip 181 (similar to the embodiment of fig. 13 to 16) which is bent into the inside of the intermediate element 170. This clip 181 holds a memory device 182 which is provided with electrodes which can be brought into contact with electrical contacts 22 of the retainer by inserting the ink cartridge 12 into the intermediate element 170.

**[0040]** The intermediate elements of the invention avoid the need to equip the ink cartridge with protruding resilient locking or securing means. Such locking or securing means which are normally protruding from an ink cartridge not only increase the complexity of the ink car-

tridge but also include the risk of being damaged or destroyed during transport or storage or during inserting or removing so that an ink cartridge could become useless before content of ink is consumed.

**[0041]** The intermediate elements according to fig. 1 to 19 are preferably made from plastic material especially by pressure molding. However, at least the intermediate element 80 of fig. 8 and 9 could be made from a resilient metal, especially sheet metal.

**[0042]** The embodiments of the present invention are only intended to disclose examples how the idea of the invention may be realized, i.e., how a retainer of an ink jet recording apparatus can be equipped with means for retaining an ink cartridge which means are stationary arranged in the retainer of the apparatus but may, if necessary, also be easily exchanged.

### Claims

1. Device for retaining an ink cartridge (12, 38, 71) in a retainer (11, 81) of a recording apparatus which retainer is provided with an ink receiving device (14) to which the ink cartridge has to be connected, **characterized by** an intermediate element (10, 30, 60, 70, 80, 100, 130, 170) which is handled independently from the ink cartridge (12, 38, 71) which intermediate element is provided with at least one holding element (18; 34, 35; 82, 84; 106; 136; 178) for being mounted in the retainer (11, 81) of the apparatus and which is provided with at least one retaining element (20; 36; 63; 85; 107; 138; 179) for retaining the ink cartridge (12, 38, 71).
2. Device according to claim 1, further **characterized in that** the intermediate element (10, 30, 60, 80, 90, 100, 130, 170) is an insert which is to be stationarily mounted in the retainer (11,81) of the apparatus.
3. Device according to claim 1 or 2, **characterized in that** the retaining element (20, 35, 63, 85, 107, 138, 179) for retaining the ink cartridge (12, 38, 71) is designed and/or arranged such that the ink cartridge is removable independently from releasing the holding element of the intermediate element.
4. Device according to one of claims 1 to 3, **characterized in that** the holding element (18; 34, 35; 82, 84; 106; 136; 178) for holding the intermediate element (10, 30, 60, 70, 80, 100, 130, 170) is accessible only when no ink cartridge (12, 38, 71) is present.
5. Device according to one of claims 1 to 4, **characterized in that** the intermediate element (10, 30, 60, 70, 80, 100, 130, 170) includes a positioning device (16, 32, 82, 105, 139, 180) for cooperating with counterparts of the retainer for positioning the intermediate element.
6. Device according to one of claims 1 to 5, **characterized in that** the intermediate element includes as a positioning element an adhesive.
7. Device according to one of claims 1 to 6, **characterized in that** the intermediate element (70) includes as retaining element for the ink cartridge (71) at least one clamping element for frictionally retaining the ink cartridge.
8. Device according to one of claims 1 to 6, **characterized in that** the intermediate element (10, 30, 60, 80, 100, 130, 170) is provided with at least one locking element (17, 36, 63, 85, 107, 138, 179) for cooperating with a counterpart of the ink cartridge (12, 38, 71).
9. Device according to one of claims 1 to 8, **characterized in that** the intermediate element (100, 130, 170) forms a retainer for the ink cartridge (12) and includes locking and/or clamping elements for the ink cartridge.
10. Device according to one of claims 1 to 9, **characterized in that** the intermediate element forms a standard retainer for standard ink cartridges.
11. Device according to one of claims 1 to 10, **characterized in that** the intermediate element (130, 170) holds a memory device (140, 182) which is assigned electrical contacts (22) arranged in the retainer (11) of the apparatus.
12. Device according to claim 11, **characterized in that** the intermediate element (130, 170) is provided with an interrupting arrangement for interrupting the connection between the memory device (140, 182) and the electrical contacts (22) of the retainer which interrupting arrangement is closed by inserting an ink cartridge (12) and opened by removing an ink cartridge.
13. Device according to claim 11 or 12, **characterized in that** the intermediate element (130, 170) is equipped with a source of electrical power which may be connected to the memory device (140, 182).

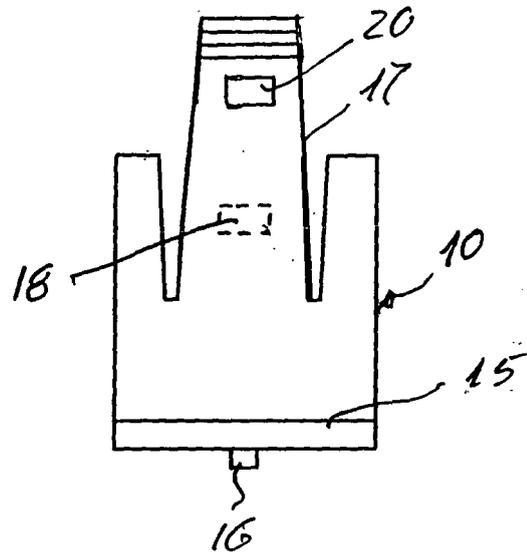


Fig. 1

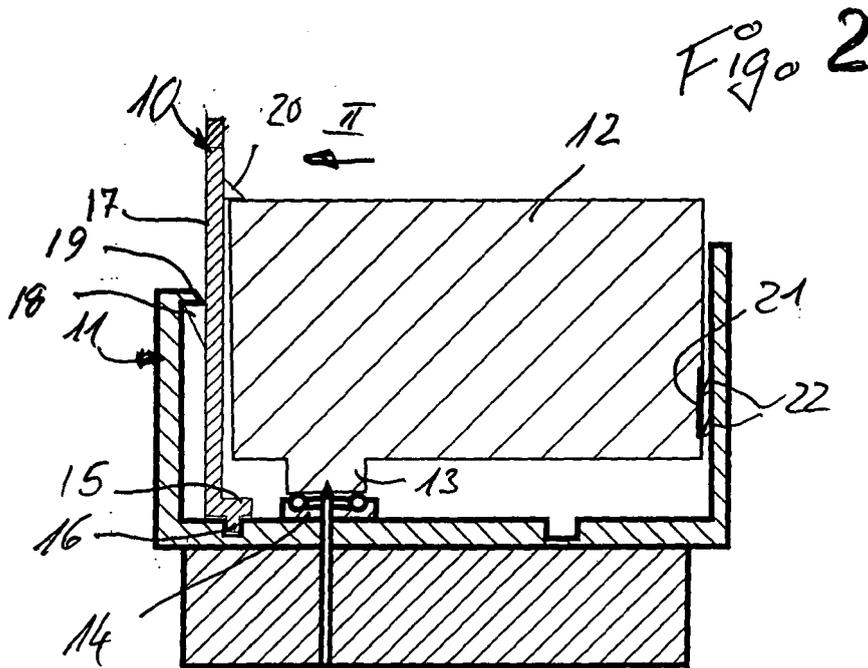


Fig. 2

Fig 4

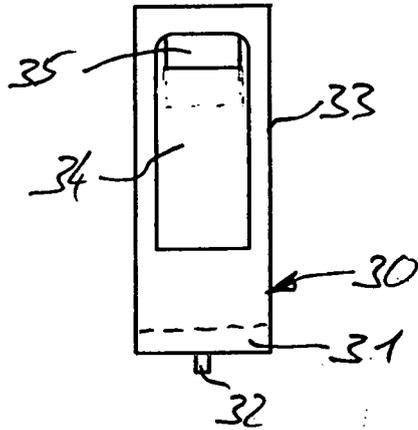


Fig 3

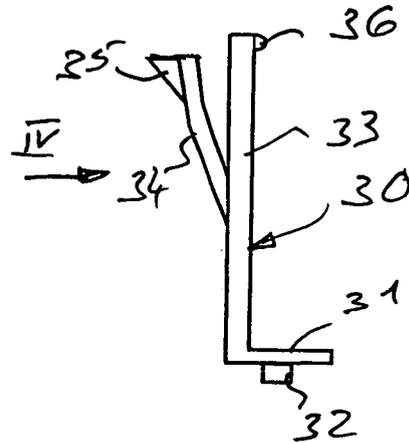


Fig 5

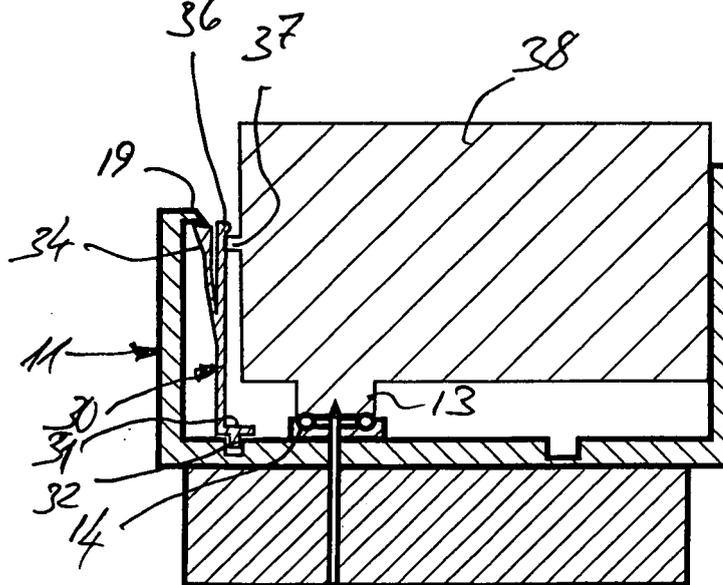


Fig 6

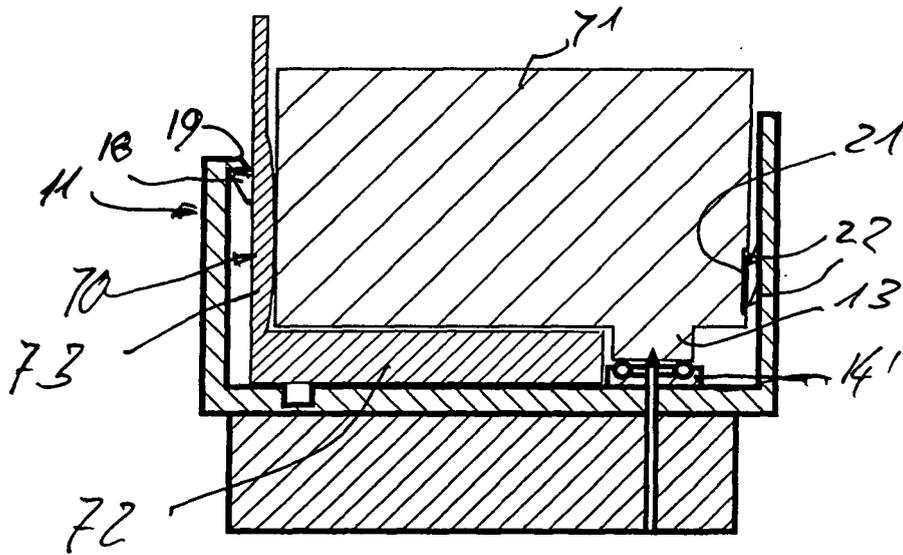
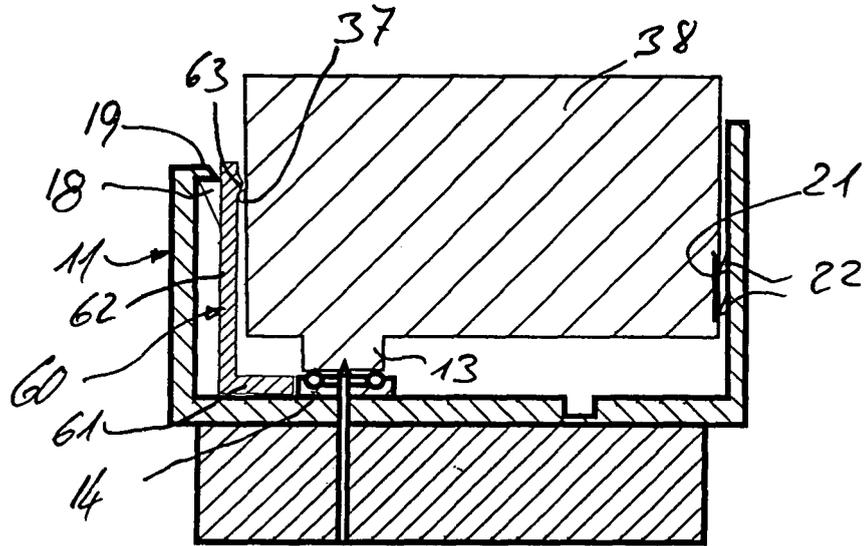


Fig 7

Fig 8

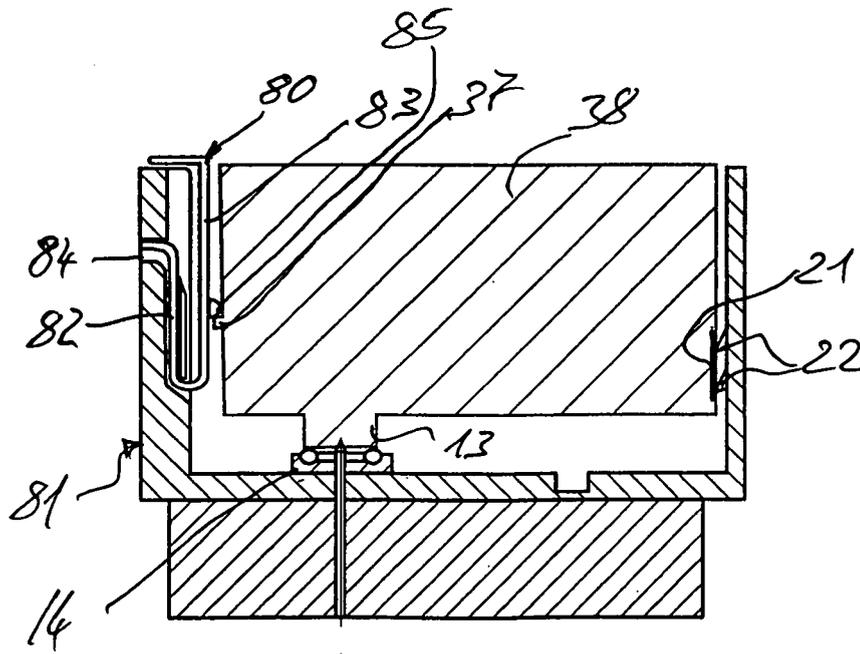
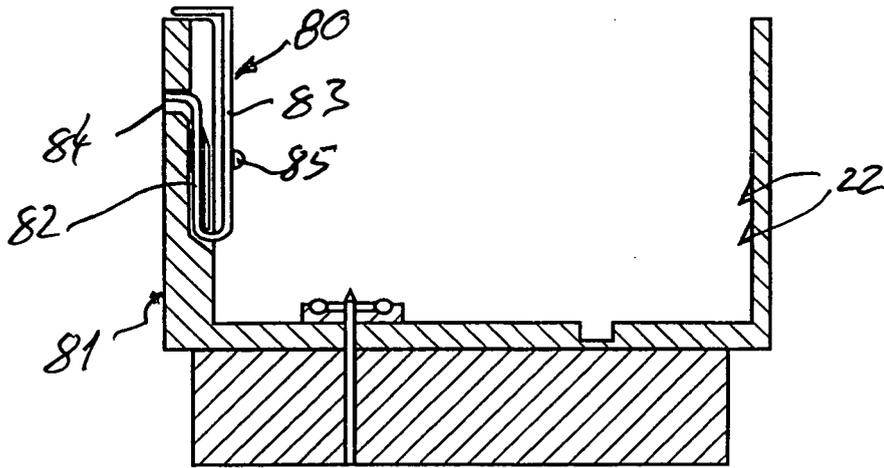
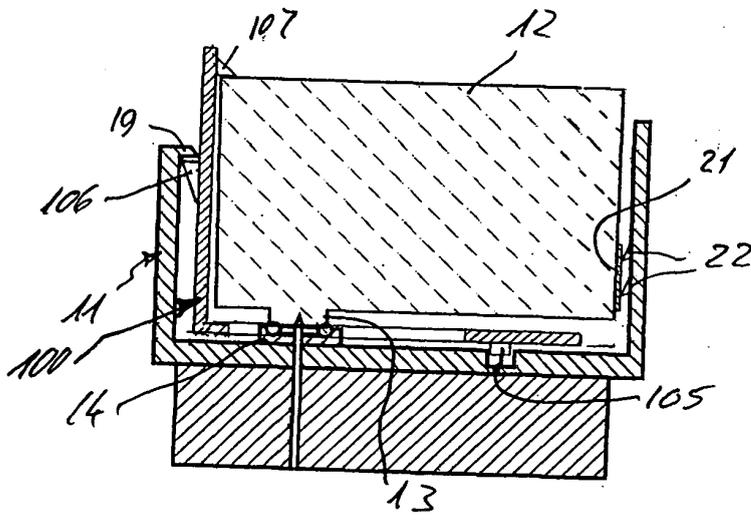
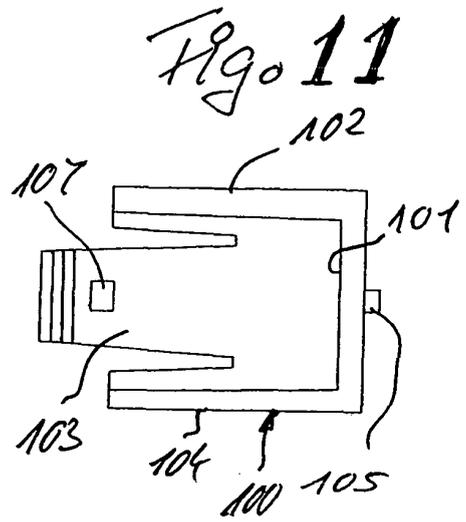
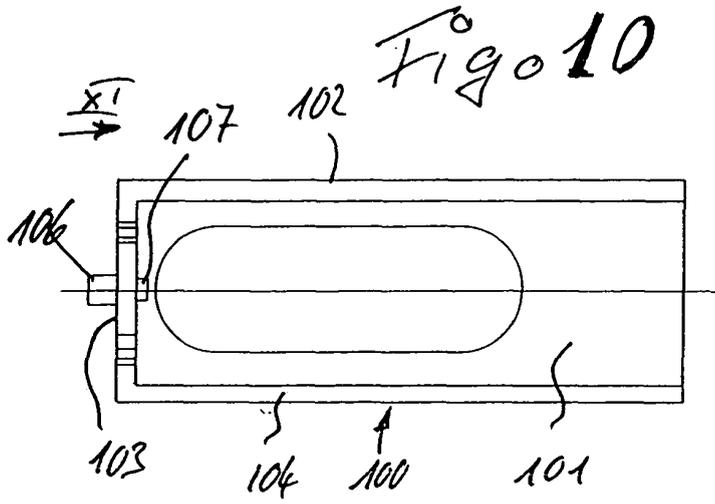


Fig 9



*Fig 12*

Fig 13

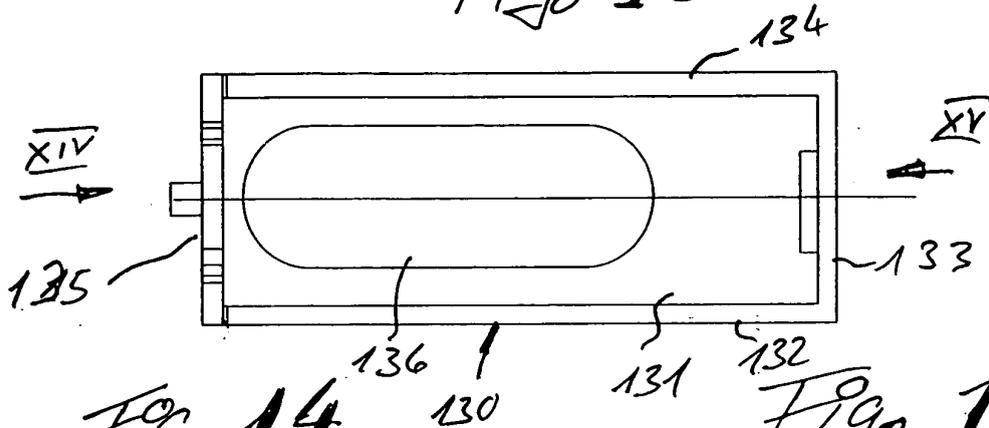


Fig 14

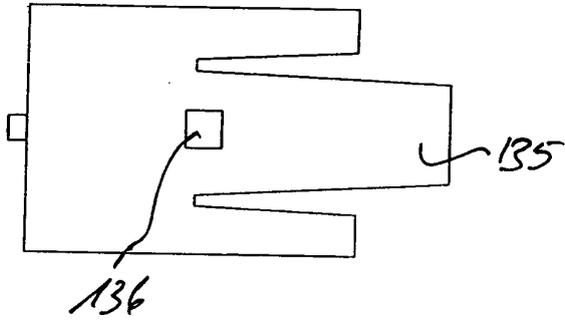


Fig 15

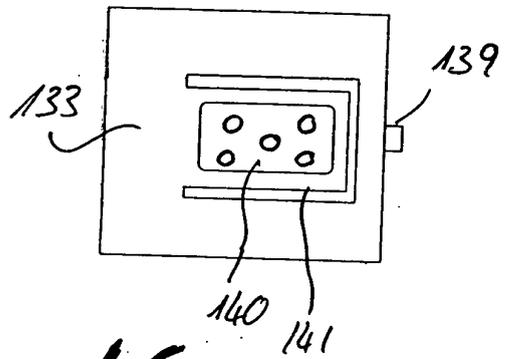


Fig 16

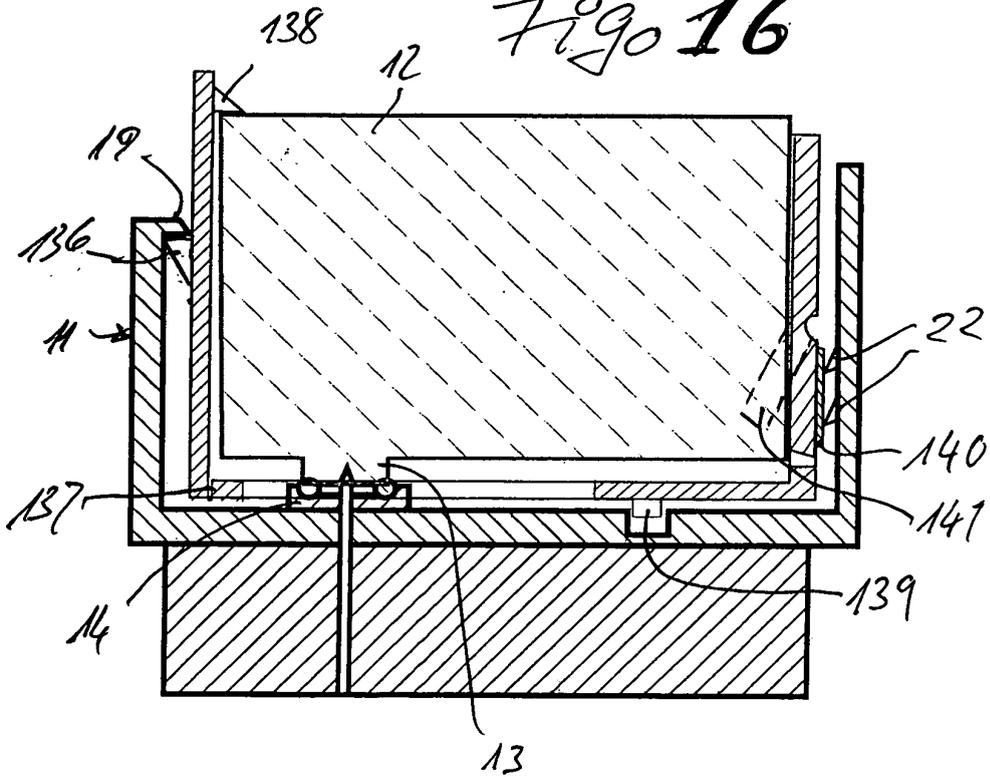


Fig 17

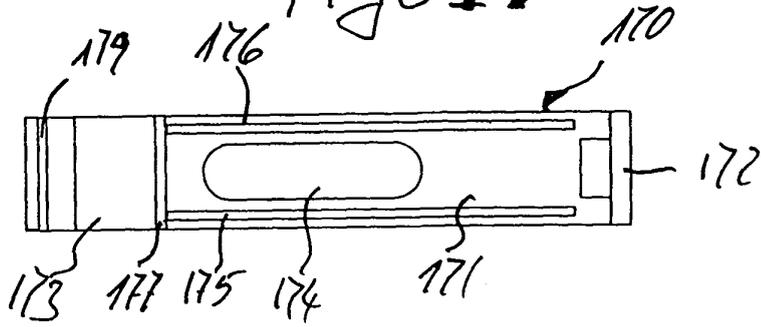


Fig 18

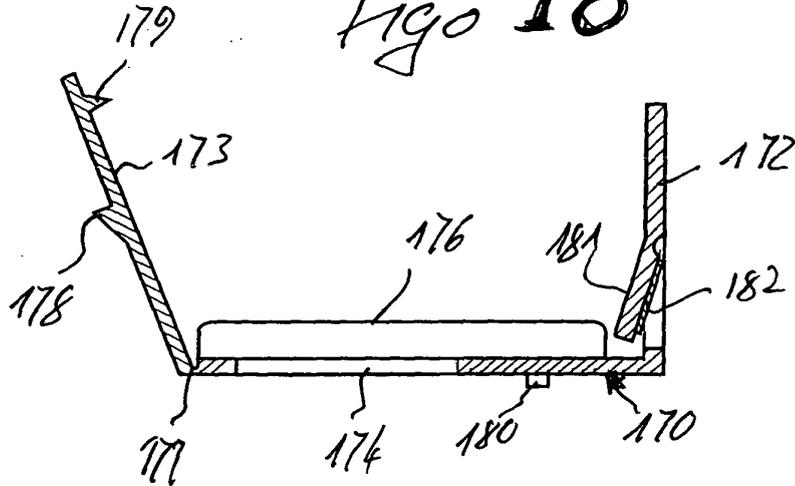
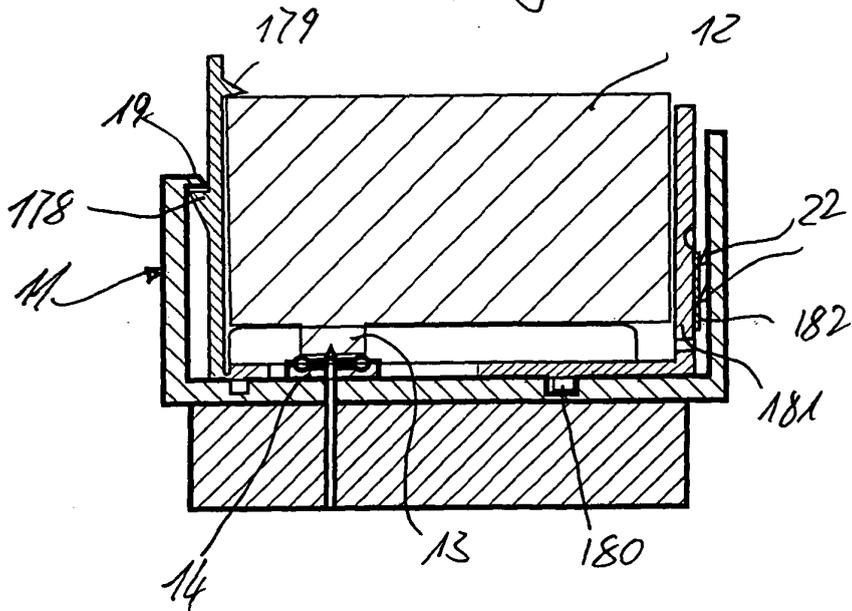


Fig 19





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Place of search		Date of completion of the search	Examiner
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X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document			

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