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(54) INK JET PRINTER NOZZLE ASSEMBLY

DÜSENAUFBAU FÜR EINEN TINTENSTRAHLDRUCKER

BUSE D'IMPRIMANTE A JET D'ENCRE

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- **PATENT ABSTRACTS OF JAPAN vol. 12, no. 289 (M-728) (3136) 8 August 1988 & JP,A,63 064 755 (HITACHI LTD) 23 March 1988**

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Description

The present invention relates to an ink jet printer nozzle assembly of the type comprising one or more nozzles mounted in a nozzle plate.

Nozzle assemblies of this type are well known and usually comprise a jewel nozzle in which an orifice is formed to a required shape and dimensions and a nozzle-supporting plate having a stepped bore into which the nozzle is fixed by means of adhesive. Adhesive is used in order to assure a permanent, rigid attachment of the nozzle in the nozzle plate.

However, there are disadvantages in using this type of fixing. For example, adhesive may enter the nozzle orifice or the narrower portion of the stepped bore in the nozzle plate and thus impede the desired flow through it. Furthermore, the adhesive forms a layer between the underside of the nozzle and the shoulder in the stepped bore in the nozzle plate and it is difficult to control, to the desired degree of accuracy, the precise positioning of the nozzle, as a result. Accuracy of position is important and particularly so in regard to ensuring that the emitted ink jet is normal to the surface of the nozzle plate. It is also known to retain the nozzle in the nozzle plate by a crimp of the nozzle plate surface (see document FR-A-2 208 339).

According to the present invention therefore, there is provided a nozzle assembly for an ink jet printer, the nozzle assembly comprising a nozzle mounted in a stepped bore in a supporting nozzle plate, the nozzle being disposed on a supporting shoulder within the stepped bore, sealed thereto by a resilient seal ring disposed between the nozzle and the shoulder, and retained therein by a crimp of the nozzle plate surface.

The invention also includes a method of manufacturing a nozzle assembly of this type, in which the nozzle is disposed on a supporting shoulder within the stepped bore of the nozzle plate, a resilient seal ring is provided between the shoulder and the nozzle, and the nozzle is retained within the stepped bore by crimping of the nozzle plate surface around the open end of the stepped bore.

The seal ring preferably comprises a seal ring which is formed of PTFE or other similar compliant material, to provide a secure seal between the underside of the nozzle and the shoulder in the stepped bore. Alternatively, the shoulder may include a retained seal disposed, for example in an annular groove in the shoulder or the adjacent wall of the bore.

The use of a PTFE seal ensures a sufficiently secure seal to avoid leakage around the nozzle in use, avoiding the need for adhesive to be used in fixing and sealing the nozzle in the nozzle plate.

Crimping the nozzle in position enables the problems associated with adhesive fixing to be overcome and, in particular, enables the nozzle to be accurately positioned in parallelism with the nozzle plate to ensure the precise location of the jet of ink which issues therefrom in use.

The nozzle may be initially held in position within the stepped bore by a cylindrical guide around which an annular crimping tool may slide, so as to be driven against the edge of the open end of the bore around the nozzle, to produce the crimp.

One example of a nozzle assembly according to the present invention will now be described with reference to the accompanying drawings, in which:-

Fig. 1 is a side elevation, partly sectioned, of a nozzle plate and crimping tool;
Fig. 2 is an enlarged view of the crimp head of a crimping tool;
Fig. 3 is an enlarged view of a location pin for locating the plate relative to the tool; and,
Fig. 4 is a plan view of the PTFE seal.

Figure 1 shows a nozzle plate 1 positioned on the base plate 2 of a crimping tool, the base plate 2 having a hardened steel locating pin 3 which locates within a bore 4 formed in the nozzle plate. Coaxial with the bore 4 is an enlarged counterbore 5 in which are positioned firstly a PTFE seal 6 and a jeweled nozzle 7 having a tapered central orifice 8. Figure 1 shows the finished nozzle plate, after crimping of the jewel 7 into position in the counterbore 5 has taken place, an annular crimp 9 being shown.

In order to form the crimp 9 a cylindrical guide 10 is first lowered into position on top of the jewel 7 and thereafter the annular crimping head 11 of the crimping tool is thrust downwardly around the cylindrical guide 10 into engagement with the upper surface 12 of the nozzle plate immediately around the end of the counterbore 5 in order to form the crimp. PTFE seal 6 supports the jewel or nozzle in the counterbore 5 at a predefined position so that the nozzle or jewel 7 is always fixed in the same relative position within the nozzle plate, thus ensuring consistency of dimensions across different nozzle assemblies.

The shape of the end of the annular crimping head 11 is more clearly seen in figure 2 and the form of the locating pin 3 seen in more detail in figure 3. The PTFE seal itself is shown in figure 4.

Claims

1. A nozzle assembly for an ink jet printer, the nozzle assembly comprising a nozzle mounted in a stepped bore (4) in a supporting nozzle plate (1), the nozzle (7) being disposed on a supporting shoulder within the stepped bore, and retained therein by a crimp (9) of the nozzle plate surface, characterized in that the nozzle is sealed to the supporting shoulder by a resilient seal ring (6) disposed between the nozzle and the shoulder.

2. A nozzle assembly according to claim 1, wherein the seal ring comprises a separate seal ring (6) formed from a compliant material, to provide a

secure seal between the underside of the nozzle (7) and the shoulder in the stepped bore (4).

3. A nozzle assembly according to claim 2, wherein the seal ring (6) is formed from PTFE or other similar material.

4. A nozzle assembly according to claim 1, wherein the shoulder includes a retained seal disposed in an annular groove on the shoulder or adjacent wall of the bore.

5. A method of manufacturing a nozzle assembly in which the nozzle (7) is disposed on a supporting shoulder within a stepped bore (4) of a nozzle plate (1), and is retained within the stepped bore by crimping of the nozzle plate surface around the open end of the stepped bore, characterized in that a resilient seal ring is provided between the shoulder and the nozzle.

6. A method according to claim 5, wherein the nozzle (7) is initially held in position within the stepped bore (4) by a cylindrical guide around which an annular crimping tool (11) may slide, so as to be driven against the edge of an open end of the bore around the nozzle, to produce the crimp (9).

Patentansprüche

1. Düsenaufbau für einen Tintenstrahldrucker, wobei der Düsenaufbau eine in einer abgestuften Öffnung (4) in einer Düsen-Trägerplatte (1) angebrachte Düse umfaßt und die Düse (7) auf einer Stützschulter innerhalb der abgestuften Öffnung angeordnet ist und dort mittels einer Sicke (9) der Düsenplattenoberfläche gehalten wird, dadurch **gekennzeichnet**, daß die Düse gegenüber der Stützschulter mittels eines elastischen Dichtungsrings (6) abgedichtet ist, der zwischen der Düse und der Schulter angeordnet ist.

2. Düsenaufbau nach Anspruch 1, dadurch **gekennzeichnet**, daß der Dichtungsring einen separaten, aus einem nachgiebigen Material ausgebildeten Dichtungsring (6) umfaßt, um eine sichere Abdichtung zwischen der Unterseite der Düse (7) und der Schulter in der abgestuften Öffnung (4) zu schaffen.

3. Düsenaufbau nach Anspruch 2, dadurch **gekennzeichnet,** daß der Dichtungsring (6) aus PTFE oder einem anderen ähnlichen Material ausgebildet ist.

4. Düsenanordnung nach Anspruch 1, dadurch **gekennzeichnet**, daß die Schulter eine gehalterte Abdichtung beinhaltet, die in einer ringförmigen Nut an der Schulter oder an der benachbarten Wandung der Öffnung angeordnet ist.

5. Verfahren zum Herstellen eines Düsenaufbaus, bei dem die Düse (7) auf einer Stützschulter innerhalb einer abgestuften Öffnung (4) einer Düsenplatte (1) angeordnet wird und in der abgestuften Öffnung durch Sicken der Düsenplattenoberfläche um das offene Ende der abgestuften Öffnung herum gehaltert wird, dadurch **gekennzeichnet**, daß zwischen der Schulter und der Düse ein elastischer Dichtungsring vorgesehen wird.

6. Verfahren nach Anspruch 5, dadurch **gekennzeichnet,** daß anfänglich die Düse (7) in der abgestuften Öffnung (4) mittels einer zylindrischen Führungsvorrichtung in Position gehalten wird, entlang derer ein ringförmiges Sickenwerkzeug (11) gleiten kann, um so gegen die Kante eines offenen Endes der Öffnung um die Düse getrieben zu werden und die Sicke (9) zu erzeugen.

Revendications

1. Ensemble de buse pour une imprimante à jet d'encre, l'ensemble de buse comportant une buse montée dans un alésage étagé (4) dans une plaque de buse de support (1), la buse (7) étant disposée sur un épaulement de support à l'intérieur de l'alésage étagé, et retenu dedans par un sertissage (9) de la surface de plaque de buse, caractérisé en ce que la buse est rendue étanche sur l'épaulement de support par un joint d'étanchéité élastique (6) disposé entre la buse et l'épaulement.

2. Ensemble de buse selon la revendication 1, dans lequel le joint d'étanchéité comporte un joint d'étanchéité séparé (6) formé dans une matière élastique, afin de procurer une étanchéité sûre entre le côté inférieur de la buse (7) et l'épaulement dans l'alésage étagé (4).

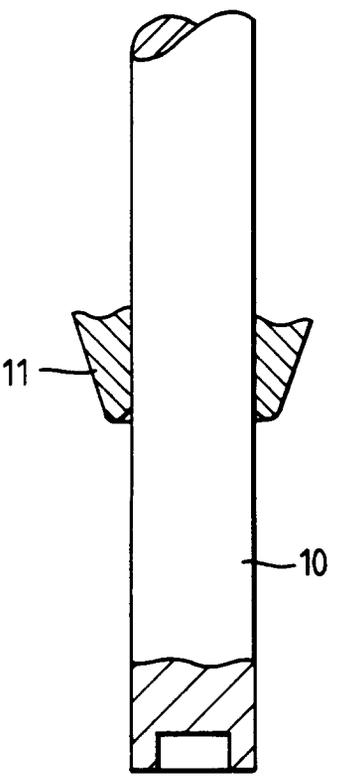
3. Ensemble de buse selon la revendication 2, dans lequel le joint d'étanchéité (6) est formé en PTFE ou une autre matière similaire.

4. Ensemble de buse selon la revendication 1, dans lequel l'épaulement comprend un joint retenu disposé dans une rainure annulaire dans l'épaulement ou la paroi adjacente de l'alésage.

5. Procédé de fabrication d'un ensemble de buse, dans lequel la buse (7) est disposée sur un épaulement de support dans un alésage étagé (4) d'une plaque de buse (1), et est retenue dans l'alésage étagé par sertissage de la surface de plaque de buse autour de l'extrémité ouverte de l'alésage étagé, caractérisé en ce qu'un joint d'étanchéité élastique est prévu entre l'épaulement et la buse.

6. Procédé selon la revendication 5, dans lequel la buse (7) est initialement maintenue en position dans l'alésage étagé (4) par un guide cylindrique autour duquel peut coulisser un outil de sertissage annulaire (11), de façon à être entraînée contre le bord d'une extrémité ouverte de l'alésage autour de la buse, afin de produire le sertissage (9).

Fig.1.



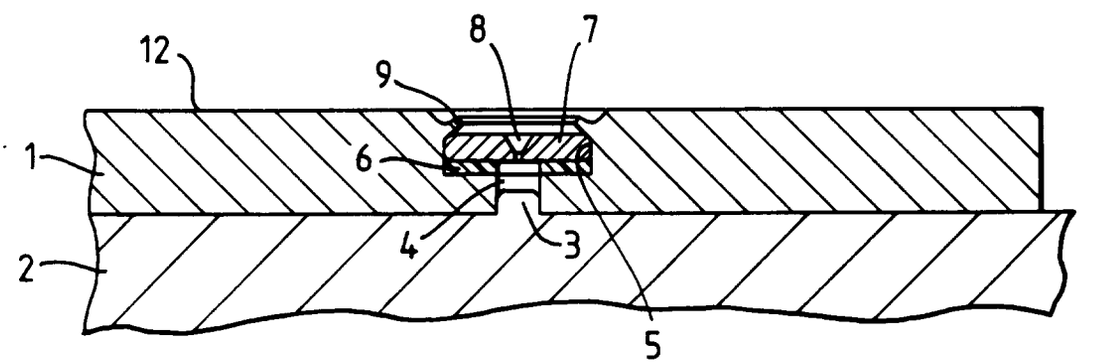


Fig.2.

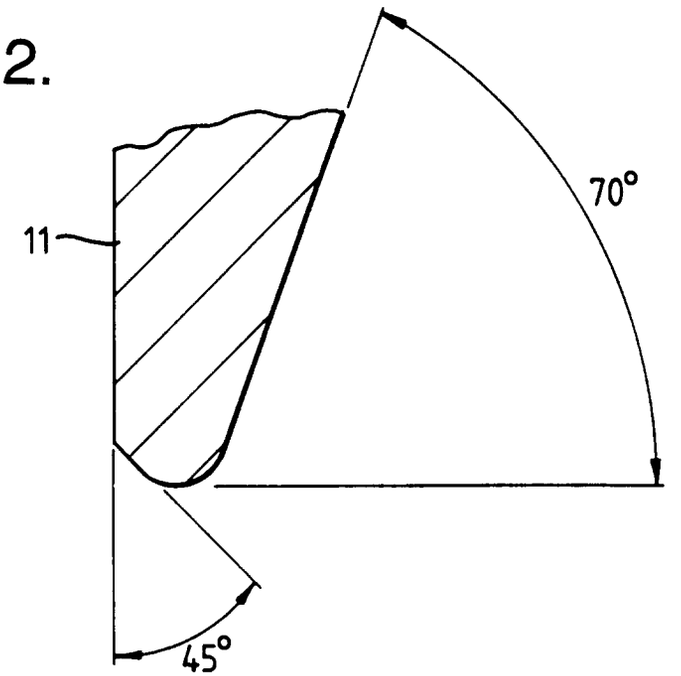


Fig.3.

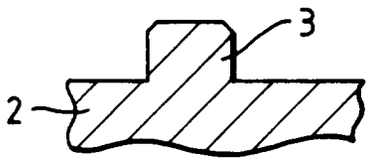


Fig.4.