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(54) Dot matrix printer head.

(57) A dot matrix printer head comprising an ink supply tank (2,2″) containing ink absorbing means (60″,61,62) characterised in that the ink absorbing means (60″,61,62) has been impregnated with ink at a pressure lower than atmospheric pressure.

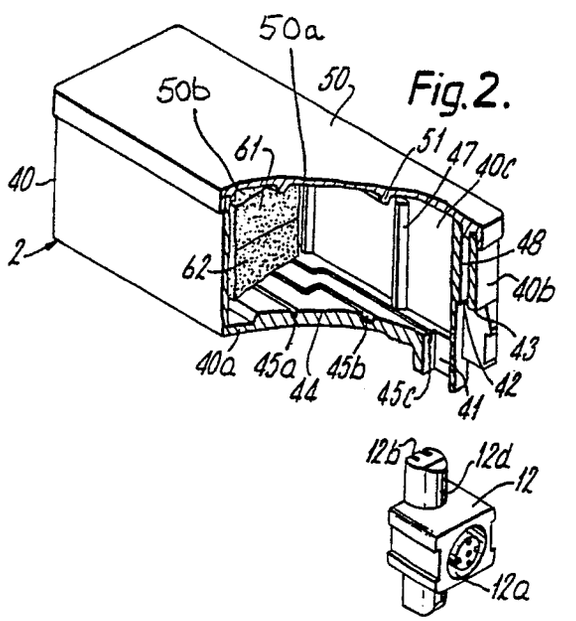


Fig.2.

EP 0 406 982 A2

DOT MATRIX PRINTER HEAD

The present invention relates to a dot matrix printer head and, although it is not so restricted, it relates more particularly to a wire dot matrix printer head having wires supplied with ink at distal end faces and movable against a sheet of print paper for transferring ink to the sheet in the form of dots to record a character, a figure, a graphic image or the like on the sheet.

An ink supply system for a wire dot matrix printer is known in which an ink ribbon is not used, but ink is supplied from an ink tank to the distal ends of the wire and transferred from the wires directly to a sheet of print paper. One known ink guide mechanism for such an ink supply system is disclosed in US-A-4,194,846 and comprises a porous member capable of absorbing ink from an ink tank, the ink guide mechanism having wires contacting the porous member. The porous member contains fine holes whose sizes or diameters vary in a certain range, with the result that the ink absorbing capability varies from porous member to porous member, and both excessive and insufficient quantities of ink are liable to be supplied to the distal ends of the wires. The quantities of ink retained in the vicinity of the distal ends of the wires differ widely, and the porous member is liable to vary in dimensions or to be deformed due to coaction with the sides of the wires. Consequently, the ink densities of the so-formed dots are irregular.

EP-A-97,009 discloses another ink supply mechanism in which ink is supplied from an ink tank to the distal ends of wires by means of a pump. The ink supply mechanism of EP-A-97,009 has, however, the disadvantage that the construction of the connection between the pump and a printer head is complex and results in increased cost. It is necessary to provide a good seal so as to obtain good pump performance, and a large-torque drive source is required for driving the pump. The ink supply mechanism is particularly complex in the case of a multi-colour printer head, and such an ink supply mechanism is not suitable for use with a small printer head.

It is therefore an object of the present invention to provide a high-quality and highly reliable dot matrix printer head of a simple construction which is capable of supplying a stable and appropriate quantity of ink from an ink tank thereof to the distal ends of a wire or wires and is less subjected to the influence of environmental changes such as temperature variations than prior constructions.

In DE-A-2,546,835 there is disclosed a wire dot matrix printer head comprising an ink tank; a wire guide means having a portion which is arranged to receive ink from the ink tank; and a printing wire a distal end portion of which is mounted in a hole in the wire guide means, the wire guide means having a capillary ink path which communicates both with the said portion of the wire guide means and with a distal end portion of the printing wire so as to supply ink to the latter.

In DE-A-2,546,835, however, the ink tank contains liquid ink which enters one end of the capillary ink path, with the result that ink flow is liable to vary or to be interrupted if the liquid ink contains particles of dust etc. which clog the capillary ink path. Furthermore, the wire guide means is so constructed that any air which has been drawn into the ink by capillary force cannot escape therefrom prior to reaching the distal end surface of the wire guide means, with the result that the air can expand under the low pressure which is present and cause flow problems. Additionally, no means are provided for preventing excessive ink accumulating on the distal end surface of the wire guide means.

In EP-A-0,042,293 there is disclosed a wire dot matrix printer head comprising an ink supply means; a wire guide means having a portion which is arranged to receive ink from the ink supply means and which has a distal end surface; and a printing wire a distal end portion of which is mounted in a hole in the wire guide means with a gap therebetween, the wire guide means having a capillary ink path which communicates both with the said portion and the distal end surface of the wire guide means and with the distal end portion of the printing wire so as to supply ink to the latter, the said hole communicating with at least one ink collection groove situated in the distal end surface of the wire guide means into which ink collection groove any excessive ink on the distal end surface of the wire guide means is drawn under capillary attraction, the or each ink collection groove being open to the atmosphere. In this construction, however, there is no provision for ensuring that the force of capillary attraction increases in the direction from the ink supply means to the said distal end surface with the result that there can be wastage of ink in the said ink supply means, especially if air is trapped in the latter.

According, therefore, to the present invention, there is provided a dot matrix printer head comprising an ink supply tank containing ink absorbing means characterised in that the ink absorbing means has been impregnated with ink at a pressure lower than atmospheric pressure.

Preferably, the pressure at which the ink is impregnated is in the range 5 to 10 mmHg.

The ink supply tank preferably has an air hole

therein which communicates with air in at least one space between the ink absorbing means and an inner wall surface of the ink supply tank.

The ink absorbing means may comprise first and second porous members which are in contact with each other so that ink may flow from one to the other. Moreover, the ink supply tank may have an ink supply port which is arranged to receive ink from the second porous member, the first porous member having pores therein whose average diameter is greater than those of the second porous member.

Alternatively, the ink absorbing means may comprise a porous member whose pores are progressively reduced in size in a direction towards an ink supply port of the ink supply tank.

The porous member is preferably compressed in the vicinity of the said ink supply port.

The head may comprise a printing wire a distal end portion of which is mounted in a wire guide hole or holes of a wire guide means, a portion of the wire guide means being arranged to receive ink from the ink absorbing means, and the wire guide means having a capillary ink path which communicates both with the said portion of the wire guide means and with the distal end portion of the printing wire.

The said ink absorbing means reduces the chance of particles of dust being carried into the capillary ink path. Moreover, air which has been drawn into the ink by capillary force can escape therefrom through ink collection groove or grooves, while the latter may serve to prevent excessive ink building up on the distal end surface of the wire guide means.

The invention is illustrated, merely by way of example, in the accompanying drawings, in which:-

Figure 1 is an exploded perspective view of a printer head according to the present invention,

Figure 2 is an exploded perspective view, partly cut away, of an ink tank and ink supply guide forming part of the printer head of Figure 1;

Figure 3 is a side elevational view illustrating the manner in which an ink tank is mounted in place in a head body of the printer head of Figure 1;

Figure 4 is an exploded perspective view of an ink guide which may form part of a printer head of the present invention;

Figure 5 is an exploded perspective view of an ink tank which may form part of a printer head of the present invention;

Figure 6 is a perspective view, partly broken away, of an ink tank previously known to the applicants;

Figure 7 is a schematic view to illustrate the way in which air trapped in the ink tank of Figure 6 is expanded; and

Figure 8 is a schematic view of a seven-column printer to illustrate an arrangement of wires thereof.

Figures 6 and 7 of the accompanying drawings illustrate an ink tank construction previously known to the applicants comprising an ink-impregnated member 160, e.g. of a porous material, which fills a tank 140. The ink tank construction of Figures 6 and 7 is of a simple shape and can supply a suitable amount of ink to a printer head body under appropriate capillary attraction by the ink-impregnated member 160. The member 160 can be impregnated with a large quantity of ink while preventing unwanted ink outflow from an air hole 142 in the tank 140 and from an ink supply port 141.

When ink is supplied from the ink tank 140 of such a construction, the ink in the ink tank 140 which is remote from the ink supply port is moved toward the ink supply port 141 under a pressure difference which is developed between the ink close to the ink supply port 141 and the ink remote therefrom as capillary attraction of the ink-impregnated member 160 in the vicinity of the ink supply port 141 is increased due to ink consumption. However, as can be seen in porous materials, as the quantity of impregnated ink is reduced, ink-impregnated members are generally subjected to an increased resistance to ink flow and to the fact that interrupted ink paths prevent smooth ink flow. If the ink flow is prevented before a pressure difference is produced high enough to move the ink in the ink tank 140, then the ink remote from the ink supply port 141 remains in position and unused, resulting in a short ink supply duration.

As shown schematically in Figure 7, the ink tank 140 frequently has pockets or layers of air trapped therein. When the ambient temperature rises or the atmospheric pressure is lowered in such circumstances, an air layer 143 communicating directly with the air hole 142 is expanded and is discharged out of the air hole 142 as indicated by arrows A without applying any pressure to the impregnated ink, whereas a pocket 144 of completely trapped air is expanded as indicated by the arrows B and thus moves the surrounding ink. Upon arrival of such an air pocket 144 at the ink supply port 142, the resulting undesired ink outflow can cause a sheet of print paper to be smeared by an ink spot or can allow ink to find its way into the printer head mechanism, with a resulting malfunction of the latter.

In one embodiment of the present invention, a printer head is adapted for use in a multi-colour printer. Movement is effected of the head of such a printer or of a sheet of print paper or both, a wire corresponding to a desired one of the colours being directed against the print paper at a prescribed position thereon to form an ink dot. Desired characters and figures can thus be produced by

repeating the above cycle. In such a colour image printer using inks of different colours, a sheet of print paper (or other materials may be scanned by a printer head in a direction normal to the direction of feed of the print paper to form a one-dot line in one scanning stroke, and the print paper may be fed along by line pitches to record images.

The construction of a multi-colour printer is schematically shown in Figure 8. A printer head 70 is movable back and forth in the directions of an arrow X, and a sheet of print paper (or other material) 71 is fed along successively at a one line pitch in the direction of an arrow Y. An array of wire positions 72, 73, 74, 75 on the printer head 70 extends along a straight line inclined at an angle θ with respect to the scanning directions X, the wire positions being spaced in the direction Y at a pitch of L sin θ. Yellow-ink, magenta-ink, cyan-ink, and black-ink wires (not shown) are located at the positions 72, 73, 74 and 75, respectively, to effect colour-image printing free from undesired colour mixing. Since a dot of one colour is put on top of a dot of another colour for mixed colour formation, multi-colour image printers are generally liable to suffer from unwanted colour mixing because the ink of the former colour is applied to the wire carrying the ink of the latter colour. In the printer construction of Figure 8, yellow ink, which is the ink most affected in colour by inks of the other colours, is first applied to the print paper so as to prevent the inks of the other colours from being applied to the tip of the wire carrying the yellow ink, thus avoiding the mixture of the yellow ink with the inks of the other colours.

The present invention is concerned primarily with a printer head, and no further detailed description of the overall printer construction will therefore be given.

Figure 1 is an exploded perspective view of a printer head according to the present invention.

An ink tank 2 is detachably mounted by a holder on top of a printer head body 1. The ink tank 2 is of a double construction composed of an ink tank 2b for containing a black ink and an ink tank 2a which is divided into three sections for coloured inks. The inks are impregnated in ink-impregnated members 61, 62 (Figure 2) or member 60″ (Figure 5) of a porous material contained in the ink tank 2.

For each ink, the printer head body 1 has in its front portion an ink supply guide 12 (Figure 2) having ink guide grooves 12b with ends leading to the respective ink-impregnated member 61, 62 and a wire guide 13 (Figure 4) having a wire guide hole 13a for guiding the tip or distal end portion of a respective printing wire (not shown) therein.

There are thus as shown in Figure 1 four ink tanks and associated wires etc, but in order to simplify the description below, reference will normally be made only to a single ink tank and its associated wire etc.

The ink supply guide 12 and the wire guide 13 jointly form an ink path from the ink tank 2 to the distal end portion of the wire. The printer head shown in Figures 1 and 2 is adapted for use in a four-colour printer plotter or in a four-colour image printer, and four wires are employed respectively corresponding to the four colours.

In a standby position, the distal end portion of the wire is located rearwardly of a distal end surface 13c of the wire guide 13, and the length of the wire is selected such that an ink meniscus formed in a front portion of the wire guide hole 13a covers the distal end of the wire.

An ink guide assembly, which comprises an ink supply guide 12″ and the wire guide 13, will be described in greater detail with reference to Figure 4.

The ink supply guide 12″ has a central hole 12″f for guiding the distal end portion of the wire. The ink supply guide 12″ also has an axial ink guide groove 12″b leading to the ink-impregnated member 62. The ink guide groove 12″b has a width and a depth selected such that ink will be stably supplied from the ink tank 2 as described later on. The ink supply guide 12″ has on a front surface 12″e thereof a circular groove 12″a which communicates with the ink guide groove 12″b through an inner portion (not shown). The wire guide 13 has a proximal end 13d thereof placed in the circular groove 12″a. There is only a small gap between the wire and the peripheral surface defining the wire guide hole 13a in the wire guide 13. The ink is guided from the ink tank 2 through the ink guide groove 12″b in the ink supply guide 12″ and through the wire guide 13 to the distal end portion of the wire under capillary attraction.

The ink tank 2 will now be described in detail with reference to Figure 2.

The ink tank 2, or each ink tank 2a, 2b, comprises an ink tank body 40, two stacked ink-impregnated members 61, 62 of a porous material which are disposed in the space in the ink tank body 40 so as to fill the latter, and a lid 50. The ink-impregnated members 61, 62 are impregnated with ink at a pressure below atmospheric pressure ranging from 5 to 10 mmHg, so that air remaining in the porous ink-impregnated members will be reduced as much as possible to increase the amount of impregnated ink. The ink tank body 40 has a bottom or inner wall surface 40a provided with a front ink supply port 41 and a front wall 40b having an air hole 42 defined in a stepped portion thereof. The ink supply guide 12 has an arm 12d which is inserted in the ink supply port 41 and which projects from the printer head body 1. The

bottom or inner wall surface 40a of the ink tank body 40 has a raised or projecting portion 44 in which there are a plurality of slots 45a, 45b, 45c which communicate with the ink supply port 41. The slots 45a, 45b, 45c are disposed opposite to and communicate with the ink supply grooves 12b provided in the arm 12d of the ink supply guide 12. Although not shown, the slots 45a, 45b are joined together to form a single slot which together with the slot 45c guides the ink into the ink supply grooves 12b. The ink tank body 40 also has a side wall 40C having on its inner wall surface a plurality of vertical ridges 47 which project therefrom. The ridges 47 have lower ends held against the bottom 40a and upper ends kept out of contact with the tank lid 50. The ink tank body 40 further has a front partition 48 which is disposed behind the air hole 42 and in front of the ink supply port 41, the front partition 48 having one end joined to the side wall 4° C. The tank lid 50 has on a lower or inner wall surface 50a thereof a plurality of longitudinal ridges 51 which project from the surface 50a.

The space or hollow interior defined by the bottom 40a, the side wall 40C, the partition 48, and the lid 50 of the tank body 50 accommodates therein the two porous members 61, 62 as double layers which are held in contact with only the raised surface 44 of the bottom 40a, the vertical ridges 47 of the side wall 40C, the partition 48, and the ridges 51 of the lid 50. Thus there is a space 50b between the porous member 61 and the inner wall surface 50a of the tank lid 50, and this space 50b communicates with the air hole 42. The porous members 61, 62 have different average hole sizes or diameters. The porous member 61, which has a larger average hole diameter, is placed on top of the other porous member 62. Thus the porous member 62 which is closer to the ink supply port 41, is made of a porous material having a smaller average hole diameter than that of the porous member 61, while the porous member 61, which is further from the ink supply port 41 has a greater average hole diameter than that of the porous member 62.

In the ink guide assembly and the ink tank thus constructed, the capillary attraction is successively greater along the ink path, that is, successively from the porous member 61 having the larger average hole diameter to the porous member 62 having the smaller average hole diameter and thence to the ink guide slots 45a, 45b, 45c provided in the raised surface 44 of the bottom or inner wall surface 40a of the ink tank body 40 and so to the ink guide grooves 12b provided in the ink supply guide arm 12d and hence to gaps between the ink supply guide 12 and the wire guide 13, and finally to the gap between the ink supply guide 12 and the wire and the gap between the wire guide 12 and the wire. The above capillary attraction setting can be achieved by providing the following dimensions:

The average hole diameter of the porous member 61: 0.4 mm.

The average hole diameter of the porous member 62: 0.3 mm.

The width of each of the ink guide slots 45a, 45b, 45c: 0.12 mm.

The width of the ink guide grooves 12b: 0.1 mm

The gaps between the ink supply guide 12 and the wire guide 13: 0.1 mm

The gap between the surface defining the wire guide hole 13a and the wire: 0.01 mm

A construction for removably attaching the ink tank 2 will be described with reference to Figures 1 and 3.

The printer head body 1 has a head frame 30 including side walls extending from upper and back portions of the printer head body 1 and serving as a holder support 31. Each of the side walls of the holder support 31 has a holder support hole 32, a leaf spring 36 which is defined by two vertical recesses 33a, 33b in the holder support 31 and which has a holder attachment hole 34, and a guide slot 35. A holder 70a has on each of its opposite sides a cylindrical projection 71a, which is rotatably mounted in a holder support hole 32 in the head frame 30, and a semispherical projection 72a, which is engageable in a holder attachment hole 34. Each of the ink tanks 2a, 2b has a side disposed closer to the respective holder support 31 and having a cylindrical projection 49 engageable with a lower edge of the respective guide slot 35.

The ink tank 2 can be attached to the holder 70a and detached therefrom in the following manner.

The holder 70a is supported in the position shown in Figure 3, and the ink tank 2 is inserted into the holder 70a in the directino of the arrow C. At this time, the ink tank 2 is not required to be accurately positioned in the holder 70a and hence can easily be inserted into the holder 70a. Then, the holder 70-a is turned in the direction of the arrow D to bring the projection 49 on each of the sides of the ink tank 2 into contact with an edge of the respective guide slot 35 in the head frame 30, whereupon the ink tank 2 is positioned with respect to the head frame 30.

The ink supply port 41 is now positioned correctly above the arm 12d of the ink supply guide 12 which projects upwardly from the printer head body 1. Continued turning movement of the holder 70a causes the arm 12d to engage in the ink support port 41 and be inserted into the ink tank 2. The semispherical projection 72a on each side of the tank holder 70a engages and spreads the leaf springs 36 apart from each other. The semispher-

ical projections 72a finally engage in the attachment holes 34 in the leaf springs 36, whereupon the leaf springs 36 return to the vertical positions to retain the holder 70a securely in position. At this time, the ink guide slots 45a, 45b, 45c in the bottom or inner wall surface 40a of the ink tank 2 are disposed opposite to the ink guide grooves 12b in the arm 12d of the ink supply guide 12, thus forming part of the ink path from the ink tank 2 to the printer head body 1. The ink tank 2 can be removed in a procedure which is the reverse of the attachment process described above.

In operation, the distal end of the wire projects through the ink meniscus, carries ink thereon, and hits a sheet of print paper (not shown) to transfer the ink to the print paper. When the wire is in a standby position, the distal end thereof is located inwardly of the distal end surface 13c of the wire guide 13 so that an ink meniscus is formed in front of the distal end of the wire. Accordingly, ink is attached successively to the distal end of the wire as the latter is projected and retracted. The transfer of ink to the distal end of the wire 11, and other details of an inked-wire dot matrix printing process are described in the above-mentioned EP-A-97,009 and will therefore not be described here in greater detail.

Any excessive ink on the distal end surface 13c of the wire guide 13 is drawn under capillary attraction into cross-sectionally V-shaped collection grooves 13b (Figure 4) provided in the front and side surfaces of the wire guide 13 and is returned to the ink supply guide 12 without smearing the print paper. The grooves 13b are thus provided in the distal end surface of the wire guide 13 and communicate with the wire guide hole 13a. As shown in Figure 4, the grooves 13b extend to the outer periphery of the wire guide 13 so as to be open to the atmosphere.

The operation of the ink supply mechanism of the inked wire dot matrix printer head referred to above will now be described.

In order to obtain a proper dot density, it is necessary to apply an appropriate quantity of ink stably to the distal end of the wire. Therefore, the wire guide hole 13a should have a proper dimension in the vicinity of the distal end of the wire and a proper amount of ink, without either an excess or a shortage of ink, should be supplied from the ink tank 2.

In the printer head construction described above, the ink guide path from the ink tank 2 to a position in the vicinity of the distal end of the wire, is composed of slots, grooves, and gaps. By selecting suitable dimensions of the widths of the slots, grooves, and gaps, the amount of ink necessary for printing can be guided to the distal end of the wire under appropriate capillary attraction without causing an overflow.

An appropriate quantity of ink can be supplied even when the ink supply from the ink supply grooves 12b is reduced due to increased use of ink.

The dimensions of the ink supply grooves and gaps, the hole diameters of the porous members 61, 62 and the widths of the slots 45a, 45b, 45c are selected so that the capillary attraction is progressively greater along the ink path. Therefore, ink will not be interrupted in the ink path as described below.

The ink is consumed from the ink tank 2 as printing progresses, ink flows from the porous member 62 through the ink guide grooves 12b, or through the ink guide grooves 12b and the slots 45a, 45b, 45c, into the printer head body 1. Since the ink moves transversely across the porous member 62 at this time, the distance that the ink moves through the porous member 62 is small and no ink interruption occurs. When ink in the porous member 62 is consumed, a pressure difference immediately occurs between the ink in the porous member 61 and the ink in the porous member 62 due to the difference between their average hole diameters, and the same quantity of ink as is consumed is supplied from the porous member 61 to the porous member 62. No ink interruption takes place at this time since the ink moves transversely in and across the porous member 61. The amount of ink retained in the porous member 62 thus remains substantially the same as ink which has been fed out. Therefore, as the printing operation progresses, the ink in the porous member 61 is first used up, and then the ink in the porous member 62 is used up.

The ink guide mechanism in the printer head body operates to produce the same advantage. If the flow of ink is interrupted in the ink path by reason of vibrations or the like, a mass of ink which has been so interrupted is moved forward until it is joined to a preceding mass of ink since the capillary attraction is greater in the ink path than in the ink tank. Since the capillary attraction is greater in the vicinity of the distal end of the wire than in the portion of the ink path in which the flow of ink is interrupted, no ink is retracted from the distal end of the wire, and hence the dot density will not be rendered unstable even momentarily, so that all ink on the distal end of the wire can be used up.

In the ink tank construction described above, the ink-impregnated members 61, 62 are supported on the ridges 47, 51 in the ink tank body 40. The ink-impregnated members 61, 62 are therefore surrounded by a layer of air which communicates by way of the air hole 42 with the ambient air. Since the ink is impregnated under a low pressure, there is substantially no air layer or pocket enclosed by

the ink in the ink-impregnated members 61, 62. Therefore, any expansion of the air in the tank 2 caused by a temperature rise or by a reduction in atmospheric pressure is released through the air hole 42, so that the pressure in the tank 2 is equalized to atmospheric pressure and does not force the ink out of the ink tank 2.

The ink tank 2 is therefore protected from an ink outflow due to variations in temperature and atmospheric pressure, and is capable of supplying ink stably.

The ink tank 2 and the ink guide path for supplying ink to the wire have dimensions dependent on the accuracy of the shapes of the components. Since the components can be easily formed with high dimensional accuracy, as by moulding, the ink tank 2 and the ink guide path can be highly dimensionally accurate and have a stable ink supply capability. The ink tank 2 and the ink guide path can easily be assembled as they are composed of a small number of parts. They may be maintained free from wear and deformation for a long period of use and can keep their initial performance partly because of the lubrication effected by the ink.

As shown in Figure 4, the ink guide groove 12″b has mounted therein an ink guide porous member 12″e which serves as an extension of the ink-impregnated members in the ink tank. The operation of the ink guide member 12″ is essentially the same as that of the member 12 of Figure 2.

Figure 5 is an exploded perspective view of an ink tank 2″ which may be used in the present invention. The parts of the ink tank of Figure 7 other than a porous member 60″ are the same as those in the embodiment shown in Figure 2. The porous member 60″ has different front and rear thicknesses so that the thicker front portion, which is disposed adjacent to the ink supply port 41, is compressed by the tank lid 50 when the porous member 60″ is introduced into the tank body 40. Therefore, even if the porous member 60″ has uniform hole diameters, the front portion thereof, which is adjacent to the ink supply port 41, has a smaller average hole diameter, with the hole diameter becoming progressively greater toward the rear portion, which is remote from the ink supply port 41, at the time when the porous member 60″ is placed in the ink tank body 40. The porous member 60″ is structurally equivalent to a plurality of porous sheet layers of different average hole diameters which are placed in the ink tank body 40″ with the average hole diameters becoming progressively greater from the front to rear portion of the member 60″. Therefore, the operation of the porous member 60″ is basically the same as that of the porous members 61, 62 shown in Figure 2.

Although in the embodiment of Figure 1, the ink tank 2 is placed above the printer head 1, the ink tank 2 may be located below the wires to achieve a stable printing density through the ink guiding process described above.

In the constructions described above, ink can be stably supplied through a simple construction from an ink tank to the distal end of a wire, and ink is stably attached to the distal end of the wire for producing a stable and prcper ink dot density. The ink will not be interrupted in the ink guide path and the risk of a supply failure will be reduced. The quantity of ink absorbed in the ink guide path is smaller than would be the case with a known arrangement in which a porous member is used to apply ink to the distal end of the wire. Therefore, any wasted ink which is not used for printing is of a small quantity, and hence substantially all the ink in the ink t4ank can effectively be used for printing.

If the ink tank runs short of ink, or if the ink in the ink tank is rendered highly viscous by being dried at a high temperature, or if the supply of ink fails due to its solidification, a fresh cartridge ink tank can be mounted in place so that fresh ink can immediately be supplied to the distal end of the wire for resuming the desired printing operation.

In the printer head described above, no ink flow occurs due to variations in temperature and atmospheric pressure and a stable ink dot density is available. Unwanted ink flow out of the ink tank is prevented, thus avoiding smearing the print paper with undesired ink spots. No ink will enter the printer head mechanism, which is prevented from malfunctioning. The cartridge ink tank can easily be detached and attached for ink replenishment.

Since the ink supply system of the invention is simple in construction, it takes up only a small space. Where a multi-colour printer head employs ink supply systems as described above, the ink supply systems for different ink colours can be spaced widely so that any unwanted colour mixing can be avoided.

Claims

1. A dot matrix printer head comprising an ink supply tank (2,2″) containing ink absorbing means (60″,61,62) characterised in that the ink absorbing means (60″,61,62) has been impregnated with ink at a pressure lower than atmospheric pressure.

2. A dot matrix printer head as claimed in claim 1 characterised in that the pressure at which the ink is impregnated is in the range 5-10 mmHg.

3. A dot matrix printer head as claimed in claim 1 or 2 characterised in that the ink supply tank (2) has an air hole (42) therein which communicates with air in at least one space (50b) between the ink absorbing means (60″,61,62) and an inner wall sur-

face (50a) of the ink supply tank (2).

4. A dot matrix printer head as claimed in any preceding claim characterised in that the ink absorbing means comprises first and second porous members (61,62) which are in contact with each other so that ink may flow from one to the other.

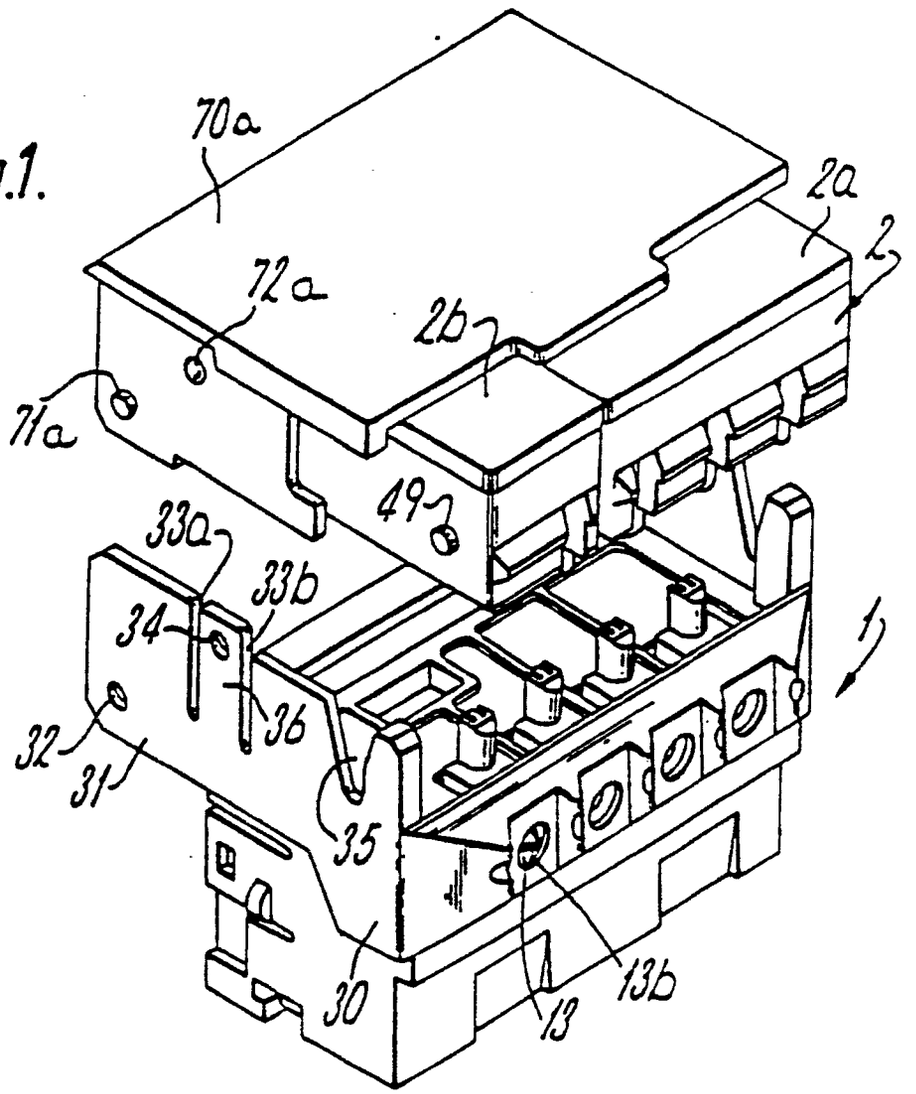
5. A dot matrix printer head as claimed in claim 4 characterised in that the ink supply tank (2) has an ink supply port (41) which is arranged to receive ink from the second porous member (62), the first porous member (61) having pores therein whose average diameter is greater than those of the second porous member (62).

6. A dot matrix printer head as claimed in any of claims 1-3 characterised in that the ink absorbing means comprises a porous member (60″) whose pores are progressively reduced in size in a direction towards an ink supply port (41) of the ink supply tank (2″).

7. A dot matrix printer head as claimed in claim 6 characterised in that the porous member (60″) is compressed in the vicinity of the said ink supply port (41).

8. A dot matrix printer head as claimed in any preceding claim characterised in that the head comprises a printing wire a distal end portion of which is mounted in a wire guide hole or holes (13a) of a wire guide means (12,12″,13), a portion (12d,12″d) of the wire guide means (12,12″,13) being arranged to receive ink from the ink absorbing means (60″,61,62), and the wire guide means (12,13) having a capillary ink path which communicates both with the said portion (12d,12″d) of the wire guide means (12,12″,13) and with the distal end portion of the printing wire.

Fig.1.



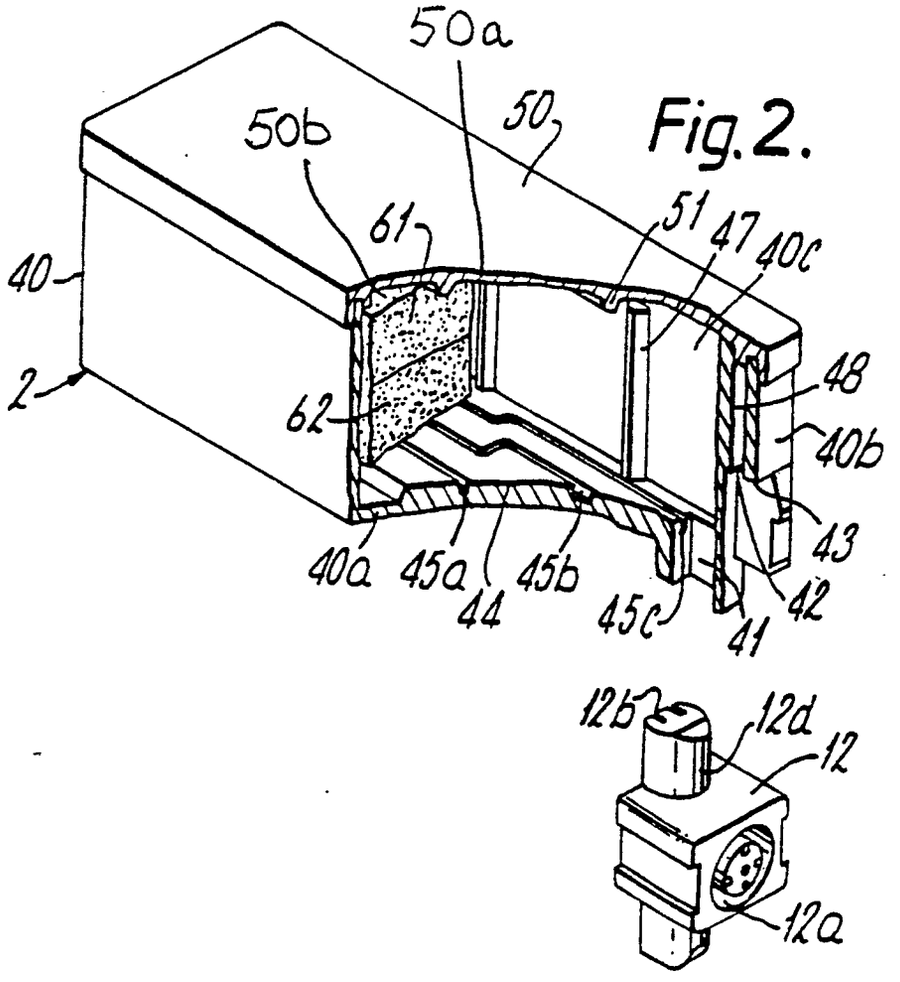
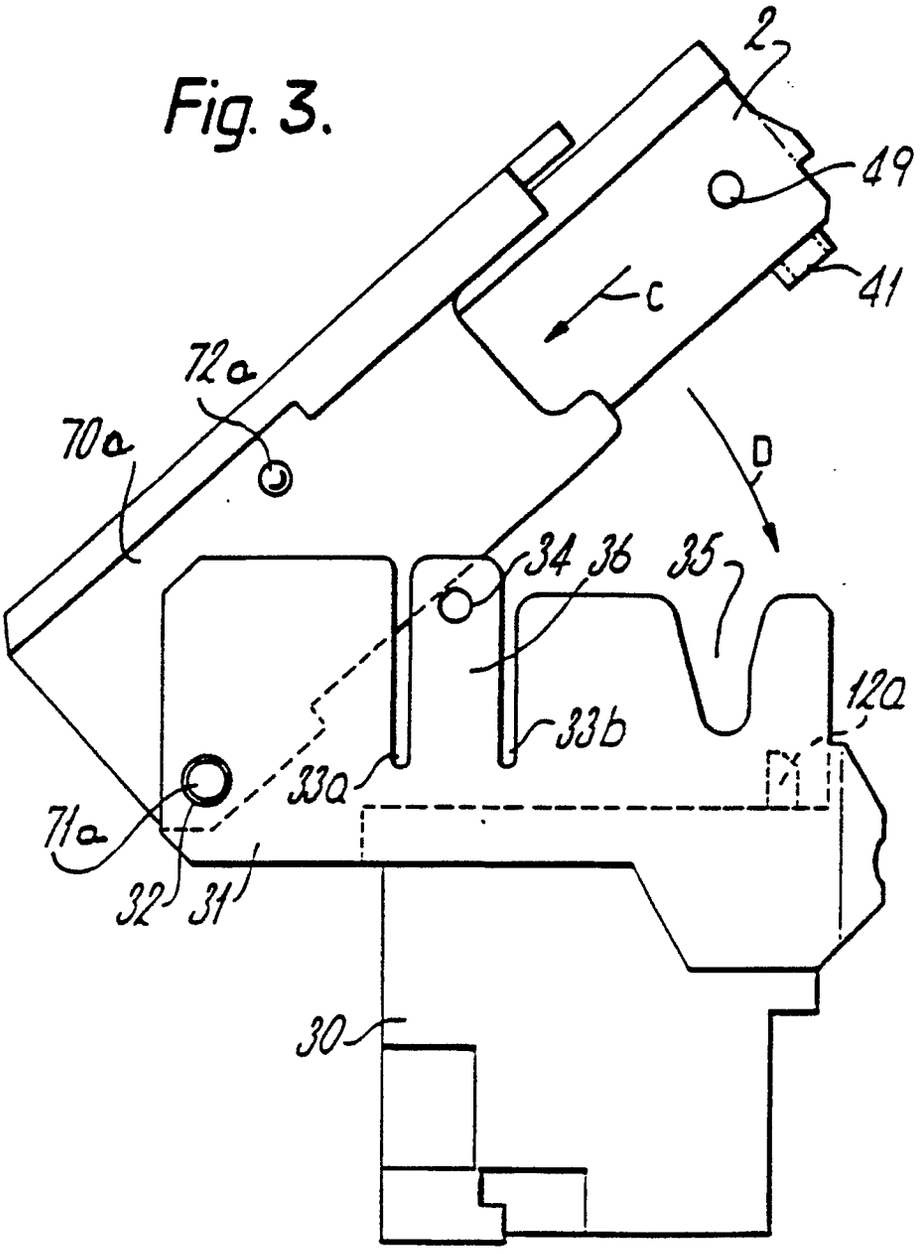

50a
50b
50
61
51
47
40c
40
2
48
62
40b
43
40a
45a
44
45b
45c
42
41
12b
12d
12
12a

Fig. 2.

Fig. 3.



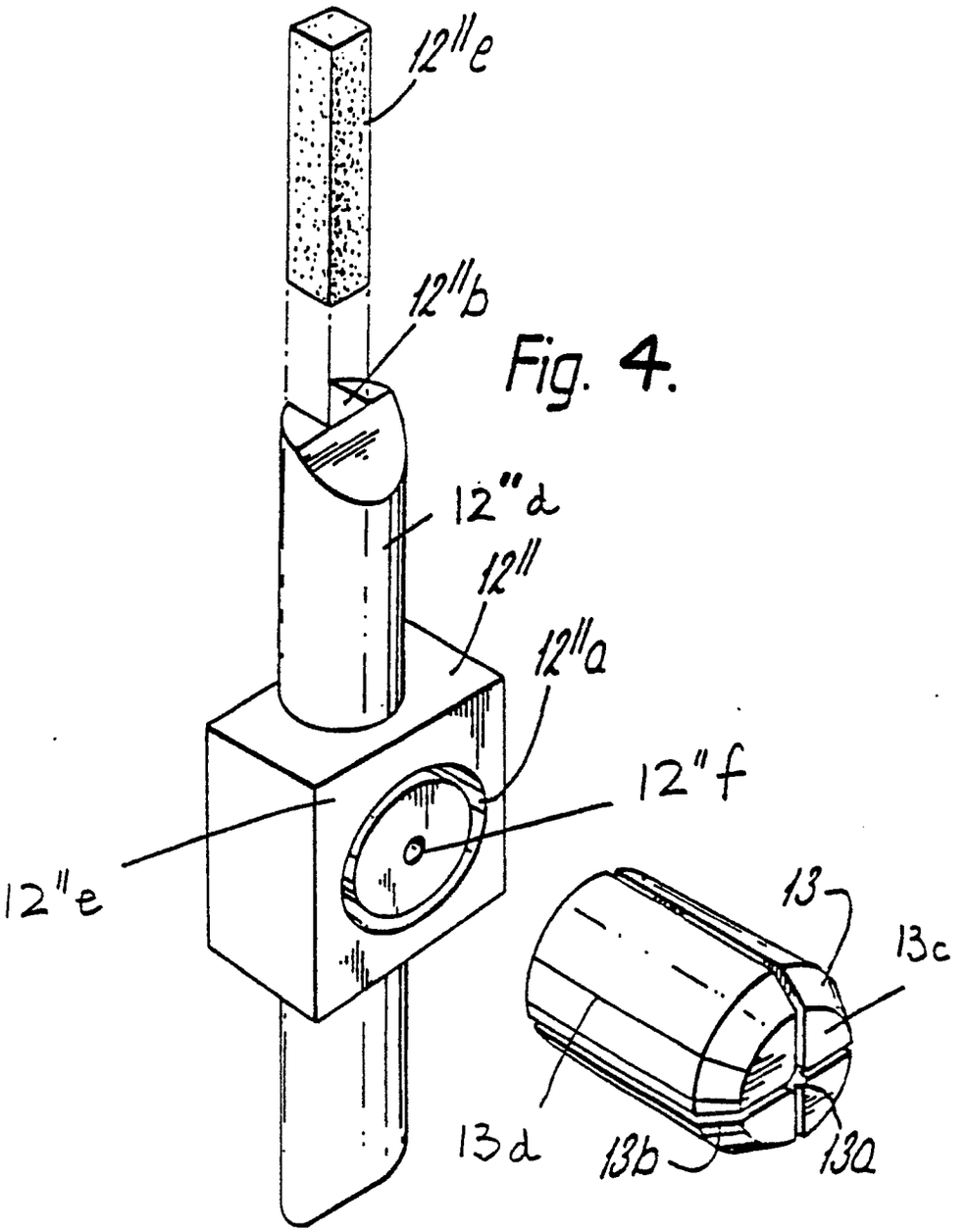


Fig. 4.

Fig. 5.

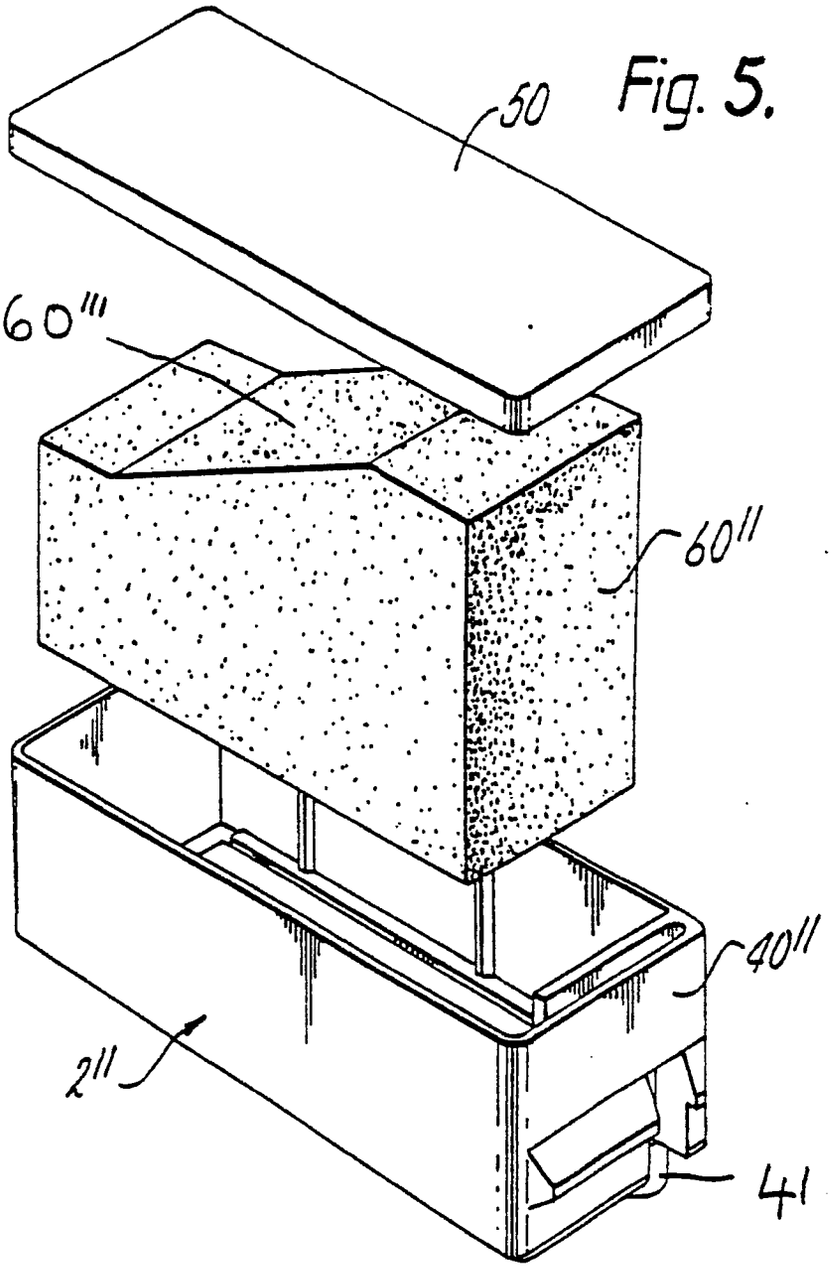


Fig. 7.

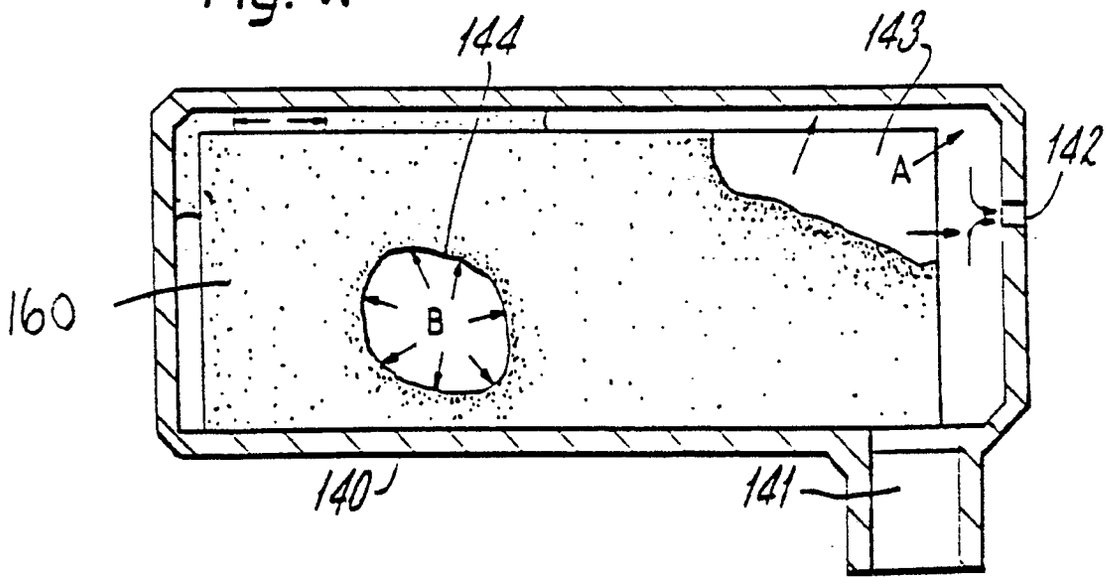


Fig. 6.

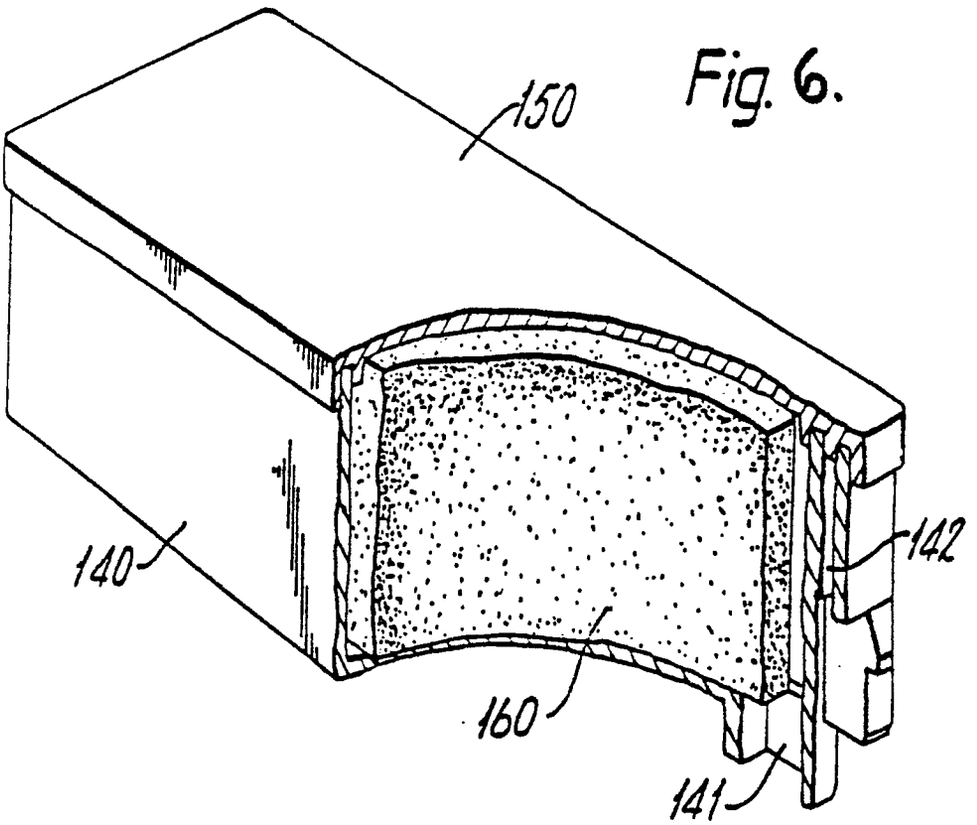


Fig. 8.