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[54] **WEFT INSERTING CHANNEL FOR PNEUMATIC WEAVING MACHINES**

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[52] **U.S. Cl.** ..... **139/127 P,** 226/95

[51] **Int. Cl.** **D03d 47/30**

[58] **Field of Search** ..... 139/127 P, 188; 226/95

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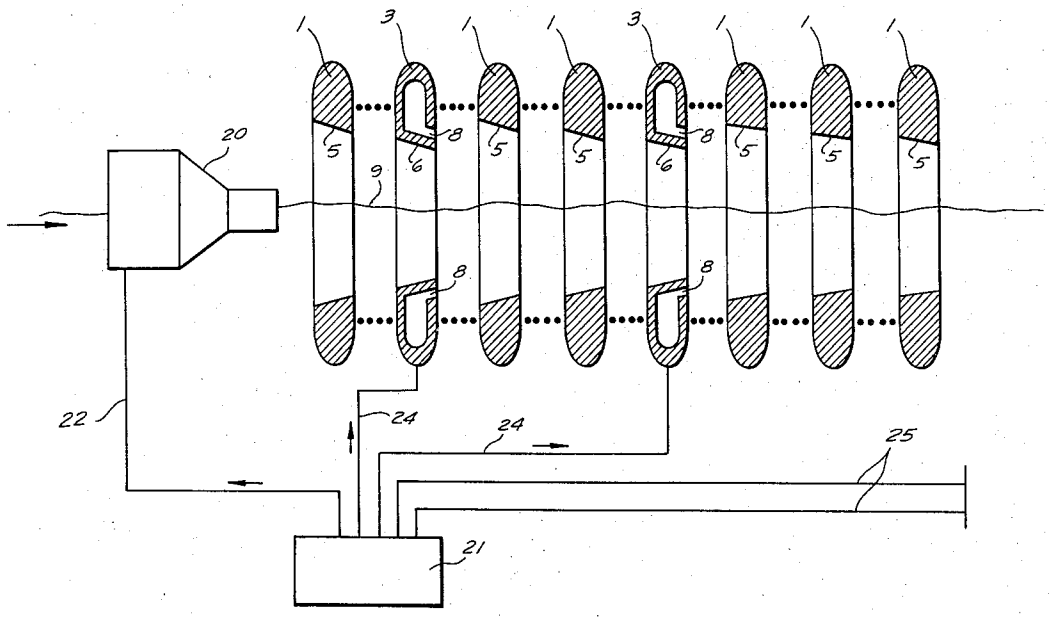
Primary Examiner—Henry S. Jaudon

[57] **ABSTRACT**

Weft inserting channel for pneumatic weaving machines, the channel being disposed in the shed and consisting of active and passive sections provided with a weft inserting opening and a directing profile for centripetally directing both the main and the additional pressure air jets in the direction of weft insertion. The radial distance of the directing profile from the axis of the weft inserting channel of at least one passive section adjacent an active section in the direction of weft insertion is equal to or longer than the radial distance of the separate points of connecting line of the tangential point of the directing profile of the following active section with the point of intersection on the front wall of the preceding active section while the radial distance of such point of intersection from the axis is longer than the radial distance of the discharge openings.

4 Claims, 7 Drawing Figures



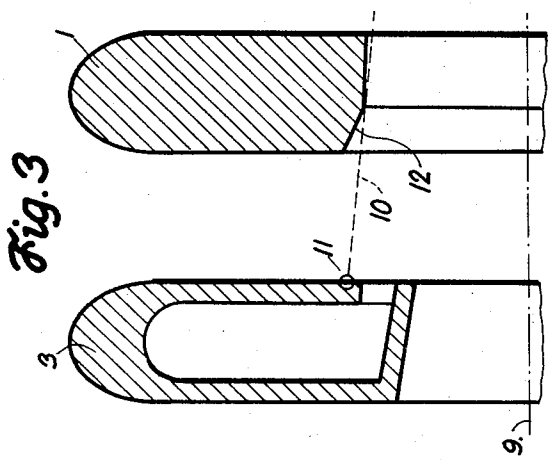


Fig. 3

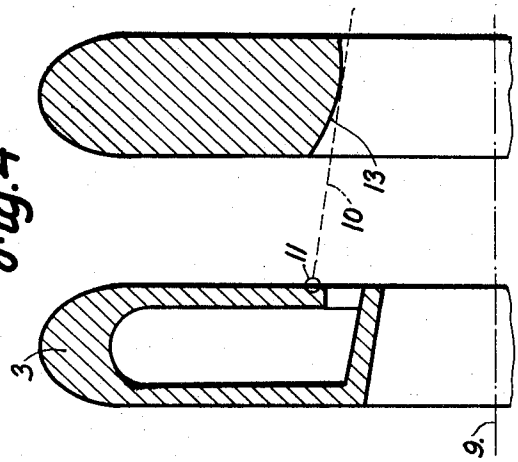


Fig. 4

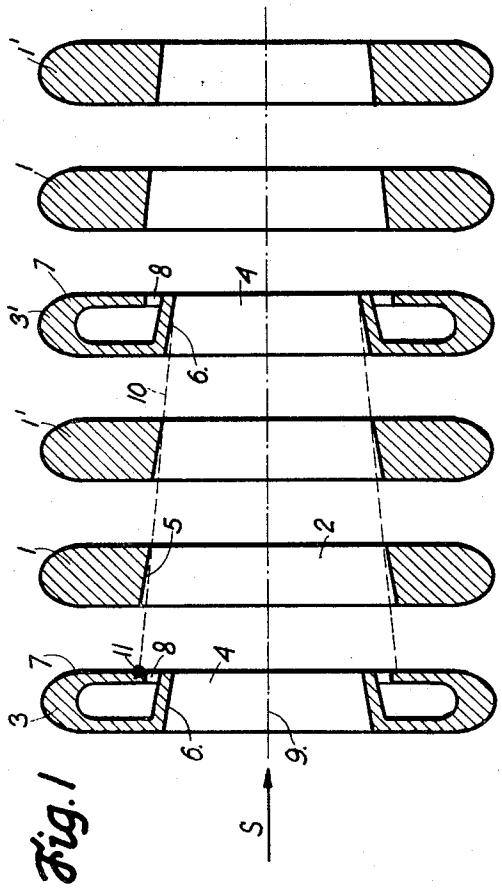


Fig. 1

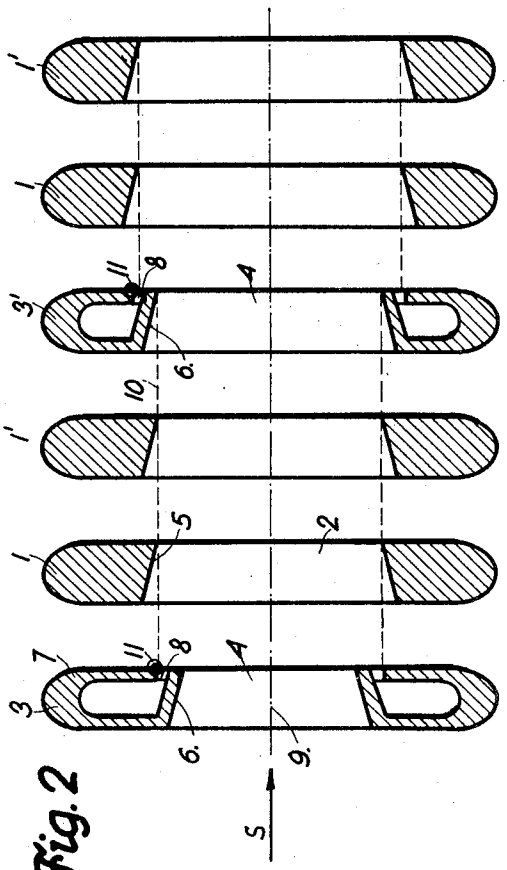
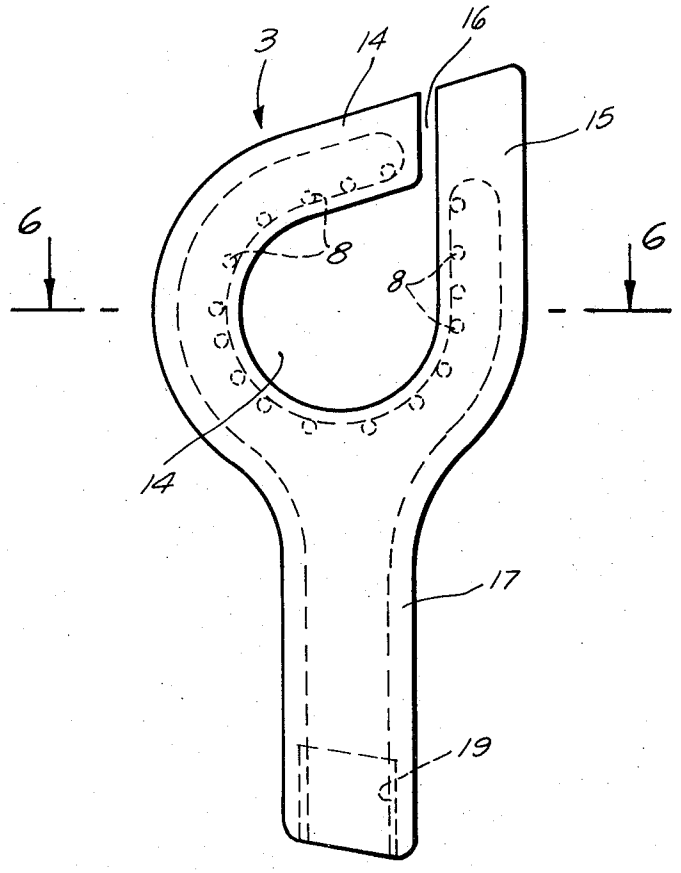


Fig. 2

FIG. 5



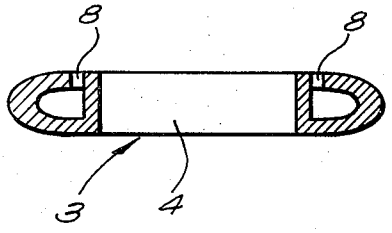
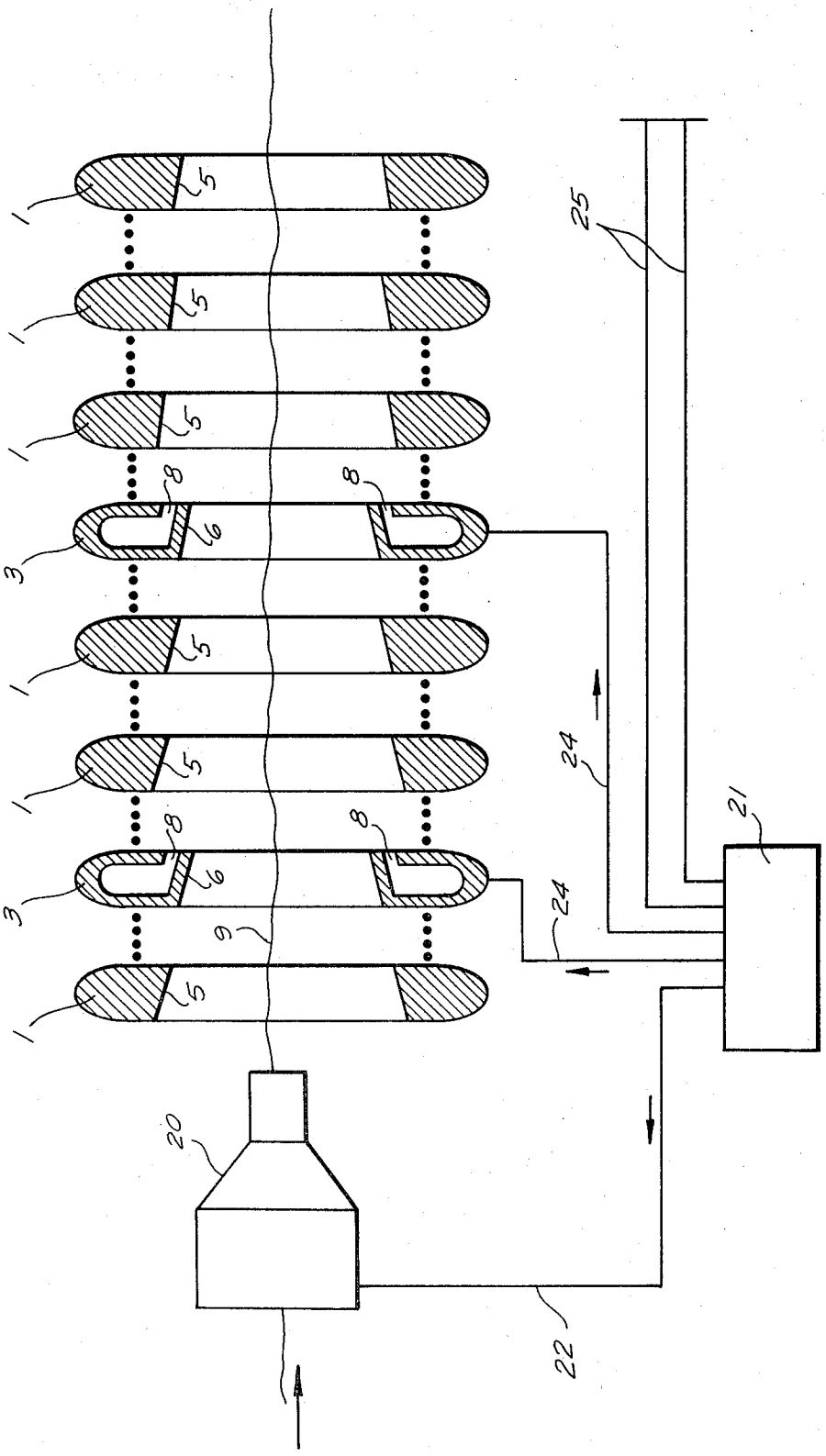


FIG. 6

FIG. 7



WEFT INSERTING CHANNEL FOR PNEUMATIC WEAVING MACHINES

The present invention relates to a weft inserting channel for pneumatic weaving machines; said channel being disposed in the shed and constituted of both passive and active sections.

In weaving machines with pneumatic weft insertion, usually a weft inserting channel disposed in the shed is used, such channel being constituted of sections of which each is provided with a continuous conical opening for centripetally directing the pressure air jet from the weft inserting nozzle.

A channel made in such manner presents a considerable resistance to the flowing air, thus causing an undesired reduction of speed of the air jet and consequently a slower weft insertion to remote points of the weaving shed.

In order to achieve a more uniform weft inserting speed throughout the whole length of the weaving shed, and for increasing the working width of the weaving machine, weft inserting channels are used, between the sections of which there are mounted several hollow sections with ejecting openings for additive pressure air, which are arranged on the front wall of the section in the direction of the main pressure air jet.

By interposing hollow, so-called active sections into the system of normal, so-called passive sections, a theoretically infinite weft inserting length can be achieved.

However, upon practical application of a weft inserting channel with both active and passive sections, disadvantages appear; these include the fact that the main pressure air jet from the weft inserting nozzle is interfered with by additive pressure air jets from the active sections. Consequently, the efficiency of utilizing pressure air energy is rather low, as well as the quality of weft insertion through the shed, the working width of the machine being thereby restricted.

A further disadvantage of the known weft inserting channel consists in its relatively considerable dimensions, particularly the considerable diameter of the weft inserting opening, which requires a large shed. The considerable dimensions of the weft inserting channel lead to its rather considerable weight which causes, in turn, undesirable inertial forces.

The above disadvantages are mitigated by the present invention. In accordance with the invention, the radial distance of the directing profile from the axis of the weft inserting channel of at least one passive section adjacent an active section in the direction of weft insertion is equal to or longer than the radial distance of the separate points of the line connecting the tangential point of the directing profile of the following active section with the point of insertion on the front wall of the preceding active section, the radial distance of said point of intersection from the axis being longer than the radial distance of the outlet openings.

Further, the directing profile has the shape of a bent line, of which the part directed towards the outlet openings of the active section forms a larger angle with the axis than its reversed part.

A still further feature is that the directing profile has the shape of a curve inscribed into a bent line.

Still another feature is that the spacing between the separate sections is shorter at more distant points from the weft inserting nozzle.

The advantage of the weft inserting channel according to the present invention consists in that a smooth fusion of the additional pressure air jets from the active sections and the main pressure air jet from the weft inserting nozzle is made possible, thus improving the economy of the pressure air used and securing an optional course of the velocity of the weft to be inserted throughout the whole length of the shed.

A further advantage consists in increasing the working width of the weaving machine.

A very important advantage consists in the possibility of substantially reducing the cross section of the weft inserting channel; this causes a reduction of the shed dimensions, a reduction in weight of the weft inserting channel and thus a reduction of the inertial forces. As proved by tests, the present invention is advantageous particularly with weft inserting openings having a cross section less than 1 sq. cm.

An embodiment of the present invention in the form of an example is shown in the accompanying drawings, of which:

FIG. **1** represents a diagrammatic section through a part of the length of a weft inserting channel in accordance with the invention with both active and passive sections, the diameters of the weft inserting openings of all active sections being equal;

FIG. **2** is a similar view of a weft inserting channel in accordance with the invention, the active sections having throughout the length of the shed, continuously increasing diameters of the weft inserting openings;

FIG. **3** is a partial diagrammatic section through one active section and the adjacent passive section, the directing profile of the passive section being formed by a broken or angular line;

FIG. **4** is a view similar to FIG. **3** of a further embodiment in which the directing profile of the passive section is made in the form of a curve;

FIG. **5** is a view in rear elevation of an active section of the weft inserting channel of FIG. **1**;

FIG. **6** is a view in transverse section through the element shown in FIG. **5**, the section taken along the line **6—6** in FIG. **5**; and

FIG. **7** is a schematic view of the weft inserting channel of the invention and the parts attendant thereto, the sections forming the weft inserting channel being shown in longitudinal axial section.

In the embodiments of FIGS. **1** and **2**, the weft inserting channel consists of passive sections **1** provided with a weft inserting opening **2** preferably of circular or approximately circular cross section and of active sections **3** also provided with a weft inserting opening **4** with a cross section of the same shape. The sequence of the separate sections **1, 3** is chosen in such manner that between two active sections **3, 3'** several passive sections **1, 1'** are interposed, of which only two are shown in FIGS. **1** and **2** for the sake of simplicity.

The passive sections **1, 1'** are provided about the circumference of the weft inserting opening **2** with a chamferlike directing profile **5**, which centripetally directs the pressure air jet intermittently leaving the weft inserting nozzle in the directions S, i.e., in the direction of weft insertion of a weft yarn, and simultaneously directing the additional air jets from the active sections **3, 3'** .

The active sections **3, 3'** are also provided about the circumference of the weft inserting opening **4** with a chamferlike directing profile **6** which is directed in the

same manner and for the same purpose as the passive sections **1, 1'** .

The active sections **3, 3'** are provided on their front walls **7** in the direction S with discharge openings **8** for the additional pressure air.

All sections **1, 1'** and **3, 3'** are arranged with their weft inserting openings **2, 4** disposed symmetrically about axis **9** of the weft inserting channel.

In an illustrative embodiment shown in FIG. **1,** all active sections **3, 3'** have the same diameter of weft inserting openings **4.** The diameter of the weft inserting openings **2** of passive sections **1, 1'** is larger than the diameter of the weft inserting openings **4** of active sections **3, 3'** . However, in at least some passive sections **1, 1'** it is different, and becomes smaller behind the active section **3** in the direction towards a further active section **3'**. In the most advantageous geometrical arrangement the tangential points of the directing profiles **5** of passive sections **1, 1'** are situated on the connecting line **10** of the tangential points of the directing profile **6** of one active section **3** with the front wall of the preceding active section **3.** The point of intersection **11** of the connecting line **10** with the front wall **7** is situated on the front wall **7** at a farther radial distance from axis **9** of the weft inserting channel than the discharge openings **8.**

The main pressure air jet from the weft inserting nozzle flowing through the weft inserting openings **2** and **4** of sections **1** and **3** is, together with the weft, directed centripetally by the directing profiles **5** and **6.**

For reinforcing the main air jet from the weft inserting nozzle and for completing its drop as well as the drop of its kinetic energy during its passing through the weft inserting channel, additional pressure air is fed through the discharge openings **8** of the active sections **3, 3'** into the weft inserting openings **2** of passive sections **1, 1'**.

In view of the specified location of the discharge openings **8** on the front wall **7** of each active section **3,** a perfect confluence of the additional pressure air jet takes place with the main air jet being discharged from the weft inserting nozzle. This is achieved in such manner that the directing profiles **5** of passive sections **1, 1'** direct by their location, in view of the discharge openings **8** of one active section **3,** the additional pressure air jet into the weft inserting opening **4** of the following active section **3'** without being disturbed by undesired turbulence inside the weft inserting channel. This effect can be achieved even in the case wherein on the connecting line **10** there are situated all the passive sections **1, 1'**, or the directing profiles **5,** or only the tangential points of only several passive sections **1** behind the active section **3.**

From the illustrative embodiment of the weft inserting channel shown in FIG. **2,** it is evident that the same or an analogous effect can also be achieved in cases wherein all passive sections **1, 1'** located between two active sections **3, 3'** have the diameter of the weft inserting openings **2** the same as the diameter of the weft inserting opening **4** of the following active section **3',** while the preceding active section **3** has a weft inserting opening **4** of a smaller diameter.

In that exemplary embodiment, all lines **10** connecting the tangential points of the directing profiles **5** of the passive sections **1, 1'**, and the tangential points of the directing profile **6** of the following active section **3'** are mutually parallel; the point of intersection **11** of connecting line **10** with the front wall **7** of the preceding active section **3** is situated at a farther radial distance from axis **9** of the weft inserting channel than the discharge openings **8** of this active section **3.**

A weft inserting channel constructed in that manner has a continuously increasing diameter of weft inserting openings **2, 4** in the direction of the pressure air jet.

As shown in FIG. **3,** the directing profile **5** of passive section **1** can have the shape of a broken or angular line **12,** while its part directed towards the discharge openings **8** forms with a larger angle with axis **9** of the weft inserting openings **2, 4** than its reversed part. In that embodiment, a more favorable air flowing is achieved, by which the losses of kinetic energy is diminished.

The directing profile **5** can have also the shape of a curve **13** (FIG. **4**) which is advantageously inscribed into the broken line **12** shown in FIG. **3.**

For certain cases, the weft inserting channel can be constituted by a combination of all the above exemplary embodiments.

The spacings of the separate sections **1, 1', 3, 3'** need not be identical throughout the whole length of the weft inserting channel, and might e.g. diminish in the direction of weft insertion.

The present invention can be applied particularly for the construction of weft inserting channels for pneumatic weaving machines of large weaving width, and advantageously for constructing weft inserting channels with a cross section of the weft inserting openings less than 1 sq. cm.

As shown in FIG. **5,** the active section of the channel there shown has an angularly directed arm **14** and a vertically directed arm **15,** there being a vertical weft receiving slot **16** between the free end of the arm **14** and the surface of the arm **15** which the arm **14** confronts. The active element **3** has a hollow stem **17** the lower end of which is provided with internal threads **19** by means of which the hollow space within the stem **17** and the arms **14** and **15** is connected to a source of air under pressure.

In FIG. **7** there is shown a weft inserting channel having a series of aligned passive sections **1** and active sections **3,** the active sections being interspersed between successive passive sections. A pressure air weft inserting jet **20** is disposed at the rear end of the channel with the nozzle thereof directed in a forward direction, that is the direction of weft insertion. The pressure air jet weft inserting nozzle **20** is supplied by a source of air under pressure through a conduit **22.** The spaces within the active channel sections **3** are supplied with air under pressure from the source **21** through conduits **24,** as shown. A control circuit **25** extends to the source of pressure air **21,** such source including solenoid valves selectively energized through the control circuit **25** whereby to direct pressure air from the source **21** through the conduits leading therefrom to the elements **3** and **20** in periodically spaced weft inserting pulses.

Although the invention is illustrated and described with reference to a plurality of preferred embodiments thereof, it is to be expressly understood that it is in no way limited to the disclosure of such a plurality of preferred embodiments, but is capable of numerous modifications within the scope of the appended claims.

What is claimed is:

1. In a pneumatic weaving machine forming successive sheds, a weft inserting channel for pneumatically inserting weft into the successive sheds, said channel

including aligned active and passive sections, said active sections having weft inserting openings of substantially circular cross-section, said active sections each having a directing profile forming at least a part of its weft inserting opening, each of said active sections having a front wall facing in the direction of weft inserting and having discharge openings arranged around said weft inserting opening therein, each of said passive sections having a weft inserting opening of substantially circular cross-section, the weft inserting openings of all of the active and passive sections lying on a common axis, which is also the axis of the channel, said passive sections being arranged between successive active sections, said passive sections having a directing profile arranged in said weft inserting openings thereof, a pressure air jet weft-inserting nozzle arranged at the rear end of the channel and directing a jet of air in the forward, weft inserting direction, a source of pressure air coupled with said pressure air jet weft-inserting nozzle, a source of additional pressure air coupled with said discharge openings of said active sections, the radial distance of the directing profile from the common axis of at least one passive section adjacent an active section in the direction of web insertion being no less than the radial distance of imaginary lines connecting tangential points of the directing profile of the following active section with the points of intersection on said front wall of the preceding active section, and the radial distance of said points of intersection from the common axis of the channel being longer than the radial distance of said discharge openings of said active sections.

2. A weft inserting channel as claimed in claim **1,** wherein the directing profile of each passive section has a cross-section in the shape of a line having two angularly related parts, one part of which, directed towards the discharge openings of the active section, forms with said axis a larger angle than the other part of said line.

3. A weft inserting channel as claimed in claim **1,** wherein the directing profile of each passive section has a cross-section in the shape of a curve.

4. A weft inserting channel as claimed in claim **3,** wherein the spacings between the separate sections are smaller at points which are situated at a longer distance from the weft inserting nozzle than between the separate sections which are situated at a shorter distance from the weft inserting nozzle.

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