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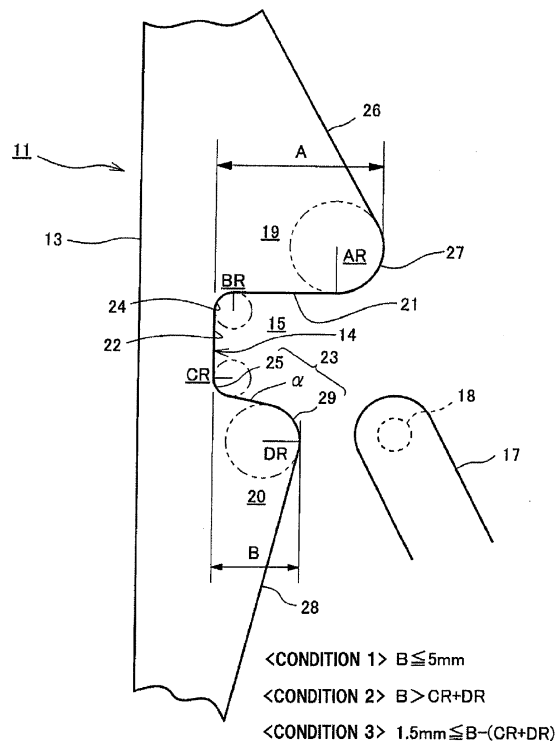
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(54) **Profile reed for air jet loom**

(57) A profile reed for an air jet loom includes a dent having a guide recess and a lower jaw portion located below the guide recess, and a weft yarn passage formed by a plurality of the dents juxtaposed in the direction of weft insertion. The guide recess is formed with upper, inner lower wall surfaces. The inner wall surface is connected with the lower wall surface through a lower arcuate surface formed with a radius of curvature. The front end of the lower jaw portion is defined by a lower jaw arcuate surface formed with a radius of curvature. The lower jaw portion extends frontward for a distance between the inner wall surface and the front end of the lower jaw portion. The distance is set at or lower than 5.0 millimeters. The sum of the radii of curvature is smaller than the distance.

FIG. 3



Description**BACKGROUND OF THE INVENTION**

5 **[0001]** The present invention relates to a profile reed for an air jet loom.

[0002] Japanese Patent Application Publication No. 8-74143 discloses a profile reed for an air jet loom. The profile reed for the air jet loom disclosed in the above Publication forms a weft yarn passage. The weft yarn passage is formed such that a weft yarn can fly through the weft yarn passage at a relatively high speed with stability.

10 **[0003]** Fig. 4 is an enlarged fragmentary side view showing a reed dent 51 of the profile reed for the air jet loom disclosed in the above Publication. Referring to Fig. 4, the reed dent 51 is formed with a guide recess 52 having an upper wall surface 52A, an inner wall surface 52B, a lower wall surface 52C, the upper arcuate surface 52D and a lower arcuate surface 52E. The reed dent 51 is formed in such a way that the distance Wa between the inner wall surface 52B and the front end of the reed dent 51 adjacent to the upper wall surface 52A is 9.0 millimeters (mm) and the distance Wb between the upper wall surface 52A and the lower wall surface 52C, which is substantially the same as the vertical dimension of the inner wall surface 52B, is 5.5 mm. The reed dent 51 is also formed such that the distance Wc between the inner wall surface 52B and the front end of the reed dent 51 adjacent to the lower wall surface 52C is 4.0 mm. The distance L1 between the upper wall surface 52A and the injection hole 53A of the weft insertion sub-nozzle 53 and the distance L2 between the front end of the reed dent 51 adjacent to the lower wall surface 52C and the injection hole 53A are set such that the weft yarn insertion sub-nozzle 53 does not cause any adverse effect on the quality of woven cloth.

20 **[0004]** Furthermore, the reed dent 51 is formed such that the radius of curvature r of the upper arcuate surface 52D is 0.5 mm, and the radius of curvature R of the lower arcuate surface 52E is 2.0 mm. The front end of the reed dent 51 adjacent to the lower wall surface 52C is formed with a radius of curvature that is substantially the same as the radius of curvature R of the lower arcuate surface 52E, so that the lower wall surface 52C is formed only by a curved surface. According to this profile reed disclosed in the above Publication, the weft insertion sub-nozzle 53 can be located closer to the reed dent 51 thereby to shorten the distance between the inner wall surface 52B and the injection hole 53A of the weft insertion sub-nozzle 53, so that the air consumption of the weft insertion sub-nozzle 53 may be reduced.

25 **[0005]** Using the profile reed for air jet loom disclosed in the above Publication, however, the frequency of the weft insertion failure is increased depending on the count of the weft yarns to be inserted. More particularly, the frequency of the weft insertion failure tends to be increased with a decrease of the yarn count of weft yarns to be inserted.

30 **[0006]** The present invention is directed to providing a profile reed for an air jet loom which reduces the frequency of weft insertion failure while maintaining the air consumption of the weft insertion sub-nozzle substantially the same as in the case of the background art.

SUMMARY OF THE INVENTION

35 **[0007]** In accordance with the present invention, a profile reed for an air jet loom includes a dent and a weft yarn passage. The dent has a guide recess and a lower jaw portion located below the guide recess. The weft yarn passage is formed by a plurality of the dents juxtaposed in the direction of weft insertion. The guide recess is formed with an upper wall surface, an inner wall surface and a lower wall surface. The inner wall surface is connected with the lower wall surface through a lower arcuate surface formed with a radius of curvature. The front end of the lower jaw portion is defined by a lower jaw arcuate surface formed with a radius of curvature. The lower jaw portion extends frontward for a distance between the inner wall surface and the front end of the lower jaw portion. The distance is set at or lower than 5.0 millimeters. The sum of radii of curvature is smaller than the distance.

40 **[0008]** Other aspects and advantages of the invention will become apparent from the following description, taken in conjunction with the accompanying drawings, illustrating by way of example the principles of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

50 **[0009]** The invention together with objects and advantages thereof, may best be understood by reference to the following description of the presently preferred embodiments together with the accompanying drawings in which:

Fig. 1 is a fragmentary perspective view of an air jet loom having a profile reed according to a preferred embodiment of the present invention;

55 Fig. 2 is an enlarged fragmentary perspective view showing part of the profile reed of Fig. 1;

Fig. 3 is an enlarged side view showing a reed dent of the profile reed of Fig. 1; and

Fig. 4 is an enlarged fragmentary side view showing a dent of a profile reed for air jet loom according to the background art.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0010] The following will describe a profile reed for air jet loom according to a preferred embodiment of the present invention with reference to Figs. 1 through 3. Referring firstly to Fig. 1, the air jet loom has a weft insertion mechanism 10 having a profile reed 11 and a slay 12. The profile reed 11 includes a plurality of dents 13 juxtaposed in the direction of weft insertion and is fixedly mounted on the slay 12, as shown in Fig. 1.

[0011] Each dent 13 has a guide recess 14, and a plurality of the guide recesses 14 cooperate to form a weft yarn passage 15 in the profile reed 11. The air jet loom has a weft insertion main nozzle 16 disposed so as to face the inlet of the weft yarn passage 15 for injecting air for insertion of a weft yarn Y along the weft yarn passage 15.

[0012] The air jet loom further has a plurality of weft insertion sub-nozzles 17 mounted to the front surface of the slay 12 at a predetermined spaced interval along the weft yarn passage 15. Each weft insertion sub-nozzle 17 has an injection hole 18 formed at the end thereof and directed such that air issued from the injection hole 18 is directed obliquely along the weft yarn passage 15. The weft yarn passage 15 is formed in the profile reed 11, and each injection hole 18 of the weft insertion sub-nozzle 17 is directed along the weft yarn passage 15. In weft insertion, the weft insertion sub-nozzles 17 enter into a shed of the warp yarns T while separating the warp yarns T. In reed beating, the weft insertion sub-nozzles 17 move out from the shed of the warp yarns T. The diameter of the weft insertion sub-nozzle 17 is set small enough for warp yarns T to move into and out of the a shed at a high speed without damaging the warp yarns T.

[0013] The following will describe the guide recess 14 of the dent 13 with reference to Figs. 2 and 3. As shown in Figs. 2 and 3, the guide recess 14 of dent 13 is formed with an upper wall surface 21, an inner wall surface 22 and a lower wall surface 23. The guide recess 14 is further formed with an upper arcuate surface 24 connecting the upper wall surface 21 and the inner wall surface 22 and a lower arcuate surface 25 connecting the inner wall surface 22 and the lower wall surface 23. As shown in Fig. 3, the upper arcuate surface 24 is formed with a predetermined radius of curvature BR, and the lower arcuate surface 25 is formed with a predetermined radius of curvature CR. The dent 13 has an upper jaw portion 19 located above the guide recess 14. The upper jaw portion 19 is defined by the upper wall surface 21, the upper arcuate surface 24, an upper front surface 26 and an upper jaw arcuate surface 27 which connects the upper wall surface 21 and the upper front surface 26. The upper jaw arcuate surface 27 is formed with a predetermined radius of curvature AR. The upper wall surface 21 is formed with the upper arcuate surface 24, a part of the upper jaw arcuate surface 27 and a horizontal surface extending between the upper arcuate surface 24 and the upper jaw arcuate surface 27. The upper jaw portion 19 is formed extending frontward for a distance A as indicated in Fig. 3, which distance A is substantially the same as the distance between the inner wall surface 22 of the guide recess 14 and the front end of the upper jaw portion 19.

[0014] The dent 13 has a lower jaw portion 20 located below the guide recess 14. The lower jaw portion 20 is defined by the lower wall surface 23, the lower arcuate surface 25, a lower front surface 28 and a lower jaw arcuate surface 29 which connects the lower wall surface 23 and the lower front surface 28. More specifically, the front end of the lower jaw portion 20 is defined by the lower jaw arcuate surface 29 formed with a predetermined radius of curvature DR. The lower wall surface 23 is formed with the lower arcuate surface 25, a part of the lower jaw arcuate surface 29 and a flat wall surface α , or a wall surface without curvature, extending between the lower arcuate surface 25 and the lower jaw arcuate surface 29. According to the preferred embodiment of the present invention, the flat wall surface α is inclined forwardly and downwardly at an angle of 10 degrees with respect to the horizontal. Boundaries between the inner wall surface 22 and the lower arcuate surface 25 and between the lower arcuate surface 25 and the flat wall surface α and between the flat wall surface α and the lower jaw arcuate surface 29 are shown by dotted lines in Fig. 2, respectively. The lower jaw portion 20 extends frontward for a distance B as indicated in Fig. 3, which distance B is substantially the same as the distance between the inner wall surface 22 and the front end of the lower jaw portion 20.

[0015] According to the preferred embodiment of the present invention, two conditions are fulfilled, namely the first condition that the distance B is set at or lower than 5.0 millimeters (mm), the second condition that the sum of the radii of curvature CR and DR (CR+DR) is set smaller than the distance B. For reducing the air consumption of the weft insertion sub-nozzle 17, the distance between the upper arcuate surface 24 and the injection hole 18 of the weft insertion sub-nozzle 17 should preferably be as short as possible. If the lower jaw portion 20 is located excessively close to the weft insertion sub-nozzle 17, the warp yarns T are pressed against the profile reed 11 when the weft insertion sub-nozzle 17 enters into a shed while separating the warp yarns T, with the result that a weaving defect such as nozzle mark is made on the warp yarns T. Thus, there is a limit in shortening the distance between the lower jaw portion 20 and the weft insertion sub-nozzle 17. For reducing the amount of air consumption, therefore, the distance B needs to be shortened.

[0016] Fulfilling the first condition in the profile reed 11 of the preferred embodiment, the weft insertion sub-nozzle 17 may be located closer to the reed dents 13, so that the distance between the upper arcuate surface 24 and the injection hole 18 is shortened, and the air consumption of the weft insertion sub-nozzle 17 is reduced.

[0017] Fulfilling the second condition, a part of the lower wall surface 23 is formed by the flat wall surface α , or the lower arcuate surface 25 and the lower jaw arcuate surface 29 are not connected directly, but through the flat wall surface α . The provision of the flat wall surface α helps to prevent effectively air jet from the weft insertion sub-nozzle 17 from being diffused. If the dimension of the flat wall surface α as measured along the slope thereof between the lower arcuate surface 25 and the lower jaw arcuate surface 29 is insufficient, the air diffusion is not prevented sufficiently, so that the weft yarn Y tends to fly out from the weft yarn passage 15. The lower wall surface 23 having the flat wall surface α is effective for preventing the weft yarn Y from flying out from the weft yarn passage 15. The dent 13 thus fulfilling the second condition is advantageous in preventing failure in weft insertion over a dent formed with a guide recess having only a lower arcuate wall surface corresponding to the lower arcuate surface 25 and a lower jaw arcuate surface corresponding to the lower jaw arcuate surface 29.

[0018] As described above, the dent 13 of the profile reed 11 of the present embodiment fulfills the first and second conditions. The dent 13 should preferably fulfill a third condition that the difference between the sum of the radii of curvature CR and DR (CR+DR) and the distance B is set at or larger than 1.5 mm. When the third condition is fulfilled, the flat wall surface α of the lower wall surface 23 has a sufficient dimension along the slope of the lower wall surface 23 thereby to improve the stability of weft insertion through a shed. Meanwhile, when the third condition is not fulfilled, or the difference between the distance B and the sum of the radii of curvature (B-(CR+DR)) is smaller than 1.5 mm, and the flat wall surface α has an insufficient dimension along the slope, the stability of weft insertion may be impaired and the frequency of the weft insertion failure is increased.

[0019] The following will describe the operation tests using a plurality of profile reeds having different reed dents and the results from the testing. Operation tests were conducted using the above profile reeds each of which was mounted to the weft insertion mechanism of an air jet loom and the results of the tests were evaluated. Air jet loom Model JAT710 manufactured by the assignee of the present invention was used as air jet loom for the testing. The air jet loom was operated at speed of 900 rpm, and weft yarn with yarn count of 6 was used. The Table 1-1 and Table 1-2 below show the testing results of the examples 1 through 3 and a comparative example.

Table 1-1

	A (mm)	B (mm)	CR (mm)	DR (mm)	CR+DR (mm)	B-(CR+DR) (mm)	Dimension of flat wall surface of lower wall surface (mm)
Example1	9.0	5.0	1.0	2.0	3.0	2.0	2.68
Example2	9.0	4.7	1.0	2.0	3.0	1.7	2.38
Example3	9.0	4.0	1.0	2.0	3.0	1.0	1.66
Comparative example	9.0	4.0	2.0	2.5	4.5	-0.5	0.45

Table 1-2

	Rotational speed (mm)	Testing hours (h/m/s)	Weft insertion failure (time)	Weft insertion failure (time/h)	Evaluation
Example1	900	8:15:00	0	0	Good
Example2	900	7:16:00	0	0	Good
Example3	900	8:24:00	1	0.12	Good
Comparative example	900	0:01:07	5	270	Bad

[0020] The following will describe the example 1. As shown in Table 1-1, the reed dent according to the example 1 had the distance A of 9.0 mm, the distance B of 5.0 mm, the radius of curvature CR of 1.0 mm and the radius of curvature DR of 2.0 mm. According to the example 1, the sum of the radii of the curvature (CR+DR) was 3.0 mm, the difference (B-(CR+DR)) between the distance B and the sum of the radii of curvature (CR+DR) was 2.0 mm and the dimension of the flat wall surface α of the lower wall surface was 2.68 mm. The profile reed using the dents according to the example

1 thus fulfilled the conditions 1 through 3. As shown in Table 1-2, the result of operation test for the example 1 shows that the testing hours were 8 hours and 15 minutes, the number of times of weft insertion failure in the testing hours was zero, and the number of times of weft insertion failure per hour was zero (calculated value). Therefore, the result of operation test of the example 1 was evaluated as good.

[0021] The following will describe the example 2. As shown in Table 1-1, the reed dent according to the example 2 had the distance A of 9.0 mm, the distance B of 4.7 mm, the radius of curvature CR of 1.0 mm and the radius of curvature DR of 2.0 mm. According to the example 2, the sum of the radii of the curvature (CR+DR) was 3.0 mm, the difference (B-(CR+DR)) between the distance B and the sum of the radii of curvature (CR+DR) was 1.7 mm and the dimension of the flat wall surface α of the lower wall surface was 2.38 mm. The profile reed using dents according to the example 2 thus fulfilled the conditions 1 through 3. As shown in Table 1-2, the result of operation test for the example 2 shows that the testing hours were 7 hours and 16 minutes, the number of times of weft insertion failure in the testing hours was zero, and the number of times of weft insertion failure per hour was zero (calculated value). Therefore, the result of operation test of the example 2 was evaluated as good.

[0022] The following will describe the example 3. As shown in Table 1-1, the reed dent according to the example 3 had the distance A of 9.0 mm, the distance B of 4.0 mm, the radius of curvature CR of 1.0 mm and the radius of curvature DR of 2.0 mm. According to the example 3, the sum of the radii of the curvature (CR+DR) was 3.0 mm, the difference (B-(CR+DR)) between the distance B and the sum of the radii of curvature (CR+DR) was 1.0 mm and the dimension of the flat wall surface α of the lower inner surface was 1.66 mm. The profile reed using the dents according to the example 3 thus fulfilled the conditions 1 and 2. As shown in Table 1-2, the result of operation test for the example 3 shows the testing hours were 8 hours and 24 minutes, the number of times of weft insertion failure in the testing hours were one, and the number of times of weft insertion failure per hour was 0.12 (calculated value). According to the example 3, there was the weft insertion failure, but the failing frequency of weft insertion is acceptable for practical use. Therefore, the result of operation test of the example 3 was evaluated as good.

[0023] The following will describe the comparative example. As shown in Table 1-1, the reed dent according to the comparative example had the distance A of 9.0 mm, the distance B of 4.0 mm, the radius of curvature CR of 2.0 mm and the radius of curvature DR of 2.5 mm. According to the comparative example, the sum of the radii of the curvature (CR+DR) was 4.5 mm, the difference (B-(CR+DR)) between the distance B and the sum of the radii of curvature (CR+DR) was minus 0.5 mm and the dimension of the flat wall surface α of the lower wall surface was 0.45 mm. The profile reed using the dents according to comparative example thus fulfilled only the condition 1, but failed to fulfill the conditions 2 and 3. As shown in Table 1-2, the result of operation test for the comparative example shows the testing hours were 1 minute and 7 seconds, the number of times of weft insertion failure in the testing hours was five, and the number of times of weft insertion failure per hours was 270 (calculated value). In the comparative example, the frequency of the weft insertion failure is not acceptable for practical use. Therefore, the result of operation test of the comparative example was evaluated as bad.

[0024] The preferred embodiment offers the following advantageous effects.

(1) The distance B is smaller than 5 mm, and the sum of the radii of curvature CR of the lower arcuate surface 25 and DR of the lower jaw arcuate surface 29 (CR+DR) is smaller than the distance B, so that the flat wall surface α of the lower wall surface 23 is formed with a sufficient dimension. The weft yarns Y are prevented from flying out from the weft yarn passage 15 in weft insertion and, therefore, the frequency of the weft insertion failure in inserting a weft yarn is reduced. In addition, the frequency of the weft insertion failure in inserting a weft yarn with a smaller yarn count may be less in comparison with the case of the background art.

(2) The difference between the distance B and the sum of the radii of curvature CR and DR (CR+DR) is larger than 1.5 mm, and the lower wall surface 23 has the flat wall surface α having a sufficient dimension, which is effective to prevent a weft yarn Y from flying out from the weft yarn passage 15, and hence to prevent the weft insertion failure, reliably.

[0025] The present invention is not limited to the above-described embodiment, but may be modified into various embodiments within the scope of the present invention.

[0026] A profile reed for an air jet loom includes a dent having a guide recess and a lower jaw portion located below the guide recess, and a weft yarn passage formed by a plurality of the dents juxtaposed in the direction of weft insertion. The guide recess is formed with upper, inner lower wall surfaces. The inner wall surface is connected with the lower wall surface through a lower arcuate surface formed with a radius of curvature. The front end of the lower jaw portion is defined by a lower jaw arcuate surface formed with a radius of curvature. The lower jaw portion extends frontward for a distance between the inner wall surface and the front end of the lower jaw portion. The distance is set at or lower than 5.0 millimeters. The sum of the radii of curvature is smaller than the distance.

Claims

1. A profile reed (11) for an air jet loom comprising:

a dent (13) having a guide recess (14) and a lower jaw portion (20) located below the guide recess (14); and a weft yarn passage (15) formed by a plurality of the dents (13) juxtaposed in the direction of weft insertion, **characterized in that** the guide recess (14) is formed with an upper wall surface (21), an inner wall surface (22) and a lower wall surface (23), the inner wall surface (22) is connected with the lower wall surface (23) through a lower arcuate surface (25) formed with a radius of curvature (CR), the front end of the lower jaw portion (20) is defined by a lower jaw arcuate surface (29) formed with a radius of curvature (DR), the lower jaw portion (20) extends frontward for a distance (B) between the inner wall surface (22) and the front end of the lower jaw portion (20), the distance (B) is set at or lower than 5.0 millimeters, and the sum of radii of curvature (CR+DR) is smaller than the distance (B).

2. The profile reed (11) according to claim 1, **characterized in that** the difference between the sum of the radii of curvature (CR+DR) and the distance (B) is set at or larger than 1.5 millimeters.

3. The profile reed (11) according to claim 1 or 2, **characterized in that** the lower wall surface (23) is formed with the lower arcuate surface (25), a part of the lower jaw arcuate surface (29) and a flat wall surface (α) extending between the lower arcuate surface (25) and the lower jaw arcuate surface (29), and the flat wall surface (α) is inclined forwardly and downwardly with respect to the horizontal.

4. The profile reed (11) according to claim 3, **characterized in that** the flat wall surface (α) is inclined at an angle of 10 degrees.

FIG. 1

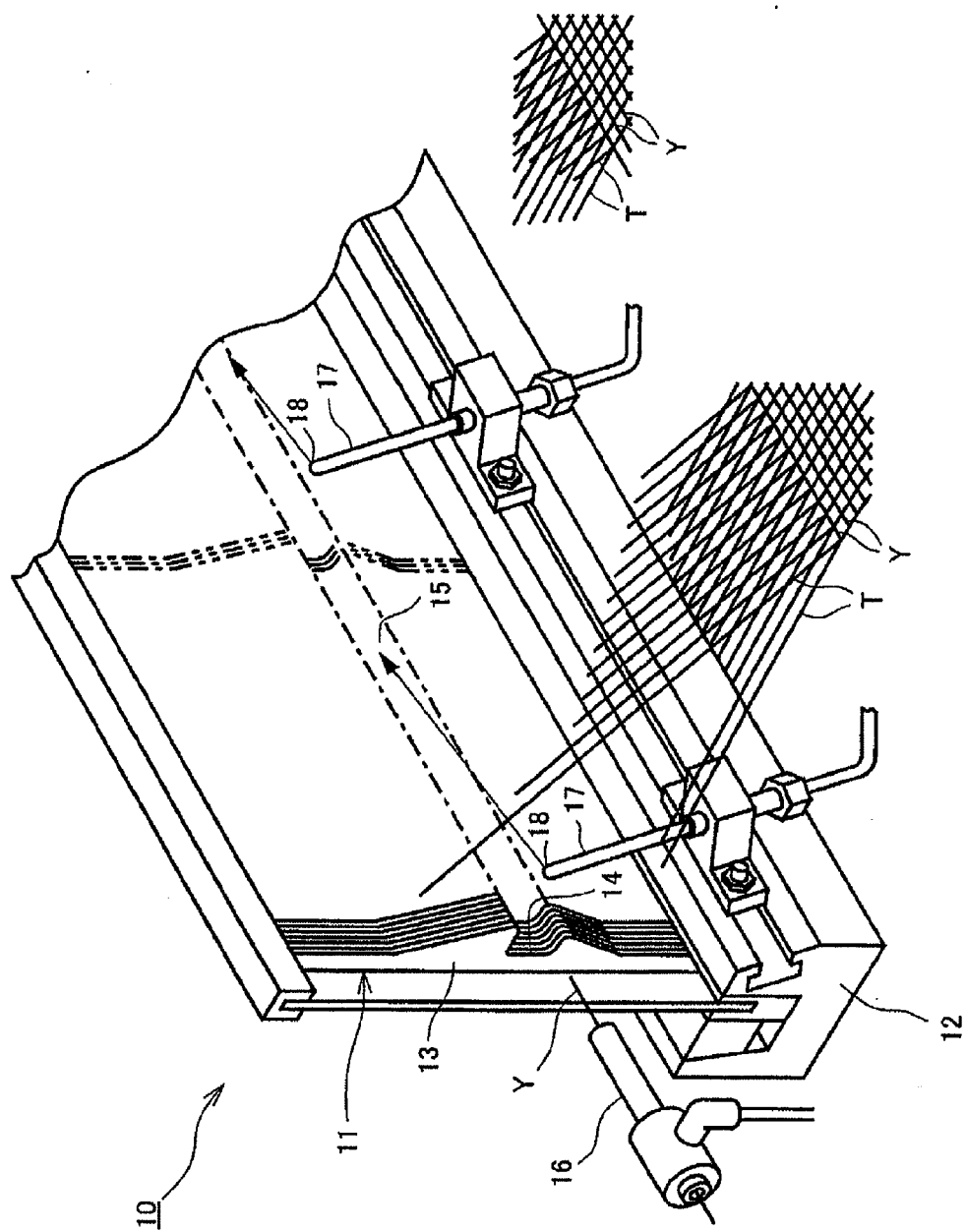


FIG. 2

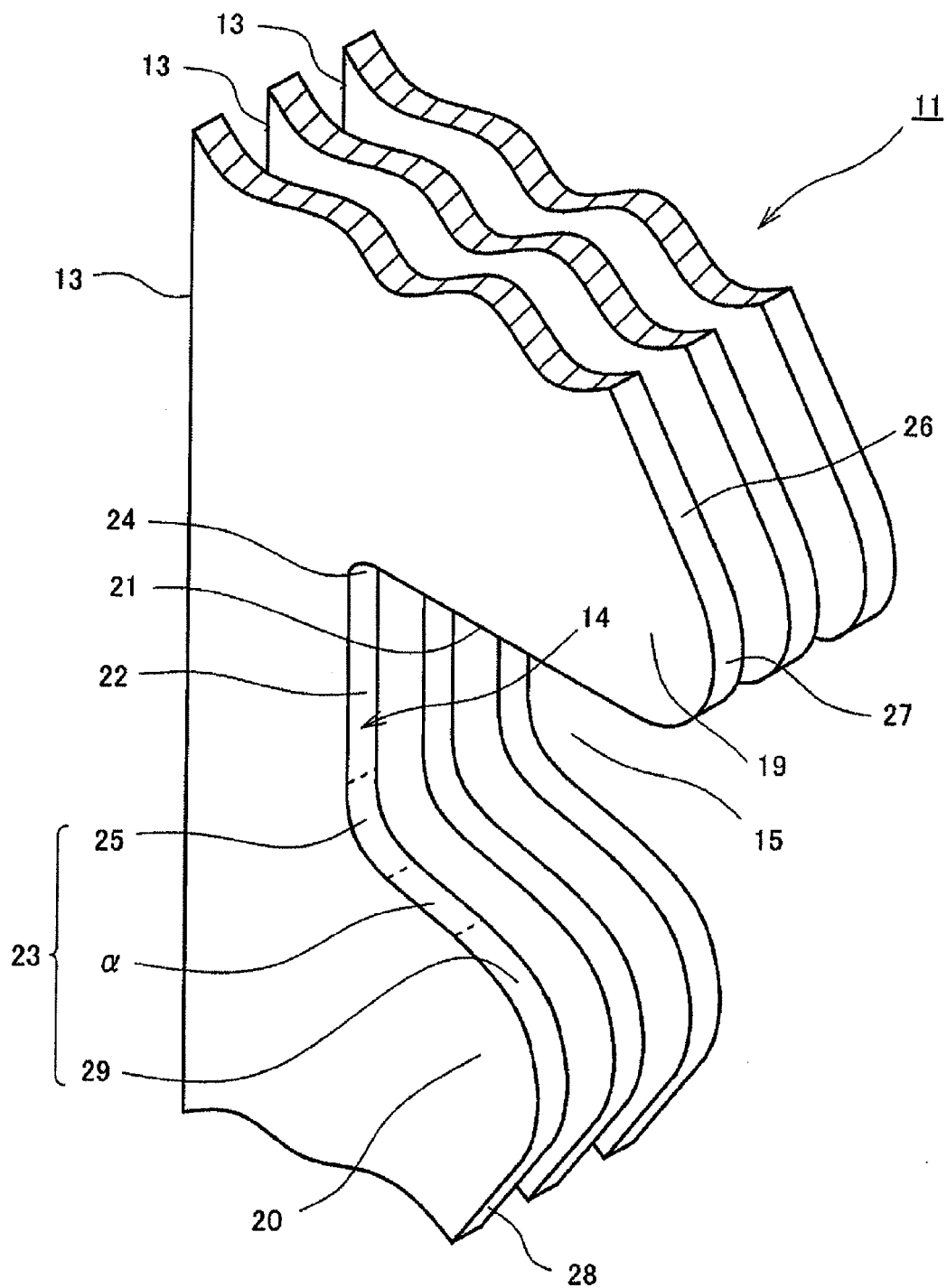


FIG. 3

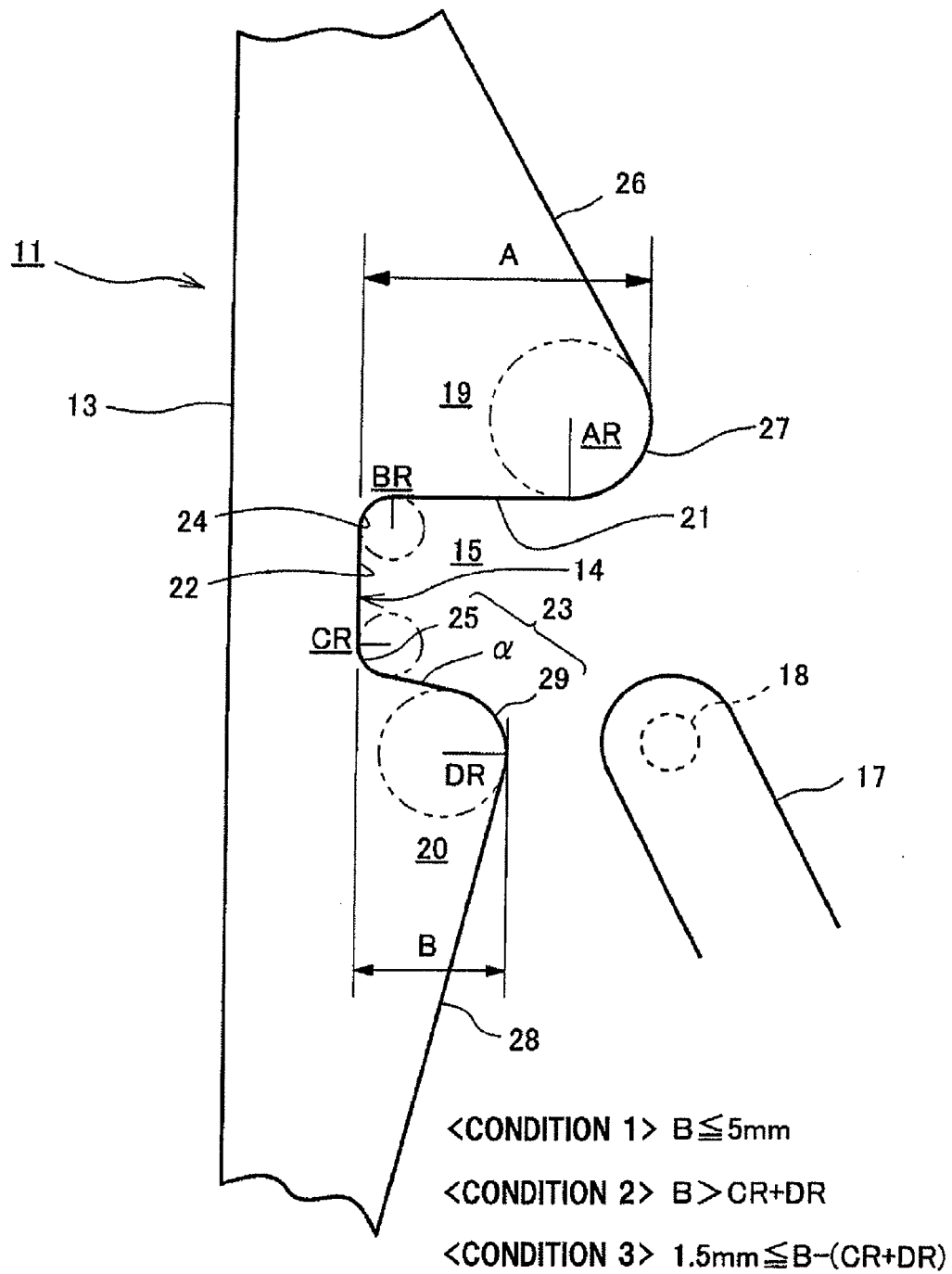
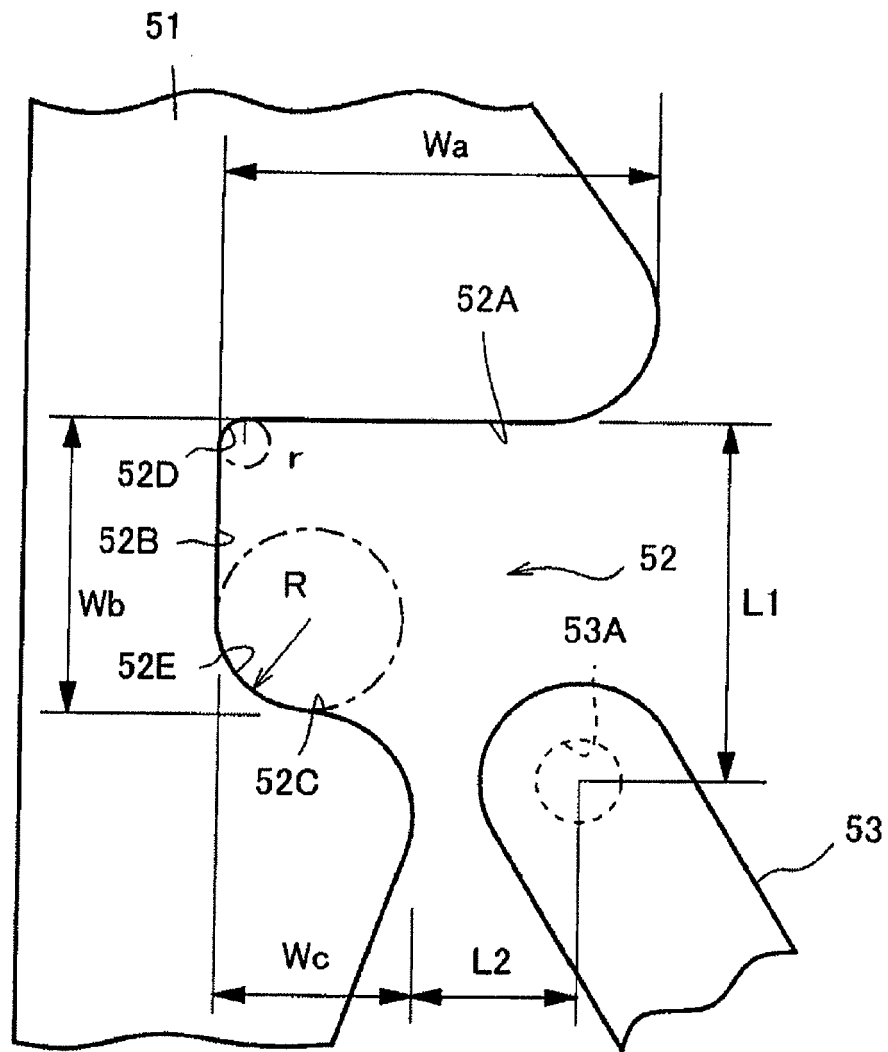


FIG. 4
BACKGROUND ART



REFERENCES CITED IN THE DESCRIPTION

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