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TITLE OF THE INVENTION

Leadframe

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates to a leadframe included in a resin-sealed semiconductor device, for example.

Description of the Background Art

When a resin-sealed semiconductor device, for example, is fabricated, a leadframe is prepared to mount a semiconductor element (chip) thereon.

Fig. 18 is a perspective view showing a configuration of a background-art leadframe 100. A sheet metal is processed to form the leadframe 100. The leadframe 100 has a pad 2 for mounting the semiconductor element 3 at its center portion, which is supported by suspension leads 6a to 6d from four directions. Inner leads 5 radially extend from the periphery towards the pad 2. The inner leads 5 are connected to electrode portions of the semiconductor element 3 with metal thin wires 4.

After the leadframe 100 in the state of Fig. 18 is obtained, the semiconductor element 3 is sealed by resin such as epoxy resin and the inner leads 5 and the suspension leads 6a to 6d are cut off from the leadframe 100.

In a case of a semiconductor package which includes a larger number of inner leads 5, such as a multiple pin QFP (Quad Flat Package), each inner lead 5 thereof becomes narrower and longer and its rigidity becomes lower. To prevent deformation of such inner lead 5 in a fabricating process, a support tape is applied

to the inner leads 5 and the suspension leads 6a to 6d. As to the support tape, a variety of forms are proposed as below.

(a-1) The First Background Art

Fig. 18 shows a rectangular ring-shaped support tape 201. The rectangular ring-shaped support tape 201 is applied to the inner leads 5 and the suspension leads 6a to 6d around the pad 2. Since the support tape is rectangular, the inner leads 5 and the suspension leads 6a to 6d are not deformed or displaced even if the support tape 201 contracts.

Fig. 19 is a plan view illustrating a manner of taking the support tape 201 out of its material. The material 200 for the support tape 201 is generally supplied in tape form, and a rectangular ring-shaped support tape 201 is punched and applied to the inner leads 5. In this case, there are remaining portions 202 and 203, and the material 200 is disadvantageously utilized with low efficiency. In general, the material 200 is expensive, and therefore low-efficient use of the material 200 leads to a costly leadframe 100.

(a-2) The Second Background Art

To solve the problem of the first background art, use of strip-shaped support tapes, instead of rectangular ring-shaped support tapes, is proposed. Fig. 20A is a plan view showing a configuration of a leadframe 101 and Fig. 20B is a section taken along the one-dot chain line XX-XX and viewed from the direction of the arrow of Fig. 20A.

The support tapes 211 and 221 are of strip-shape and applied to all of the inner leads and suspension leads 6a to 6d. Fig. 21 is a plan view illustrating a

manner of taking the support tapes 211 and 221 out of their materials 210 and 220 in tape form. The support tapes 211 and 221 can be taken out of the materials 210 and 220 with higher efficiency than that of the first background art since these support tapes are rectangular.

With this type of support tapes, however, the inner leads 5 are deformed at the suspension leads 6a to 6d and their vicinities, e.g., in an area A including the suspension lead 6b and its vicinity. Fig. 22 is an enlarged plan view of an area A and its vicinity of Fig. 20A. Among the inner leads 5, an inner lead 501 adjacent to the suspension lead 6b to which both the support tapes 211 and 221 are applied is pulled in the directions of the arrows by contractions of the support tapes 211 and 221. The inner lead 501 is thereby deformed and comes into contact with an adjacent inner lead 502 at a point B. Then, the suspension lead 6b and the inner lead 502 are also deformed.

(a–3) The Third Background Art

To solve the problems of the first and second background arts, it is also proposed that the strip–shaped support tapes 211 and 221 should be applied to the inner leads 5 and the suspension leads 6a to 6d with their end portions overlapped. Fig. 23A is plan view showing a configuration of a leadframe 102 and Fig. 23B is a section taken along the one–dot chain line XXIII–XXIII of Fig. 23A and viewed from the direction of the arrow.

The end portions of the strip–shaped support tapes 211 and 221 are overlapped to form a rectangular ring–shaped support tape on the whole and further their materials 210 and 220 can be utilized with higher efficiency. Moreover, at their overlapped end portions, stresses generated by contraction along the directions

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of the respective lengths of the support tapes 211 and 221 are balanced and the suspension leads 6a to 6d are given stresses only in a direction towards the pad 2. That avoids deformation of the suspension leads 6a to 6b.

It is not desirable, however, that many portions are each given stresses in different directions at an angle of 90° when the support tapes contract. The reason is the alignment of their end portions to be overlapped should be accurately made in order to balance the stresses applied to the support tapes 211 and 221 along the directions of their lengths.

SUMMARY OF THE INVENTION

The present invention is directed to a leadframe. According to a first aspect of the present invention, the leadframe comprises: a plurality of inner leads provided radially; and a group of support tapes applied to the plurality of inner leads in a ring shape, in which inner end portions of the plurality of inner leads expose on inner peripheral side of the group of support tapes, and in which the group of support tapes includes a plurality of first support tapes of L-shape, and both end portions of one of the plurality of first support tapes are overlapped with end portions of at least one of the plurality of first support tapes which is different from said one of the plurality of first support tapes.

According to a second aspect of the present invention, in the leadframe of the first aspect, the group of support tapes includes two first support tapes.

According to a third aspect of the present invention, the leadframe of the first aspect further comprises: a pad of substantially rectangular surrounded by the plurality of inner leads, in which the respective center portions of the plurality of first support tapes are located on two opposed ones of four suspension leads which

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are inner leads for supporting the pad at its four corners.

According to a fourth aspect of the present invention, in the leadframe of the third aspect, one of the plurality of first support tapes is applied to a front surface of the inner leads and the other is applied to a back surface of the inner leads, and the respective end portions are overlapped with each other through the inner leads.

According to a fifth aspect of the present invention, in the leadframe of the second aspect, each of the end portions of the plurality of first support tapes has a chipped portion having an angle of almost 45° in its extending direction.

According to a sixth aspect of the present invention, in the leadframe of the first aspect, the group of support tapes includes four first support tapes.

According to a seventh aspect of the present invention, the leadframe of the sixth aspect further comprises: a pad of substantially rectangular surrounded by the plurality of inner leads, in which the respective center portions of the plurality of first support tapes are located on four suspension leads which are inner leads for supporting the pad at its four corners.

According to an eighth aspect of the present invention, in the leadframe of the seventh aspect, a first pair of the plurality of first support tapes are opposed to each other and a second pair of the plurality of first support tapes are opposed to each other, the first pair and the second pair are different from each other, the first pair is applied to a front surface of the inner leads and the second pair is applied to a back surface of the inner leads, and end portions of the first support tapes are overlapped with adjacent ones through the inner leads.

According to a ninth aspect of the present invention, the leadframe comprises: a plurality of inner leads provided radially; and a group of support tapes applied to the plurality of inner leads in a ring shape, in which inner end portions of the

plurality of inner leads expose on inner peripheral side of the group of support tapes, and in which the group of support tapes includes a plurality of first support tapes of L-shape and a plurality of second support tapes of strip-shape, and both end portions of one of the plurality of first support tapes are overlapped with end portions of the plurality of second support tapes.

According to a tenth aspect of the present invention, in the leadframe of the ninth aspect, the plurality of first support tapes are applied to a front surface of the inner leads and the plurality of second support tapes are applied to a back surface of the inner leads, and end portions of the first support tapes are overlapped with end portions of second support tapes through the inner leads.

The leadframe of the first aspect employs the L-shaped first support tapes, and therefore achieves higher efficiency in utilizing the material for support which is generally in tape form.

When the support tapes are overlapped in a portion where stresses may be generated in different directions at an angle of 90°, the overlapping should be made with sufficient accuracy. The leadframe of the second and third aspects needs only two overlapped portions of the support tapes, and therefore the number of the overlapped portions requiring sufficient accuracy in overlapping is reduced.

The leadframe of the fifth aspect employs the first support tapes whose end portions each have a chipped portion at an angle of almost 45°, and therefore makes it possible to take the first support tape having longer sides out of the material for support tape. That allows standardization of width of the material for support tape for a variety of leadframes of different sizes, and thereby facilitates an abundant supply of materials for support tapes of few kinds, resulting in a lower price of the material for support tape.

Although the leadframe of the sixth and seventh aspects needs four overlapped portions of the support tapes, no stress in different directions at an angle of 90° is generated at the overlapped portions. Therefore, the leadframe has no overlapped portion requiring sufficient accuracy in overlapping.

The second support tapes used in the leadframe of the ninth aspect are of strip-shape, and therefore can be taken out of the material for support tape with much higher efficiency. Moreover, since the second support tape is interposed between the first support tapes, it is possible to standardize width of the material for support tape for a variety of leadframes of different sizes, even for a larger leadframe regardless of the extent of the enlargement. That facilitates an abundant supply of materials for support tapes of few kinds, resulting in a lower price of the material for support tape.

The leadframe of the fourth, eighth and tenth aspects has no overlapped portion of any two support tapes on its front surface, and therefore suppresses degradation of accuracy in resin-sealing.

An object of the present invention is to reduce the number of overlapped portions of the support tapes where the stresses are generated in different directions at an angle of 90°, for reduction in number of portions requiring accurate alignment in overlapping, and further to suppress deformation of an inner lead at a low cost by using the support tape which can be taken out of the material with higher efficiency.

These and other objects, features, aspects and advantages of the present invention will become more apparent from the following detailed description of the present invention when taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Figs. 1A and 1B are a plan view and a section taken along the line I–I and viewed from the direction of the arrow, respectively, showing a configuration of a leadframe 301a in accordance with a first preferred embodiment of the present invention;

Fig. 2 is a plan view showing a manner of taking support tapes 71 and 72 out of a material 9 for support tape;

Fig. 3 is a plan view showing a manner of taking support tapes 73 and 74 out of a material 9 for support tape;

Figs. 4A and 4B are a plan view and a section taken along the line IV–IV and viewed from the direction of the arrow, respectively, showing a configuration of a leadframe 302a in accordance with the first preferred embodiment of the present invention;

Fig. 5 is a plan view showing a manner of taking support tapes 75 and 76 out of a material for support tape 9;

Figs. 6A and 6B are a plan view and a section taken along the line VI–VI and viewed from the direction of the arrow, respectively, showing a configuration of a leadframe 303a in accordance with the first preferred embodiment of the present invention;

Figs. 7A and 7B are a plan view and a section taken along the line VII–VII and viewed from the direction of the arrow, respectively, showing a configuration of a leadframe 304a in accordance with the first preferred embodiment of the present invention;

Figs. 8A and 8B are a plan view and a section taken along the line VIII–VIII and viewed from the direction of the arrow, respectively, showing a configuration

of a leadframe 305a in accordance with a second preferred embodiment of the present invention;

Figs. 9A and 9B are a plan view and a section taken along the line IX–IX and viewed from the direction of the arrow, respectively, showing a configuration of a leadframe 306a in accordance with a third preferred embodiment of the present invention;

Figs. 10A and 10B are a plan view and a section taken along the line X–X and viewed from the direction of the arrow, respectively, showing a configuration of a leadframe 307a in accordance with the third preferred embodiment of the present invention;

Figs. 11A and 11B are a plan view and a section taken along the line XI–XI and viewed from the direction of the arrow, respectively, showing a configuration of a leadframe 301b in accordance with a fourth preferred embodiment of the present invention;

Figs. 12A and 12B are a plan view and a section taken along the line XII–XII and viewed from the direction of the arrow, respectively, showing a configuration of a leadframe 302b in accordance with the fourth preferred embodiment of the present invention;

Figs. 13A and 13B are a plan view and a section taken along the line XIII–XIII and viewed from the direction of the arrow, respectively, showing a configuration of a leadframe 303b in accordance with the fourth preferred embodiment of the present invention;

Figs. 14A and 14B are a plan view and a section taken along the line XIV–XIV and viewed from the direction of the arrow, respectively, showing a configuration of a leadframe 304b in accordance with the fourth preferred

embodiment of the present invention;

Figs. 15A and 15B are a plan view and a section taken along the line XV–XV and viewed from the direction of the arrow, respectively, showing a configuration of a leadframe 305b in accordance with the fourth preferred embodiment of the present invention;

Figs. 16A and 16B are a plan view and a section taken along the line XVI–XVI and viewed from the direction of the arrow, respectively, showing a configuration of a leadframe 306b in accordance with the fourth preferred embodiment of the present invention;

Figs. 17A and 17B are a plan view and a section taken along the line XVII–XVII and viewed from the direction of the arrow, respectively, showing a configuration of a leadframe 307b in accordance with the fourth preferred embodiment of the present invention;

Fig. 18 is a perspective view showing a configuration of a first background art;

Fig. 19 is a plan view showing the first background art;

Figs. 20A and 20B are a plan view and a section taken along the line XX–XX and viewed from the direction of the arrow, respectively, showing a configuration of a second background art;

Fig. 21 is a plan view showing the second background art;

Fig. 22 is an enlarged view of an area A and its vicinity of Fig. 20A; and

Figs. 23A and 23B are a plan view and a section taken along the line XXIII–XXIII and viewed from the direction of the arrow, respectively, showing a configuration of a third background art.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

(b-1) The First Preferred Embodiment

Fig. 1A is plan view of a leadframe 301a in accordance with the first preferred embodiment of the present invention and Fig. 1B is a section taken along the one-dot chain line I-I of Fig. 1A and viewed from the direction of the arrow.

In the leadframe 301a, L-shaped support tapes 71 and 72 are applied to the inner leads 5 and the suspension leads 6a to 6d. End portions of the support tapes 71 and 72 are overlapped with each other at the upper-right suspension lead 6b and the lower-left suspension lead 6d and their vicinities, and thus these two support tapes form together a rectangular ring-shaped one. That avoids the problem of the second background art that the inner leads 5 and the suspension leads 6a to 6d are deformed.

Moreover, since the support tapes 71 and 72 are of L-shape, their center portions and their vicinities are positioned at the suspension leads 6a and 6c and their vicinities, respectively, and there are only two overlapped end portions of the support tapes 71 and 72 at the suspension leads 6b and 6d. Thus, the overlapped portions at the suspension leads and their vicinities are reduced in number by two as compared with those in the third background art, and the necessity for accurate alignment is thereby suppressed.

Furthermore, as to the material efficiency which is the problem in the first background art, an improvement as discussed below is achieved.

Fig. 2 is a plan view illustrating a manner of taking the support tapes 71 and 72 out of the material 9. The material 9 is of tape form with a width B. If each outer side of the rectangular ring-shape which is formed of the support tapes 71 and 72 shown in Fig. 1 has a length L1, the support tapes 71 (72) are arranged to

be adjacent to each other in a direction of the length of the material 9 (perpendicular to the direction of its width). By obtaining the support tapes 71 (72) in this manner, the remaining portions 81 of the material 9 are reduced.

The remaining portions of the material 9 can be further reduced. Fig. 3 is a plan view illustrating a manner of taking the L-shaped support tapes 73 and 74 out of the material 9. If the support tapes 73 and 74 each have a width W, a pattern of adjacent L-shaped support tapes 73 (74) is made so that isosceles triangles whose shorter sides each have a length W/2 may extend off the material 9. In this case, each remaining portion 82 is an isosceles triangle whose shorter sides each have a length W/2 and is smaller in area than the remaining portion 81 which is an isosceles triangle whose shorter sides each have a length W. Thus, the material 9 is utilized with higher efficiency.

In this case, both end portions of each support tape 73 (74) are actually chipped by an isosceles triangle whose shorter sides each have a length W/2. Nevertheless, the support tapes 73 and 74 can be overlapped with each other.

Fig. 4A is plan view of a leadframe 302a on which end portions of the support tapes 73 and 74 are overlapped at the upper-right suspension lead 6b and the lower-left suspension lead 6d and their vicinities. Fig. 4B is a section taken along the one-dot chain line IV-IV of Fig. 4A and viewed from the direction of the arrow.

In these figures, the end portions of the support tapes 73 and 74 are overlapped in a pentagon which corresponds to a square whose sides each have a length W with a chipped portion of isosceles triangle whose shorter sides each have a length W/2. That makes a rectangular ring-shape which is formed of the support tapes 73 and 74 with longer outer sides each of which has a length L2 = L1 +

(W/2), while keeping a balance of stresses.

In other words, the material 9 having a width B can be used for leadframes of different sizes. For a variety of semiconductor devices of different sizes, standardization of size of the materials for support tape can be easily achieved. That facilitates an abundant supply of materials for support tapes of few kinds, resulting in a lower price of the material for support tape. Thus, the support tape can be made available at a still lower cost.

The remaining portion of the material 9 can be further reduced in area. Fig. 5 is a plan view illustrating a manner of taking the support tapes 75 and 76 out of the material 9. If the support tapes 75 and 76 each have a width W, a pattern of adjacent L-shaped support tapes 75 (76) is made so that isosceles triangles whose shorter sides each have a length W may extend off the material 9. In this case, no remaining portion is left and the material 9 is utilized with the maximum efficiency.

In this case, both end portions of each support tape 75 (76) are actually chipped by an isosceles triangle whose shorter sides each have a length W. Nevertheless, the support tapes 75 and 76 can be overlapped with each other.

Fig. 6A is plan view of a leadframe 303a on which end portions of the support tapes 75 and 76 are overlapped at the upper-right suspension lead 6b and the lower-left suspension lead 6d and their vicinities. Fig. 6B is a section taken along the one-dot chain line VI-VI of Fig. 6A and viewed from the direction of the arrow.

In these figures, the end portions of the support tapes 75 and 76 are overlapped in an isosceles triangle whose shorter sides each have a length W. That makes a rectangular ring-shape which is formed of the support tapes 75 and 76 with still longer outer sides each of which has a length L3 = L1 + W, while

keeping a balance of stresses.

It is naturally possible to make a rectangular ring-shape with shorter outer sides. Fig. 7A is plan view of a leadframe 304a on which end portions of the support tapes 75 and 76 are overlapped extending off each other at the upper-right suspension lead 6b and the lower-left suspension lead 6d and their vicinities. Fig. 7B is a section taken along the one-dot chain line VII-VII of Fig. 7A and viewed from the direction of the arrow.

In these figures, the end portions of the support tapes 75 and 76 are overlapped in a square whose sides each have a length W. That makes a rectangular ring-shape which is formed of the support tapes 75 and 76 with outer sides each of which has a length L1.

This means that the material for support tape is utilized with still higher efficiency while facilitating standardization of size of the materials for support tape for a variety of semiconductor devices of different sizes without any hindrance.

As indicated by two-dot chain lines in Figs. 3, 4, 5 and 6, the center portion of the L-shaped support tape may be intentionally chipped so as to be uniform in shape with the overlapped portions.

(b-2) The Second Preferred Embodiment

Fig. 8A is plan view of a leadframe 305a in accordance with the second preferred embodiment of the present invention and Fig. 8B is a section taken along the one-dot chain line VIII-VIII of Fig. 8A and viewed from the direction of the arrow.

The support tapes 71a to 71d are of L-shape like the support tapes 71 (72) discussed in the first preferred embodiment. The corner portions of the support

tapes 71a to 71d are positioned and applied to the upper-left suspension lead 6a, the upper-right suspension lead 6b, the lower-right suspension lead 6c and the lower-left suspension lead 6d respectively and their vicinities. One end portion of the support tape 71a is overlapped with one end portion of the support tape 71b and the other end portion is overlapped with one end portion of the support tape 71d. Similarly, one end portion of the support tape 71c is overlapped with the other end portion of the support tape 71b and the other end portion is overlapped with the other end portion of the support tape 71d.

Thus, since the support tapes are overlapped on some of the inner leads 5 other than those in the vicinity of the suspension leads 6a to 6d, stresses by contraction of the support tapes are prevented from applying to the overlapped portion from different directions at an angle of 90°. Thus, in the second preferred embodiment, it is desirably possible to further reduce the number of the overlapped portions to which the stresses are applied from different directions at an angle of 90° as compared with those in the first preferred embodiment.

Furthermore, if the support tape 71a (71b, 71c, 71d) has a length L1, a rectangular ring-shaped pattern which is formed of the support tapes 71a to 71d with sides each of which has a length $L4 = 2 \cdot L1 - D$ (where D represents a length of an overlapped portion) is applied to the inner leads 5 and the suspension leads 6a to 6d. Thus, advantageously, the present invention can be applied to a leadframe which is larger, regardless of the extent of the enlargement.

(b-3) The Third Preferred Embodiment

Fig. 9A is plan view of a leadframe 306a in accordance with the third preferred embodiment of the present invention and Fig. 9B is a section taken along

the one-dot chain line IX-IX of Fig. 9A and viewed from the direction of the arrow.

Like the second preferred embodiment, the corner portions of the L-shaped support tapes 71a to 71d are positioned and applied to the upper-left suspension lead 6a, the upper-right suspension lead 6b, the lower-right suspension lead 6c and the lower-left suspension lead 6d respectively and their vicinities. An end portion of the L-shaped support tape 71a and that of the L-shaped support tape 71b are overlapped with opposite end portions of the strip-shaped support tape 77a respectively. Similarly, the other end portion of the L-shaped support tape 71b and an end portion of the L-shaped support tape 71c are overlapped with opposite end portions of the strip-shaped support tape 77b respectively, the other end portion of the L-shaped support tape 71c and an end portion of the L-shaped support tape 71d are overlapped with opposite end portions of the strip-shaped support tape 77c respectively, and the other end portion of the L-shaped support tape 71d and that of the L-shaped support tape 71a are overlapped with opposite end portions of the strip-shaped support tape 77d respectively.

Thus, the present invention can be applied to a still larger leadframe while achieving an advantage of no overlapped portion to which the stresses are applied from different directions at an angle of 90°, like the second preferred embodiment. Specifically, a rectangular ring-shaped pattern with sides each of which has a length $L5 = 2 \cdot L1 + K - 2/D$ (where K represents the length of each support tape 77a (77b, 77c and 77d)) is achieved.

Naturally, the present invention can be applied to a still much larger leadframe by using longer strip-shaped support tapes (making K larger). Fig. 10A is plan view of a leadframe 307a in which strip-shaped support tapes 78a to 78d longer

than the strip-shaped support tapes 77a to 77b are employed. Fig. 10B is a section taken along the one-dot chain line X-X of Fig. 10A and viewed from the direction of the arrow. In these figures, a rectangular ring-shaped pattern with sides each of which has a length L6 (> L5) is achieved.

As discussed in the first preferred embodiment, the L-shaped support tapes such as the support tapes 71a to 71d can be taken out of the material for support tape with higher efficiency. As discussed in the second background art, also the strip-shaped support tapes such as the support tapes 77a to 77d and 78a to 78d can be taken out of the material for support tape with higher efficiency. Therefore, material efficiency of the support tape in the third preferred embodiment does not become worse than other preferred embodiments.

(b-4) The Fourth Preferred Embodiment

As a variation of the above preferred embodiments, the support tapes to be overlapped may be alternately applied to a front surface and a back surface of the leadframe. Figs. 11A and 11B, 12A and 12B, 13A and 13B, 14A and 14B, 15A and 15B, 16A and 16B, and 17A and 17B show configurations of leadframes 301b to 307b as variations of the leadframes 301a to 307a shown in Figs. 1A and 1B, 4A and 4B, 6A and 6B, 7A and 7B, 8A and 8B, 9A and 9B, and 10A and 10B, respectively. Figures A are plan views and figures B are sections taken along the one-dot chain lines XI-XI of Fig. 11A, XII-XII of Fig. 12A, XIII-XIII of Fig. 13A, XIV-XIV of Fig. 14A, XV-XV of Fig. 15A, XVI-XVI of Fig. 16A, and XVII-XVII of Fig. 17A, respectively, and viewed from the direction of the arrow.

These configurations achieve the same effect as discussed in the first to third preferred embodiments. Furthermore, in each variation, there is no overlapped

portions of two support tapes on the front surface, and therefore it becomes possible to suppress degradation in accuracy of resin-sealing.

While the invention has been shown and described in detail, the foregoing description is in all aspects illustrative and not restrictive. It is therefore understood that numerous modifications and variations can be devised without departing from the scope of the invention.

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CLAIMS:

1. A lead frame, comprising:

a plurality of inner leads provided radially; and

a group of support tapes applied to said plurality of inner leads in a ring shape,

wherein inner end portions of said plurality of inner leads expose on inner peripheral side of said group of support tapes,

said group of support tapes includes a plurality of first support tapes of L-shape, and

both end portions of one of said plurality of first support tapes are overlapped with end portions of at least one of said plurality of first support tapes, said at least one of said plurality of first support tapes being different from said one of said plurality of first support tapes.

2. The lead frame of claim 1, wherein

said group of support tapes includes two first support tapes.

3. The lead frame of claim 2, further comprising:

a pad of substantially rectangular surrounded by said plurality of inner leads,

wherein the respective center portions of said plurality of first support tapes are located on two opposed ones of four suspension leads which are inner leads for supporting said pad at its four corners.

4. The lead frame of claim 3, wherein

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one of said plurality of first support tapes is applied to a front surface of said inner leads and the other is applied to a back surface of said inner leads, and the respective end portions are overlapped with each other through said inner leads.

5. The lead frame of claim 2, wherein

each of said end portions of said plurality of first support tapes has a chipped portion having an angle of almost 45° in its extending direction.

6. The lead frame of claim 1, wherein

said group of support tapes includes four first support tapes.

7. The lead frame of claim 6, further comprising:

a pad of substantially rectangular surrounded by said plurality of inner leads,

wherein the respective center portions of said plurality of first support tapes are located on four suspension leads which are inner leads for supporting said pad at its four corners.

8. The lead frame of claim 7, wherein

a first pair of said plurality of first support tapes are opposed to each other and a second pair of said plurality of first support tapes are opposed to each other, said first pair and said second pair being different from each other,

said first pair is applied to a front surface of said inner leads and said second pair is applied to a back surface of said inner leads, and

end portions of said first support tapes are overlapped with adjacent ones through said inner leads.

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9. A lead frame, comprising:

a plurality of inner leads provided radially; and

a group of support tapes applied to said plurality of inner leads in a ring shape,

wherein inner end portions of said plurality of inner leads expose on inner peripheral side of said group of support tapes,

said group of support tapes includes a plurality of first support tapes of L–shape and a plurality of second support tapes of strip–shape, and

both end portions of one of said plurality of first support tapes are overlapped with end portions of said plurality of second support tapes.

10. The lead frame of claim 9, wherein

said plurality of first support tapes are applied to a front surface of said inner leads and said plurality of second support tapes are applied to a back surface of said inner leads, and

end portions of said first support tapes are overlapped with end portions of second support tapes through said inner leads.

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FIG. 1A FIG. 1B

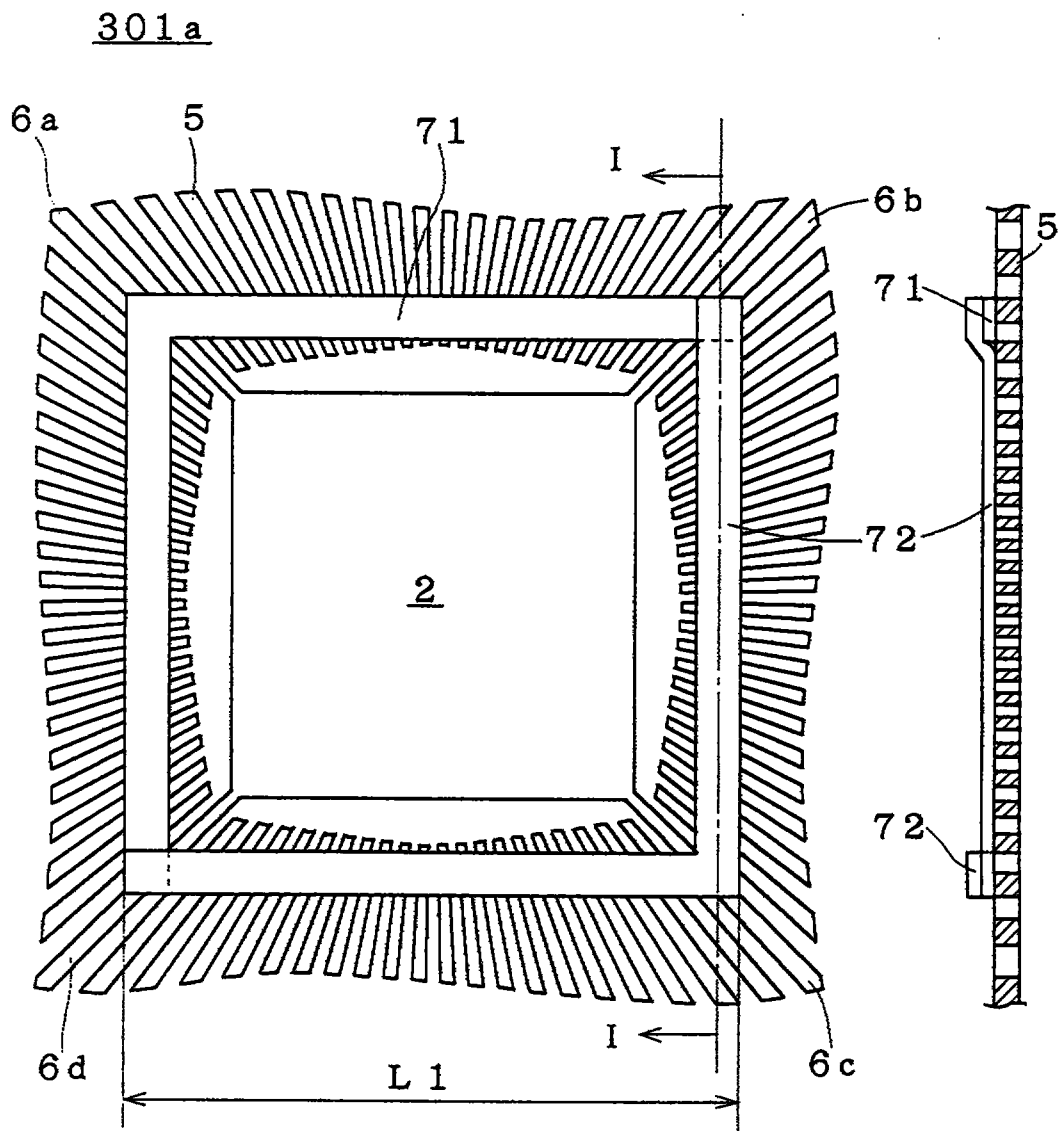


FIG. 2

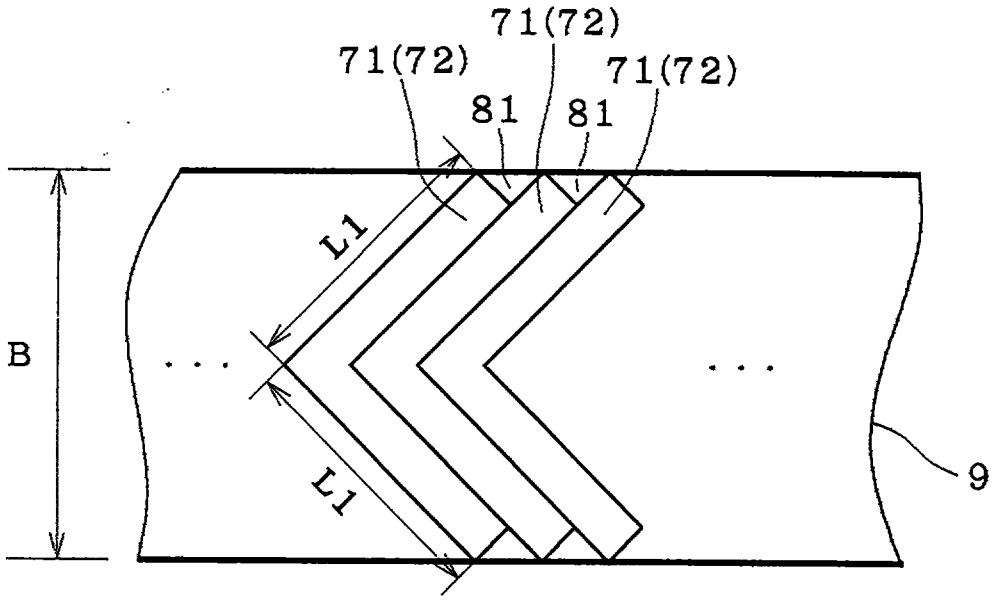


FIG. 3

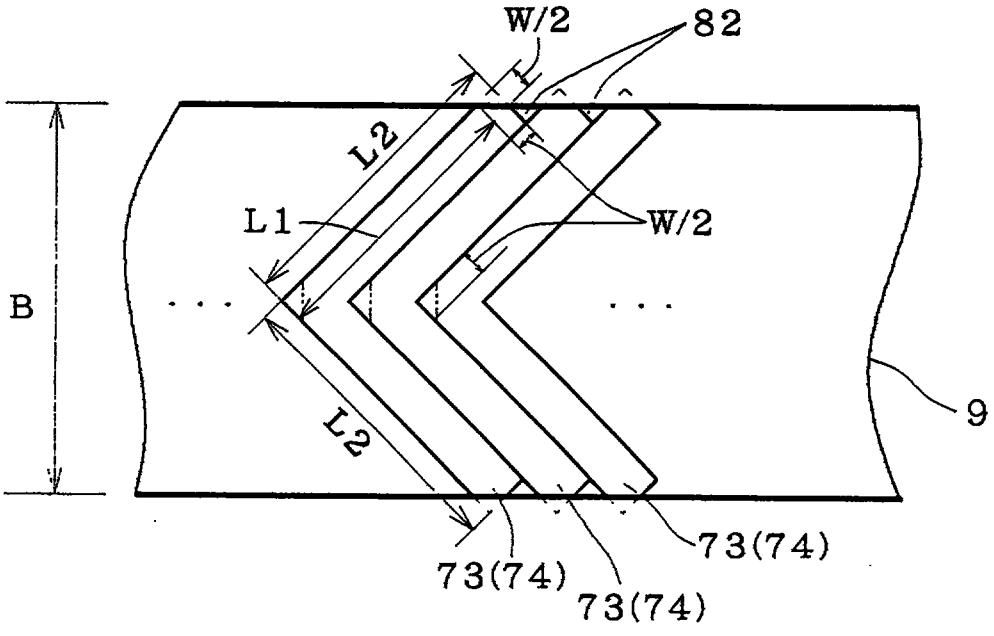


FIG. 4A

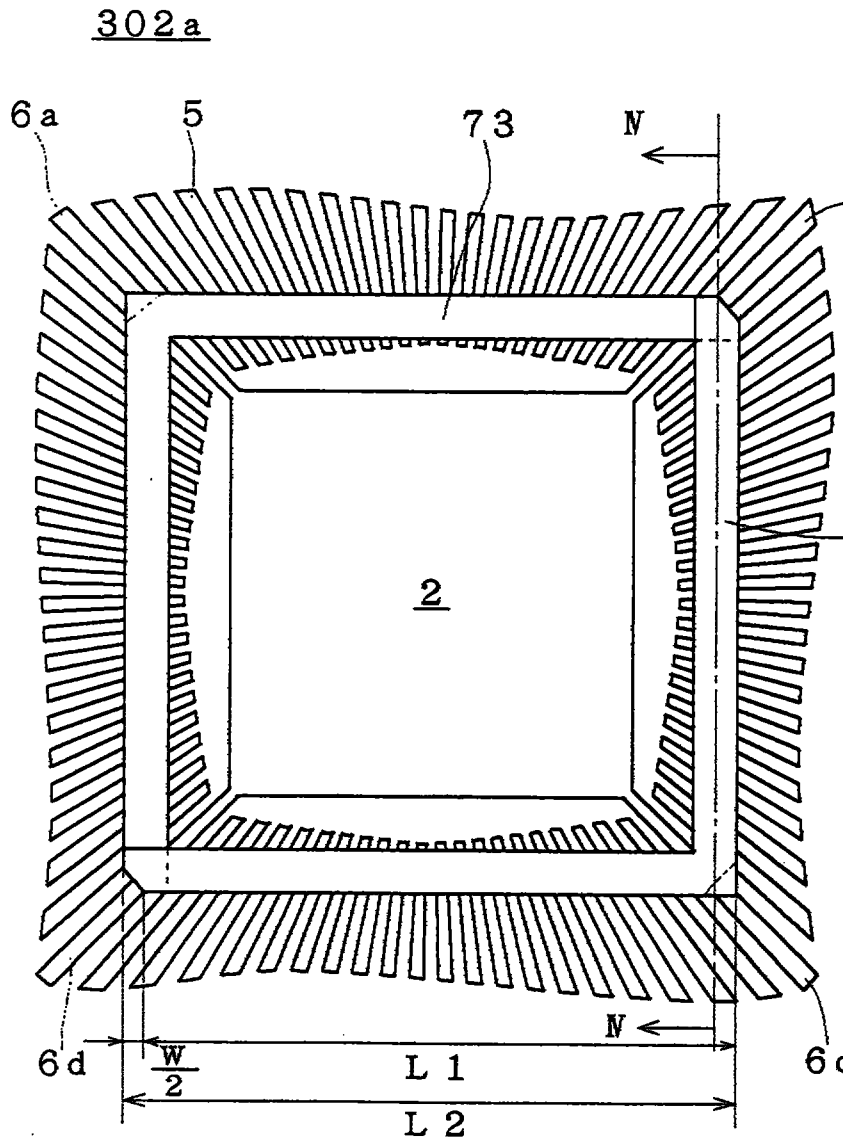


FIG. 4B

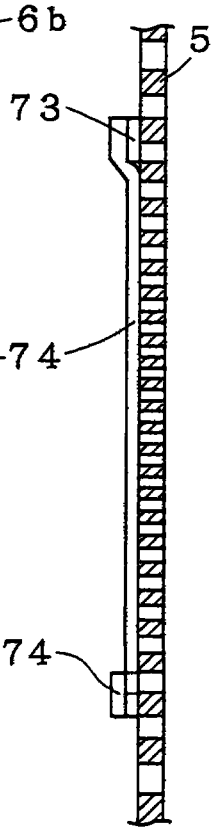


FIG. 5

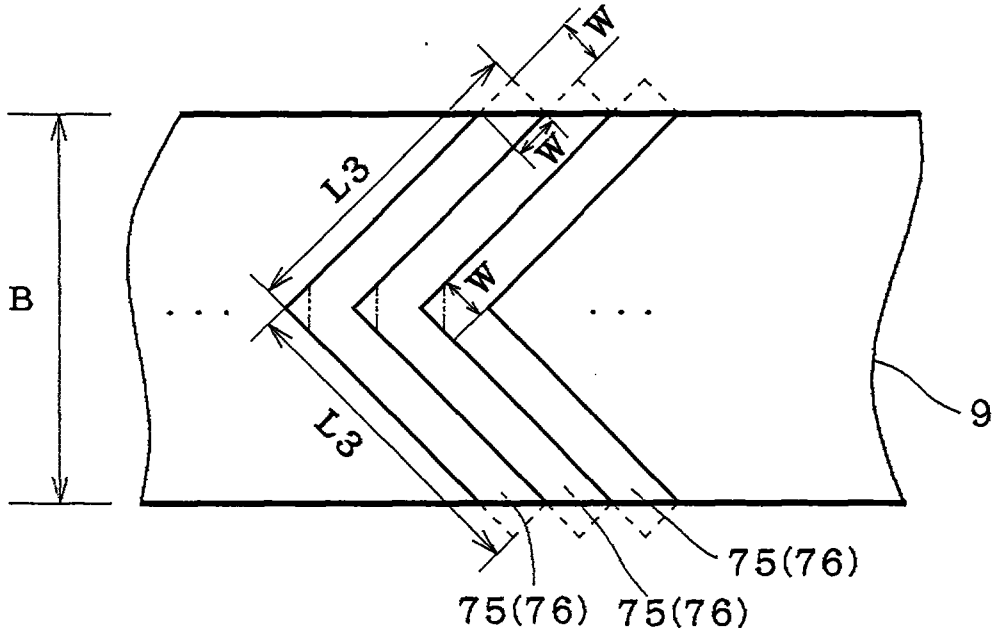


FIG. 6A

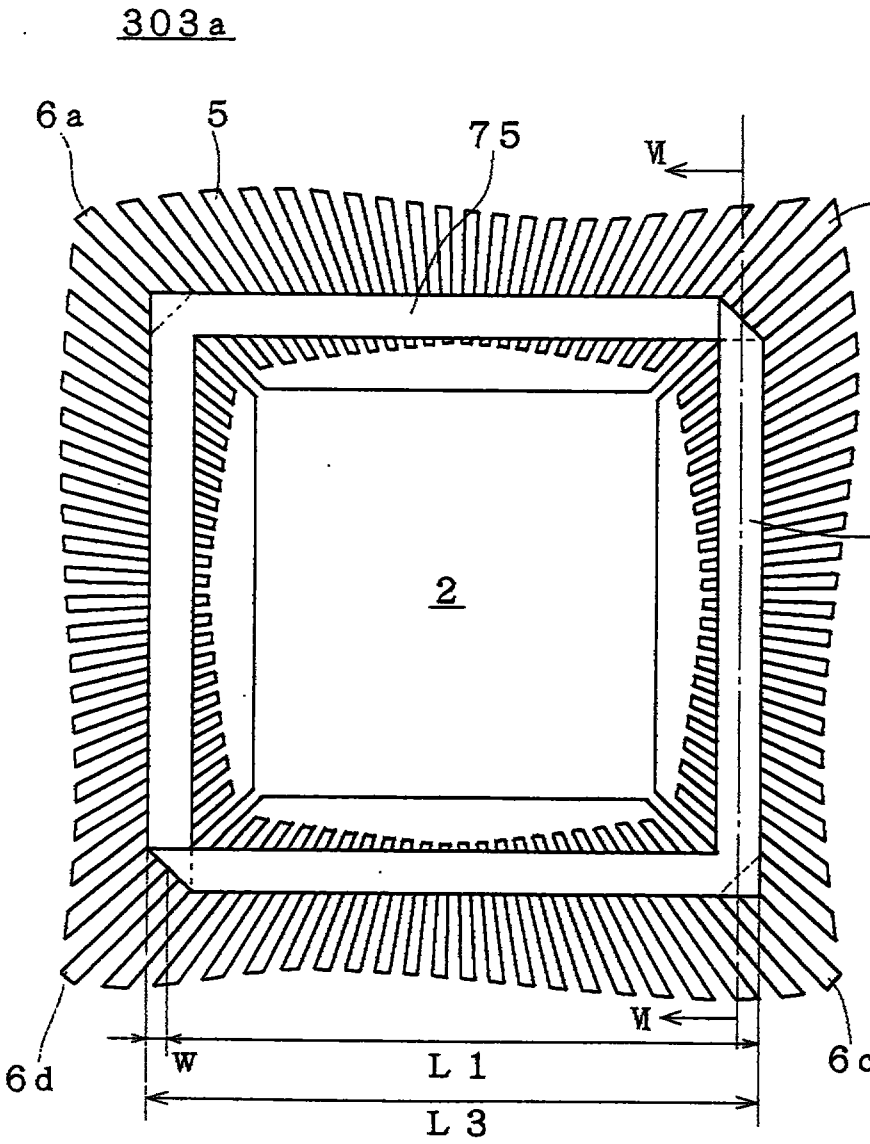


FIG. 6B

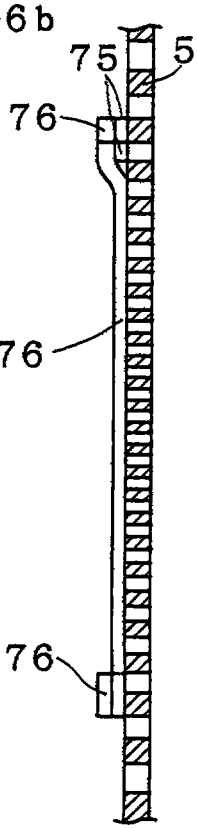


FIG. 7A

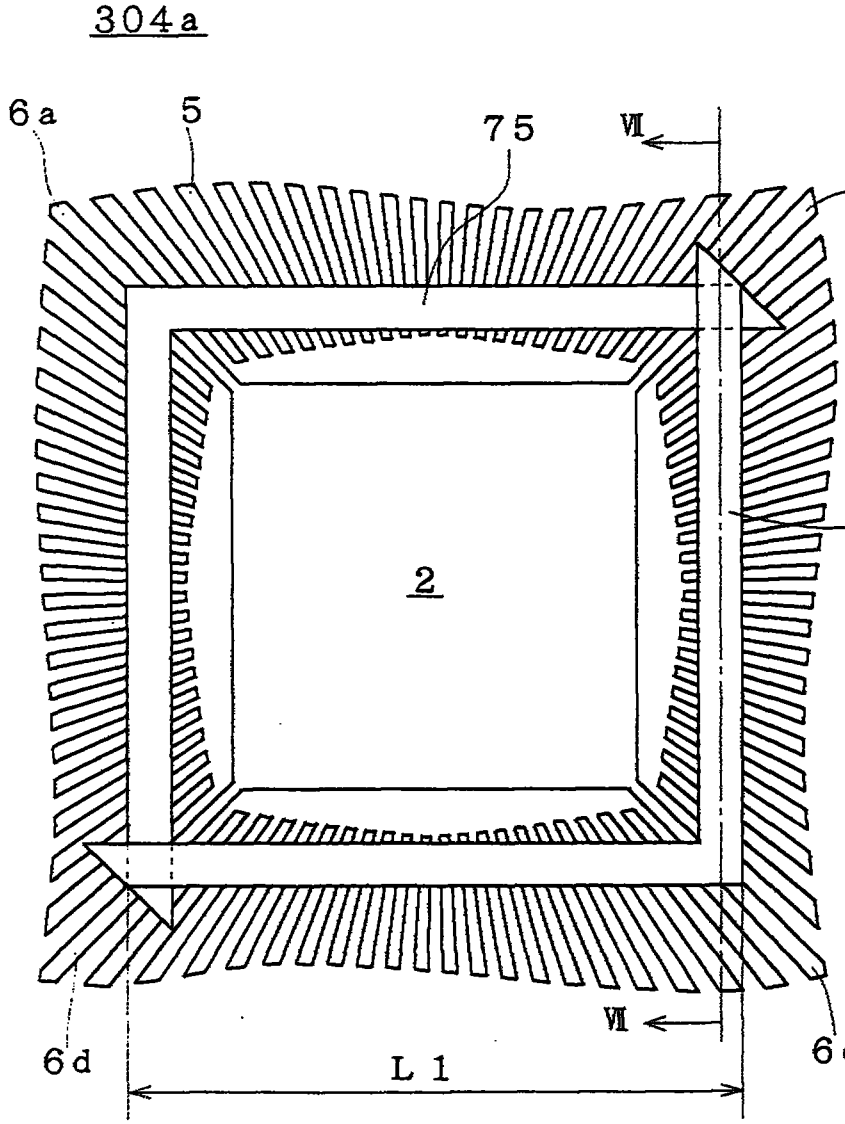


FIG. 7B

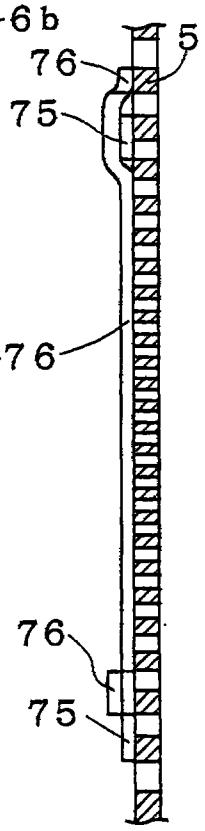


FIG. 8A

FIG. 8B

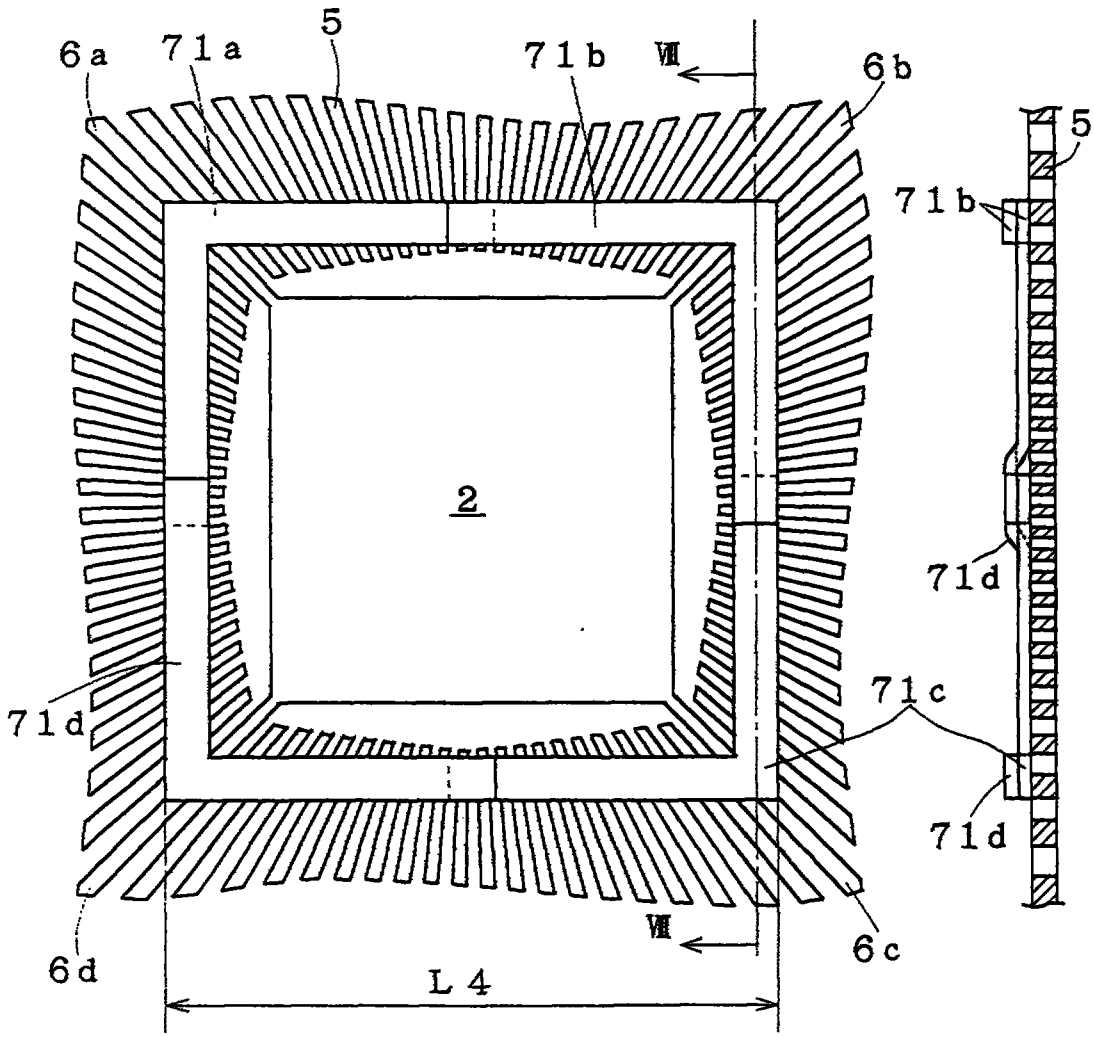


FIG. 9A FIG. 9B

306a

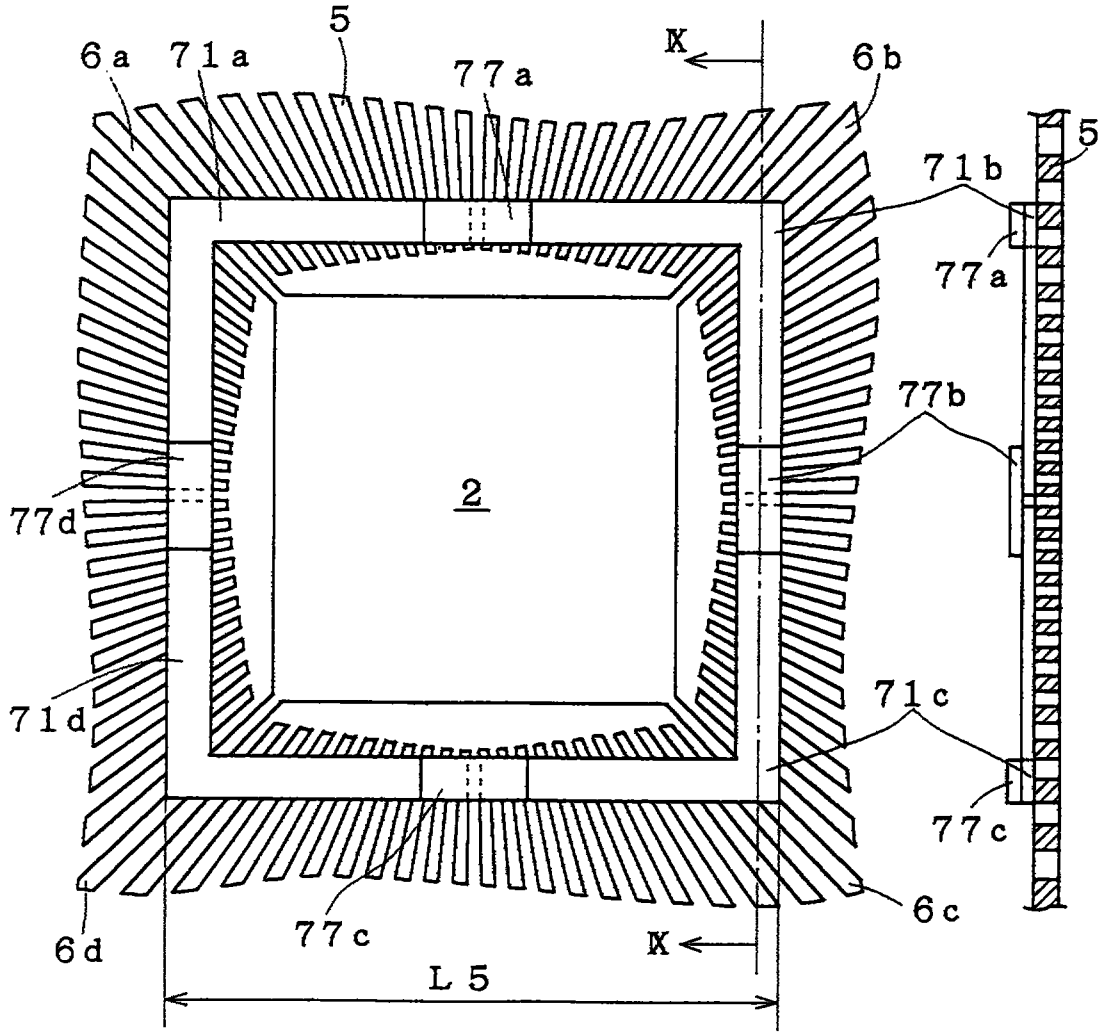


FIG. 10A FIG. 10B

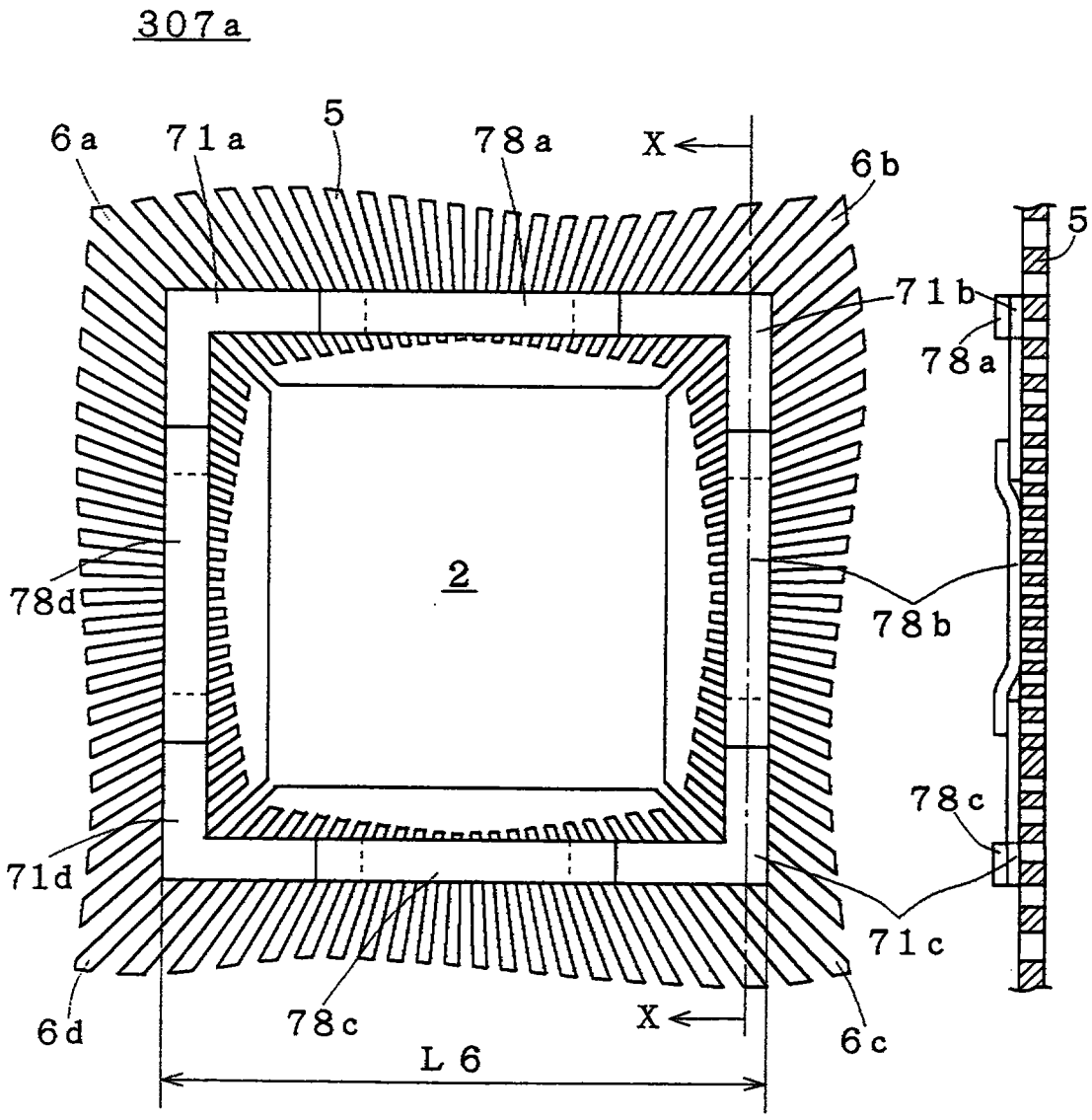


FIG. 11A

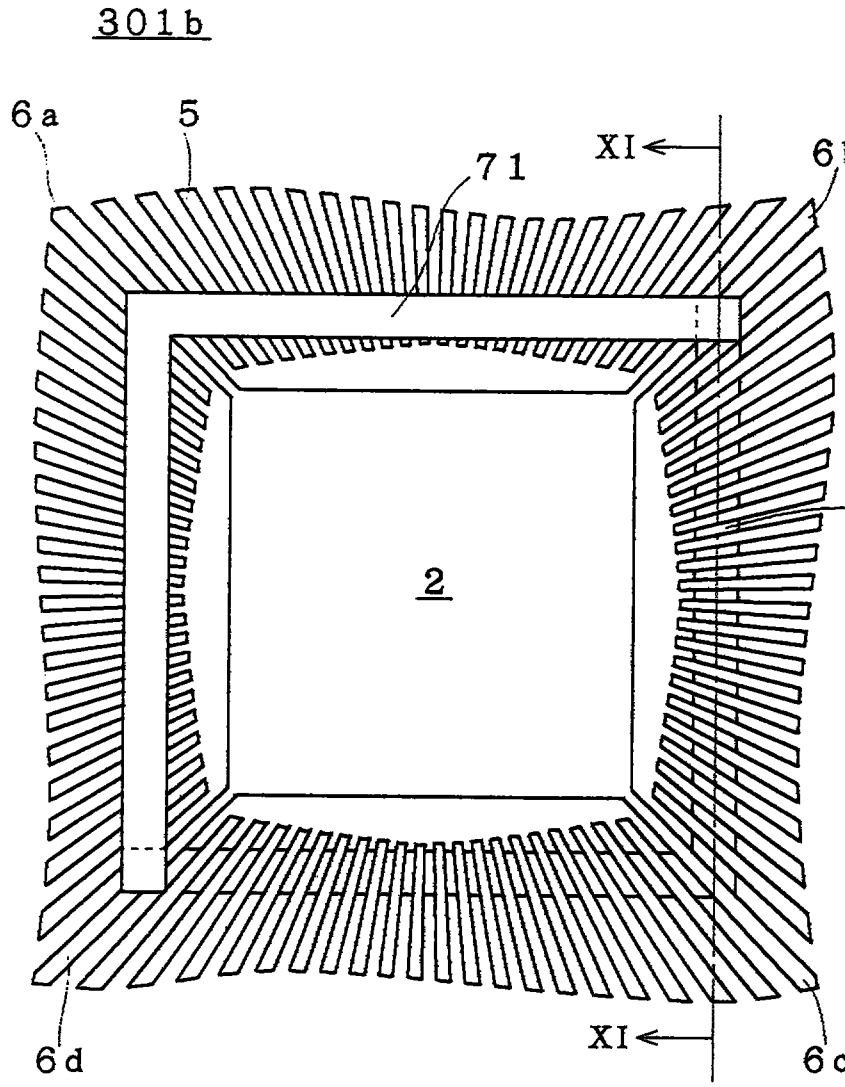


FIG. 11B

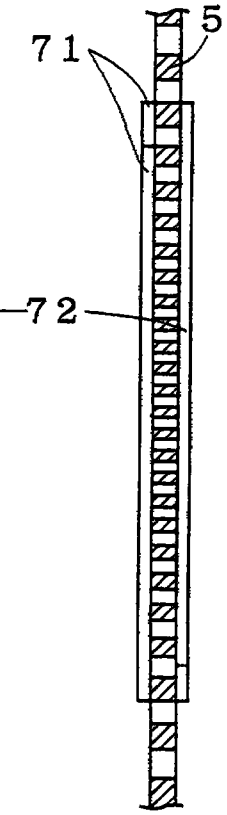


FIG. 12A

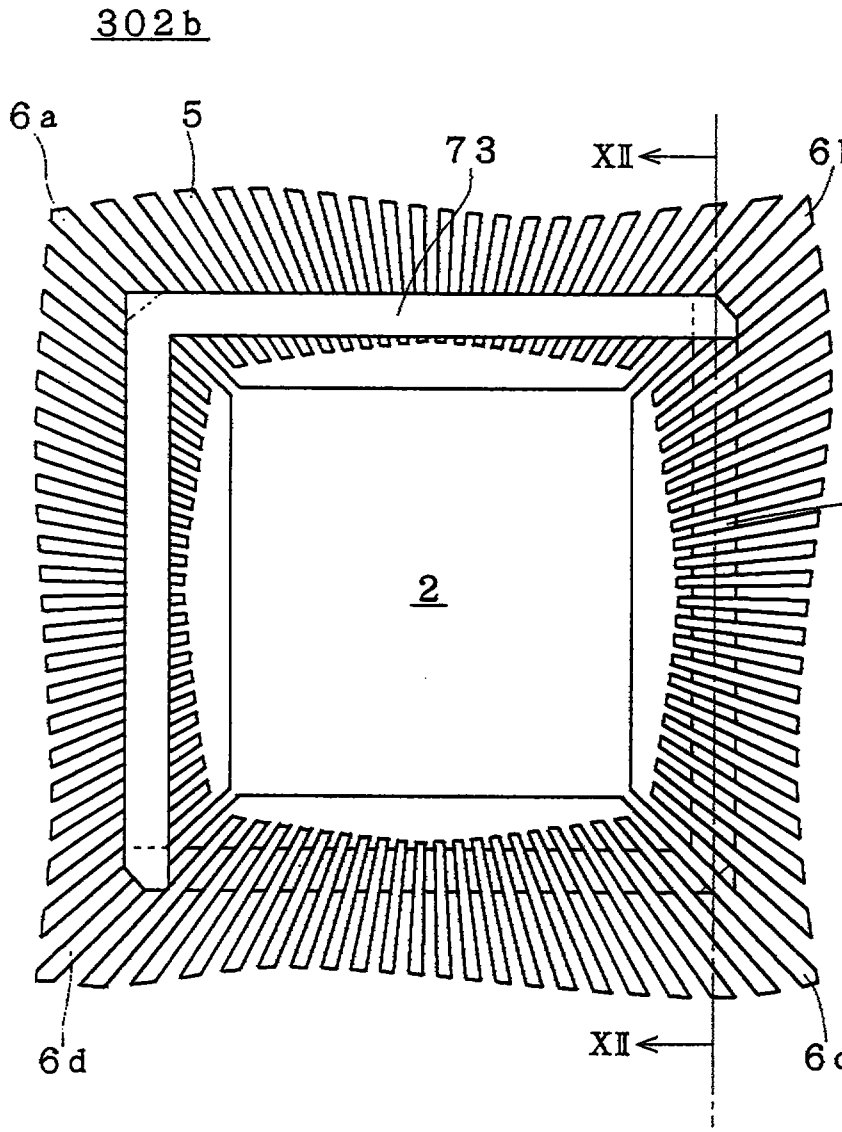


FIG. 12B

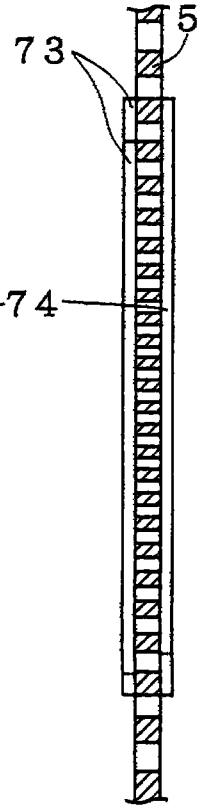


FIG. 13A

FIG. 13B

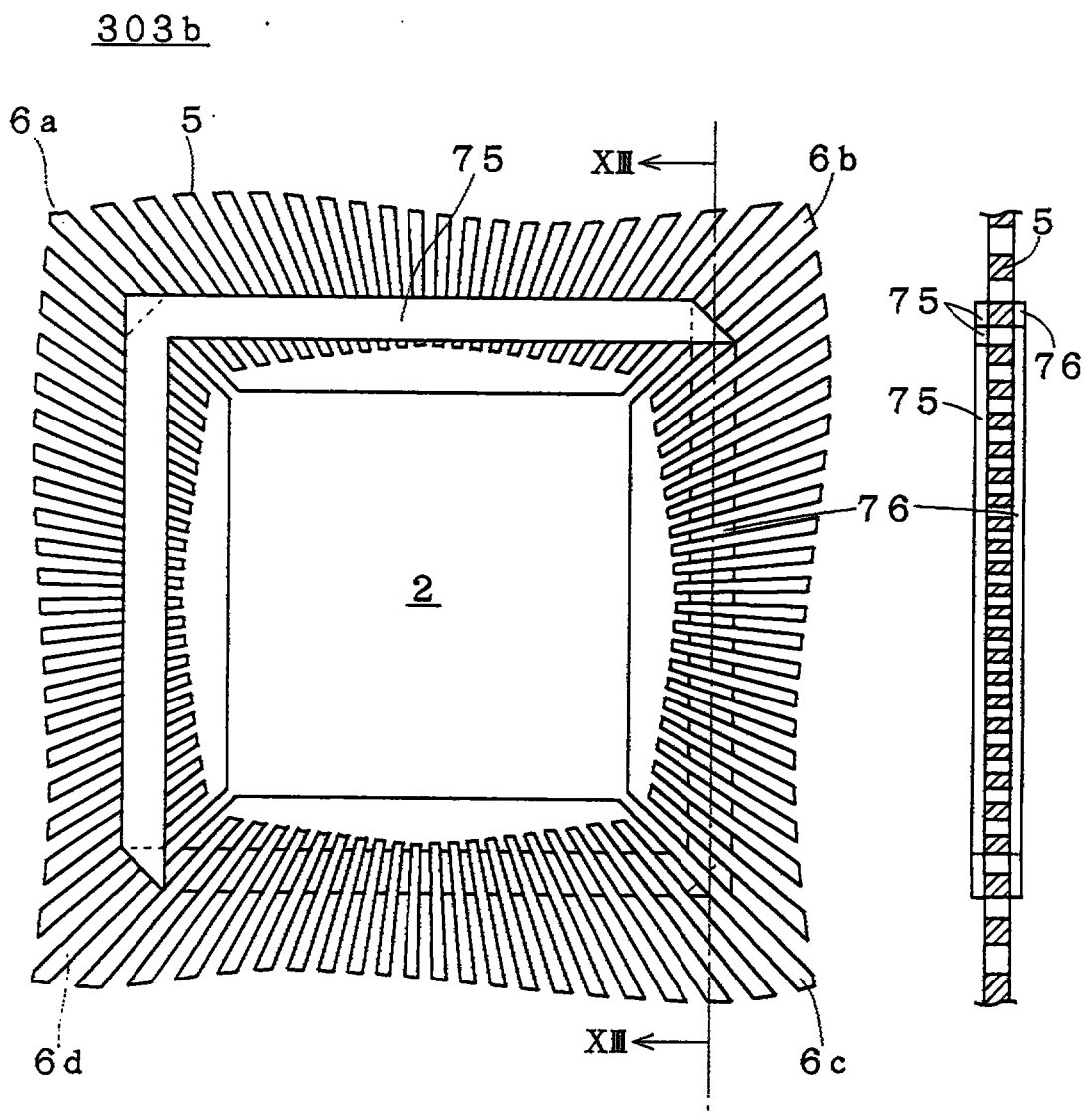


FIG. 14A

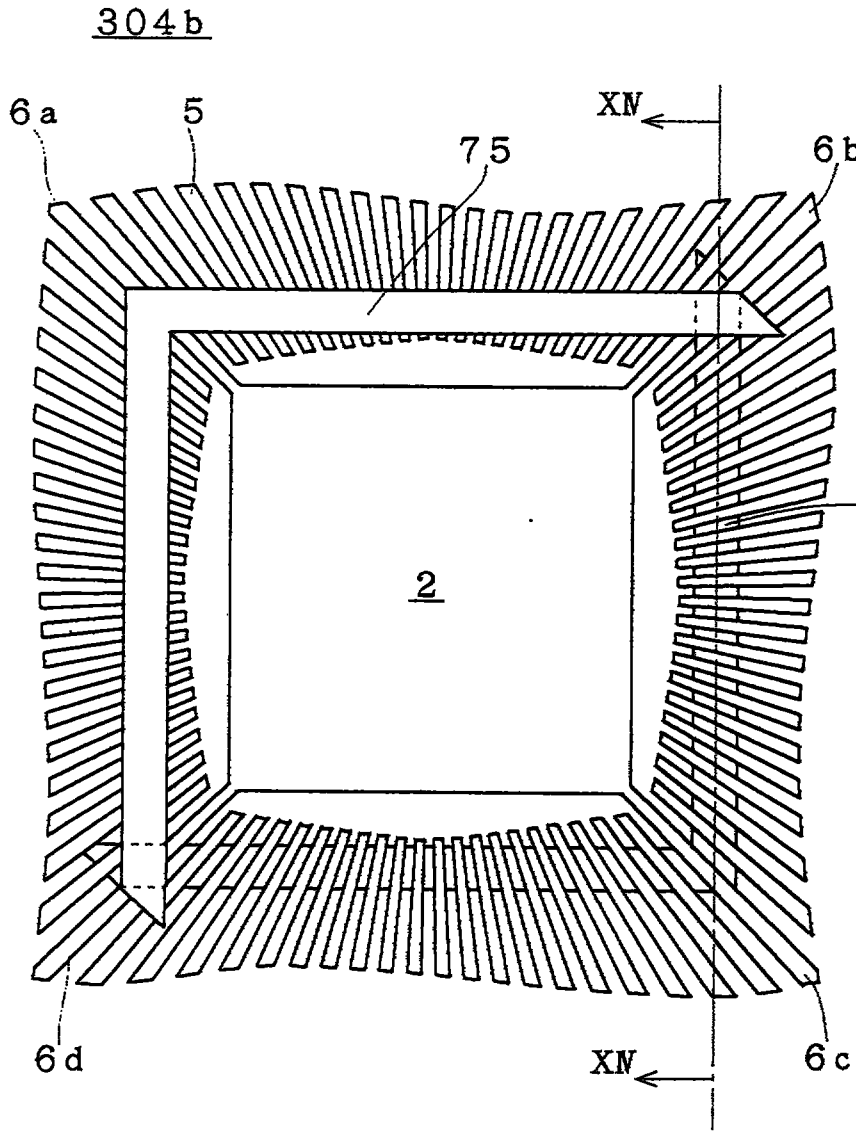


FIG. 14B

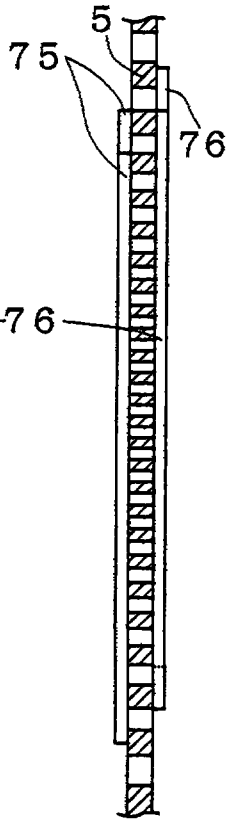


FIG. 15A FIG. 15B

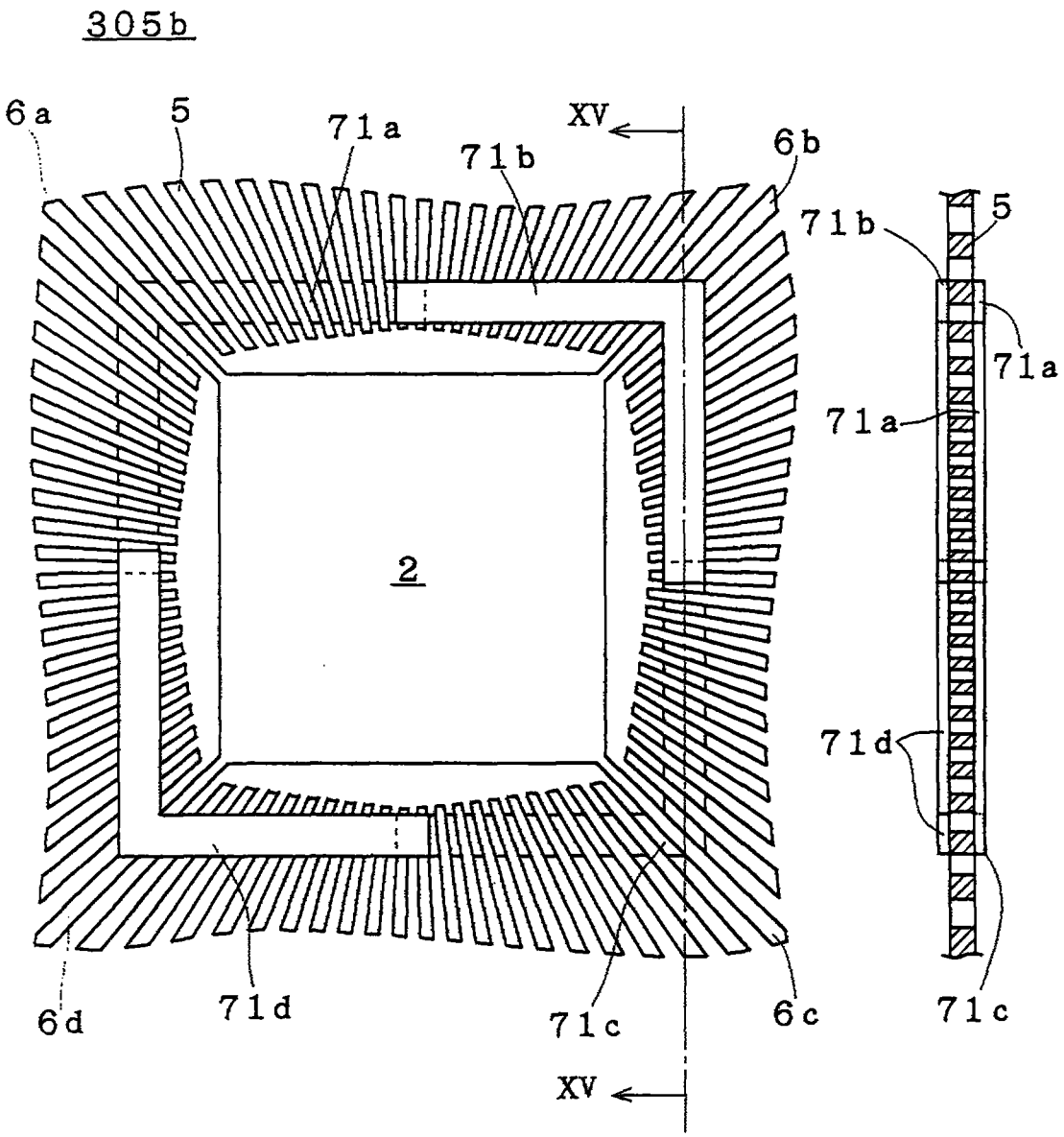


FIG. 16A FIG. 16B

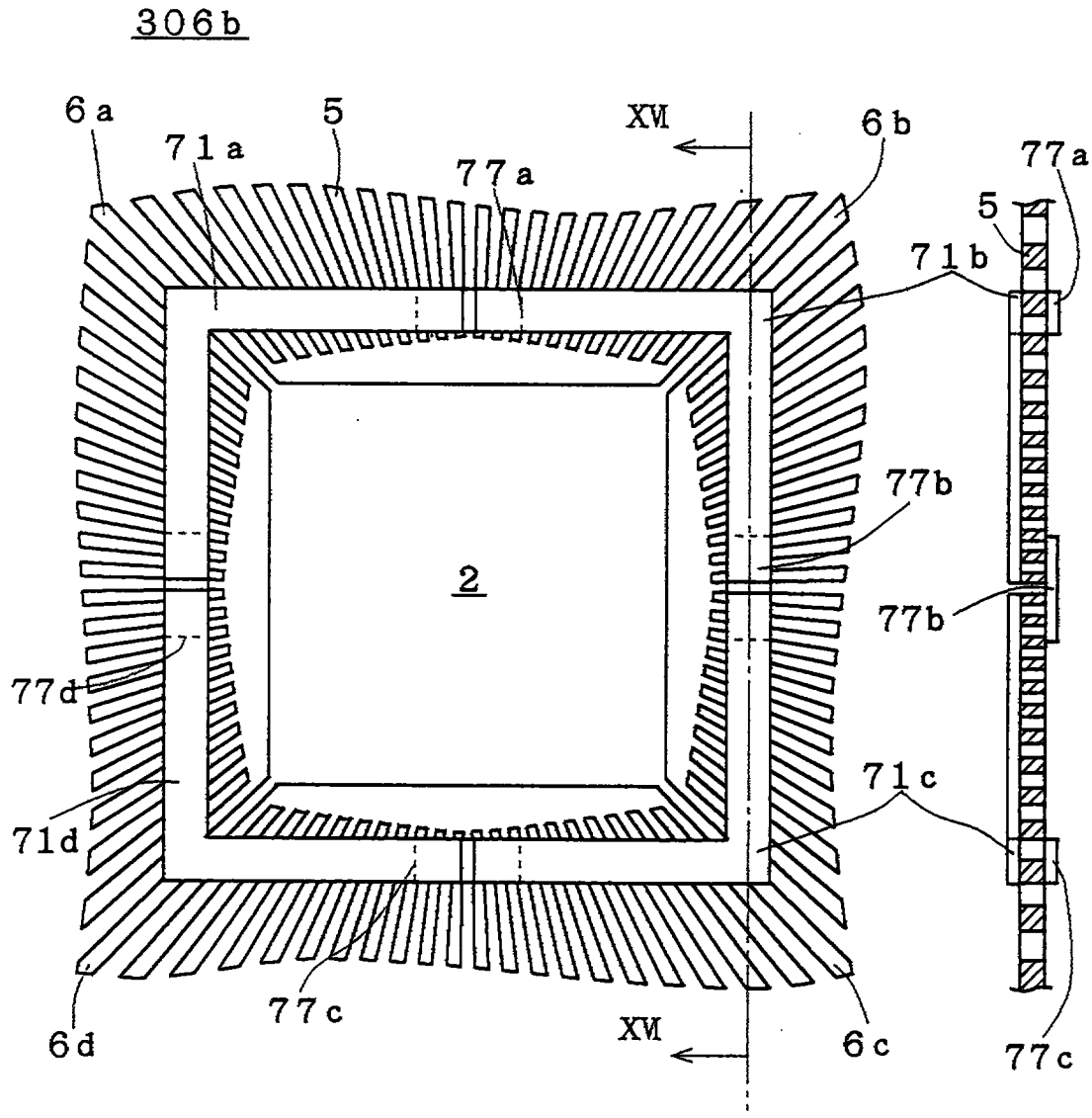
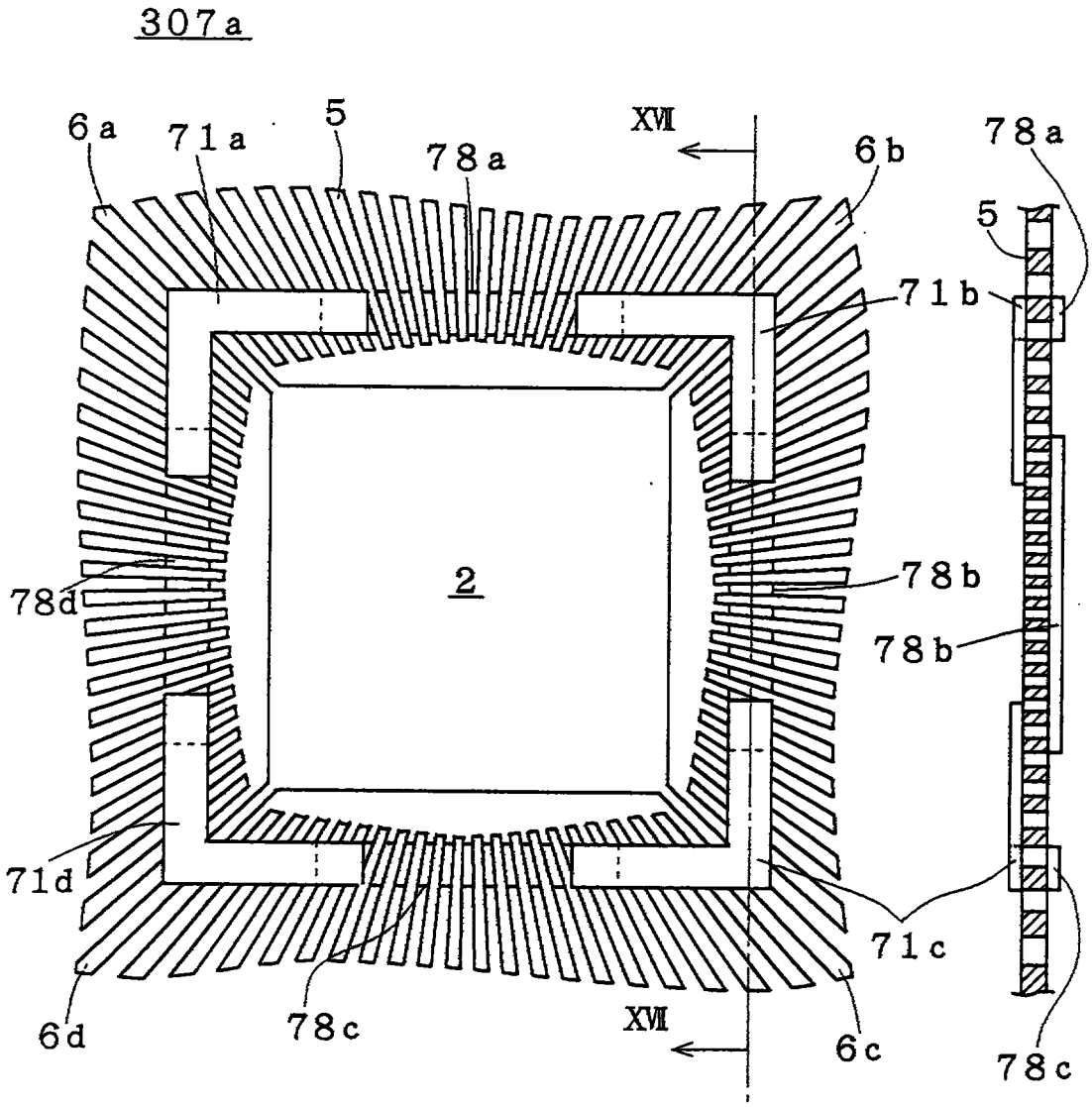


FIG. 17A FIG. 17B



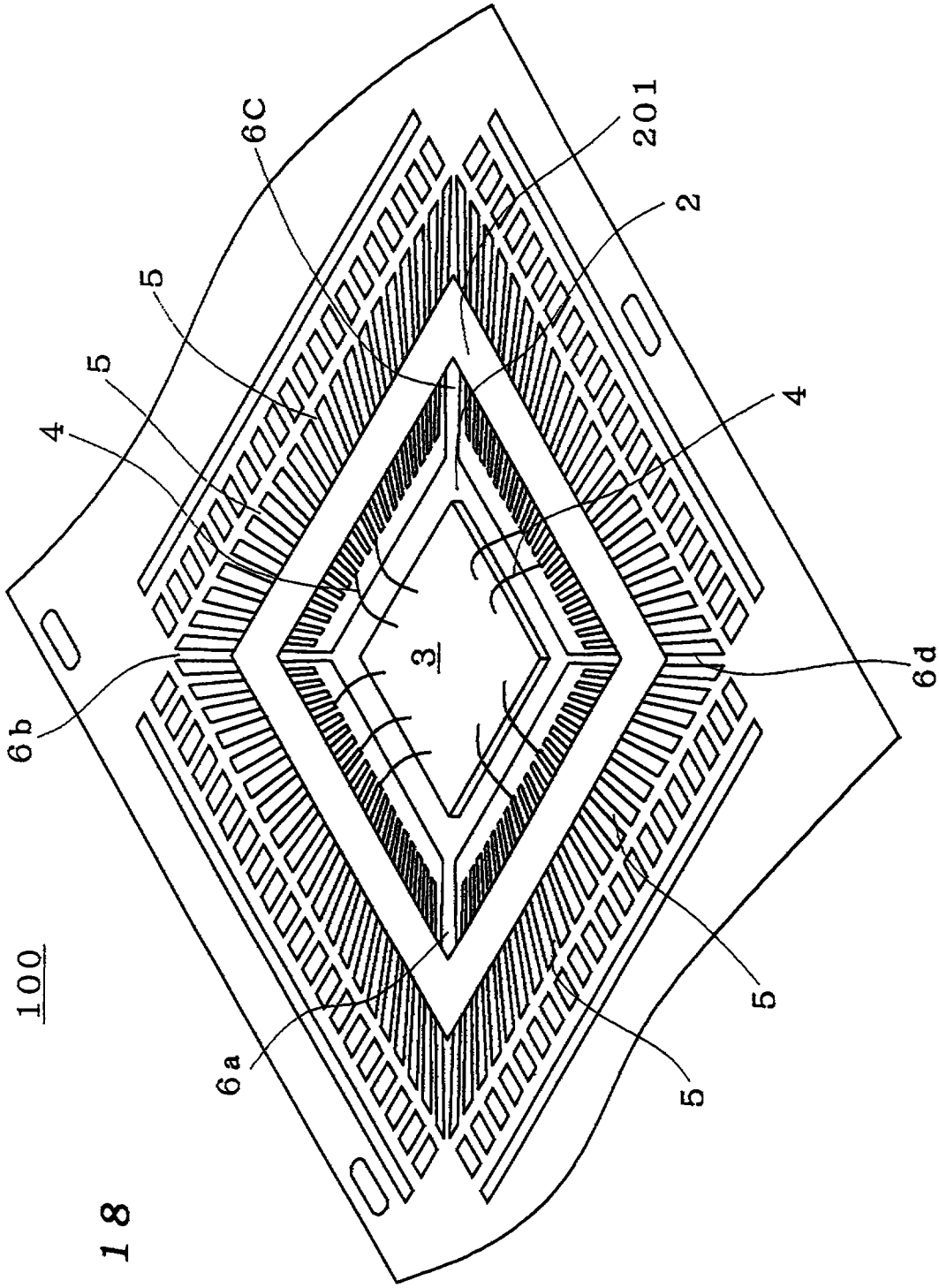


FIG. 18

FIG. 19

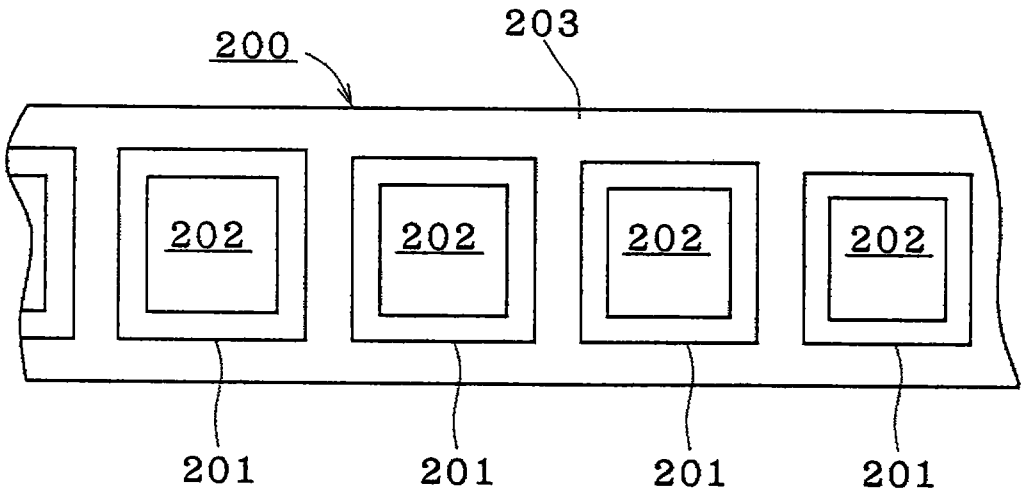


FIG. 20A FIG. 20B

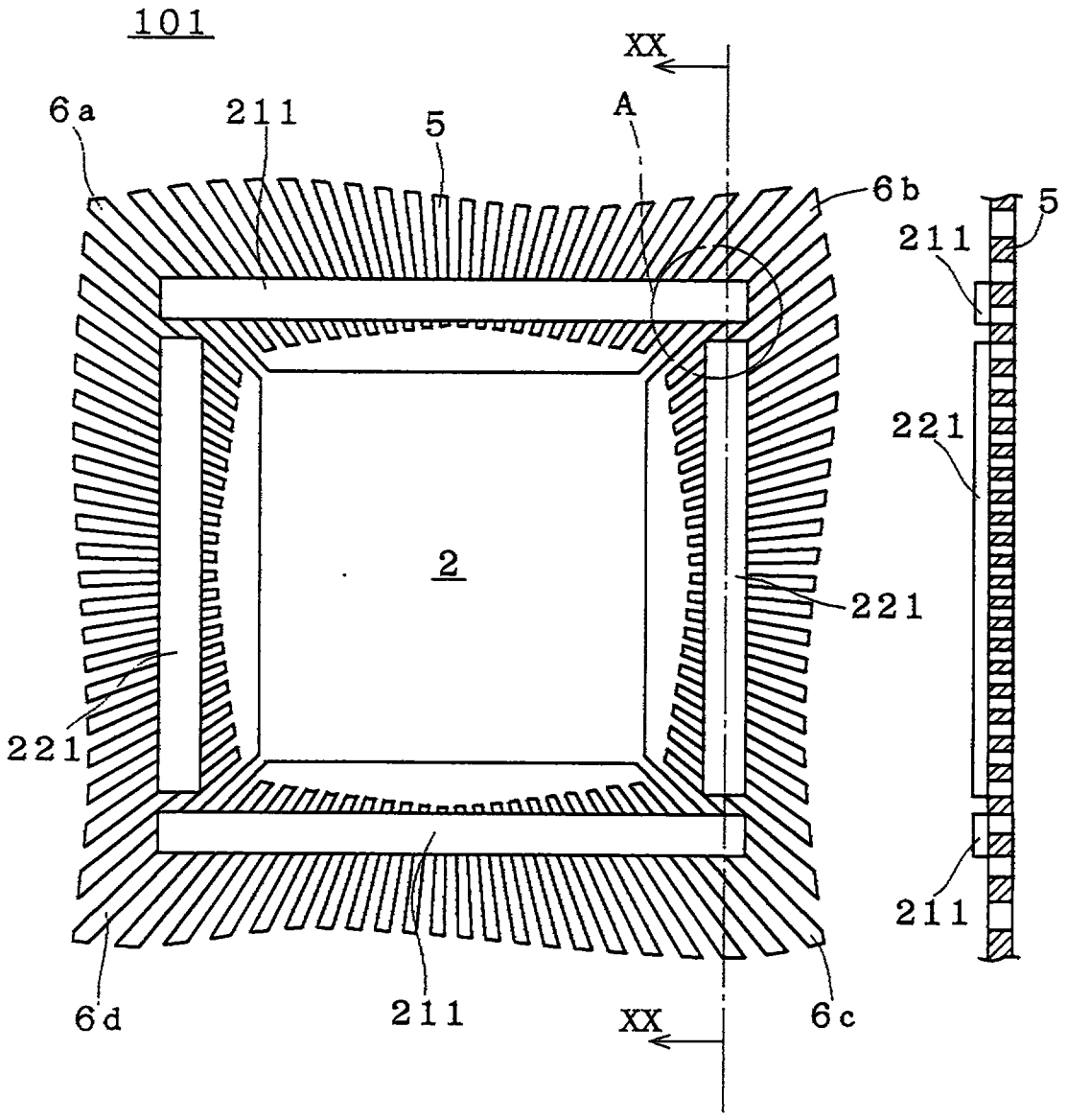


FIG. 21

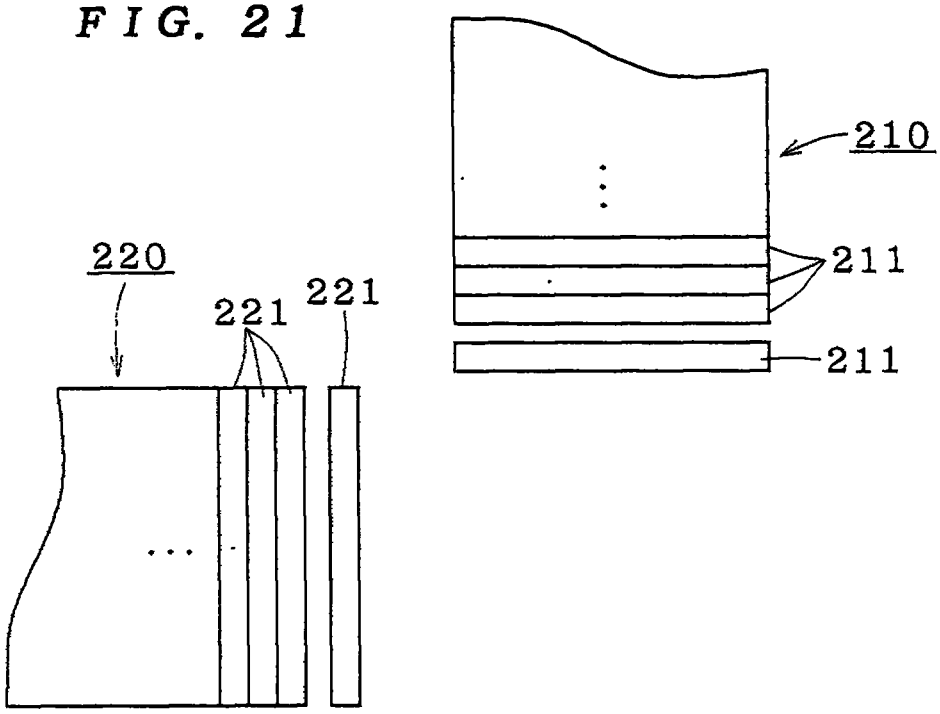


FIG. 22

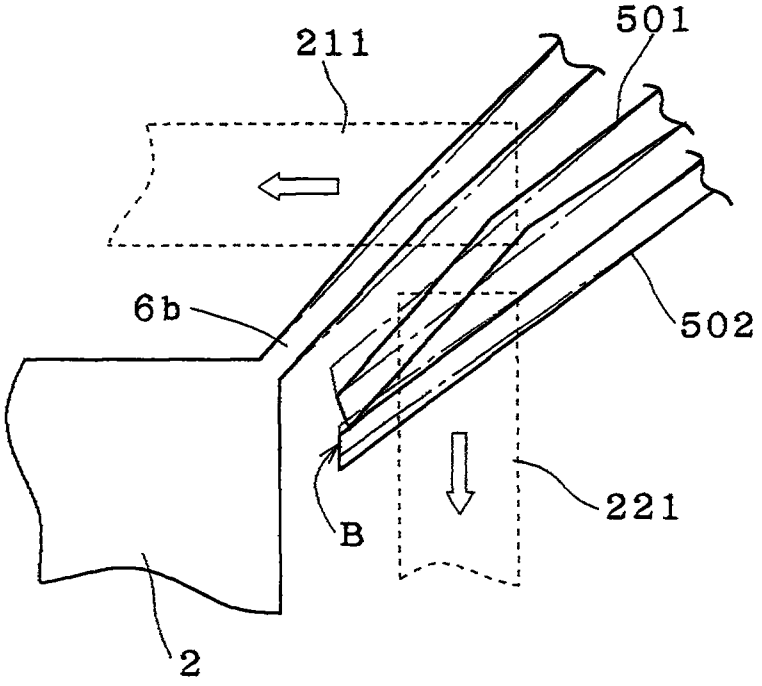


FIG. 23A

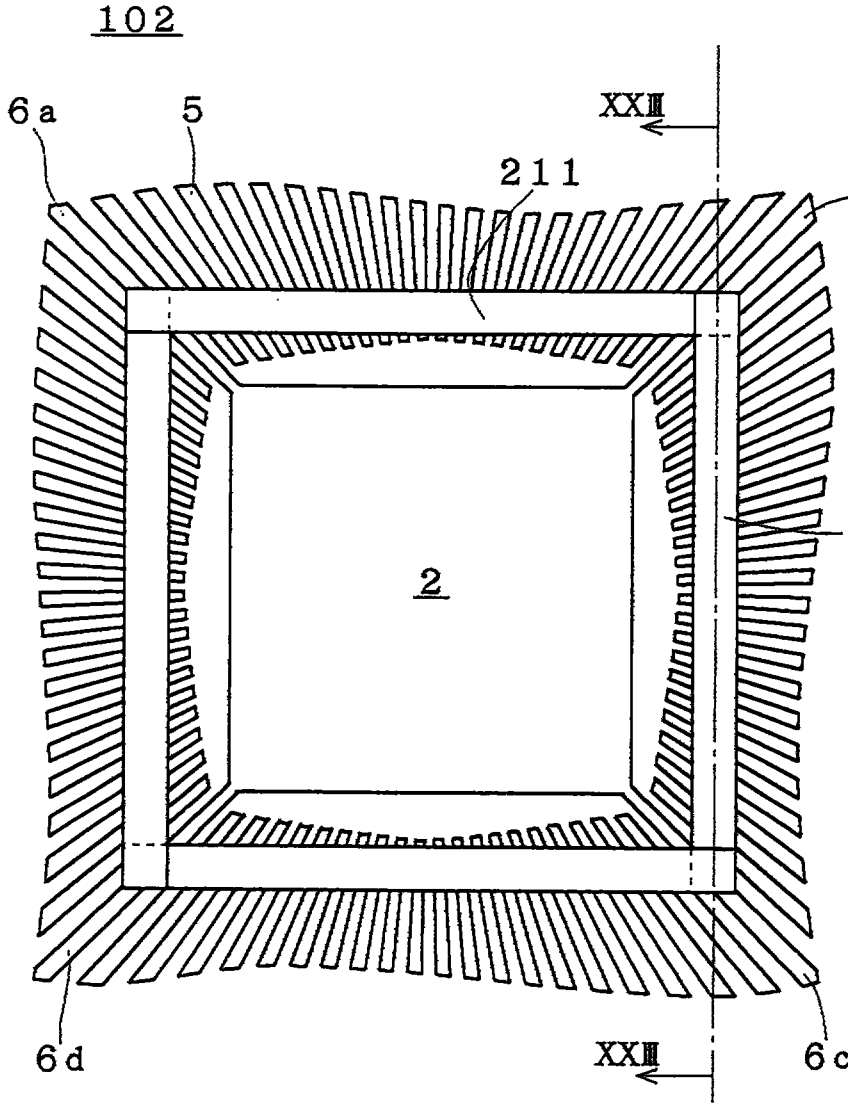
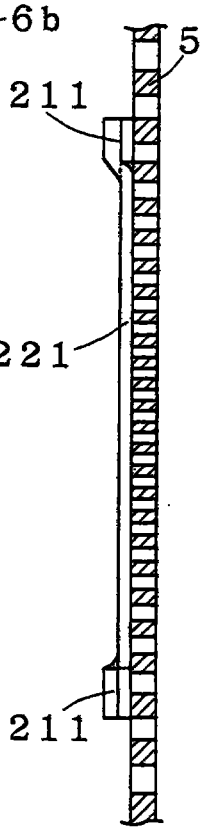


FIG. 23B



ABSTRACT OF THE DISCLOSURE

TITLE OF INVENTION: LEADFRAME

In a leadframe (301a), L–shaped support tapes (71, 72) are applied to inner leads (5) and suspension leads (6a to 6d). End portions of the support tapes (71, 72) are overlapped with each other at the suspension leads (6b, 6d) and their vicinities to form together a rectangular ring–shape. Since the support tapes (71, 72) are of L–shape, when the center portions thereof are positioned at the suspension leads (6a, 6c) and their vicinities, there are only two overlapped portions of the support tapes (71, 72) at the suspension leads (6b, 6d). Thus, the number of overlapped portions requiring accurate alignment is reduced. Moreover, the L–shaped support tape can be taken out of the material for support tape with higher efficiency.

of the respective lengths of the support tapes 211 and 221 are balanced and the suspension leads 6a to 6d are given stresses only in a direction towards the pad 2. That avoids deformation of the suspension leads 6a to 6b.

It is not desirable, however, that many portions are each given stresses in different directions at an angle of 90° when the support tapes contract. The reason is the alignment of their end portions to be overlapped should be accurately made in order to balance the stresses applied to the support tapes 211 and 221 along the directions of their lengths.

SUMMARY OF THE INVENTION

The present invention is directed to a leadframe. According to a first aspect of the present invention, the leadframe comprises: a plurality of inner leads provided radially; and a group of support tapes applied to the plurality of inner leads in a ring shape, in which inner end portions of the plurality of inner leads expose on inner peripheral side of the group of support tapes, and in which the group of support tapes includes a plurality of first support tapes of L-shape, and both end portions of one of the plurality of first support tapes are overlapped with an end portion(s) of at least one other of said group of support tapes to form said ring shape.

According to a second aspect of the present invention, in the leadframe of the first aspect, the group of support tapes includes two first support tapes.

According to a third aspect of the present invention, the leadframe of the first aspect further comprises: a pad of substantially rectangular surrounded by the plurality of inner leads, in which the respective center portions of the plurality of first support tapes are located on two opposed ones of four suspension leads which

CLAIMS:

1. A lead frame, comprising:

a plurality of inner leads provided radially; and

a group of support tapes applied to said plurality of inner leads in a ring shape,

wherein inner end portions of said plurality of inner leads expose on inner peripheral side of said group of support tapes,

said group of support tapes includes a plurality of first support tapes of L-shape, and

both end portions of one of said plurality of first support tapes are overlapped with an end portion(s) of at least one other of said group of support tapes to form said ring shape.

2. The lead frame of claim 1, wherein

said group of support tapes includes two first support tapes.

3. The lead frame of claim 2, further comprising:

a pad of substantially rectangular surrounded by said plurality of inner leads,

wherein the respective center portions of said plurality of first support tapes are located on two opposed ones of four suspension leads which are inner leads for supporting said pad at its four corners.

4. The lead frame of claim 3, wherein

CLAIMS:

1. A lead frame, comprising:

a plurality of inner leads provided radially; and

a group of support tapes applied to said plurality of inner leads in closed loop,

wherein end portions of said plurality of inner leads expose on inner peripheral side of said group of support tapes,

said group of support tapes includes a plurality of first support tapes of L-shape, and

both end portions of one of said plurality of first support tapes are overlapped with at least one end portion of at least one other of said plurality of first support tapes to form said ring shape.

2. The lead frame of claim 1, wherein

said group of support tapes includes two first support tapes.

3. The lead frame of claim 2, further comprising:

a pad of substantially rectangular surrounded by said plurality of inner leads,

wherein the respective center portions of said plurality of first support tapes are located on two opposed ones of four suspension leads which are inner leads for supporting said pad at its four corners.

4. The lead frame of claim 3, wherein

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9. A lead frame, comprising:

a plurality of inner leads provided radially; and

a group of support tapes applied to said plurality of inner leads in a ring shape,

wherein inner end portions of said plurality of inner leads expose on inner peripheral side of said group of support tapes,

said group of support tapes includes a plurality of first support tapes of L-shape and a plurality of second support tapes of strip-shape, and

both end portions of one of said plurality of first support tapes are overlapped with end portions of said plurality of second support tapes.

10. The lead frame of claim 9, wherein

said plurality of first support tapes are applied to a front surface of said inner leads and said plurality of second support tapes are applied to a back surface of said inner leads, and

end portions of said first support tapes are overlapped with end portions of second support tapes through said inner leads.

11. A resin-sealed semiconductor device including said lead frame as claimed in claims 1-10.

CLAIMS:

1. A lead frame, comprising:

a plurality of inner leads provided radially; and

a group of support tapes applied to said plurality of inner leads in a ring shape,

wherein inner end portions of said plurality of inner leads expose on inner peripheral side of said group of support tapes,

said group of support tapes includes a plurality of first support tapes of L-shape, and

both end portions of one of said plurality of first support tapes are overlapped with an end portion(s) of at least one other of said group of support tapes to form said ring shape.

2. The lead frame of claim 1, wherein

said group of support tapes includes two first support tapes.

3. The lead frame of claim 2, further comprising:

a pad of substantially rectangular surrounded by said plurality of inner leads,

wherein the respective center portions of said plurality of first support tapes are located on two opposed ones of four suspension leads which are inner leads for supporting said pad at its four corners.

4. The lead frame of claim 3, wherein

9. A lead frame, comprising:

a plurality of inner leads provided radially; and

a group of support tapes applied to said plurality of inner leads in a ring shape,

wherein inner end portions of said plurality of inner leads expose on inner peripheral side of said group of support tapes,

said group of support tapes includes a plurality of first support tapes of L-shape and a plurality of second support tapes of strip-shape, and

both end portions of one of said plurality of first support tapes are overlapped with end portions of said plurality of second support tapes.

10. The lead frame of claim 9, wherein

said plurality of first support tapes are applied to a front surface of said inner leads and said plurality of second support tapes are applied to a back surface of said inner leads, and

end portions of said first support tapes are overlapped with end portions of second support tapes through said inner leads.

~~11. A resin-sealed semiconductor device including said lead frame as claimed in claims 1-10.~~