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(12) # EUROPEAN PATENT SPECIFICATION

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(54) **A barrel assembly for a plating apparatus.**

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Courier Press, Leamington Spa, England.

Description

This invention relates to a barrel assembly for a plating apparatus and particularly to a barrel assembly improved so as to facilitate drainage from the barrel means.

A plating apparatus, such as an electro-chemical apparatus customarily comprises an electroplating tank and a barrel immersed in a liquid plating solution in said tank. In the plating operation, voltage is applied across an anode plate and cathode bar, each, in turn, placed in said tank and said barrel, while the barrel is rotated with articles to be plated loaded.

Under such circumstances, the barrel is provided with perforations for the solution to flow into the barrel. However, since articles often happen to be small parts, such as a nut, washer or the like, the perforations must be confined to be of smaller diameter to prevent the pieces from passing therethrough. The condition is such that upon withdrawing the barrel from the plating tank, though the solution in the barrel is almost drained through the perforations, the perforations are clogged by the solution and liable to stay therein under influence of the surface tension. This degrades the drainage performance because the dripping of the solution is prolonged, while the solution tends to reside within the barrel with the result that the residual solution may be ultimately discarded.

It is, therefore, a primary object of the invention to provide a barrel assembly which is capable of improving drainage performance by terminating the dripping condition of the liquid in short periods of time and also reducing the residual solution in the barrel means.

The invention provides a barrel assembly for plating apparatus comprising a hollow chamber member into which articles to be plated may be placed defined by a tubular wall portion and a pair of opposed open ends, and end plates secured to said chamber member to close said open ends, characterised in that there are provided a multitude of perforations extending completely through said wall portion of such size as to prevent articles placed in said chamber member from passing through said perforations while allowing free passage of liquid plating solution into and out of said chamber member, and liquid passageways that extend completely through said wall portion, each passageway communicating one of said perforations with an adjacent perforation, the width of said passageways being less than the width of said perforations so said passageways serve to prevent liquid solution from being retained in said perforations due to the influence of surface tension when liquid solution is emptied from said barrel assembly.

The present invention will be more clearly understood from the following specification and accompanying drawings in which:—

Figures 1—5 show a first embodiment of the invention wherein Figure 1 is a perspective view of a plating machine partly broken away;

Figure 2 is a cross sectional view taken along the line II—II of Figure 1;

Figure 3 is a perspective view of a barrel assembly partly broken away;

Figure 4 is an enlarged exploded view of components of the barrel assembly;

Figure 5 is an enlarged view taken along the line V—V of Figure 1;

Figure 6 is a view similar to Figure 4 according to a second embodiment of the invention; and

Figure 7 is a side elevational view looking from the direction of the arrow in Figure 6 when the components are assembled;

Referring to Figures 1—5, a first embodiment of the invention will be described hereinafter.

A plating apparatus, e.g., an electro-chemical plating machine is generally designated by reference numeral 10. It includes an electroplating tank 11 containing a liquid plating solution 12 and a barrel 13 immersed in the solution 12. The barrel 13 comprises a body portion 13a comprising annular elements as described hereinafter, and side disks 14 secured to the right and left open ends of said body portion 13a, so that the barrel 13 is vertically movably suspended by a pair of hangers 15, each end of which is respectively pivoted to a tubular shaft 16 attached to the side disk 14.

Annular elements 17 are made of electrically non-conductive material such as plastic to have a hexagon-shaped configuration of a predetermined width and thickness, each side of which is zigzagged in a suitable manner as best seen in Figure 4, while the hexagonal surface of the elements 17 are cut out to form semi-circular notches 18. A plurality of the annular elements 17 are laminated coaxially with thin spacers 19 to form a generally hexagonal cylindrical configuration. With the result that a liquid passageway 20 is formed at the slight clearance between the adjacent surfaces of the elements 17, while a perforation 21 appears at each opening formed from a pair of opposed notches 18. In this way, the passageways 20 are automatically predetermined narrower than the diameter of the perforations. By way of example, the passageways may be 0.8 mm in width and the perforations may be 4 mm in diameter to prevent articles to be plated from passing therethrough. Elongated bolts 22 are inserted through holes 23, 24, provided in the side disks 14 and the elements 17.

Both ends of the bolts 22 are secured by means of nuts 25, to hold the barrel in shape. One side of the barrel 13 is provided with an entry and exit opening 27 for the work pieces. A pair of opposed peripheral ends of the opening 27 are provided with offset sections 28 having a lengthwise channel 29. A porous hatch 30 is removably mounted on the barrel 13 to open and close the opening 27 and includes a pivoted

arm 31, the ends of which fit into the channels 29 to latch the hatch 30 against removal as shown in Figure 2.

An anode plate 32 is immersed in the solution 12 and is connected to an electrical conductor cable 34 and cathode 33 (known as "thief" to those skilled in the art) extend into the interior of the barrel 13 and are connected to an electrical conductor cable 35 passing through the hollow portion 16*a* of the shaft 16.

With the structure thus far described, it should be apparent that an operator can apply voltage across the cables 34 and 35, and at the same time, rotate the barrel 13 by means of, e.g. an electric motor (not shown) with the work pieces loaded to start a plating operation and as a consequence, the barrel 13 agitates and tumbles the work pieces to bounce them against the cathodes 33 during the plating operation.

When the plating operation is completed, the hangers 15 are lifted to withdraw the barrel 13 from the tank 11.

When the barrel 13 is withdrawn from the tank 11, the solution 12 is drained out through the perforations 21 and the passageways 20 from the barrel 13. However, when the drainage nearly comes to end, the perforations 21 are clogged by the solution 12. The solution 12 remaining at the perforations 21 is pulled in the direction of arrows 36 shown in Figure 5 to flow into the passageways 20 under influence of the surface tension and ultimately drips into the tank 11 because the passageway 20 is narrower then the diameter of the perforations. This facilitates the solution 12 to pass through the perforations 21 without remaining therein to improve the drainage performance, with the result that the dripping condition of the solution 12 terminates in a short period of time to reduce the residual solution volume. As a result of experiment, the residual solution volume, which conventionally has been 1300 ml, is found to be reduced to as little as 500 ml, i.e. below half of the conventional residual volume.

The drainage performance, thus improved, prevents the solution 12 from dripping outside the tank 11, upon transferring the barrel 13 to a further operation.

Furthermore, the liquid passageways 20 provided in the barrel 13 increase the total opening area so that an electrically conductive effect through the opening is facilitated to improve plating performance.

Still further, the invention provides a readily manufactured barrel assembly since the passageways 20 and perforations 21 are formed by merely laminating a plurality of annular elements 17.

It is noted that the shape of the perforations 21 is not limited to a circular configuration as described and may be an elliptic configuration or the like.

Referring next to Figures 6 and 7, a second embodiment of the invention comprises annular elements 37 having saw-toothed notches 38 on both hexagonal surfaces. A plurality of the annular elements 37 are laminated concentrically and spaced apart a predetermined distance to form a barrel 39, with the result that perforations 40 appears at the lozenge openings between the registered notches 38, while liquid passageways 41 appear at the clearance between the apexes.

According to the invention, the liquid in a barrel is facilitated to pass through the perforations under the influence of surface tension without lingering therein, so as to imrove drainage performance upon withdrawing the barrel from a plating tank, as particularly stated in the first embodiment.

This enables the dripping condition of the liquid to be terminated in a short period of time to reduce the residual liquid volume in the barrel and avoids liquid being discarded and wasted.

Although a barrel is comprised of annular elements in each embodiment of the invention, the construction is not limited to this and the barrel may be constructed of wood. Furthermore, the barrel may be mounted for oscillation rather than being rotatably mounted.

Claims

1. A barrel assembly for plating apparatus comprising a hollow chamber member (13) into which articles to be plated may be placed defined by a tubular wall portion (13*a*) and a pair of opposed open ends, and end plates (14) secured to said chamber member to close said open ends, characterised in that there are provided a multitude of perforations (21) extending completely through said wall portion (13*a*) of such size as to prevent articles placed in said chamber member (13) from passing through said perforations (21) while allowing free passage of liquid plating solution into and out of said chamber member (13), and liquid passageways (20) that extend completely through said wall portions (13*a*), each passageway (20) communicating one of said perforations (21) with an adjacent perforation (21), the width of said passageways being less than the width of said perforations so said passageways serve to prevent liquid solution from being retained in said perforations due to the influence of surface tension when liquid solution is emptied from said barrel assembly.

2. A barrel assembly as claimed in claim 1, wherein said passageways extend circumferentially on said chamber member and have a slit-like configuration.

3. A barrel assembly as claimed in claim 2, wherein said chamber member comprises a plurality of narrow annular elements connected coaxially together with a predetermined space therebetween, said spaces creating said passageways in said chamber member.

4. A barrel assembly as claimed in claim 3, wherein said perforations in said chamber

member are defined by matching notches in adjacent annular elements.

Revendications

1. Tonneau pour appareil de revêtement, comprenant un élément de chambre creux (13) dans lequel les articles à revêtir peuvent être placés, et qui défini par une partie de paroi tubulaire (13*a*) et une paire d'extrémités ouvertes opposées, et des plaques d'extrémités (14) fixées audit élément de chambre pour fermer lesdites extrémités opposées, caractérisé en ce qu'il y est prévu une multitude de perforations (21) qui traversent entièrement ladite partie de paroi (13*a*) et sont d'une dimension telle qu'elles empêchent les articles placés dans ledit élément de chambre (13) de passer à travers lesdites perforations (21) tout en laissant la solution de revêtement liquide passer librement pour pénètrer dans ledit élément de chambre (13) et en sortir et des passages de liquide (20) qui traversent entièrement ladite partie de paroi (13*a*), chaque passage (20) faisant communiquer l'une desdites perforations (21) avec une perforation (21) adjacente, la largeur desdits passage étant inférieure à la largeur desdites perforations, de sorte que lesdits passages évitent que la solution liquide ne soit retenue dans lesdites perforations sous l'influence de la tension superficielle lorsqu'on vide la solution liquide dudit tonneau.

2. Tonneau selon la revendication 1, dans lequel lesdits passages s'étendent circonférentiellement sur ledit élément de chambre et présentent une configuration en forme de fente.

3. Tonneau comme revendiqué dans la revendication 2, dans lequel ledit élément de chambre comprend une pluralité d'éléments annulaires étroits assemblés coaxialement avec un espace prédéterminé entre eux, lesdits espaces créant lesdits passages dans ledit élément de chambre.

4. Tonneau selon la revendication 3, dans lequel lesdites perforations formées dans ledit élément de chambre sont définies par des encoches complémentaires présentes dans les éléments annulaires adjacents.

Patentansprüche

1. Trommelanordnung für eine Galvanisiervorrichtung bestehend aus einer hohlen Trommel (13) zur Aufnahme der zu galvanisierenden Gegenstände, die von einem tubusförmigen Wandteil (13a) und zwei einander gegenüberstehenden offenen Enden begrenzt ist, und Stirnplatten (14), die an der Trommel befestigt sind, um die offenen Enden zu schließen, dadurch gekennzeichnet, daß das gesamte Wandteil (13a) von einer Vielzahl von Löchern (21) durchdrungen ist, die eine solche Größe aufweisen, daß die in der Trommel (13) enthaltenen Artikel nicht durch die Löcher (21) herausfallen, jedoch, der freie Durchgang der flüssigen Galvanisierungslösung in und aus der Trommel möglich ist, und daß die Flüssigkeitskanäle (20) sich durch das gesamte Wandteil (13a) erstrecken, wobei jeder Kanal (20) eines der Löcher (21) mit einem benachbarten Loch (21) verbindet, wobei die Breite der Kanäle geringer ist, als der Durchmesser der Löcher, so daß die Kanäle dazu dienen, es zu verhindern, daß flüssige Lösung unter dem Einfluß der Oberflächenspannung in den Löchern zurückgehalten wird, wenn die Lösung aus der Trommelanordnung entleert wird.

2. Trommelanordnung nach Anspruch 1, bei der die Kanäle sich in Umfangsrichtung auf der Trommel erstrecken und eine schlitzartige Gestalt aufweisen.

3. Trommelanordnung nach Anspruch 2, bei der die Trommel aus einer Vielzahl von schmalen Ringelementen besteht, die koaxial miteinander in vorbestimmtem Abstand verbunden sind, wobei die Abstände die Kanäle in der Trommel ausbilden.

4. Trommelanordnung nach Anspruch 3, bei der die Löcher in der Trommel durch einander gegenüberstehende Kerben in benachbarten Ringelementen gebildet sind.

FIG. 1

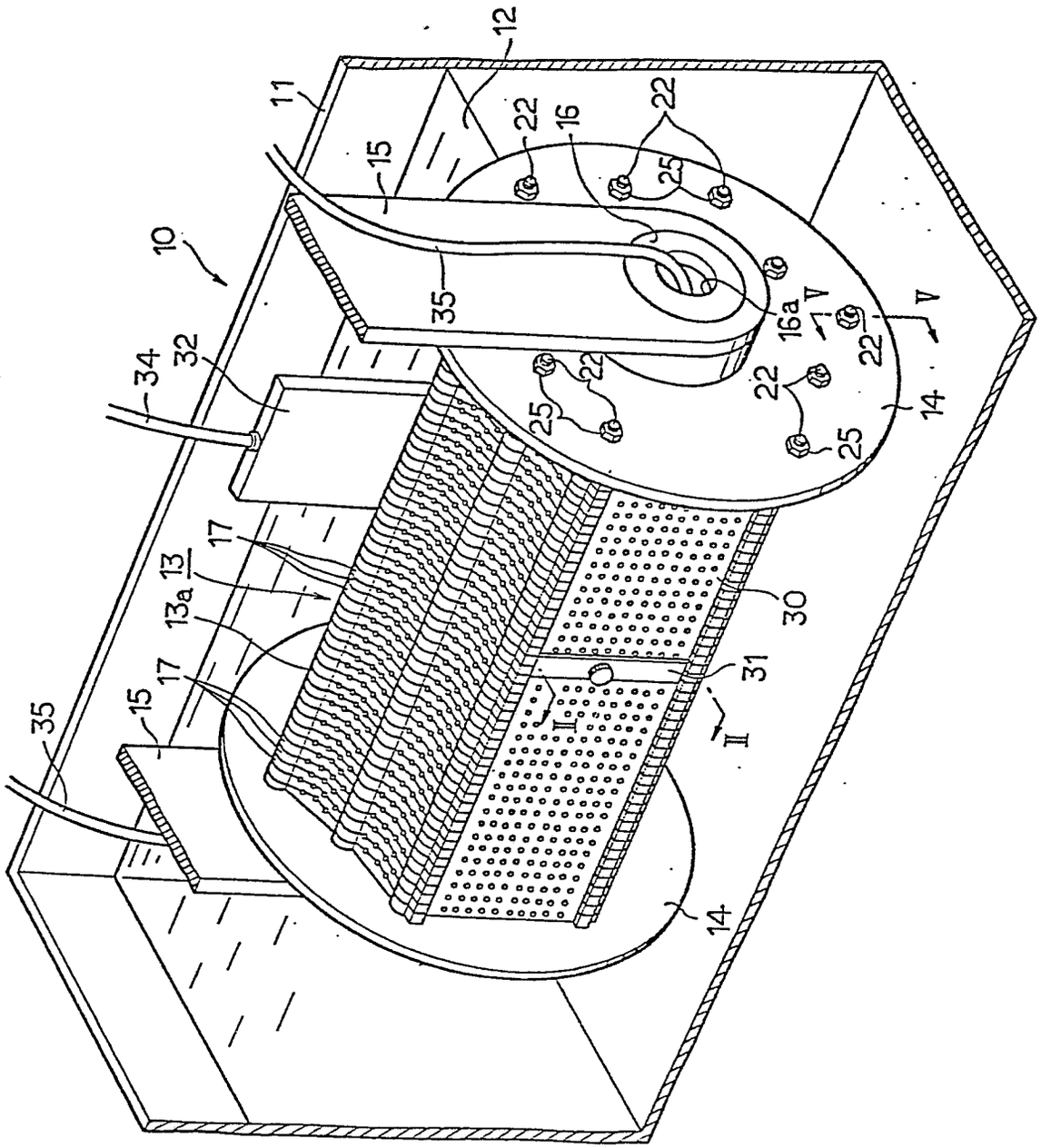

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FIG. 2

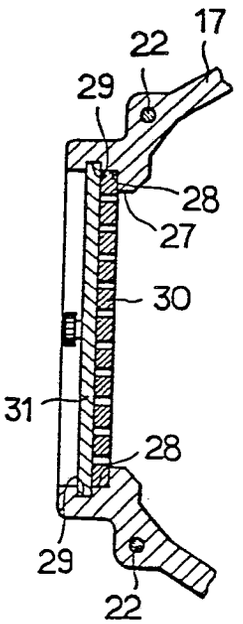

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FIG. 3

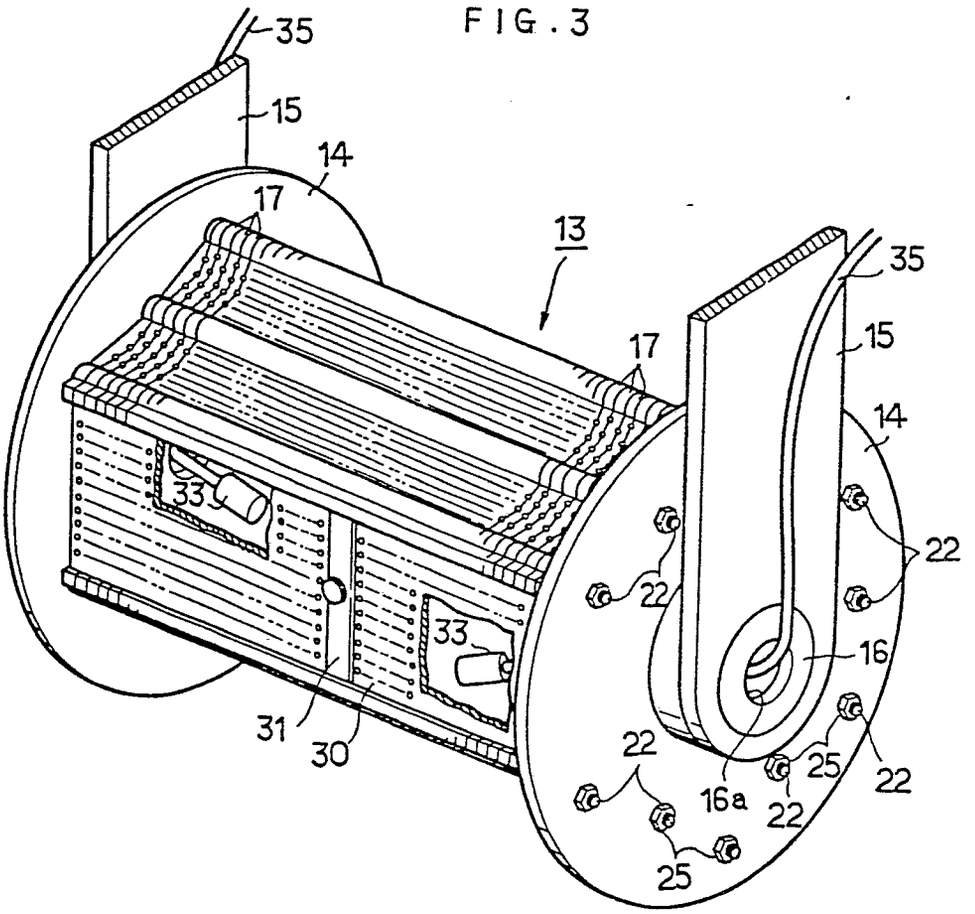

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FIG. 4

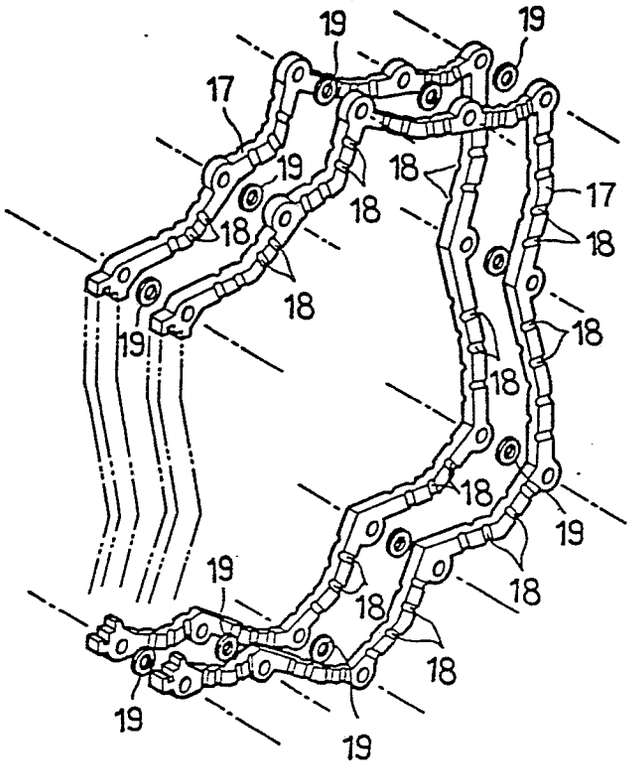

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FIG. 5

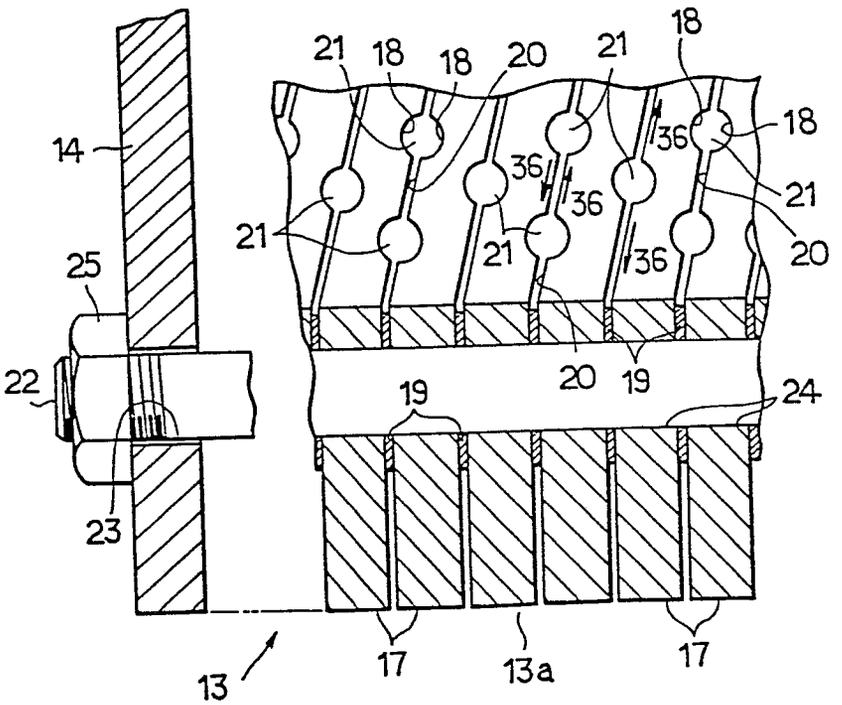

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13a
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FIG. 6

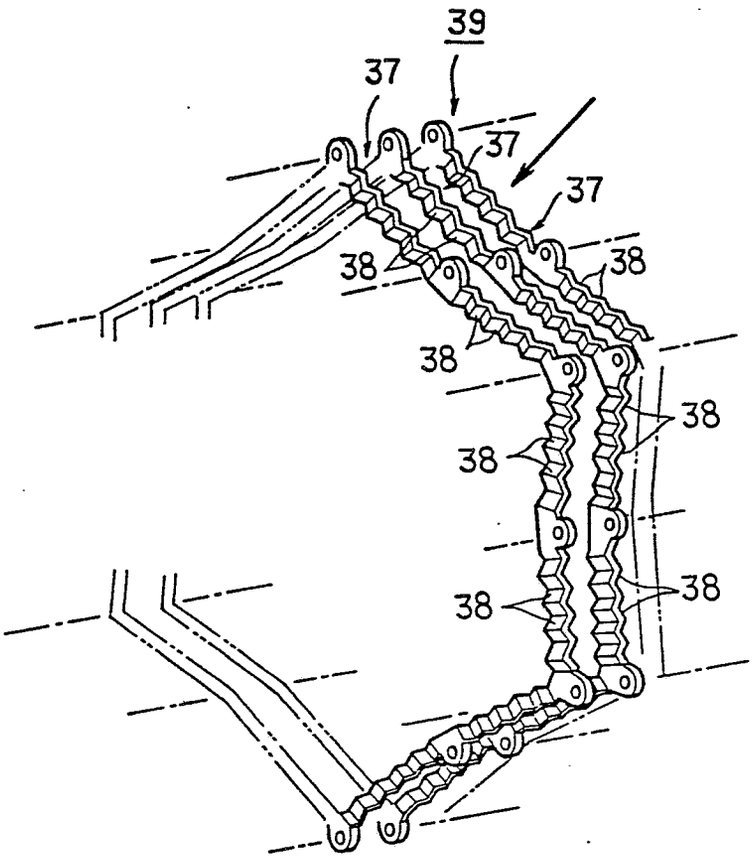


FIG. 7

