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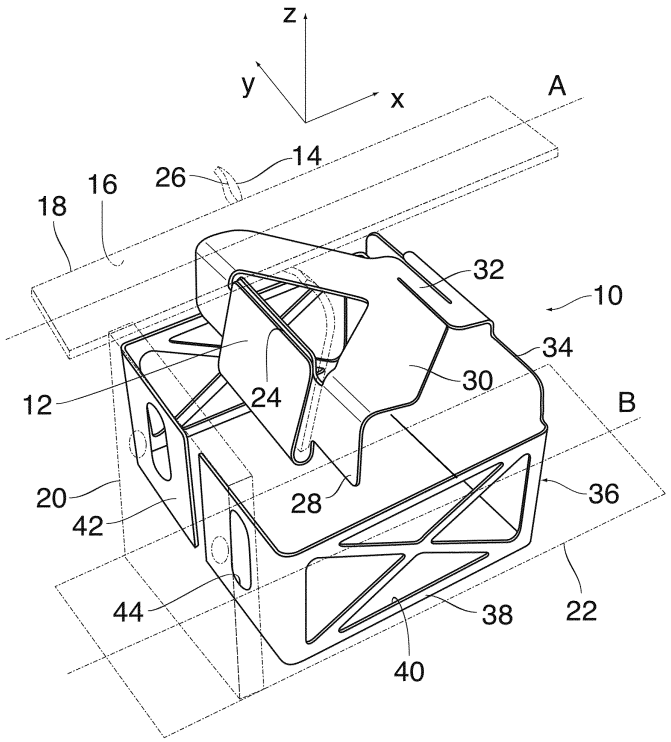
(54) **WIPER MOUNT FOR INK JET PRINTER**

(57) A wiper mount structure in an ink jet printer, wherein a wiper mount (10) is arranged to move along a nozzle plate (18) of a print head of the printer in a longitudinal direction (x) of the nozzle plate and comprises a holder (12) for holding a wiper (14), and a spring assembly (30, 32, 38) capable of elastically biasing the holder (12) and the wiper (14) against a nozzle face (16) of the nozzle plate (18) and capable of elastically yielding to a rotation of the wiper (14) about an axis (A) in parallel with the longitudinal direction (x), wherein the spring assembly (30, 32, 38) is arranged to elastically yield to a displacement of the wiper (14) in a transverse direction (y) in parallel with the nozzle face (16) and normal to the longitudinal direction.

Fig. 1**A**



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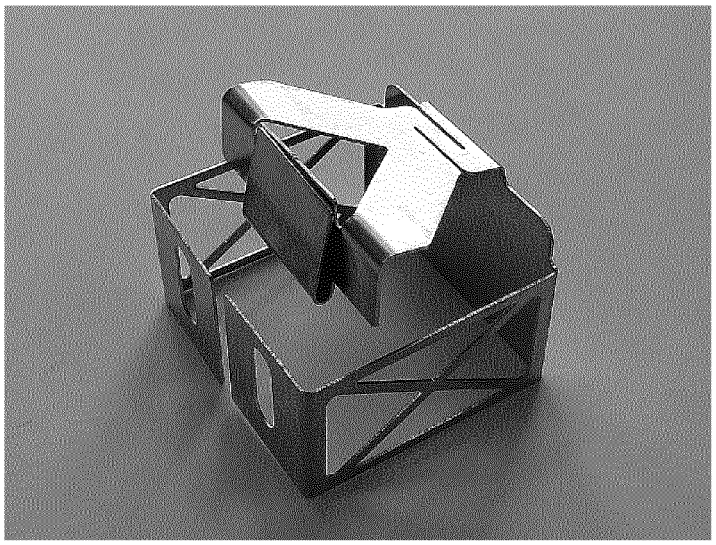


Fig. 1B

Description

[0001] The invention relates to a wiper mount structure in an ink jet printer, wherein a wiper mount is arranged to move along a nozzle plate of a print head of the printer in a longitudinal direction of the nozzle plate and comprises a holder for holding a wiper, and a spring assembly capable of elastically biasing the holder and the wiper against a nozzle face of the nozzle plate and capable of elastically yielding to a rotation of the wiper about an axis in parallel with the longitudinal direction.

[0002] A print head of an ink jet printer has a nozzle plate formed with a plurality of nozzle orifices from which ink is to be jetted out in order to print an image. Since the nozzle face, i.e. the surface of the nozzle plate in which the nozzle orifices are formed, tends to become stained with residues of ink and other contaminants which may compromise the jetting behavior of the nozzles, it is common practice to provide a wiper which is moved over the nozzle face in longitudinal direction of the nozzle plate in order to clean the nozzle surface.

[0003] US 2006098040 A1 discloses a wiper mount of the type indicated above, wherein a spring assembly is provided for biasing the holder and the wiper held therein against the nozzle face so that the wiper will engage the nozzle surface with a uniform and constant pressure. When the wiper is moved along the nozzle plate while an edge of the wiper is in engagement with a nozzle surface, even a minor twist of the nozzle face over the length of the nozzle plate would have the effect that the edge of the wiper is not always parallel to the nozzle face, so that the pressure with which the wiper is pressed against the nozzle plate varies over the width of the nozzle face and, consequently, the nozzle face cannot be cleaned properly. For this reason, the known wiper mount is also capable of elastically yielding to a rotation of the wiper about the axis extending in the longitudinal direction, so that the wiper mount may follow the twist in the nozzle face and keep the edge of the wiper always in parallel with the nozzle face.

[0004] It is an object of the invention to provide a wiper mount which permits an improved performance of the wiper.

[0005] In order to achieve this object, in the wiper mount structure according to the invention, the spring assembly is arranged to elastically yield to a displacement of the wiper in a transverse direction in parallel with the nozzle face and normal to the longitudinal direction.

[0006] In cases where a rail which guides the wiper mount during its movement along the nozzle plate is not exactly parallel to the longitudinal direction of the nozzle plate, the wiper is displaced in the transverse direction relative to the nozzle plate as the wiper mount moves in the longitudinal direction. Since the width of the wiper is larger than the width of the nozzle face so that the wiper may sweep over the entire width of the nozzle face, the edge of the wiper which comes into engagement with the nozzle surface projects over the nozzle plate at both sides. Since the wiper has certain resilience and is biased against the nozzle surface, the nozzle plate will dig into the edge of the wiper to a certain extent, with the result that the wiper cannot easily move in transverse direction relative to the nozzle plate. For this reason, a stick-slip effect may occur as the wiper moves over the nozzle surface, and the movement of the wiper over the nozzle surface becomes non-uniform and, consequently, a smooth and uniform cleaning operation can no longer be performed.

[0007] However, the wiper mount according to the invention permits the wiper and its holder to move in the transverse direction with low resistance, so that the wiper may smoothly follow the edges of the nozzle plate even when the nozzle plate is askew relative to the direction of travel of the wiper mount. Thus, the stick-slip effect is avoided and the smoothness and uniformity of the cleaning operation is improved.

[0008] More specific optional features of the invention are indicated in the dependent claims.

[0009] In one embodiment, the wiper mount is punched and canted from a single piece of sheet metal which, due to its own elasticity, constitutes also the spring assembly of the wiper mount.

[0010] The spring assembly may comprise two parallel leaf spring portions projecting from a wiper carriage that is driven to move along the nozzle plate, the leaf spring portions extending in planes that are parallel to the longitudinal direction of the nozzle plate and normal to the nozzle face. The free ends of the leaf spring portions may carry the holder for the wiper, so that the holder and the leaf spring portions together form a parallelogram linkage permitting the wiper to move in the transverse direction while keeping its posture in the other degrees of freedom.

[0011] Another leaf spring portion for biasing the holder and the wiper against the nozzle face and a torsion spring portion allowing the wiper to yield to rotations may be provided between the free ends of the two parallel leaf spring portions and the holder.

[0012] An embodiment example will now be described in conjunction with the drawings, wherein:

Fig. 1A is a perspective view of a wiper mount structure according to the invention;

Fig. 1B is a photograph of a wiper mount structure according to the invention;

Fig. 2 is a top plan view of the wiper mount;

Fig. 3 is a sectional view taken along the line III-III in Fig. 2 and further shows a wiper as well as a cross-sectional view of a nozzle plate;

Fig. 4 is a view analogous to Fig. 3 and shows a deformation of the wiper mount in response to a transverse displacement of the wiper; and

Fig. 5 is a view analogous to Figs. 3 and 4 and shows a deformation of the wiper mount in response to the rotation of the wiper.

[0013] As is shown in Fig. 1A, a wiper mount 10 has a holder 12 arranged to hold a resilient, sheet-like wiper 14 which serves for cleaning a nozzle face 16 of a nozzle plate 18. The wiper 14 and the nozzle plate 18 have only been shown in phantom lines in Fig. 1A. The nozzle face 16 is on the bottom side of the nozzle plate 18 and is therefore not directly visible in Fig. 1A.

[0014] The nozzle plate 18 is elongated in a longitudinal direction x and, accordingly, has a longitudinal axis A.

[0015] The wiper mount 10 is secured to a wiper carriage 20 which is driven to move along a rail 22 extending along an axis B that should be parallel to the longitudinal axis A of the nozzle plate 18.

[0016] The holder 12 is configured as an U-shaped clip forming, at its top edge, a nip 24 for clamping a lower portion of the wiper 14 which projects upwards towards the nozzle plate 18. As the wiper mount moves in the positive x-direction, friction between the wiper 14 and the nozzle plate 18 causes the wiper to bend in the fashion shown in Fig. 1A. An upper edge 26 of the wiper is in smooth engagement with the nozzle face 16 on the entire width of the nozzle plate.

[0017] One leg of the U-shaped holder 12 forms part of a vertical wall 28 that is bent at its top edge and merges into a V-shaped horizontal leaf spring portion 30 which elastically biases the holder 12 and the wiper 14 against the nozzle face 16 in a vertical direction z.

[0018] The vertex of the V-shaped leaf spring portion 30 merges into a horizontal meandering torsion spring portion 32 which is bent at right angles from a vertical rear wall 34 of a base frame 36 of the wiper mount. The base frame 36 has the shape of a square box that is open at its top and bottom ends and has side walls constituted by vertical leaf spring portions 38. The leaf spring portions 38 have cut-outs 40 increasing the flexibility of the leaf springs. A front wall of the base frame 36 is constituted by two mounting tabs 42 which have elongated holes 44 for fastening screws (not shown) with which the wiper mount 10 can be secured at the wiper carriage 20 in an adjustable height.

[0019] The vertical leaf spring portions 38 have their front ends fixed relative to the wiper carriage 20, whereas the free rear ends which are interconnected by the rear wall 34 can be deflected elastically in a transverse direction y in the plane of the nozzle face 16 and normal to the longitudinal direction x. The vertical leaf spring portions 38 and the rear wall 34 constitute a parallelogram linkage, so that the rear wall 34 as well as the torsion spring portion 32, the horizontal leaf spring portion 30 and the holder 12 do not change their posture but make a mere translational movement in the transverse direction y when the vertical leaf spring portions 38 are flexed, as has been indicated by phantom lines in Fig. 2.

[0020] Fig. 1B is a photograph showing a perspective view of a wiper mount structure according to the invention, in which the sheet-like wiper 14, the nozzle face 16, and the nozzle plate 18 are not present.

[0021] Figure 1B shows the holder 12, which is configured as an U-shaped clip forming, at its top edge, a of the nip 24 for clamping a lower portion of the wiper 14 which projects upwards towards the nozzle plate 18. As the wiper mount moves in the positive x-direction, friction between the wiper 14 and the nozzle plate 18 causes the wiper to bend in the fashion shown in Fig. 1A.

[0022] It can also be observed in Fig. 1B that one leg of the U-shaped holder 12 forms part of a vertical wall 28 that is bent at its top edge and merges into a V-shaped horizontal leaf spring portion 30, which elastically biases the holder 12 and the wiper 14 against the nozzle face 16 in a vertical direction z.

[0023] Fig. 1B shows the base frame 36, which has the shape of a square box that is open at its top and bottom ends and has side walls constituted by vertical leaf spring portions 38. The leaf spring portions 38 have cut-outs 40 increasing the flexibility of the leaf springs. A front wall of the base frame 36 is constituted by two mounting tabs 42 which have elongated holes 44 for fastening screws (not shown) with which the wiper mount 10 can be secured at the wiper carriage 20 in an adjustable height.

[0024] It can also be observed in Fig. 1B that the vertical leaf spring portions 38 have their front ends fixed relative to the wiper carriage 20, whereas the free rear ends which are interconnected by the rear wall 34 can be deflected elastically in a transverse direction y in the plane of the nozzle face 16 and normal to the longitudinal direction x.

[0025] Fig. 1B also shows the vertical leaf spring portions 38 and the rear wall 34. Particularly, it can be observed that the vertical leaf spring portions 38 and the rear wall 34 are linked to each other in such a way that they constitute a geometric parallelogram. This parallelogram configuration causes that the rear wall 34 as well as the torsion spring portion 32, the horizontal leaf spring portion 30 and the holder 12 do not change their posture but make a mere translational movement in the transverse direction y when the vertical leaf spring portions 38 are flexed, as is indicated by phantom lines in Fig. 2.

[0026] Fig. 3 shows the nozzle plate 18 and the vertical leaf spring portions 38 of the wiper mount 10 in a cross-sectional view. Since the wiper 14 is made of a resilient material, the nozzle plate 18 digs somewhat into the edge 26 of the wiper, so that a certain resistance opposes to a relative movement of the wiper 14 and a nozzle plate 18 in the transverse direction y.

[0027] Fig. 4 is sectional view analogous to Fig. 3, with the direction of sight being parallel to the axis B of the rail 22. It is assumed here that the longitudinal axis A of the nozzle plate 18 is not exactly parallel to the axis B but slightly slants in transverse direction, so that a side face 46 of the nozzle plate 18 becomes visible. As the wiper carriage 20 and the wiper mount 10 move in x-

direction (longitudinal direction), the slanting nozzle plate 18 forces the wiper 14 to move in the transverse direction y. The holder 12, the horizontal leaf spring portion 28, the torsion spring portion 32 and the rear wall 34 of the base frame can take part in this lateral movement because the vertical leaf spring portions 38 can easily flex in the transverse direction, as shown in Fig. 4. As a consequence, even though the nozzle plate 18 digs into the edge 26 of the wiper 14, no substantial reaction forces occur between the nozzle plate 18 and the wiper 14 so that the wiper can move smoothly along the nozzle plate.

[0028] Fig. 5 illustrates a case where the nozzle plate 18 is twisted about its longitudinal axis A, so that the wiper 14 rotates about the axis A as the wiper and the wiper mount moves in longitudinal direction. The torsion spring portion 32 of the wiper mount permits the holder 12 to follow this rotary movement, so that the edge 26 of the wiper is held in smooth engagement with the nozzle face 16 on the entire width of the nozzle plate.

[0029] As can be seen in Fig. 1A, the entire wiper mount 10 can be formed by punching and canting a single piece of elastic sheet metal.

[0030] In the following, some examples are presented for a better understanding of the present invention.

1. A wiper mount structure in an ink jet printer, wherein a wiper mount (10) is arranged to move along a nozzle plate (18) of a print head of the printer in a longitudinal direction (x) of the nozzle plate and comprises a holder (12) for holding a wiper (14), and a spring assembly (30, 32, 38) capable of elastically biasing the holder (12) and the wiper (14) against a nozzle face (16) of the nozzle plate (18) and capable of elastically yielding to a rotation of the wiper (14) about an axis (A) in parallel with the longitudinal direction (x), characterized in that the spring assembly (30, 32, 38) is arranged to elastically yield to a displacement in a transverse direction (y) of the wiper (14) by means of a translational movement of the spring assembly (30, 32, 38) in the transverse direction by flexing the vertical leaf spring portions (38).

2. The wiper mount structure according to 1, wherein the holder (12) and the spring assembly (30, 32, 38) are formed by a single piece of elastic sheet metal.

3. The wiper mount structure according to 1 or 2 comprising a mounting portion (42) adapted for securing the wiper mount (10) to a wiper carriage (20) that is movable along the nozzle plate (18) in the longitudinal direction (y), wherein the spring assembly comprises two parallel leaf spring portions (38) having each one end connected to the mounting portion (42), the opposite ends of the leaf spring portions (38) being connected to one another to form a parallelogram linkage and carrying the holder (12).

4. The wiper mount structure according to 4, wherein the holder (12) is connected to the parallelogram linkage via another leaf spring portion (30) that extends in parallel with the nozzle face (16), and via a torsion spring portion (32) capable of torsional deformation about an axis in parallel with the longitudinal direction (x).

5. The wiper mount structure according to 3 or 4, wherein the mounting portion (42), the two parallel leaf spring portions (38) and a wall (34) connecting the same constitute a tubular base frame (36) which has a rectangular cross-section.

6. The wiper mount structure according to 4 or 5, wherein the torsion spring portion (32) is formed by a meander-shaped portion of sheet metal adjoining to and in parallel with said leaf spring portion (30) that extends in parallel with the nozzle face (26).

7. A wiper mount (10) for the wiper mount structure according to any of 1 to 6, comprising a holder (12) for holding a wiper (14), and a spring assembly (30, 32, 38) capable of elastically biasing the holder (12) and the wiper (14) against a nozzle face (16) of the nozzle plate (18) and capable of elastically yielding to a rotation of the wiper (14) about an axis (A) in parallel with a longitudinal direction (x), characterized in that the spring assembly (30, 32, 38) is arranged to elastically yield to a displacement in a transverse direction (y) of the wiper (14) by means of a translational movement of the spring assembly (30, 32, 38) in the transverse direction by flexing the vertical leaf spring portions (38).

Claims

1. A wiper mount structure in an ink jet printer, wherein a wiper mount (10) is arranged to move along a nozzle plate (18) of a print head of the printer in a longitudinal direction (x) of the nozzle plate and comprises a holder (12) for holding a wiper (14), and a spring assembly (30, 32, 38) capable of elastically biasing the holder (12) and the wiper (14) against a nozzle face (16) of the nozzle plate (18) and capable of elastically yielding to a rotation of the wiper (14) about an axis (A) in parallel with the longitudinal direction (x), **characterized in that** the spring assembly (30, 32, 38) is arranged to elastically yield to a displacement of the wiper (14) in a transverse direction (y) in parallel with the nozzle face (16) and normal to the longitudinal direction (x).

2. The wiper mount structure according to claim 1, wherein the holder (12) and the spring assembly (30, 32, 38) are formed by a single piece of elastic sheet metal.

3. The wiper mount structure according to claim 1 or 2 comprising a mounting portion (42) adapted for securing the wiper mount (10) to a wiper carriage (20) that is movable along the nozzle plate (18) in the longitudinal direction (y), wherein the spring assembly comprises two parallel leaf spring portions (38) having each one end connected to the mounting portion (42), the opposite ends of the leaf spring portions (38) being connected to one another to form a parallelogram linkage and carrying the holder (12).

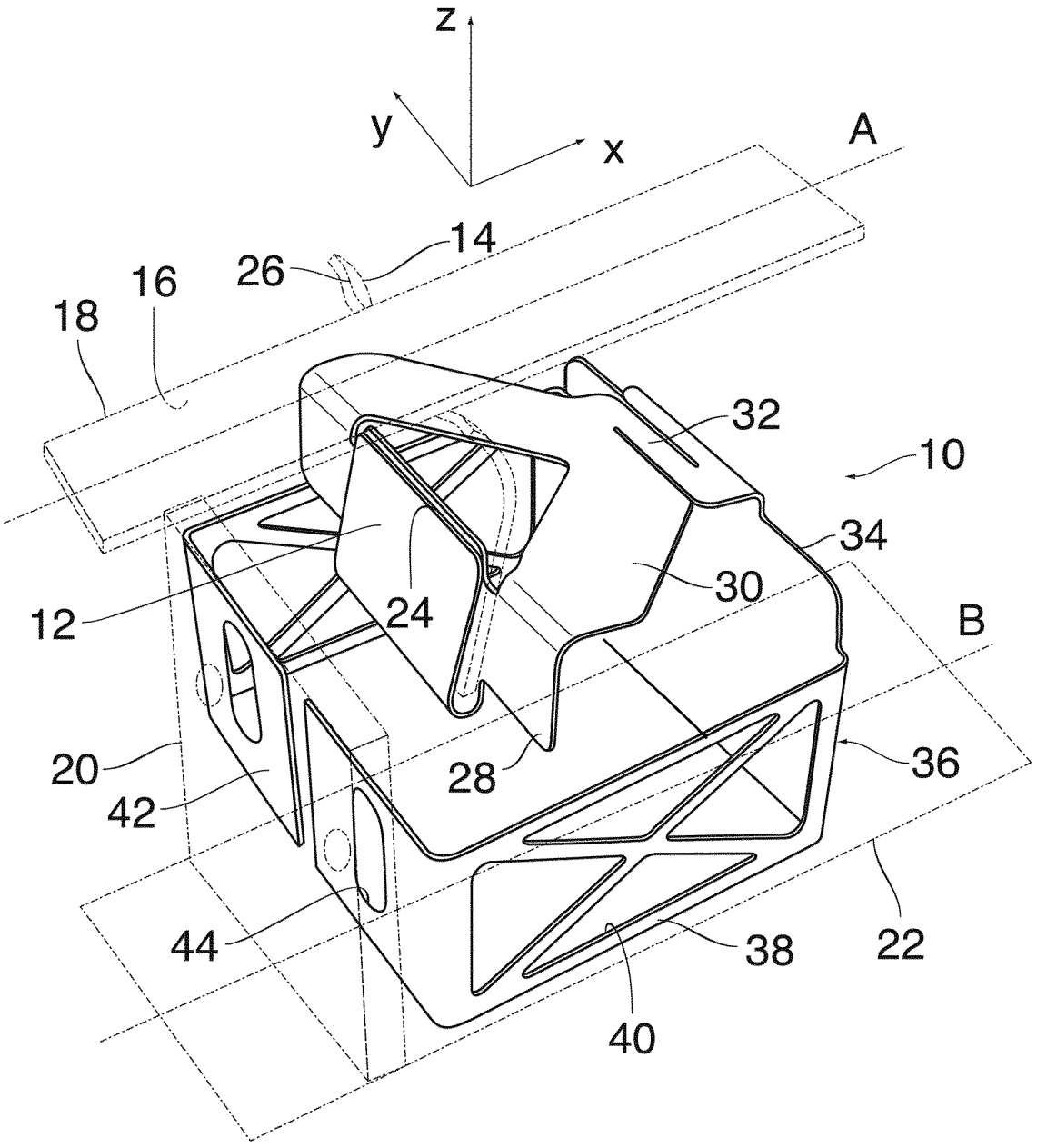
4. The wiper mount structure according to claim 3, wherein the holder (12) is connected to the parallelogram linkage via another leaf spring portion (30) that extends in parallel with the nozzle face (16), and via a torsion spring portion (32) capable of torsional deformation about an axis in parallel with the longitudinal direction (x).

5. The wiper mount structure according to claim 3 or 4, wherein the mounting portion (42), the two parallel leaf spring portions (38) and a wall (34) connecting the same constitute a tubular base frame (36) which has a rectangular cross-section.

6. The wiper mount structure according to claim 4 or 5, wherein the torsion spring portion (32) is formed by a meander-shaped portion of sheet metal adjoining to and in parallel with said leaf spring portion (30) that extends in parallel with the nozzle face (26).

7. A wiper mount (10) for the wiper mount structure according to any of the preceding claims, comprising a holder (12) for holding a wiper (14), and a spring assembly (30, 32, 38) capable of elastically biasing the holder (12) and the wiper (14) against a nozzle face (16) of the nozzle plate (18) and capable of elastically yielding to a rotation of the wiper (14) about an axis (A) in parallel with a longitudinal direction (x), **characterized in that** the spring assembly (30, 32, 38) is arranged to elastically yield to a displacement of the wiper (14) in a transverse direction (y) in parallel with the nozzle face (16) and normal to the longitudinal direction (x).

Fig. 1**A**



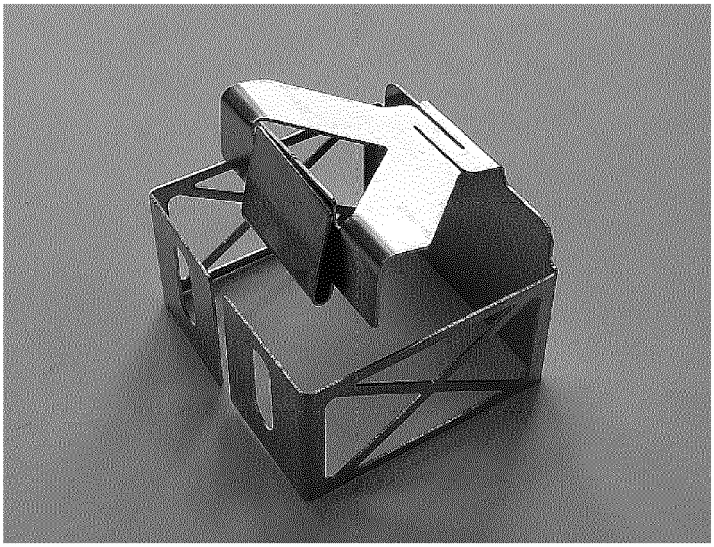


Fig. 1B

Fig. 2

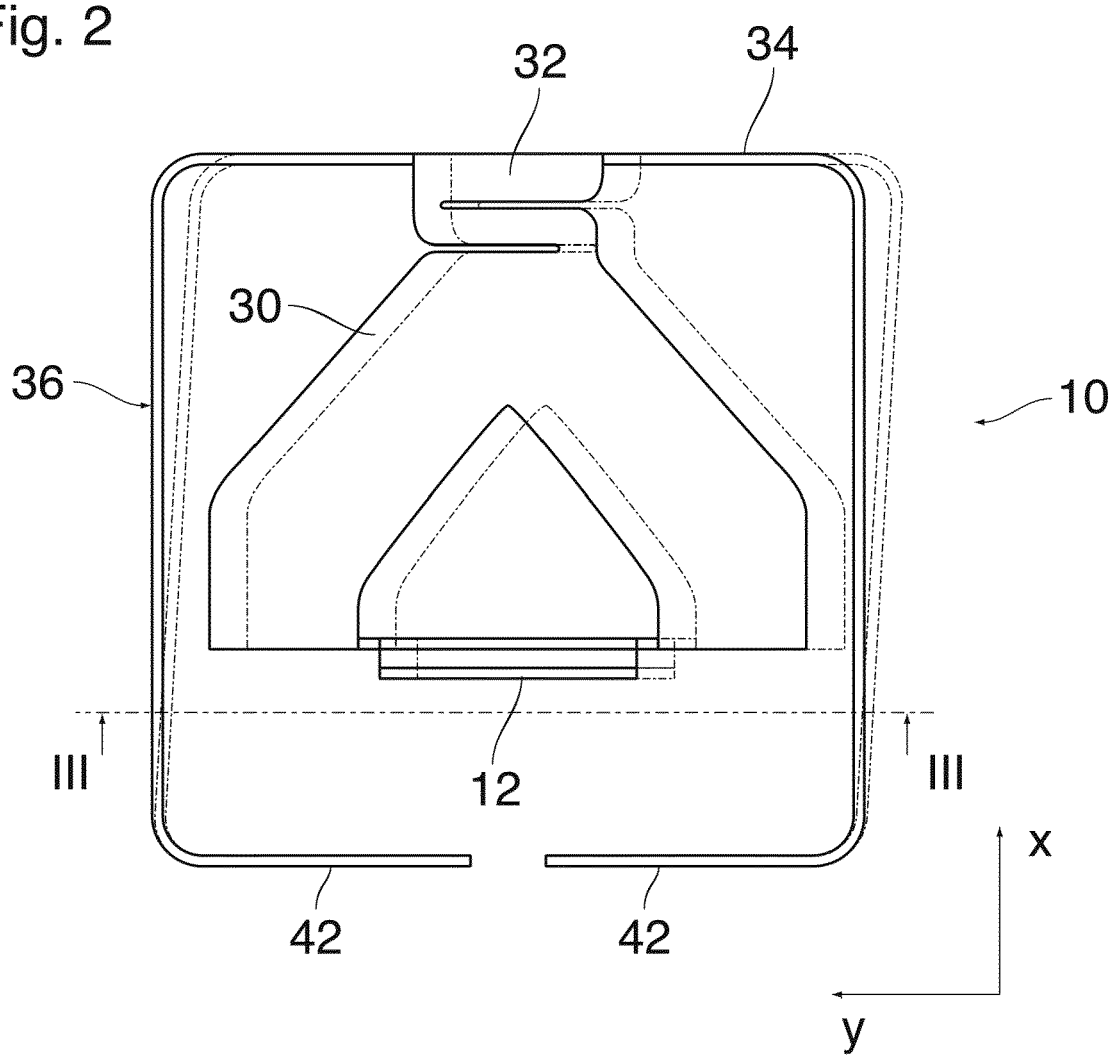


Fig. 3

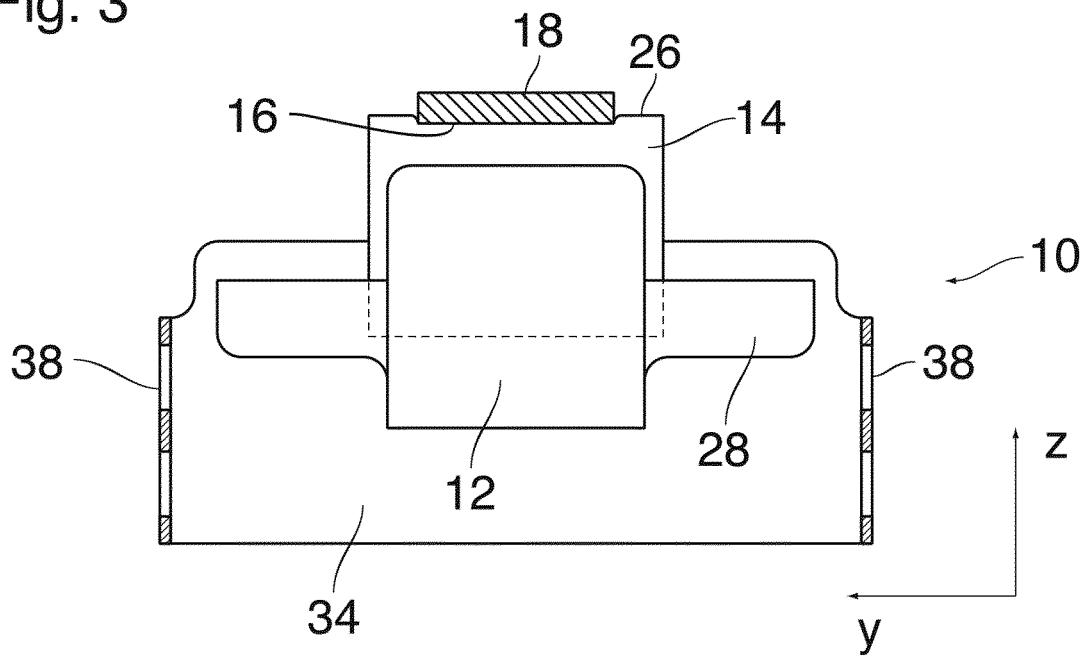


Fig. 4

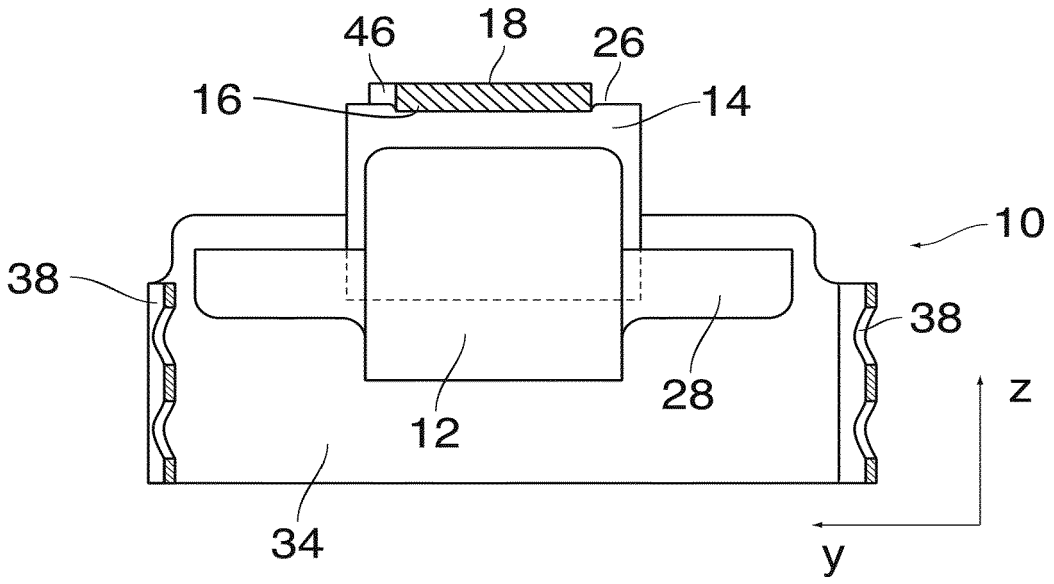
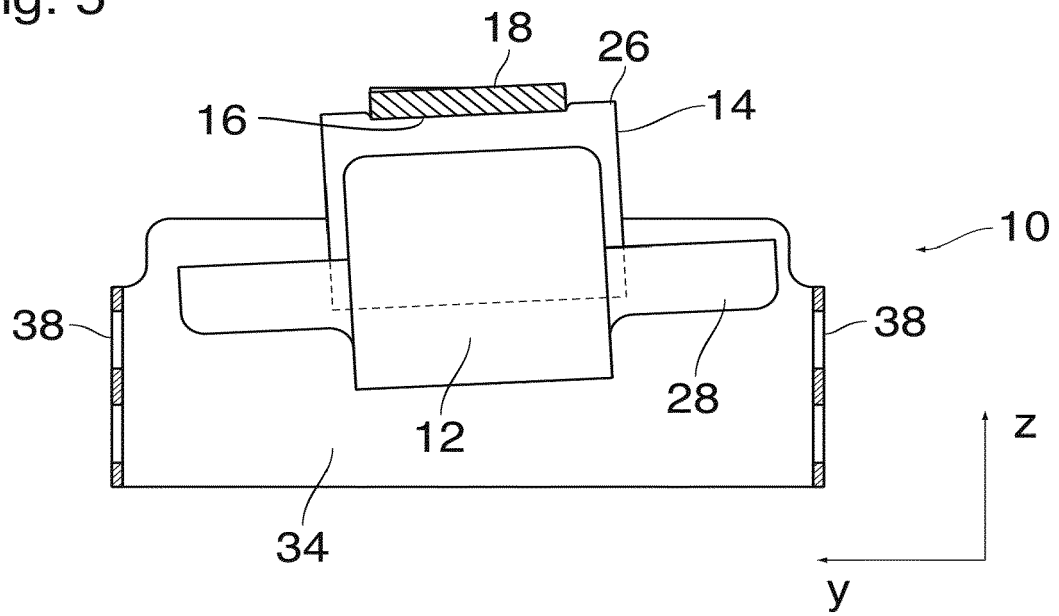


Fig. 5



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EUROPEAN SEARCH REPORT

Application Number
EP 17 20 5595

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 2005/259126 A1 (TANAKA HIROYUKI [JP] ET AL) 24 November 2005 (2005-11-24) * figures 4-5, 15 * * paragraph [0044] * * paragraph [0056] - paragraph [0058] *	1-7	INV. B41J2/165
X	US 6 000 780 A (SCHWIEBERT WILLIAM H [US] ET AL) 14 December 1999 (1999-12-14) * figures 8-10 * * column 13, line 28 - line 37 * * column 14, line 47 - column 15, line 18 *	1,7	
A	US 2009/284564 A1 (HUANG YING-CHIEH [TW] ET AL) 19 November 2009 (2009-11-19) * paragraph [0026]; figures 1-5 *	1-7	

TECHNICAL FIELDS SEARCHED (IPC)

B41J

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	16 April 2018	João, César

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16-04-2018

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