



Publication number : **0 516 587 A1**

(12)

EUROPEAN PATENT APPLICATION

(21) Application number : **92810360.5**

(51) Int. Cl.⁵ : **D03D 47/30**

(22) Date of filing : **13.05.92**

(30) Priority : **28.05.91 JP 123956/91**

(43) Date of publication of application :
02.12.92 Bulletin 92/49

(84) Designated Contracting States :
BE DE FR IT

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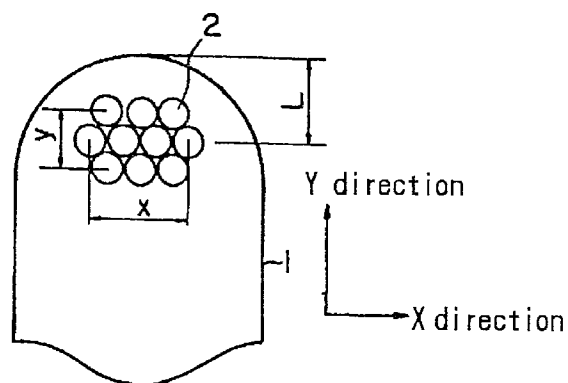
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(54) **Auxiliary nozzle in an air jet loom.**

(57) To provide an auxiliary nozzle which can increase the propulsion of air flow acting on a flying weft by increasing the air flow to be distributed along the weft flying direction. A plurality of injection holes (2) are formed and arranged adjacently the tip end of an auxiliary nozzle (1). The arrangement of the injection holes (2) is such that the center-to-center distance (x) of the air injection holes (2) located at opposite extremities and measured crosswise to the longitudinal direction of the nozzle, is greater than the center-to-center distance (y) of the air injection holes (2) located at opposite extremities as viewed in longitudinal direction of the nozzle.

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The present invention relates to an arrangement of air injection holes in an auxiliary nozzle of a plurality of such nozzles which are disposed at spaced intervals along the weft inserting direction in an air jet loom in which a weft is inserted and flown through a warp shed by means of air jets.

An auxiliary nozzle having a plurality of air injection holes adjacent its tip end, which is popularly known as a shower nozzle, can provide improved air injection characteristics reducing variation in air injection angles in both vertical and horizontal directions due to variation in the pressure of supply air. However, this shower-type auxiliary nozzle has disadvantages as follows.

Publication of Japanese Patent Application 55-36735 (1980), for example, discloses an auxiliary nozzle, having a number of air injection holes formed and located in such a way that a generally circular shape is formed by the overall arrangement of such holes. Each air injection hole is formed with angles, as to direct air flowing therethrough upwardly and horizontally obliquely, respectively, thereby making possible generation of such air flow that offers desirable action on a flying weft W and improving the above air injection characteristics for stability of air jet and hence of weft flying condition. With this prior art auxiliary nozzle, however, the diameter of an apparent circle formed by the general arrangement of the plural air injection holes is large and, therefore, the distance as measured between the tip end of the nozzle and the center of the apparent circle is large, with the result that the distance from the auxiliary nozzle to a weft as measured along the center of air jet from the nozzle will be lengthened, accordingly.

It is needless to say that the auxiliary nozzle should be positioned desirably as close to the weft as possible so that an air jet therefrom acts on the weft from as short a distance as possible. However, location of the auxiliary nozzle is restricted by various factors such as weft itself, arrangement of weft guides and other parts, etc., which makes it difficult to apply air jet to a flying weft from a position sufficiently close thereto. Relocation of auxiliary nozzle even for a short distance, e.g. 1 to 2 mm, away from the weft may allow air jet issued from the nozzle to be dispersed before it reaches the weft and, therefore, the propulsion of air jet acting on the weft to fly it through shed is decreased. Air jet from the nozzle may be strengthened in an attempt to compensate for a decrease in the propulsion by increasing the air pressure, but only as the sacrifice of an increase of air consumption.

PROBLEM THAT THE INVENTION IS TO SOLVE

Though the conventional shower-type auxiliary nozzle can offer desirable air injection characteristics, an increase in the distance from the auxiliary nozzle to a weft as measured along the center of air jet from

the nozzle causes the air jet to be dispersed before it reaches the weft, so that the propulsion of the air jet acting on the weft will not be increased as desired.

The present invention is intended to solve the above problem by providing an improved shower type nozzle on the basis of a thought that the propulsion of air jet to assist a weft in flying could be strengthened by distributing more air flow along the weft or its flying direction.

To solve the above problem, the present invention provides an auxiliary nozzle of shower type wherein the center-to-center distance of air injection holes located at horizontally opposite extremities is greater than the center-to-center distance of air injection holes located at opposite extremities as viewed in longitudinal direction of the nozzle.

Since the injection holes of auxiliary nozzle of the invention will be formed generally in a horizontally elongated arrangement, as the first advantage, the center of the general injection hole arrangement can be located closer to the nozzle tip end, thus allowing air jet from the nozzle to act on the weft with higher efficiency. Secondly, the velocity distribution of air flow issued from the auxiliary nozzle is such that air jet acts on a wider region along the weft flying direction as viewed from the top, thereby increasing the propulsion of air jet assisting a weft in flying through a shed.

An embodiment according to the present invention and details thereof will be described in the following with reference to FIGS. 1 to 10. The following drawings describe the following:

FIG. 1 is a front view showing an arrangement of air injection holes adjacent the tip end of an auxiliary nozzle according to the present invention;

FIG. 2 is a plan view showing a velocity distribution of air flow from the nozzle of FIG. 1;

FIG. 3 is a side view of the velocity distribution of air flow of FIG. 2;

FIG. 4 is a front view showing a modified arrangement of air injection holes adjacent the tip end of an auxiliary nozzle according to the present invention;

FIG. 5 is a side sectional view of the auxiliary nozzle of FIG. 4;

FIG. 6 is a front view showing an arrangement of air injection holes adjacent the tip end of a conventional auxiliary nozzle;

FIG. 7 is a side sectional view of the conventional auxiliary nozzle of FIG. 6;

FIG. 8 is a plan sectional view of the auxiliary nozzle of FIG. 6;

FIG. 9 is a plan view showing the velocity distribution of air flow from the nozzle of FIG. 6;

FIG. 10 is a side view showing the distribution of air flow velocities of the nozzle of FIG. 6.

In an air jet loom, a plurality of auxiliary nozzles 1, only one nozzle being shown in the drawings, is disposed at suitably spaced intervals along the direction

of weft insertion of the loom. Each nozzle 1 has a number of air injection holes 2 centered generally in a horizontally elongated arrangement. With the longitudinal direction of the nozzle designated by Y and the direction across Y denoted by X, respectively, as shown in FIG. 1, the injection holes 2 are arranged such that the center-to-center distance x of air injection holes located at opposite extremities in X direction of the nozzle is greater than the center-to-center distance y of air injection holes located at opposite extremities as viewed in Y direction. As compared with the distance L' measured between the tip end of the above-described prior art nozzle 1' and the center of an apparent circle of the general arrangement of its air injection holes 2', similar distance L in the nozzle 1 according to the present invention can be made smaller, if the opening areas of air injection holes of the two nozzles 1 and 1' are the same.

Pressure of air to be supplied to auxiliary nozzles should be changed depending on weaving conditions such as loom speed, kind of weft to be inserted, etc. Though air injection angle, as determined by the aforementioned angles α and β (FIGS. 7 and 8), tends to be changed by increase and decrease in air pressure, such change in the injection angle can be lessened by use of a shower-type nozzle. Because of the reduced distance L, the nozzle 1 may be placed with respect to a flying weft at a shorter distance thereto as measured along the center of air jet from the nozzle, thus permitting more effective utilization of air injection energy due to application of air jet with only a little dispersion. Furthermore, because the air injection holes 2 are arranged with larger center-to-center distance x in horizontal direction X relative to the distance y in longitudinal direction Y, the velocity distribution of air flow is such that air jet can act on a wider region of weft W along its flying direction as viewed from the top, as shown in FIG. 2, with the result that propulsion of air flow acting on the weft can be advantageously increased. On the contrary, with the conventional auxiliary nozzle 1' having injection holes formed generally in a circular arrangement, the velocity distribution becomes such that the air flow tends to center on a narrower portion of the weft as shown in FIG. 9, and, therefore, air jet from such auxiliary nozzle can assist the weft in flying only insufficiently.

Additionally, because the air injection holes 2 are centered in a region having a shorter distance y along the longitudinal direction Y of the nozzle and located closer to the nozzle tip end, as indicated by the reduced distance L, the time during which all the injection holes 2 stay in a warp shed can be made longer and air jet from the nozzle can act on the weft W for a longer period of time, accordingly.

It is to be understood that the present invention is not limited to the above-described embodiment, but it may be practiced in various modifications, as an embodiment exemplified in FIGS. 4 and 5 wherein the in-

jection holes 1 are formed generally in a horizontally elongated arrangement, i.e. the horizontal dimension of the injection hole arrangement is greater than the vertical dimension thereof, and the injection holes 1 are drilled punched or made with any different suitable hole making technique, with such angles α_1 , α_2 and so forth that the respective air jets issued therethrough are directed to one specific point. Such an arrangement of the injection holes 1 helps to minimize dispersion of the air flow from the nozzle. It is also possible that e.g. some of the holes or all the holes of the auxiliary nozzle 1 form a star shape like opening, where not all the teeth are of equal length.

According to the present invention, because the distance from the tip end of an auxiliary nozzle to the center of the overall arrangement of plural injection holes can be made smaller, the distance from the nozzle to a weft measured along the nozzle to a weft as measured along the center of air jet therefrom can be shortened, thereby permitting more effective application of air jet energy to a flying weft. Because the air flow velocity is distributed in such a way that air jet can be applied to a wider region of weft W along its flying direction, the propulsion of air jet acting on the weft can be increased. Furthermore, horizontally elongated arrangement of injection holes closer to the nozzle tip end can make it possible for the injection holes to stay within a warp shed for a longer period of time.

To provide an auxiliary nozzle which can increase the propulsion of air flow acting on a flying weft by increasing the air flow to be distributed along the weft flying direction.

A plurality of injection holes 2 are formed and arranged adjacently the tip end of an auxiliary nozzle 1. The arrangement of the injection holes 2 is such that the center-to-center distance x of the air injection holes 2 located at opposite extremities as viewed and measured crosswise to the longitudinal direction of the nozzle, is greater than the center-to-center distance y of the air injection holes 2 located at opposite extremities as viewed in longitudinal direction of the nozzle.

DESIGNATION OF REFERENCE NUMERALS

- 1 Auxiliary nozzle
- 2 Air injection hole
- W Weft yarn

Claims

1. An auxiliary nozzle (1) of plural such nozzles (1) in an air jet loom, said auxiliary nozzles (1) being disposed at spaced intervals along the weft inserting direction of the air jet loom and each of said auxiliary nozzles (1) being formed with a plurality of air injection holes (2) through the wall

thereof adjacent the tip end thereof,

said auxiliary nozzle (1) being characterized in that the center-to-center distance (x) of air injection holes (2) located at horizontally opposite extremities is greater than the center-to center distance (y) of air injection holes (2) located at opposite extremities as viewed in longitudinal direction of the nozzle (1).

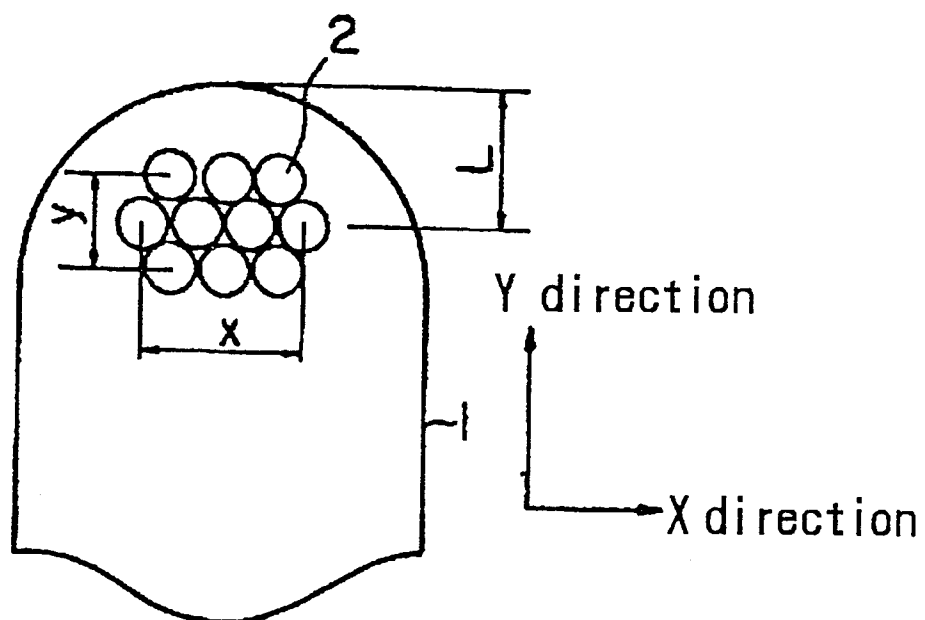
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2. An auxiliary nozzle (1) in an air jet loom, said auxiliary nozzles (1) said auxiliary nozzle (1) being formed with a plurality of air injection holes (2) through the wall thereof adjacent the tip end thereof, said auxiliary nozzle (1) being characterized in that the center-to-center distance (x) of air injection holes (2) located at opposite extremities, as viewed and measured crosswise to the longitudinal direction of the nozzle (1), is greater than the center-to center distance (y) of air injection holes (2) located at opposite extremities as viewed in longitudinal direction of the nozzle (1). 10 15 20
3. An auxiliary nozzle (1) as claimed in claim 1 or claim 2, where the wall between a part of adjacent holes (2) is partly open, such adjacent holes (2) thus forming one opening. 25
4. An auxiliary nozzle (1) as claimed in any of claims 1 to 3, where the holes (2) in the wall are arranged under different angles ($\alpha_1, \alpha_2, \alpha_3, \alpha_4$). 30
5. An auxiliary nozzle (1) as claimed in claims 4 wherein each hole (2) is arranged in the wall with such an angle ($\alpha_1, \alpha_2, \alpha_3, \alpha_4$), that the respective air jets issued therethrough are focused to one specific point or line. 35
6. An auxiliary nozzle (1) as claimed in claim 3, where the total of the holes (2) form one single star shaped opening, the so formed star shaped opening having teeth of unequal length. 40
7. An air jet loom with one or more auxiliary nozzles (1) as claimed in any of claims 1 to 6, the auxiliary nozzles (2) being disposed at spaced intervals along the weft inserting direction of the air jet loom. 45

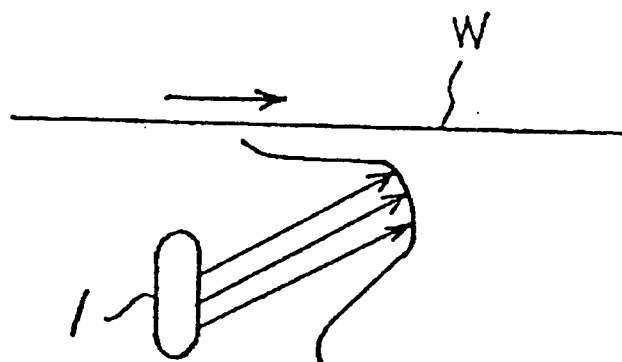
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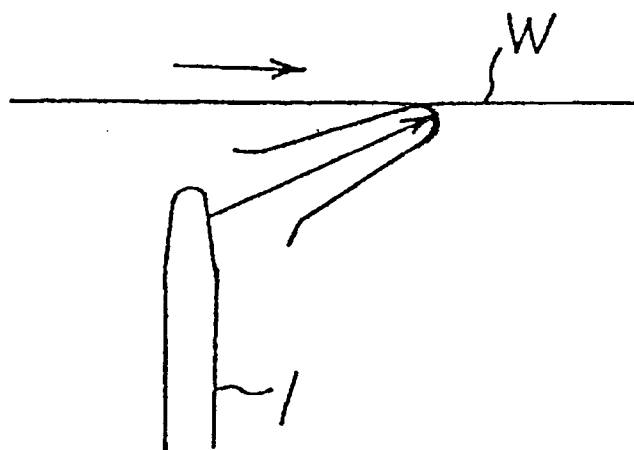
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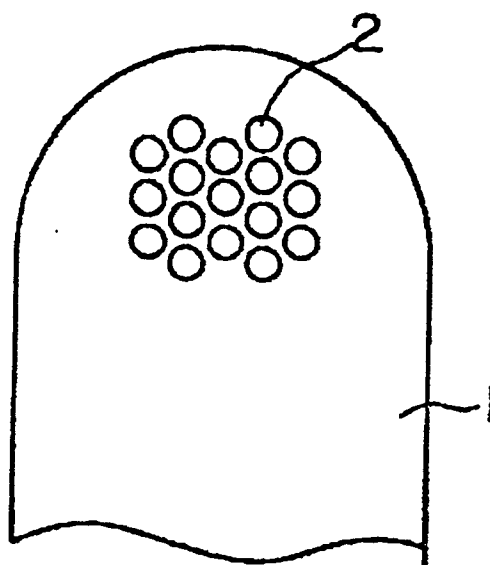
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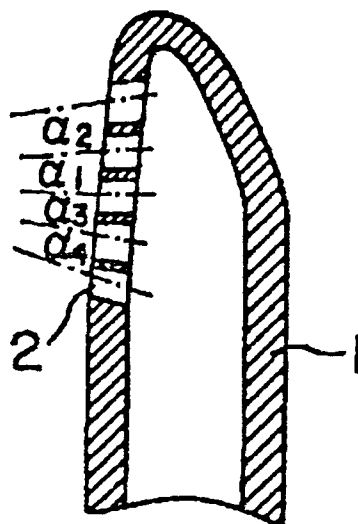
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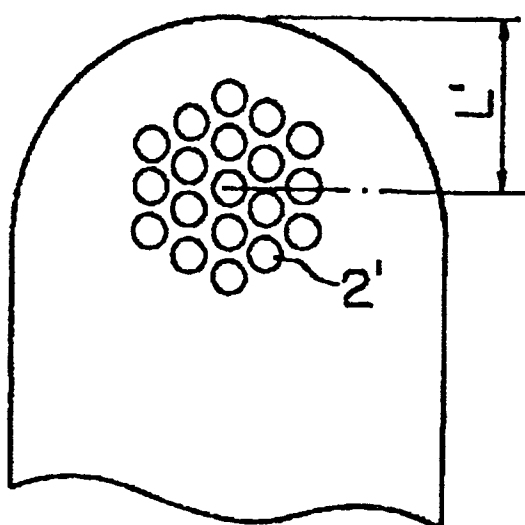
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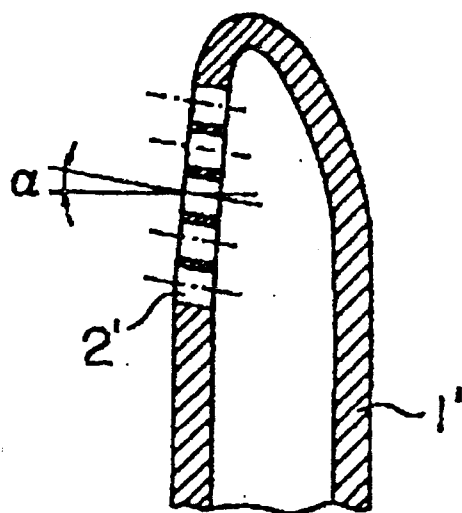
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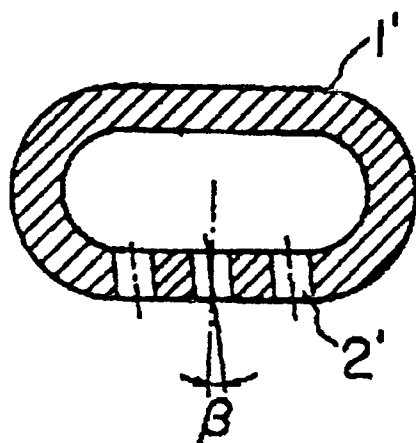
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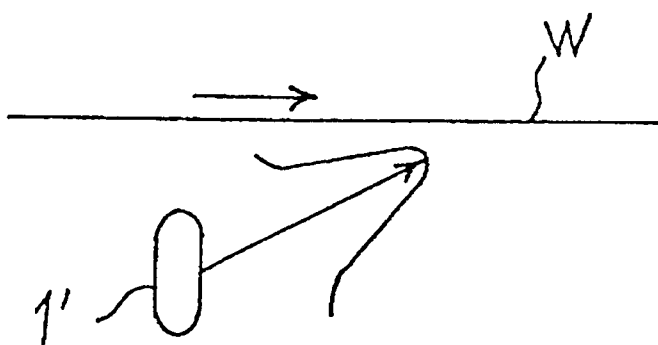
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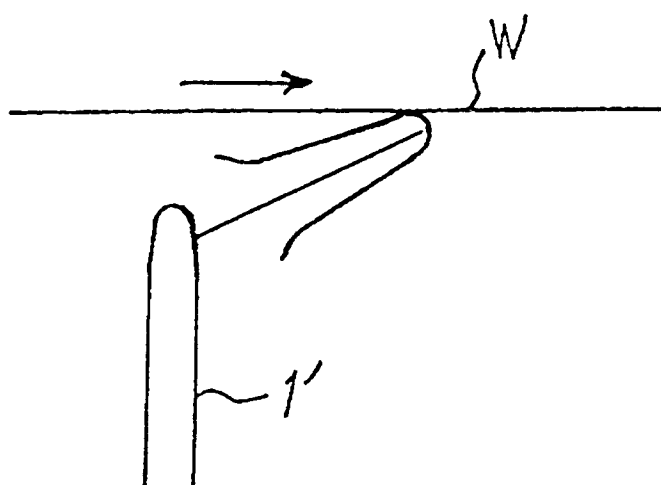
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European Patent
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EUROPEAN SEARCH REPORT

Application Number

EP 92 81 0360

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X	EP-A-0 423 066 (SULZER) * the whole document *	1, 2, 7	D03D47/30
A	EP-A-0 268 794 (PICANOL) * figures 2, 4 *	1, 2, 7	
A	DE-A-3 204 363 (GÜNNE) * figures 2, 4 *	4, 5	
A	EP-A-0 308 754 (FOERY) * figures 2, 4, 5 *	4, 5	
A	BE-A-903 100 (PICANOL) * figures 1-6 *	3, 6	
A	BE-A-892 832 (PICANOL) * figures 1-6 *	6	
A, D	JP-A-5 536 735 (RÜTI) & FR-A-2 272 207 (RÜTI)		
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			D03D
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 03 SEPTEMBER 1992	Examiner BOUTELEGIER C. H. H.
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