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(54) MULTI-STAGE FLOW DISTRIBUTION PLATE GROUP FOR HEAT EXCHANGER

MEHRSTUFIGE STRÖMUNGSVERTEILUNGSPLATTENGRUPPE FÜR WÄRMETAUSCHER

GROUPE DE PLAQUES DE DISTRIBUTION D'ÉCOULEMENT À PLUSIEURS ÉTAGES POUR ÉCHANGEUR DE CHALEUR

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Description

Field of the invention

[0001] The invention falls into the technical field of heat exchangers, and specifically relates to a multi-stage flow distribution plate group for heat exchanger.

Background information

[0002] The brazed plate heat exchanger is a high-efficiency heat exchanger made of a series of corrugated metal sheets stacked and brazed. Channels are formed between various sheets, and heat exchange is realized through these sheets. Compared with conventional shell-and-tube heat exchangers, its heat transfer coefficient is much higher under the same flow resistance and pump power. Therefore, this heat exchanger tends to replace shell-and-tube heat exchangers within the applicable range.

[0003] In the designing of recently market available brazed plate heat exchangers, more considerations are made to the flowability of the two ends of the heat exchanger without considering too much the flowing performance of the medium near the middle of the sheets. The medium flow in the heat exchanger can become drastically inhomogeneous with the increase of medium's flow distance, which leads to decreased performance of the heat exchanger or its insufficient stability.

[0004] WO 2010/090557 discloses a plate group for a heat exchanger with the features of the preamble of claim 1.

Principle of the invention

[0005] In order to solve the problem of poor uniformity of medium circulation in the existing heat exchangers, which leads to decreased performance of the heat exchanger or its insufficient stability, this invention discloses a multi-stage flow distribution plate group for heat exchanger. The main panel of the sheet is provided with a shunt area, a main heat exchanging area and a confluence area. Shunt ribs are set between the shunt area and the main heat exchanging area and between the main heat exchanging area and the confluence area, which is conducive to the uniform distribution of the medium and helps to improve the performance and stability of the heat exchanger.

[0006] In order to achieve the above objectives, the present invention provides a plate group for heat exchanger as defined in claim 1.

[0007] In one of preferred embodiments, the said angle α is 30- 45° which is equal to γ, and the angle β is 20-30°, if the said plate group is used for evaporators.

[0008] In another one of preferred embodiments, the said angle α is 20- 30° which is equal to γ, and the angle β is 30-45°, if the said plate group is used for condensers.

[0009] In another one of preferred embodiments, the said ridge I, ridge II and ridge III all tilt in the same direction; the second plate rotates 180° relative to the first plate; the height of the said ridge I, ridge II and ridge III are identical, equal to twice the height of the shunt rib.

[0010] In another one of preferred embodiments, the said valley II of the first plate is provided with a few convex grooves protruding toward the ridge II and, the said ridge II of the second plate is provided with a few concave grooves denting toward the valley II.

[0011] In another one of preferred embodiments, the said convex groove and the concave groove are equal in size, and are evenly distributed on their corresponding valley II and ridge II.

[0012] In another one of preferred embodiments, there are indentations denting toward the valley II alongside the top of ridge II of the said first plate and, there are bulges protruding toward ridge II alongside the bottom of the said second plate, which helps to increase the turbulence of the medium in the flow channel.

[0013] In another one of preferred embodiments, the heights of the said indentation and the bulge are equal, being half of the height of the ridge II.

[0014] In another one of preferred embodiments, the top of the ridge II of the first plate is divided by the indentations into a first ridge II and a second ridge II; the bottom of the said valley II of the second plate is divided by the bulges into the first valley II and the second valley II, the top width of the first ridge II , the top width of the second ridge II, the bottom width of the valley II of the first plate, the bottom width of the first valley II, the bottom width of the second valley II and the top width of the ridge II of the second plate are all equal; the bottom width of the indentation and the top width of the bulge are equal; the top width of the first ridge II is larger than the top width of the bulge.

[0015] The present invention has the following beneficial effects:

(1) In the present invention, a shunt area, a main heat exchanging area and a confluence area are arranged on the main panel of the heat exchanging plate, shunt ribs are set between the shunt area and the main heat exchanging area and between the main heat exchanging area and the confluence area, the shunt ribs helps to evenly distribute the medium flowing from the shunt area to the main heat exchanging area, allowing the medium to flow into the main heat exchanging area homogenously, after the heat exchanging is completed in the main heat exchanging area, the medium collected together evenly undergoes a secondary distribution through the shunt ribs located between the main heat exchanging area and confluence area, and flowed to the exit through the confluence area. The medium goes through two even distributions during the whole process, this allows more homogeneous circulation of the medium in the path, which helps to increase the efficiency and stability of heat exchange in a long run.

(2) In the present invention, the angle α formed by the ridge I and shunt rib, angle β formed by ridge II and the shunt rib, and angle γ formed by ridge III and the shunt rib can be adjusted to control the flowing speed of the medium in the three areas. Besides, by adjusting the angle β, the heat exchanging plates can be adjusted either to serve the evaporator or the condenser.

(3) The heat exchange plate of the present invention is provided with convex grooves on the valley II and concave grooves are set on ridge II. These convex grooves and concave grooves help to reduce the pressure drop in the flowing path, and making the medium circulation faster and more homogenous, which eventually helps to improve heat exchanging performance.

(4) In the present invention, the indentation is provided at the top of the ridge II of the first plate, and the bulge is provided at the bottom of the valley II of the second plate, which helps to increase the turbulent flow of the medium in the flowing path. Such an arrangement is not only beneficial to improve the heat exchanging efficiency, but also can effectively avoid the accumulation of dirt in the system.

Clarification of drawings

[0016] The present invention will be further described below with the figures and embodiments.

Figure 1 shows a schematic diagram of the structure of the heat exchange plate group of the present invention;

Figure 2 shows a schematic diagram of the structure of the first plate of the present invention;

Figure 3 shows an enlarged view of Part A in Figure 2;

Figure 4 shows an enlarged view of Part B in Figure 2;

Figure 5 shows a schematic view of the structure of the second plate of the present invention;

Figure 6 shows an enlarged view of Part C in Figure 5;

Figure 7 shows an enlarged view of Part D in Figure 5;

Figure 8 shows a top view of a pair of unit plate groups of the present invention;

Figure 9 shows a sectional view taken along section A-A in Figure 8;

Figure 10 shows a sectional view taken along section B-B in Figure 8;

Specific embodiment

[0017] The present invention will now be described in further details through embodiments.

[0018] Multi-stage flow distribution plate group for heat exchanger, as shown in Figs. 2, comprising at least two pairs of unit plate groups, each pair of the said unit plate group includes a first plate 1 and a second plate 2 that are stacked; both the said first plate 1 and the second plate 2 include a main panel and a surrounding baffle 3, the main panel includes a shunt area 41, a main heat exchanging area 42 and the confluence area 43; shunt ribs 44 are set between the said shunt area 41 and the main heat exchanging area 42 as well as between the main heat exchanging area 42 and the confluence area 43, which are used to evenly distribute the medium flowing from the shunt area 41 into the main heat exchanging area 42 and the medium flowing from the main heat exchanging area 42 into the confluence area 43. The shunt ribs 44 are set to make the medium flowing from the shunt area 41 to the main heat exchanging area 42 evenly distributed at the split ribs 44, which is conducive to the uniform flow of the medium into the main heat exchanging area 42. After the medium completes the heat exchange in the main heat exchanging area 42, it then collected together evenly undergoes a secondary distribution through the shunt ribs 44 located between the main heat exchanging area 42 and confluence area 43, and flowed to the exit through the confluence area 43. The medium goes through two even distributions during the whole process, this allows more homogeneous circulation of the medium in the path, which helps to increase the efficiency and stability of heat exchange in a long run.

[0019] In addition, since the main panel of the heat exchanging plate is provided with many corrugated ridges and valleys, making the structure prone to deformation, the arrangement of the shunt rib 44 can provide effective support for the entire heat exchanging plate, improve the strength of the panel, and help solve the problem of deformation.

[0020] In a specific embodiment, as shown in Figs. 2-8, the said shunt area 41 is provided with a few ridges I 411, and the neighboring ridges I 411 form valley I 412 in between, the angle formed by the ridge I 411 and the shunt rib 44 is α; the said main heat exchanging area 42 is provided with a few ridges II 421, neighboring ridge II 421 form the valley II 422 in between, the angle formed by the said ridge II 421 and the shunt rib 44 is β; the said confluence area 43 is provided with a few ridges III 431, neighboring ridge III 431 form the valley III 432, and the angle formed by the said ridge III 431 and the shunt rib 44 is γ; the angle α is not equal to β; the angle β is not equal to γ.

[0021] Since α is not equal to β, the medium will not flow directly from the shunt area 41 to the main heat exchanging area 42, rather, it will be distributed at the shunt rib 44 before entering the main heat exchanging area 42. Since the angle β is not equal to γ, the medium is thus first evenly distributed before entering the confluence area 43.

[0022] In a specific embodiment, as shown in FIG. 8, the said angle α is 30- 45° which is equal to γ, and the angle β is 20-30°, if the said plate group is used for evaporators. Since evaporation is the process of converting liquid to vapor, setting the angle α (or γ) to a larger value is more conducive to the rapid flow of liquid (or vapor)

into (or rapid evaporation out from) the main heat exchanging area 42, thereby improving evaporation performance.

[0023] In a specific embodiment, as shown in FIG. 8, the said angle α is 20- 30° which is equal to γ, and the angle β is 30-45°, if the said plate group is used for condensers. Since condensation is the process of converting vapor to liquid, setting the α (or γ) angle to a larger value is more conducive to the rapid flow of vapor (or liquid) into (or out of) the main heat exchanging area 42, thereby increasing condensation performance.

[0024] In a specific embodiment, as shown in Figure 1, Figure 9 and Figure 10, the said ridge I 411, ridge II 421 and ridge III 431 all tilt in the same direction; the second plate 2 rotates 180° relative to the first plate 1; the height of the said ridge I 411, ridge II 421 and ridge III 431 are identical, equal to twice the height of the shunt rib 44.

[0025] In a specific embodiment, as shown in Figs. 3-4 and 6-7, the said valley II 422 of the first plate 1 is provided with a few convex grooves 423 protruding toward the ridge II 421 and, the said ridge II 421 of the second plate 2 is provided with a few concave grooves 424 denting toward the valley II 422. The convex grooves 423 set on valley II 422 and the grooves 424 set on ridge II 421 help to reduce the pressure drop, enable the medium to circulate faster and more homogenously, which improves the heat exchanging performance.

[0026] In a specific embodiment, as shown in Fig. 2 and Fig. 5, the said convex groove 423 and the concave groove 424 are equal in size, and are evenly distributed on their corresponding valley II 422 and ridge II 421.

[0027] In a specific embodiment, as shown in Figs. 3-4 and 6-7, there are indentations 425 denting toward the valley II 422 alongside the top of ridge II 421 of the said first plate 1 and, there are bulges 426 protruding toward ridge II 421 alongside the bottom of the said second plate 2, which helps to increase the turbulence of the medium in the flow channel. As shown by the dotted line with arrows in Figure 9, the medium can form turbulence in the flow channel, which not only helps to improve the heat exchange efficiency, but also effectively avoids the accumulation of dirt.

[0028] In a specific embodiment, as shown in Figs. 9-10, the heights of the said indentation 425 and the bulge 426 are equal, being half of the height of the ridge II 421.

[0029] In a specific embodiment, as shown in Figs. 3-4, 6-7, and 9-10, the top of the ridge II 421 of the first plate 1 is divided by the indentations 425 into a first ridge II 4211 and a second ridge II 4212; the bottom of the said valley II 422 of the second plate 2 is divided by the bulges 426 into the first valley II 4221 and the second valley II 4222, the top width of the first ridge II 4211, the top width of the second ridge II 4212, the bottom width of the valley II 422 of the first plate 1, the bottom width of the first valley II 4221, the bottom width of the second valley II 4222 and the top width of the ridge II 421 of the second plate 2 are all equal; the bottom width of the indentation 425 and the top width of the bulge 426 are equal; the top width of the first ridge II 4211 is larger than the top width of the bulge 426.

[0030] The above-mentioned ideal embodiment in the present invention will serve as enlightenment for personnel to make various changes and modifications without deviating from the technical idea of the present invention. The technical scope of the present invention is not limited to the content of this description, and its technical scope must be determined according to the scope of the claimed rights.

[0031] List of reference signs:

1 - first plate
2 - second plate
3 - baffle
41 - shunt area
411 - ridge I
412 - valley I
42 - main heat exchanging area
421 - ridge II
4211 - first ridge II
4212 - second ridge II
422 - valley II
4221 - first valley II
4222 - second valley II
423 - convex groove
424 - concave groove
425 - indentation
426 - bulge
43 - confluence area
431 - ridge III
432 - valley III
44 - shunt rib

Claims

1. Multi-stage flow distribution plate group for heat exchanger, comprising at least two pairs of unit plate groups, each pair of the unit plate group including a first plate (1) and a second plate (2) that are stacked, wherein both the first plate (1) and the second plate (2) include a main panel and a surrounding baffle (3), and the main panel includes a shunt area (41), a main heat exchanging area (42) and a confluence area (43), wherein shunt ribs (44) are set between the shunt area (41) and the main heat exchanging area (42) as well as between the main heat exchanging area (42) and the confluence area (43), the two shunt ribs (44) being used to evenly distribute the medium flowing from the shunt area (41) into the main heat exchanging area (42) and the medium flowing from the main heat exchanging area (42) into the confluence area (43), **characterized in that** the shunt area (41) is provided with ridges I (411) that are straight, arranged side by side so that a valley I (412) is formed between each pair of neighboring

ridges I (411), and oriented in the same first direction so that the ridges I (411) that meet with the shunt rib (44) form with the shunt rib (44) same angle α, **that** the main heat exchanging area (42), which is delimited by the two shunt ribs (44) and the main heat exchanging area sides provided by the baffle (3), is provided with ridges II (421) that are straight end extend from one of the sides of the main heat exchanging area (42) to either one of the shunt ribs (44) or the other side of the main heat exchanging area (42), the ridges being arranged side by side so that a valley II (422) is formed between each pair of neighboring ridges II (421), and oriented in the same second direction so that the ridges II (421) that meet with the shunt rib (44) form with the shunt rib (44) same angle β, and **that** the confluence area (43) is provided with ridges III (431) that are straight, arranged side by side so that a valley III (432) is formed between each pair of neighboring ridges III (431), and oriented in the same third direction so that the ridges III (431) that meet with the shunt rib (44) form with the shunt rib (44) same angle γ, wherein the angle α is not equal to β, and the angle β is not equal to γ.

2. The multi-stage flow distribution plate group for heat exchanger according to claim 1, **characterized in that** the said angle α is 30- 45° which is equal to γ, and the angle β is 20-30°, if the said plate group is used for evaporators.

3. The multi-stage flow distribution plate group for heat exchanger according to claim 1, **characterized in that** the said angle α is 20- 30° which is equal to γ, and the angle β is 30-45°, if the said plate group is used for condensers.

4. The multi-stage flow distribution plate group for heat exchanger according to claim 1, **characterized in that** the said ridge I (411), ridge II (421) and ridge III (431) all tilt in the same direction; the second plate (2) rotates 180° relative to the first plate (1); the height of the said ridge I (411), ridge II (421) and ridge III (431) are identical, equal to twice the height of the shunt rib (44).

5. The multi-stage flow distribution plate group for heat exchanger according to claim 1, **characterized in that** the said valley II (422) of the first plate (1) is provided with a few convex grooves (423) protruding toward the ridge II (421) and, the said ridge II (421) of the second plate (2) is provided with a few concave grooves (424) denting toward the valley II (422).

6. The multi-stage flow distribution plate group for heat exchanger according to claim 5, **characterized in that** the said convex groove (423) and the concave groove (424) are equal in size, and are evenly distributed on their corresponding valley II (422) and ridge II (421).

7. The multi-stage flow distribution plate group for heat exchanger according to claim 1, **characterized in that** there are indentations (425) denting toward the valley II (422) alongside the top of ridge II (421) of the said first plate (1) and, there are bulges (426) protruding toward ridge II (421) alongside the bottom of the said second plate (2), which helps to increase the turbulence of the medium in the flow channel.

8. The multi-stage flow distribution plate group for heat exchanger according to claim 7, **characterized in that** the heights of the said indentation (425) and the bulge (426) are equal, being half of the height of the ridge II (421).

9. The multi-stage flow distribution plate group for heat exchanger according to claim 7 or 8, **characterized in that** the top of the ridge II (421) of the first plate (1) is divided by the indentations (425) into a first ridge II (4211) and a second ridge II (4212); the bottom of the said valley II (422) of the second plate (2) is divided by the bulges (426) into the first valley II (4221) and the second valley II (4222), the top width of the first ridge II (4211), the top width of the second ridge II (4212), the bottom width of the valley II (422) of the first plate (1), the bottom width of the first valley II (4221), the bottom width of the second valley II (4222) and the top width of the ridge II (421) of the second plate (2) are all equal; the bottom width of the indentation (425) and the top width of the bulge (426) are equal; the top width of the first ridge II (4211) is larger than the top width of the bulge (426).

Patentansprüche

1. Mehrstufige Gruppe von Platten zur Durchflussdistribution für einen Wärmetauscher, die mindestens zwei Paare von Einheitsgruppen von Platten aufweist, jedes Paar der Einheitsgruppe von Platten weist erste Platte (1) und zweite Platte (2) auf, die aufeinander angebracht sind, wobei die erste Platte (1) sowie die zweite Platte (2) ein Hauptpanel und eine Umfangstrennwand (3) aufweisen und das Hauptpanel Seitenbereich (41), Hauptwärmeübertragungsbereich (42) und Zusammenflussbereich (43) aufweist, wobei zwischen dem Seitenbereich (41) und dem Hauptwärmeübertragungsbereich (42) und zwischen dem Hauptwärmeübertragungsbereich (42) und dem Zusammenflussbereich (43) seitliche Rippen (44) platziert sind, wobei diese zwei seitlichen Rippen (44) einer eventuellen Aufteilung des Mediums, das aus dem Seitenbereich (41) in den Hauptwärmeübertragungsbereich (42) strömt, und des Mediums dienen, das aus dem Hauptwär-

meübertragungsbereich (42) in den Zusammenflussbereich (43) strömt, **dadurch gekennzeichnet, dass** der Seitenbereich (41) die Kämme I (411) aufweist, die direkt sind, derart nebeneinander angeordnet sind, dass zwischen jedem Paar der benachbarten Kämme I (411) ein Tal I (412) gebildet wird, und in derselben ersten Richtung derart orientiert sind, dass die Kämme I (411), die mit der seitlichen Rippe (44) in Berührung kommen, mit der seitlichen Rippe (44) denselben Winkel α einschließen, **dass** der Hauptwärmeübertragungsbereich (42), der durch zwei seitliche Rippen (44) und durch die Trennwand (3) gebildete seitliche Seiten des Hauptwärmeübertragungsbereichs abgegrenzt ist, die Kämme II (421) aufweist, die direkt sind und sich von einer der Seiten des Hauptwärmeübertragungsbereichs (42) entweder zu einer der seitlichen Rippen (44), oder zur anderen Seite des Hauptwärmeübertragungsbereichs (42) erstrecken, die Kämme nebeneinander derart angeordnet sind, dass zwischen jedem Paar der benachbarten Kämme II (421) ein Tal II (422) gebildet wird, und in derselben zweiten Richtung derart orientiert sind, dass die Kämme II (421), die mit der seitlichen Rippe (44) in Berührung kommen, mit dieser seitlichen Rippe (44) denselben Winkel β einschließen, und **dass** der Zusammenflussbereich (43) die Kämme III (431) aufweist, die direkt sind, nebeneinander derart angeordnet sind, dass zwischen jedem Paar der benachbarten Kämme III (431) ein Tal III (432) gebildet wird, und in derselben dritten Richtung derart orientiert sind, dass die Kämme III (431), die mit der seitlichen Rippe (44) in Berührung kommen, mit dieser seitlichen Rippe (44) denselben Winkel γ einschließen, wobei der Winkel α nicht dem Winkel β gleich ist und der Winkel β nicht dem Winkel γ gleich ist.

2. Mehrstufige Gruppe von Platten zur Durchflussdistribution für einen Wärmetauscher nach dem Anspruch 1, **dadurch gekennzeichnet, dass** der genannte Winkel α 30-45° ist, was γ gleich ist, und der Winkel β 20-30° ist, wenn die genannte Gruppe von Platten für die Verdampfer eingesetzt wird.

3. Mehrstufige Gruppe von Platten zur Durchflussdistribution für einen Wärmetauscher nach dem Anspruch 1, **dadurch gekennzeichnet, dass** der genannte Winkel α 20-30° ist, was γ gleich ist, und der Winkel β 30-45° ist, wenn die genannte Gruppe von Platten für Kondensatoren eingesetzt wird.

4. Mehrstufige Gruppe von Platten zur Durchflussdistribution für einen Wärmetauscher nach dem Anspruch 1, **dadurch gekennzeichnet, dass** sich der genannte Kamm I (411), Kamm II (421) und Kamm III (431) alle in derselben Richtung neigen; sich die zweite Platte (2) um 180° in Bezug auf die erste Platte (1) dreht; die Höhe des genannten Kamms I (411), des Kamms II (421) und des Kamms III (431) gleich ist, dem Zweifachen der Höhe der seitlichen Rippe (44) gleich ist.

5. Mehrstufige Gruppe von Platten zur Durchflussdistribution für einen Wärmetauscher nach dem Anspruch 1, **dadurch gekennzeichnet, dass** das genannte Tal II (422) der ersten Platte (1) einige konvexe Nuten (423) aufweist, die in der Richtung zum Kamm II (421) hin hervorragen und der genannte Kamm II (421) der zweiten Platte (2) einige konkave Nuten (424) aufweist, die zum Tal II (422) hin hervortreten.

6. Mehrstufige Gruppe von Platten zur Durchflussdistribution für einen Wärmetauscher nach dem Anspruch 5, **dadurch gekennzeichnet, dass** die genannte konvexe Nut (423) und die konkave Nut (424) dieselbe Größe aufweisen und auf ihrem entsprechenden Tal (422) und Kamm II (421) gleichmäßig verteilt sind.

7. Mehrstufige Gruppe von Platten zur Durchflussdistribution für einen Wärmetauscher nach dem Anspruch 1, **dadurch gekennzeichnet, dass** in der Richtung zum Tal II (422) hin entlang der Spitze des Kamms II (421) der genannten ersten Platte (1) die Absätze (425) angeordnet sind und in der Richtung zum Kamm II (421) hin entlang des Bodens der genannten zweiten Platte (2) die Beulen (426) hervortreten, die bei der Steigerung der Mediumturbulenz in dem Durchflusskanal behilflich sind.

8. Mehrstufige Gruppe von Platten zur Durchflussdistribution für einen Wärmetauscher nach dem Anspruch 7, **dadurch gekennzeichnet, dass** die Höhen des genannten Absatzes (425) und der Beule (426) gleich sind und die Hälfte der Höhe des Kamms II (421) bilden.

9. Mehrstufige Gruppe von Platten zur Durchflussdistribution für einen Wärmetauscher nach dem Anspruch 7 oder 8, **dadurch gekennzeichnet, dass** die Spitze des Kamms II (421) der ersten Platte (1) durch die Absätze (425) auf den ersten Kamm II (4211) und den zweiten Kamm II (4212) aufgeteilt ist; der Boden des genannten Tals II (422) der zweiten Platte (2) durch die Beulen (426) auf das erste Tal II (4221) und das zweite Tal II (4222) aufgeteilt ist, die Spitzenbreite des ersten Kamms II (4211), die Spitzenbreite des zweiten Kamms II (4212), die Bodenbreite des Tals II (422) der ersten Platte (1), die Bodenbreite des ersten Tals II (4221), die Bodenbreite des zweiten Tals II (4222) und die Spitzenbreite des Kamms II (421) der zweiten Platte (2) gleich sind; die Bodenbreite des Absatzes (425) und die Spitzenbreite der Beule (426) gleich sind; die Spitzenbreite des ersten Kamms II (4211) größer als

die Spitzenbreite der Beule (426) ist.

Revendications

1. Groupe à plusieurs étages de plaques pour la distribution du flux pour un échangeur de chaleur comprenant au moins deux paires de groupes de plaques unitaires, chaque paire de groupe de plaques unitaire comprend une première plaque (1) et une seconde plaque (2), les deux disposées l'une au-dessus de l'autre, tandis que la première plaque (1) et la seconde plaque (2) comprennent toutes les deux un panneau principal et une cloison périphérique (3), et le panneau principal comprend une zone latérale (41), une zone principale de transfert de chaleur (42) et une zone de confluence (43), avec des ailettes latérales (44) disposées entre la zone latérale (41) et la zone principale de transfert de chaleur (42) et entre la zone principale de transfert de chaleur (42) et la zone de confluence (43) qui servent à diviser éventuellement le fluide s'écoulant de la zone latérale (41) dans la zone principale de transfert de chaleur (42) et le fluide s'écoulant de la zone principale de transfert de chaleur (42) dans la zone de confluence (43), **caractérisé en ce que** la zone latérale (41) est pourvue de peignes I (411) qui sont droits et disposés côte à côte de sorte qu'un creux I (412) est formé entre chaque paire de peignes adjacents I (411), et orientés dans la même première direction de sorte que les peignes I (411) qui rencontrent l'ailette latérale (44) forment le même angle α avec l'ailette latérale (44) et **que** la zone principale de transfert de chaleur (42), délimitée par les deux ailettes latérales (44) et les côtés de la zone principale de transfert de chaleur formée par la cloison (3), est pourvue de peignes II (421), qui sont droits et s'étendent de l'un des côtés de la zone principale de transfert de chaleur (42) à l'une des ailettes latérales (44) ou à l'autre côté de la zone principale de transfert de chaleur (42), les peignes étant disposés côte à côte de sorte qu'un creux II (422) est formé entre chaque paire de peignes II (421) adjacents, et orientés dans la même deuxième direction de sorte que les peignes II (421) qui rencontrent l'ailette latérale (44) forment le même angle β avec cette ailette latérale (44), et **que** la zone de confluence (43) soit pourvue de peignes III (431) qui sont droit et disposés côte à côte de sorte qu'un creux III (432) est formé entre chaque paire de peignes III (431) adjacents, et orientés dans la même troisième direction de sorte que les peignes III (431) rencontrant l'ailette latérale (44) forment le même angle γ avec cette ailette latérale (44), l'angle α n'étant pas égal à β et l'angle β n'étant pas égal à γ.

2. Groupe à plusieurs étages de plaques pour la distribution du flux pour un échangeur de chaleur selon la revendication 1, **caractérisé en ce que** ledit angle α est de 30-45°, ce qui est égal à γ, et ledit angle β est de 20-30° lorsque ledit groupe de plaques est utilisé pour les évaporateurs.

3. Groupe à plusieurs étages de plaques pour la distribution du flux pour un échangeur de chaleur selon la revendication 1, **caractérisé en ce que** ledit angle α est de 20-30°, ce qui est égal à γ, et ledit angle β est de 30-45° lorsque ledit groupe de plaques est utilisé pour les condenseurs.

4. Groupe à plusieurs étages de plaques pour la distribution du flux pour un échangeur de chaleur selon de la revendication 1, **caractérisé en ce que** ledit peigne I (411), le peigne II (421) et le peigne III (431) s'inclinent tous dans la même direction; la seconde plaque (2) pivote de 180° par rapport à la première plaque (1); la hauteur dudit peigne I (411), du peigne II (421) et du peigne III (431) est la même, égale à deux fois la hauteur de l'ailette latérale (44).

5. Groupe à plusieurs étages de plaques pour la distribution du flux pour un échangeur de chaleur selon la revendication 1, **caractérisé en ce que** ledit creux II (422) de la première plaque (1) est pourvu de plusieurs rainures convexes (423) avancées vers le peigne II (421) et ledit peigne II (421) de la seconde plaque (2) est pourvu de plusieurs rainures concaves (424) avancées vers le creux II (422).

6. Groupe à plusieurs étages de plaques pour la distribution du flux pour un échangeur de chaleur selon la revendication 5, **caractérisé en ce que** ladite rainure convexe (423) et rainure concave (424) sont de même taille et sont régulièrement espacées sur leur creux II (422) et leur peigne II (421) respectifs.

7. Groupe à plusieurs étages de plaques pour la distribution du flux pour un échangeur de chaleur selon la revendication 1, **caractérisé en ce que** vers le creux II (422) les indentations (425) sont disposées le long du sommet du peigne II (421) de ladite première plaque (1) et vers le peigne II (421), les renflements (426) avancent le long du fond de ladite seconde plaque (2) pour aider à augmenter la turbulence du fluide dans le canal d'écoulement.

8. Groupe à plusieurs étages de plaques pour la distribution du flux pour un échangeur de chaleur selon la revendication 7, **caractérisé en ce que** les hauteurs de ladite indentation (425) et dudit renflement (426) sont égales et forment la moitié de la hauteur du peigne II (421).

9. Groupe à plusieurs étages de plaques pour la distribution du flux pour un échangeur de chaleur selon la revendication 7 ou 8, **caractérisé en ce que** le

sommet du peigne II (421) de la première plaque (1) est divisé par les indentations (425) en un premier peigne II (4211) et un deuxième peigne II (4212); le fond dudit creux II (422) de la seconde plaque (2) est divisé par les renflements (426) en un premier creux II (4221) et un deuxième creux II (4222), la largeur supérieure du premier peigne II (4211), la largeur supérieure du deuxième peigne II (4212), la largeur du fond du creux II (422) de la première plaque (1), la largeur du fond du premier creux II (4221), la largeur du fond du deuxième creux II (4222) et la largeur du sommet du peigne II (421) de la seconde plaque (2) sont identiques; la largeur du fond de l'indentation (425) et la largeur du sommet du renflement (426) sont identiques ; la largeur du sommet du premier peigne II (4211) est supérieure à la largeur du sommet du renflement (426).

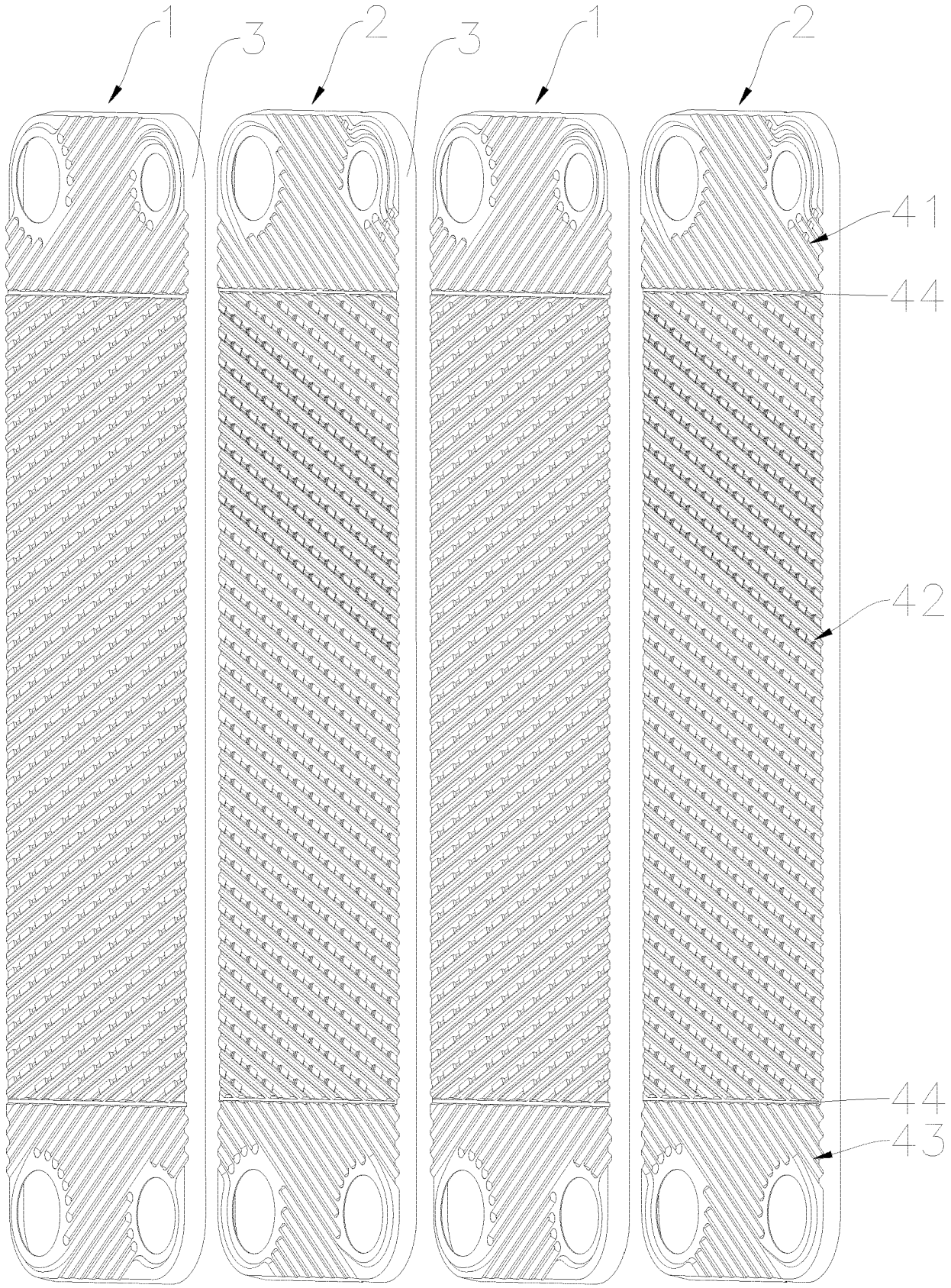

Fig. 1

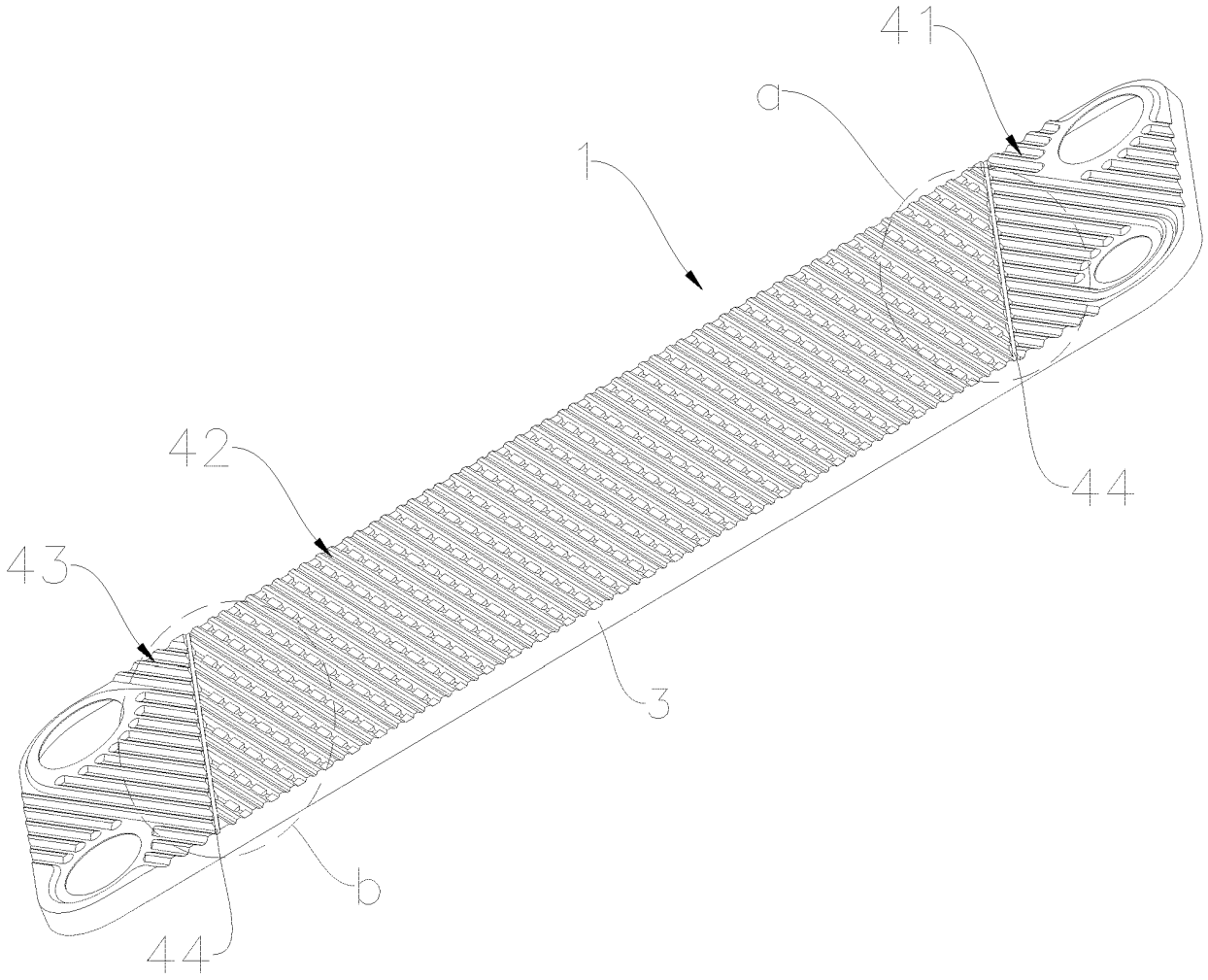

Fig. 2

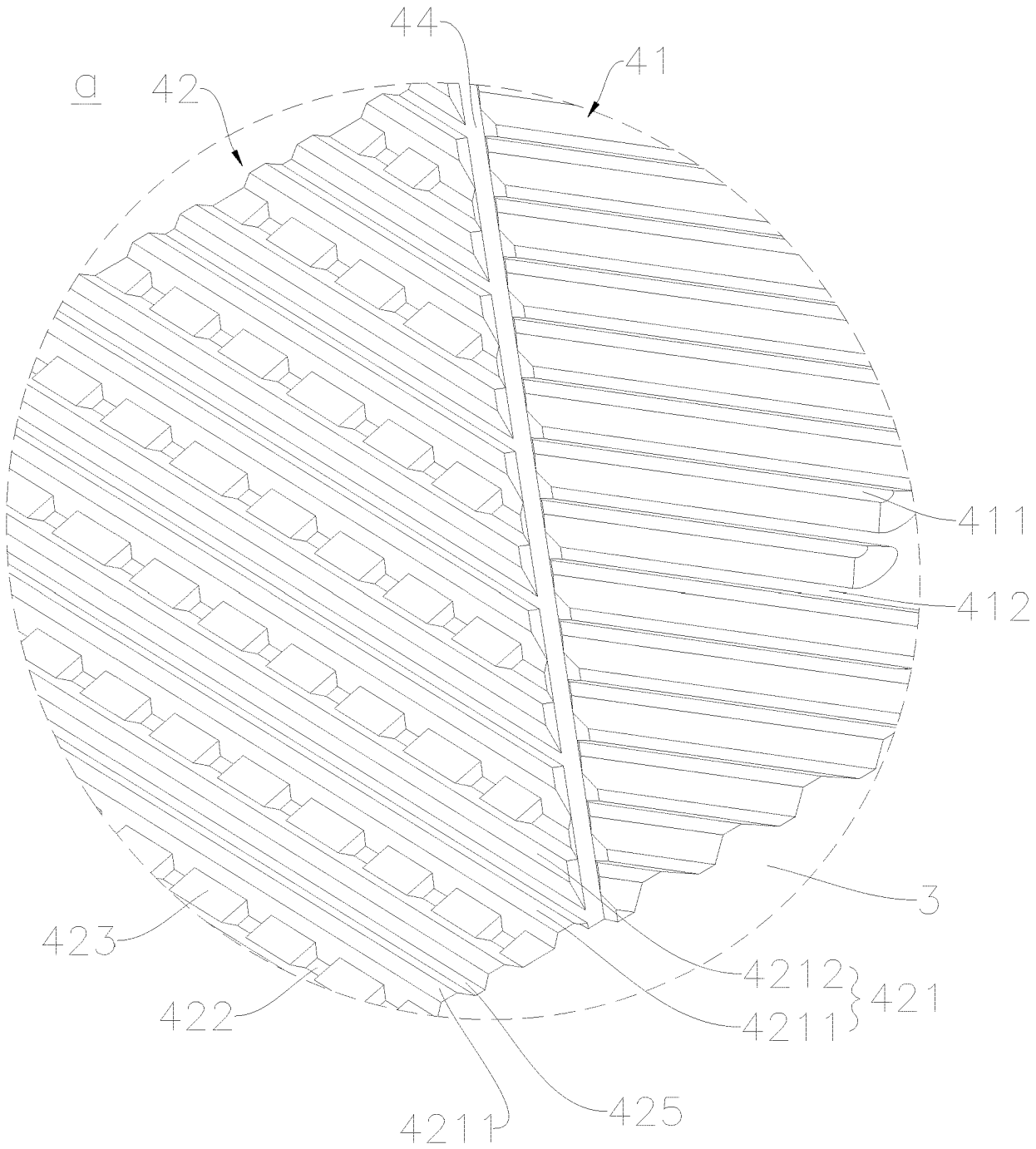

Fig. 3

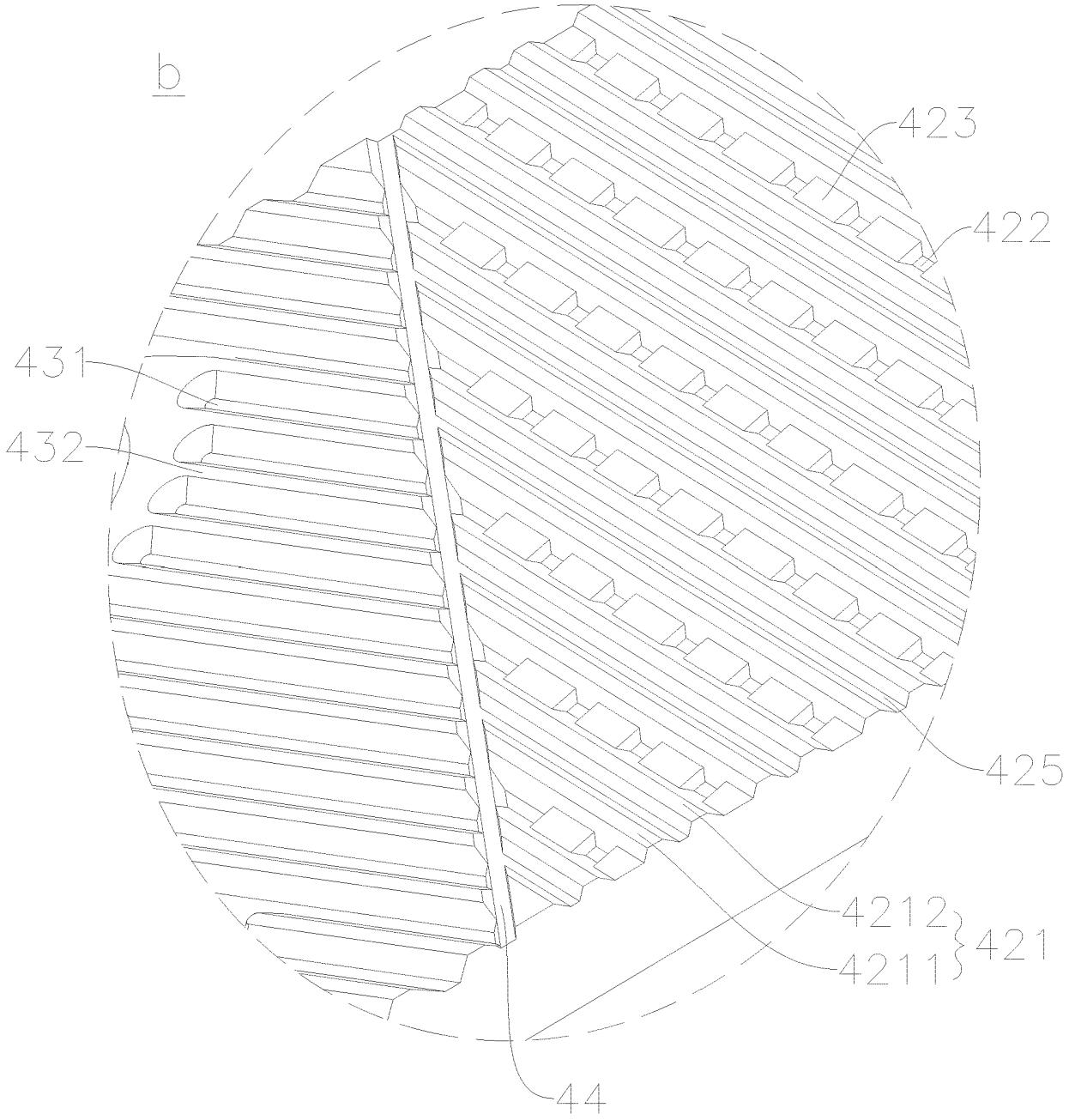

Fig. 4

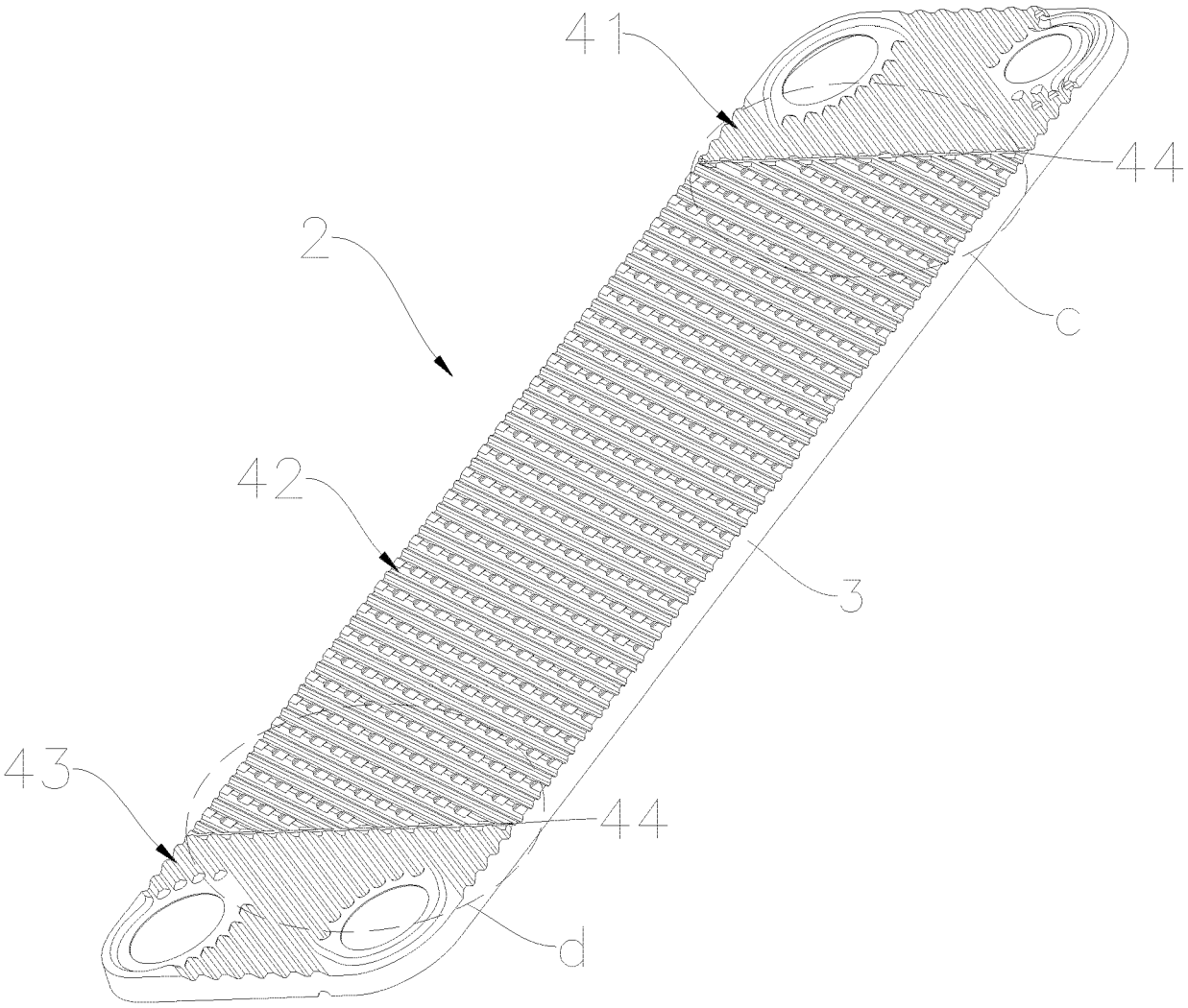

Fig. 5

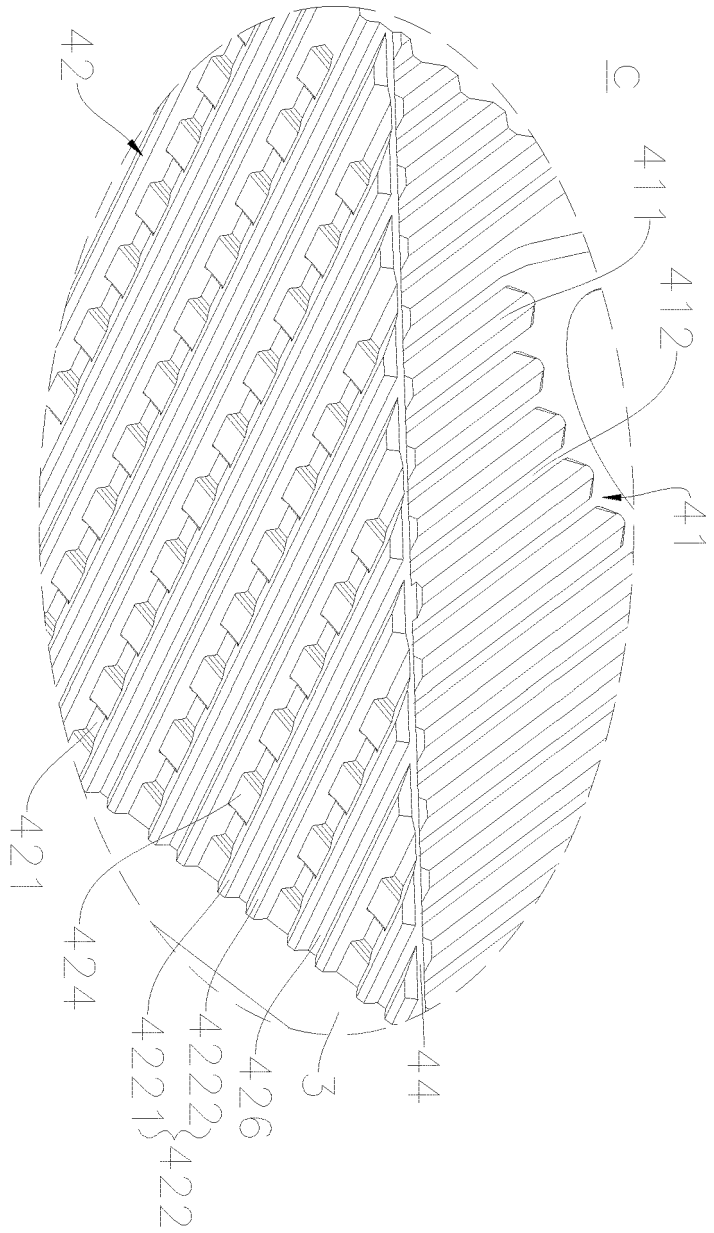

Fig. 6

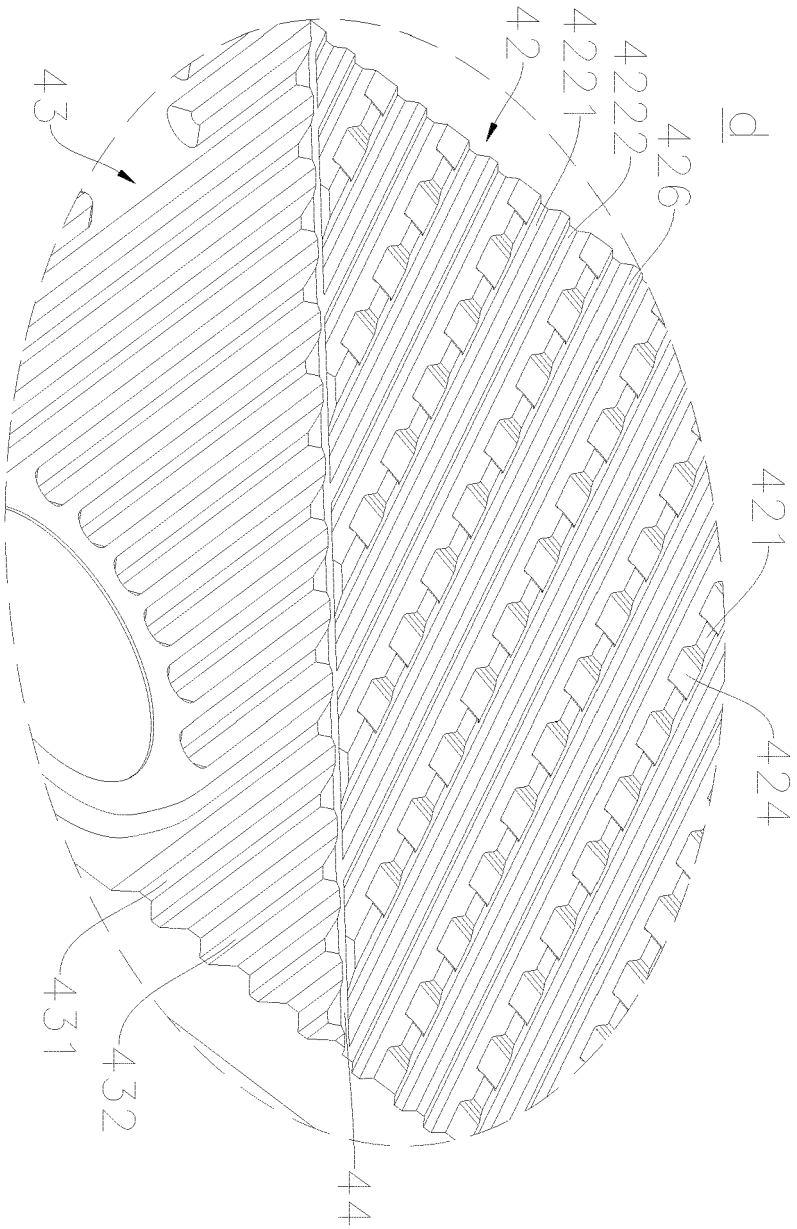

Fig. 7

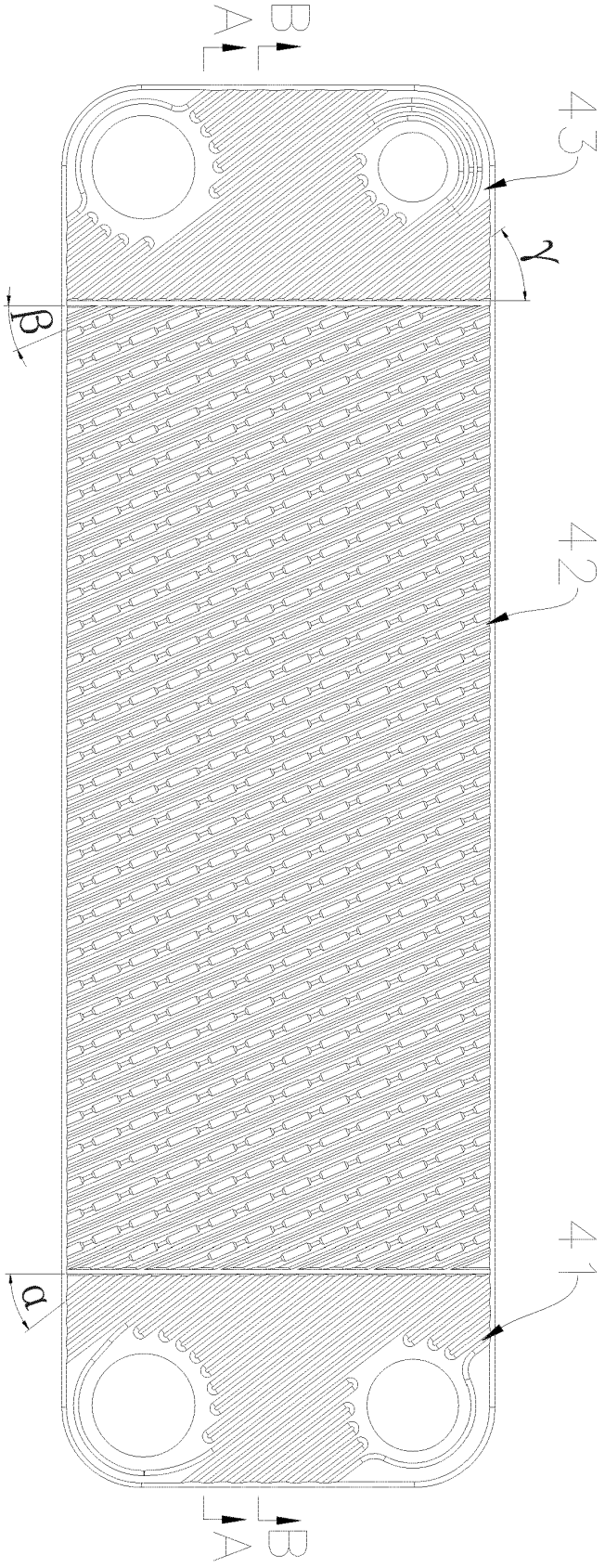

Fig. 8

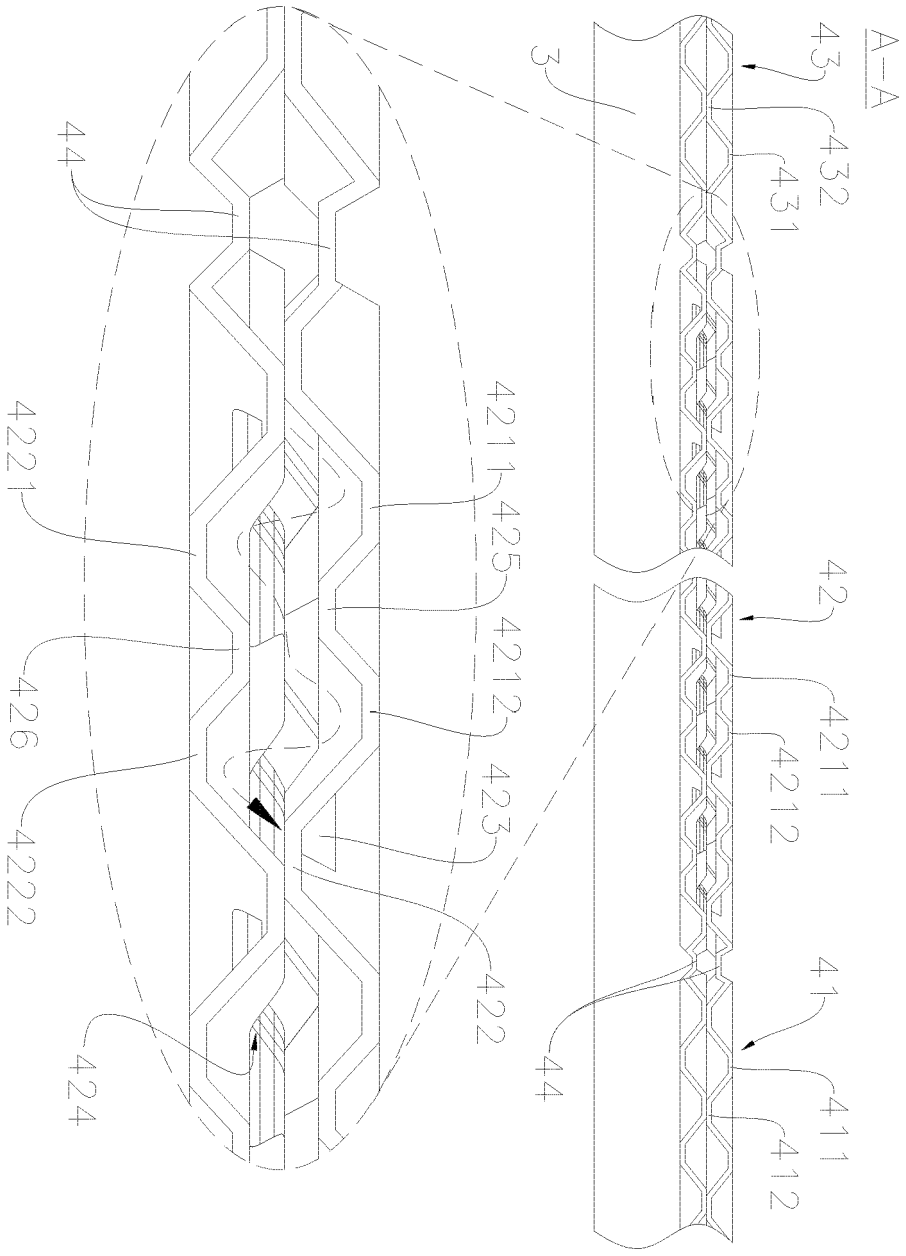
A–A
43
432
431
3
44
4221
4211
425
4212
423
426
4222
422
424
42
4211
4212
41
411
412
44

Fig. 9

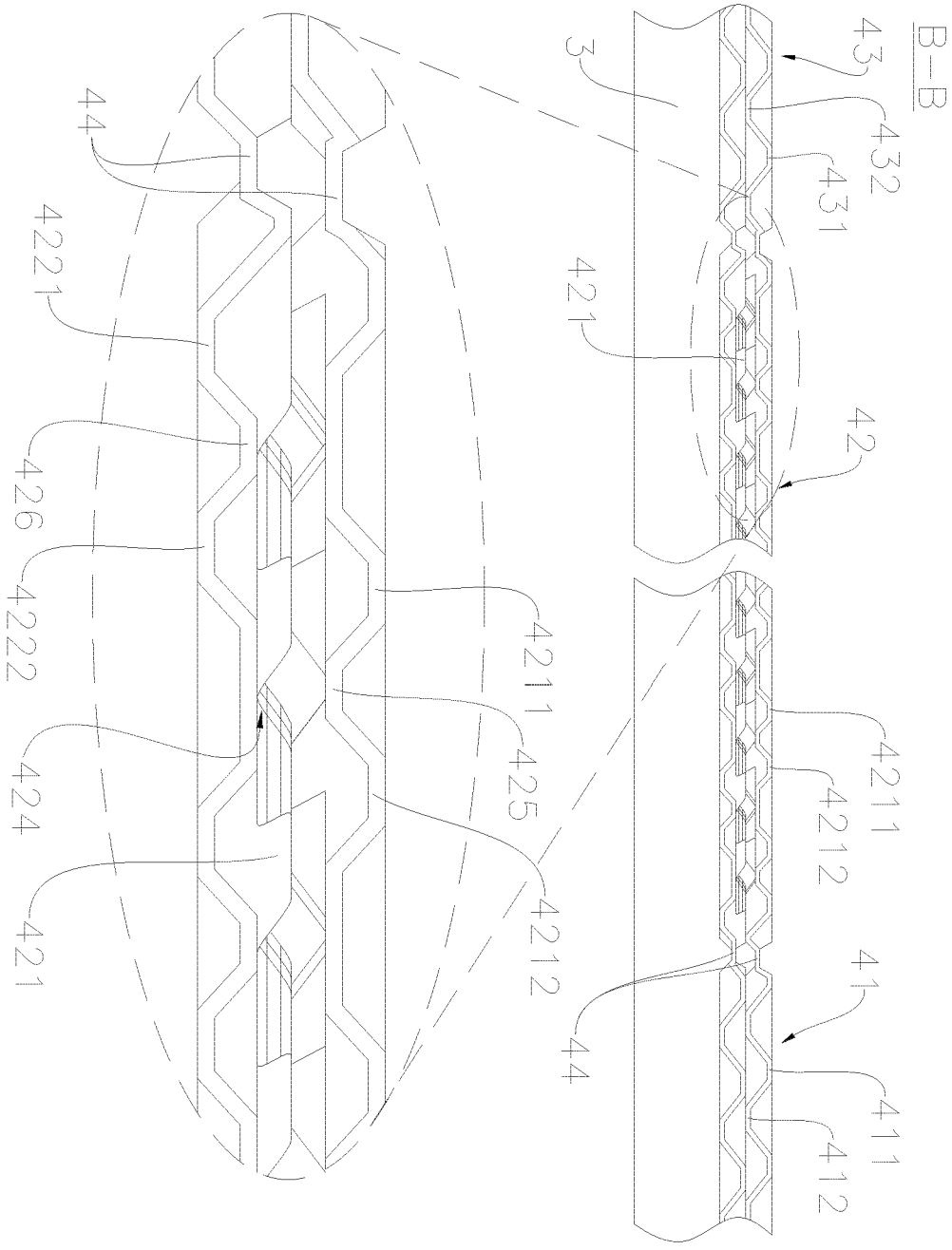
B—B
43
432
431
3
421
42
44
4221
426
4222
424
421
4211
425
4212
4211
4212
41
411
412
44

Fig. 10

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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