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(54) **Pneumatic stretching device of the weft thread for air-jet weaving looms, with a weft deflecting head arranged inside the launch channel of the reed**

(57) Pneumatic weft thread stretching device (1) for air-jet weaving looms comprising an oscillating sley (S) and a reed (R) integral therewith consisting of several adjacent teeth shaped so as to form a weft launch channel (C). A stretching device (1), slidably mounted on the sley (S) so that it can be fastened in a position at will on said oscillating sley (S), comprises a thinner weft deflecting portion (3i) arranged inside said reed launch channel (C) adjacent to the bottom wall of the same and a thicker portion (3e) facing the reed, said portions (3i, 3e) being partly separated by a cavity (9) wherein picking up of the

weft thread takes place. The weft deflecting portion (3i) comprises fixed deviation means to displace the tip of said weft thread (W) from the bottom area of the launch channel (C) towards a nozzle (7) in said picking up cavity (9), said nozzle (7) being fed by a pipe (6) at least partly housed in said thinner portion (3i) and being apt to deliver a compressed air jet into said cavity (9). The thicker portion (3e) facing the reed (R) comprises a catching tube (8) facing said nozzle (7) on the opposite side of said cavity (9) for catching the weft thread (W) from said picking up cavity (9) under the action of said compressed air jet.

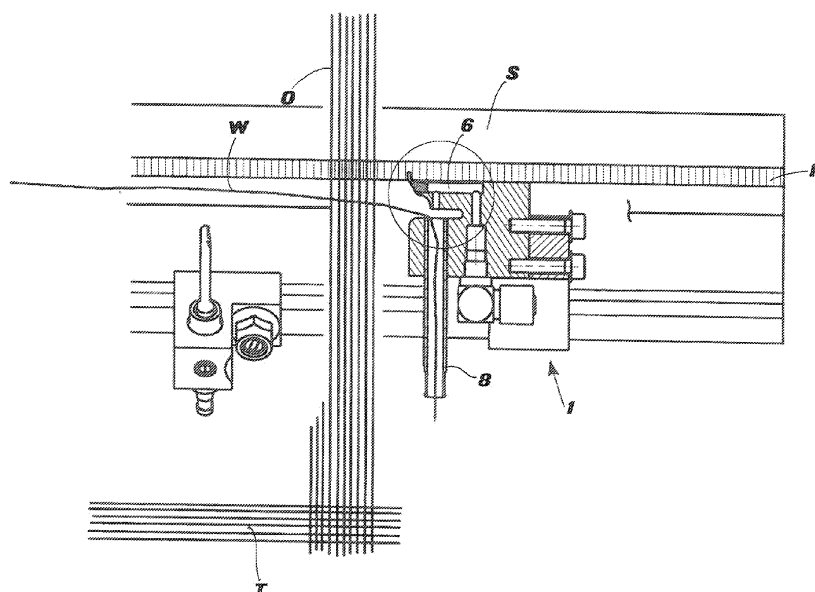


Fig. 8

Description

[0001] The present invention refers to a pneumatic stretching device of the weft thread for air-jet weaving looms, with a weft deflecting head arranged inside the launch channel of the reed. In particular, the invention refers to a device of this type which can be used directly - i.e. without particular adaptations except simply moving the device into the correct position - also with reeds of a greater width than the fabric being woven.

FIELD OF THE INVENTION

[0002] As is well-known to specialists of the field, in air-jet weaving looms the weft thread is launched into the shed by a compressed-air jet delivered by a main nozzle, and said thread is supported during its travel by a series of secondary nozzles arranged along the weaving loom slay. More precisely, the individual parallel teeth making up the reed all have a particular loop-shaped configuration in the central portion thereof, so as to determine overall a channel having a substantially C-shaped transversal section, with the open portion facing towards the fabric being woven. This tunnel-shaped channel is precisely the one inside which an air stream is established - by means of the main nozzle and the secondary nozzles - which carries the weft thread through the shed.

[0003] In this type of weaving looms, once the weft thread is launched through the shed, it is picked up on the right-hand side of the weaving loom and stretched before the beating of the reed by a pneumatic stretching device. Devices of this type are integral with the oscillating slay of the weaving loom and are normally arranged in the proximity of the right-hand outer edge of the reed, so as to pick up the weft thread as soon as it comes out of the reed and to stretch it through a suitable air jet and according to a path which often implies a sharp deviation to determine a faster and steadier stop of the thread.

[0004] In the weaving practice, reduced-height weaving operations occur with a certain frequency compared to the entire width of the weaving loom and of the reed. In these cases, if the stretching device is maintained in its position sideways of the reed, there is evidently a large waste of weft thread. On the contrary, if the reed height is reduced by either changing the reed with one of suitable height or by cutting the on-board reed, there is the disadvantage of an additional cost of spare parts and labour force.

STATE OF THE PRIOR ART

[0005] In order to meet this particular requirement, stretching devices which are no longer arranged sideways of the reed but in front of the same have hence been proposed in the art, so that their position can be adjusted at any desired location of the slay to adapt to the width of the fabric being woven at any one time. This different arrangement of the stretching devices has of

course implied an evident drawback, since the device is no longer at the exit of the launch channel, and hence in the most natural position to pick up the weft thread, but before the same. It is hence necessary to pick up the weft thread within the launch channel or to impart the weft thread a deviation towards the outside of the launch channel, so that it can then be picked up by the stretching device. In the following some solutions of the prior art in this respect are diagrammatically set forth, which, however, involve other drawbacks, as better explained below, among which an excessive turbulence of the air stream in the launch channel, a low reliability in the catching of the weft threads, deformation of the reed teeth to allow the insertion of blowing nozzles, a consistent waste of weft thread, a high consumption of compressed air.

[0006] BE 1017893 (Picanol) discloses a stretching device comprising a tubular element fixed inside the C-shaped launch channel of the reed of a loom, downstream of the warp yarns. A wider inlet of the tubular element allows to form an air jet therein with a nozzle positioned in front of the reed. An auxiliary nozzle is positioned behind the reed to tear-out the tip of weft threads which have been beaten-up out of the stretching nozzle. Warp yarn stretching is obtained without any deviation of the weft yarn from its rectilinear path within the launch channel. The stretching force acting on the weft yarn is consequently weak and a strong air jet is needed for maintaining the weft yarn conveniently stretched during reed beating.

[0007] EP 1897981 (Sulzer) discloses a stretching device wherein the weft yarn is deviated from its path thanks to a flat nozzle inserted between two teeth of the reed and blowing in the beating direction. The weft yarn head is then picked up into a receiving opening of a bent stretching tube fixed to the upper portion of the reed. Due to the position of said stretching tube in front of the reed channel and not inside the reed channel, the disclosed device has however the disadvantage of a low reliability in catching the weft thread. Moreover, the addition of devices to the upper portion of the reed, however, determines increased stress on the reed structure and considerably worsens the dynamic conditions of the alternate motion of the slay due to the mass increase in an area far from the oscillation fulcrum.

PROBLEM AND SOLUTION

[0008] The object of the invention is hence to propose a structure of a weft thread stretching device in an air-jet weaving loom, of the above described type arranged before the reed, which overcomes the above highlighted drawbacks of the known devices and hence allows to obtain a reliable catching of the weft thread, without interfering with the reed structure and which requires only a low consumption of compressed air. This object is reached through a stretching device having the features defined in claim 1. The dependent claims define other preferred features of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] Further features and advantages of the invention will be in any case more evident from the following detailed description of a preferred embodiment of the same, given purely by way of a non-limiting example and illustrated in the accompanying drawings, wherein:

fig. 1 is a perspective view of the stretching device of the present invention;
 fig. 2 is an elevation side view of the device of fig. 1;
 fig. 3 is a top plan and partly section view of the device of fig. 1;
 fig. 4 is a lateral diagrammatic, partly section view of a weaving loom sley equipped with a reed, whereon the stretching device shown in fig. 1 is mounted;
 fig. 5 is a diagrammatic top-plan, partly section view of the weaving loom with the invention device shown in fig. 4;
 fig. 6 is a perspective view of the weaving loom with the invention device shown in fig. 4;
 fig. 7 is a view similar to fig. 4 wherein the position of warp yarns is further shown;
 fig. 8 is a view similar to fig. 5 wherein the path of the weft thread in the stretching device of the invention is shown and the position of the warp yarns and of the fabric being woven is further shown; and
 fig. 9 is an enlarged view of the detail encircled in fig. 8, concerning the weft thread deflecting head of the device of fig. 1.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0010] In the drawings, the portion of a weaving loom is diagrammatically shown, whereon the stretching device of the present invention is mounted. In particular, the oscillating slay S whereon reed R is mounted is shown.

[0011] Stretching device 1 of weft thread W is mounted on the front part of slay S, and hence before the reed, through a slider coupling with locking means which allow the fastening thereof in any position along the slay, depending on the height of the fabric T being woven. In particular device 1 is fastened on slay S so as to be almost adjacent to warp threads O (fig. 8). The slider coupling described above is fully known per se and as a matter of fact it is habitually used for the mounting on the slay of the devices the position of which is susceptible of adjustment on the width of the weaving loom, such as for example secondary nozzles N; the structure thereof will hence not be further discussed here in detail.

[0012] Device 1 hence comprises a base 2 equipped with guiding and fixing means to a corresponding rail of slay S and having a sufficient vertical length so that the upper portion 2a of base 2 lies approximately in correspondence of the central portion of reed R, i.e. of the portion where launch channel C is formed. To the above-

said base 2, a main body 3 of stretching device 1 is fastened through a pair of screws 4.

[0013] The body 3 of stretching device 1 comprises a thicker first portion 3e facing the reed R and a much thinner second portion 3i, which forms the weft thread deflecting head and is inserted in launch channel C so as to be adjacent - on the bottom of said channel - to the teeth L of reed R. In the first portion 3e there are provided fast connecting means 5 to the source of compressed air and a stretching tube 8 for catching and stretching the weft thread W. In the second portion 3i there is provided a communication pipe 6 for the passage of compressed air from connecting means 5 to a nozzle 7 arranged at a short distance from the inlet of stretching tube 8 and apt to drive the weft thread W in the same. Nozzle 7 is formed so as to be coaxial to stretching tube 8, the common axis of these two elements being substantially perpendicular to the direction of insertion of weft thread W. The diameter of pipe 6 is preferably smaller than the diameter of stretching tube 8; typical acceptable ranges for these diameters are for example comprised between 1 and 2 mm for pipe 6 and between 4 and 6 mm for stretching tube 8. The thickness of said weft deflecting portion 3i of the device 1 is just about sufficient to house said compressed-air pipe 6, while the thickness of said thicker portion 3e of the device 1 is just about sufficient to house said weft thread catching tube 8.

[0014] The second thinner portion 3i of body 3, on the side facing the direction from which weft thread W is fed, is provided with a deflecting area to guide the displacement of the weft thread up to arrive in front of the nozzle 7, inside a cavity 9 formed between said nozzle and the inlet of stretching tube 8. The width of said cavity 9 is very short, for example equal to 2mm and this causes the air jet coming out of nozzle 7 to minimally disturb the main air stream transporting the weft thread into launch channel C. Starting from the bottom of launch channel C, this deflecting area consists firstly of a plug 10 - apt to close the outlet of pipe 6 formed during drilling of said pipe in portion 3i - which is provided with an outer surface inclined towards cavity 9 and furthermore with a small appendix 11 which fits between two reed teeth L to prevent a possible undesired deviation of weft thread W towards reed R instead of towards cavity 9. On the opposite part of appendix 11, the external surface of plug 10 ends in correspondence of a rounded bevel 12 which imparts to the tip of incoming weft thread W a change of direction towards the one of the axis of the stretching tube 8 while it accompanies the displacement of the weft thread into a crosswise direction, away from the reed, until it enters the field of action of nozzle 7.

[0015] Due to the particular shape of the deflecting area of the weft deflecting head 3i of stretching device 1, the tip of incoming weft thread W is prevented from entering inside the reed by appendix 11 and softly deviated by the inclined surface of plug 10 and by the rounded bevel 12 from the bottom of launch channel C away from the reed R and towards the cavity 9 of device 1, even

before the weft thread W perceives the depression effect caused inside said cavity by the compressed air jet coming out of nozzle 7 and entering tube 8; a low degree of air depression is hence sufficient to obtain a reliable deviation of weft thread W inside said tube. This allows on one hand to achieve optimal reliability when catching weft threads and, from the other hand, to use a small-diameter nozzle 7 and consequently, to need a low compressed-air consumption to carry out the stretching of the weft thread W, thereby achieving the two main objects of the invention. It is furthermore to be noted that the device of the invention, thanks to this high reliability in catching the weft threads and contrarily to the above discussed prior art, does not need any supplementary nozzle behind the reed to tear-out the tip of a weft thread which has been beaten-up out of the stretching device.

[0016] When weft thread W enters stretching tube 8, said thread builds an angle of about 90° to the main part of the thread which is stretched across the shed. This angle allows to accomplish a strong friction between weft thread W and the edge of tube 8 and, consequently, a quick dampening of the thread oscillations is achieved as well as a good stretching force also with a reduced length of the weft tails (for example 4 - 8 cm) compared to the one of known devices wherein there is no 90° deviation of the weft thread. Moreover, the length of the weft tails can be kept constant also during shed closing and reed beating operations, due to the fact that the catching point of weft thread W - i.e. the entrance edge of stretching tube 8 - is arranged exactly on the line of the warp yarns when the shed is closed (discontinued line in fig. 7). This hence allows both to maintain a constant stretching on the weft thread and not to have displacement of the weft thread with respect to the catching point thereof during shed closing, unlike what happens instead in the prior art (Sulzer) illustrated above where the catching point is arranged above the warp yarn line when the shed is closed. Also this further object of the invention is hence thereby achieved.

[0017] Finally, due to the reduced thickness of the weft deflecting portion 3i of stretching device 1 - which is precisely the portion which lies inside launch channel C - as well as to the short distance between nozzle 7 and the entrance of stretching tube 8, the main air stream for weft transportation which is formed inside said channel is very poorly disturbed and the use of the stretching device of the invention does not require any change of the work parameters of the weaving loom, in particular as concerns flow rate and orientation of the air jets of the main nozzle and of the secondary nozzles. Moreover, since the weft deflecting portion of device 1 does not penetrate between the teeth of reed R, but is simply adjacent to the same, no reed damage occurs, even after repeated uses of the device in different positions along the reed R. Moreover, unlike what is taught in the above illustrated prior art, the entire stretching device is fixed directly to the sley, without therefore affecting the upper portion of the reed and impairing the performances of the sley oscillat-

ing motion. This further object of the invention is thus also fully achieved.

[0018] However, it is understood that the invention must not be considered limited to the particular arrangement illustrated above, which represents only an exemplifying embodiment thereof, but that a number of variants are possible, all within the reach of a person skilled in the field, without necessarily departing from the scope of protection of the invention, as defined by the following claims.

Claims

1. Pneumatic weft thread stretching device (1) for air-jet weaving looms comprising an oscillating sley (S) and a reed (R) integral therewith consisting of several adjacent teeth shaped so as to form a weft launch channel (C) wherein the weft is transported by air jets from a main nozzle and multiple secondary nozzles, of the type wherein the stretching device (1) is slidably mounted on the sley (S) so that it can be fastened in a position at will on said oscillating sley (S), **characterised in that** the main body (3) of said stretching device (1) comprises a thinner weft deflecting portion (3i) arranged inside said reed launch channel (C) adjacent to the bottom wall of the same and a thicker portion (3e) facing the reed, said portions (3i, 3e) being partly separated by a cavity (9) wherein picking up of the weft thread takes place, the weft deflecting portion (3i) comprising fixed deviation means to displace the tip of said weft thread (W) from the bottom area of the launch channel (C) towards a nozzle (7) in said picking up cavity (9), said nozzle (7) being fed by a pipe (6) at least partly housed in said thinner portion (3i) and being apt to deliver a compressed air jet into said cavity (9), and the thicker portion (3e) facing the reed (R) comprising a catching tube (8) facing said nozzle (7) on the opposite side of said cavity (9) for catching the weft thread (W) from said picking up cavity (9) under the action of said compressed air jet.
2. Device as in claim 1), wherein said nozzle (7) and said catching tube (8) are coaxial.
3. Device as in claim 1), wherein the common axis of said nozzle (7) and of said catching tube (8) are perpendicular to the launching direction of the weft thread (W).
4. Device as in claim 1), wherein said catching tube (8) has a larger diameter than said nozzle (7).
5. Device as in claim 1), wherein the thickness of said weft deflecting portion (3i) of the device (1) is just about sufficient to house said compressed-air pipe (6).

6. Device as in claim 1), wherein the thickness of said thicker portion (3e) of the device (1) is just about sufficient to house said weft thread catching tube (8).
7. Device as in claim 1), wherein said fixed deviation means comprise a deflecting area formed on the side of said weft deflecting portion (3i) facing the direction from which said weft thread (W) is fed, said deflecting area consisting of a member (10) having an outer surface inclined towards said picking up cavity (9) and provided, on the side adjacent to the reed (R), with an appendix (11) fitting between two reed teeth (L) to prevent a possible undesired deviation of weft thread W towards reed (R).
8. Device as in claim 7), wherein on the opposite side of appendix 11, the external surface of member 10 ends in correspondence of a rounded bevel (12) ending in said picking up cavity (9) with a direction parallel to the common axis shared of said nozzle (7) and said stretching tube (8).
9. Device as in claim 7, wherein said member (10) consists of a plug closing the outlet of compressed air pipe 6 formed during the drilling of said pipe in the weft deflecting portion (3i).
10. Device as in claim 1, wherein the catching point of the weft thread in said stretching tube (8) is aligned with the plane of the warp yarns (O) when the shed is closed.
11. Device as in claim 1, wherein said compressed air pipe (6) is at least partly housed also inside the thicker portion (3e) of the device and ends with fast connecting means (5) to an external source of compressed air.

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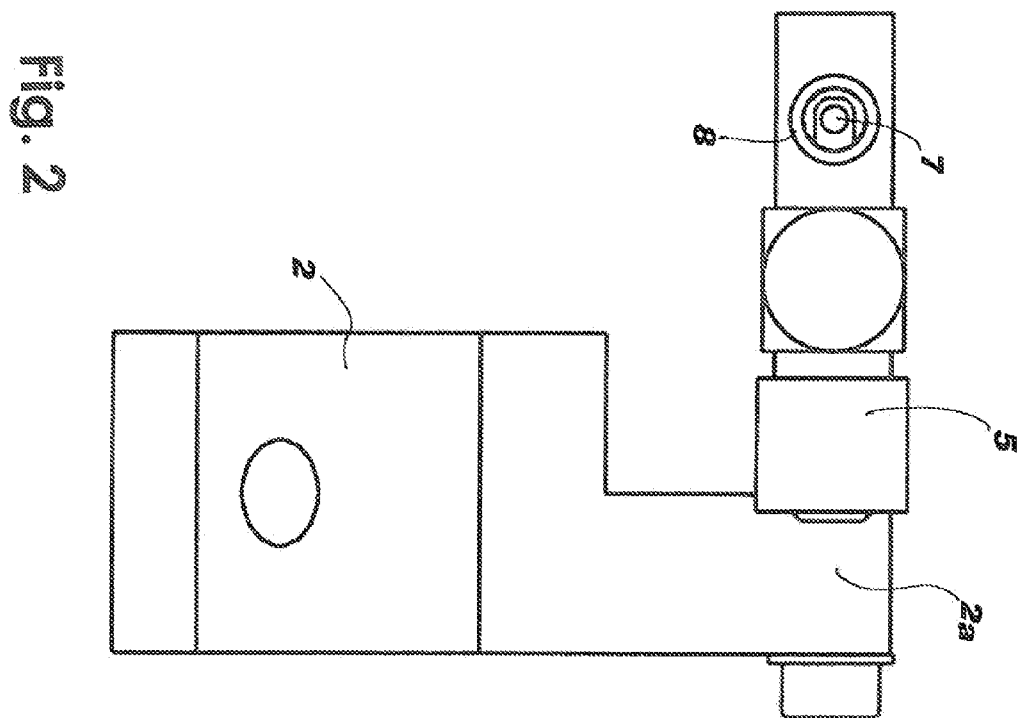
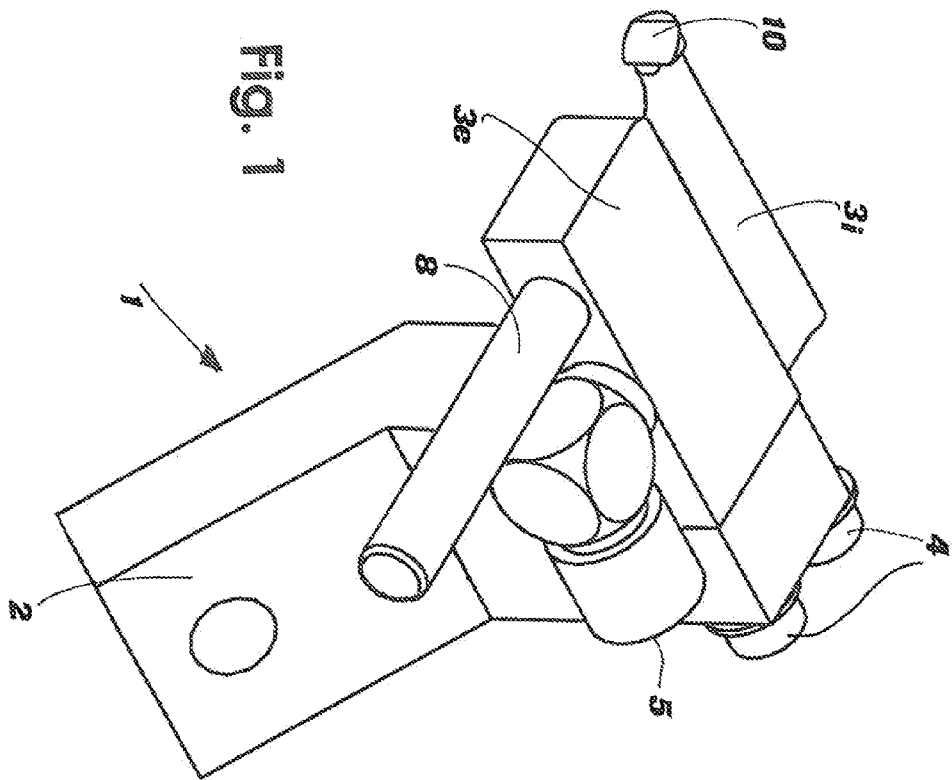
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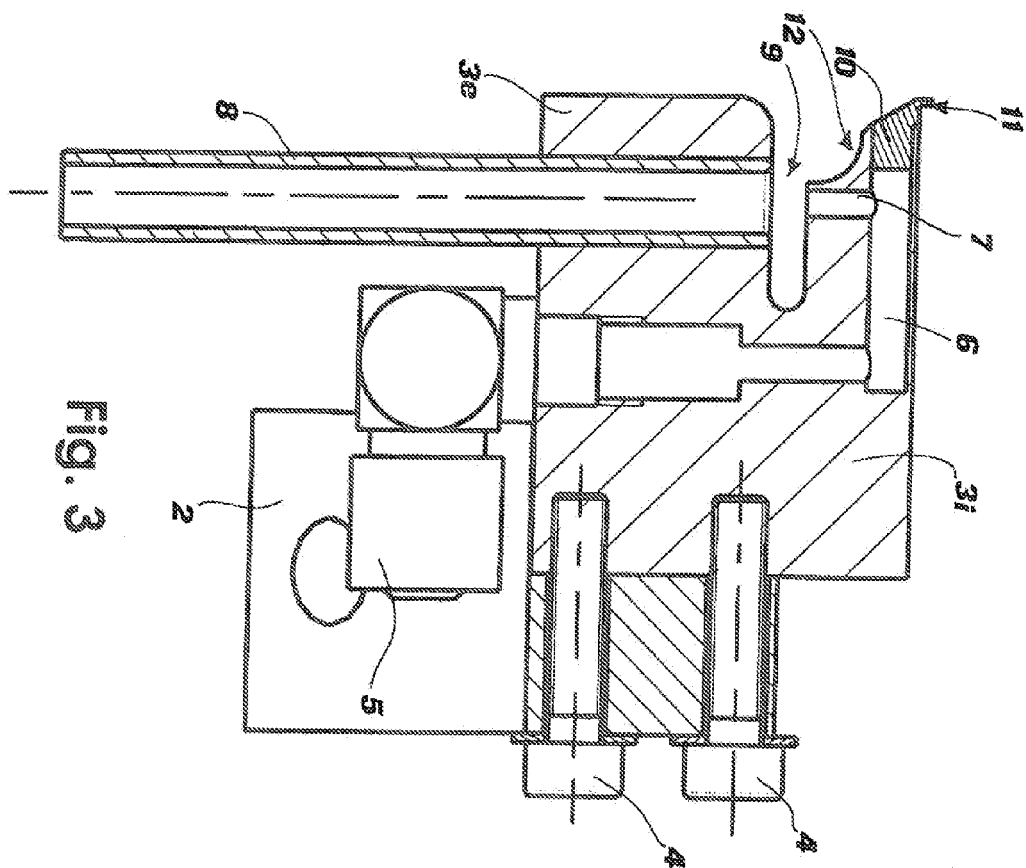
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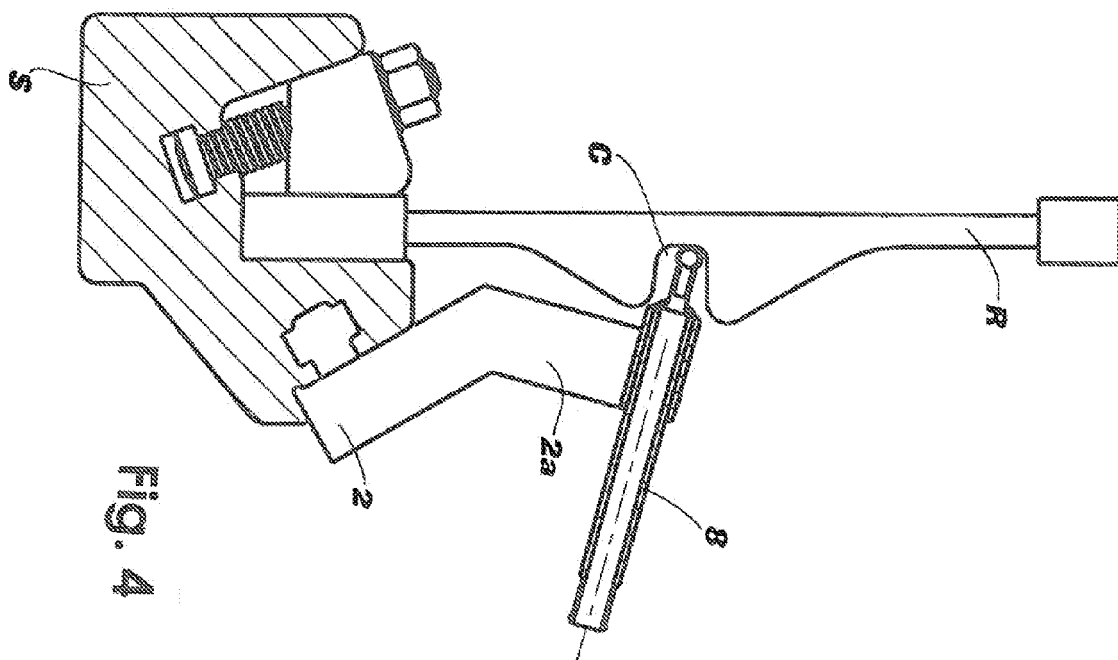
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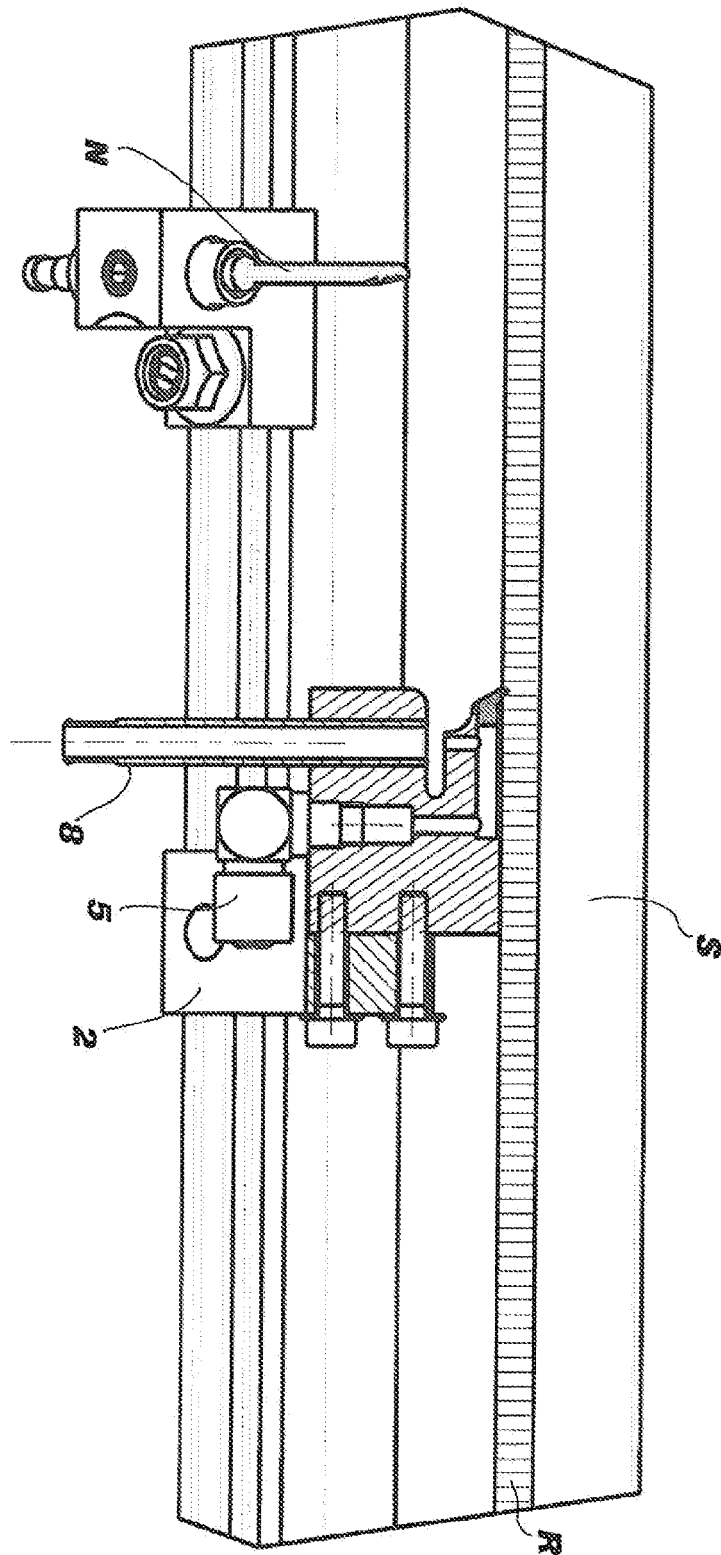


Fig. 5

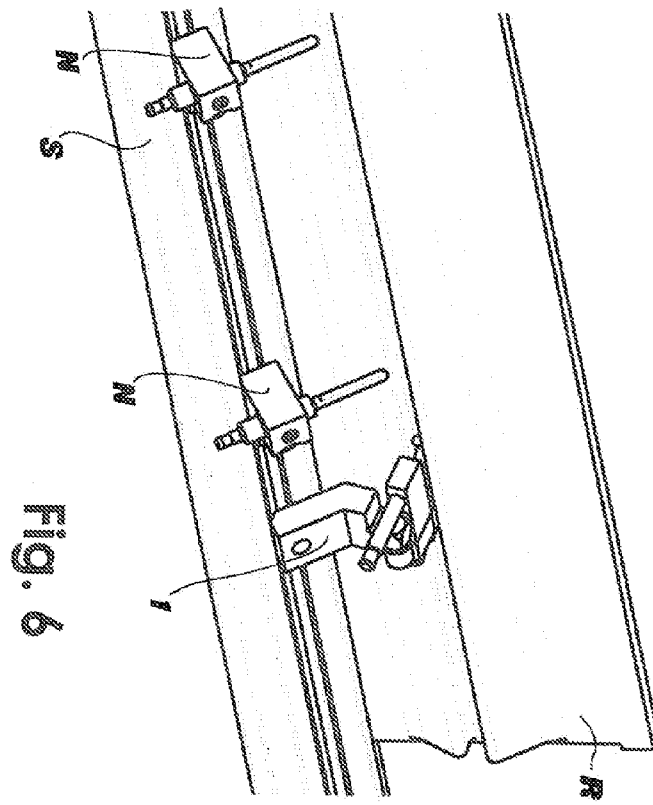


Fig. 6

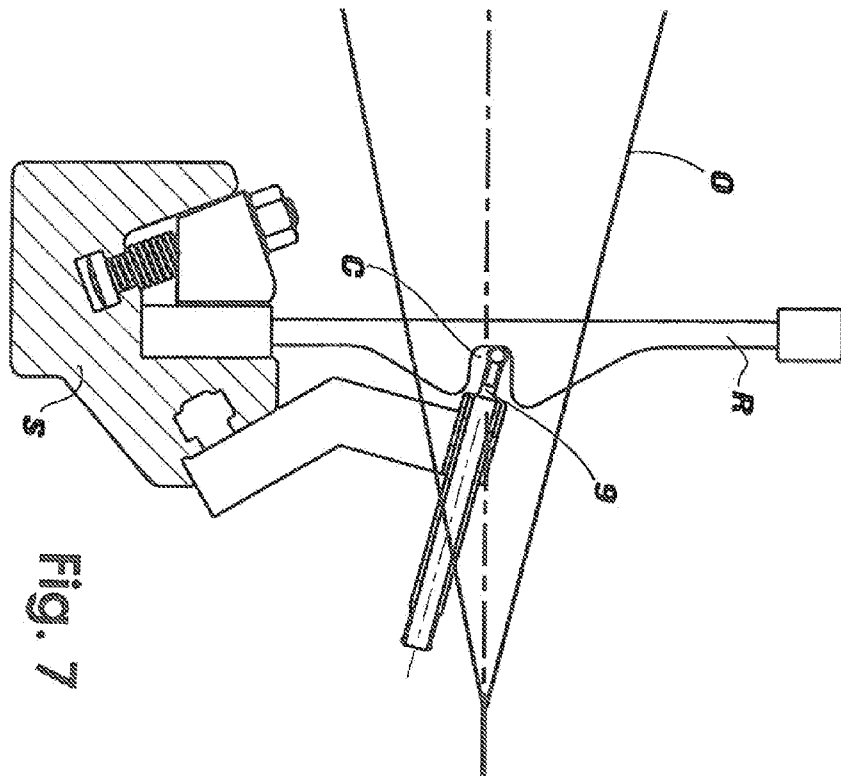


Fig. 7

Fig. 8

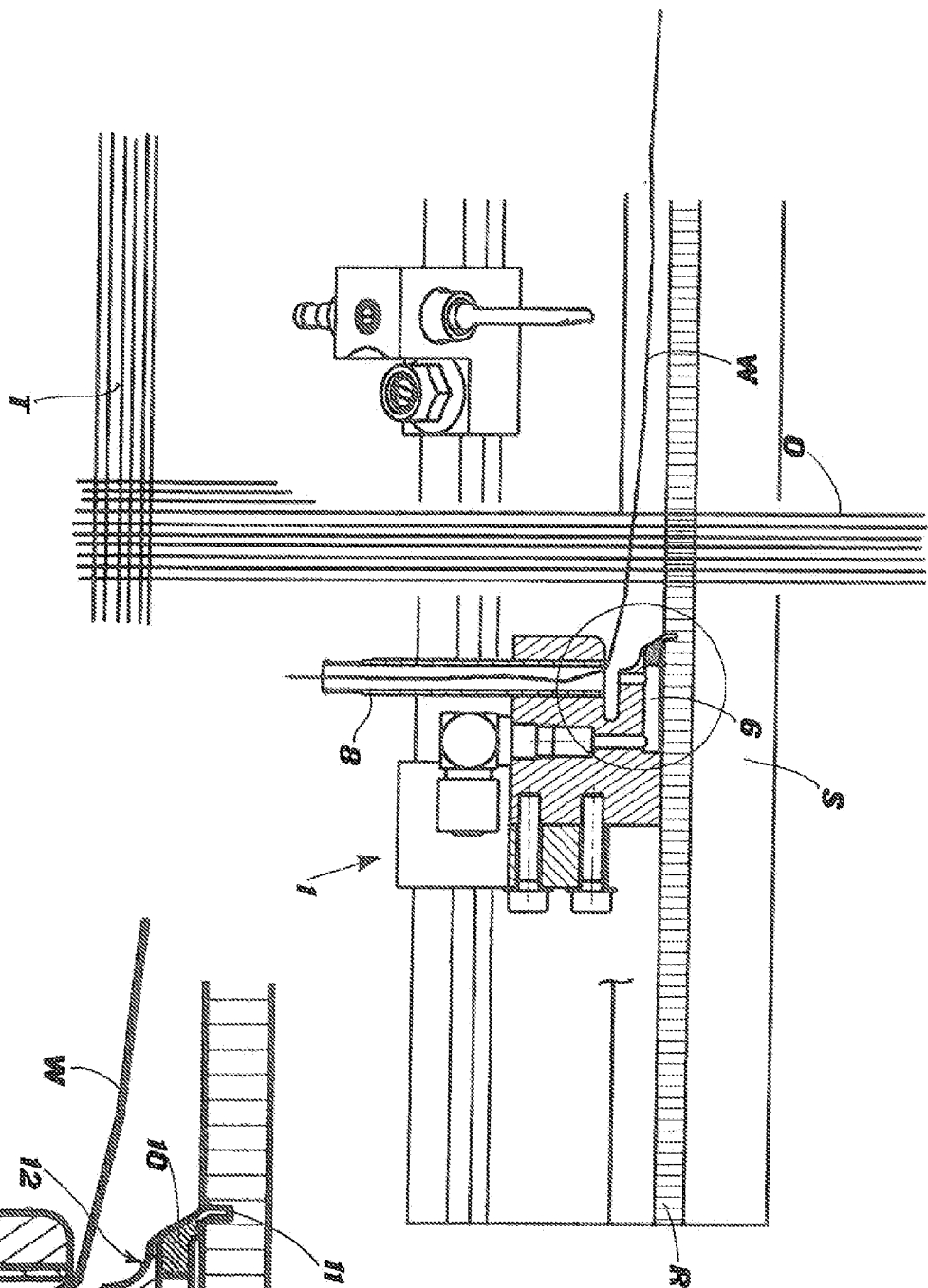
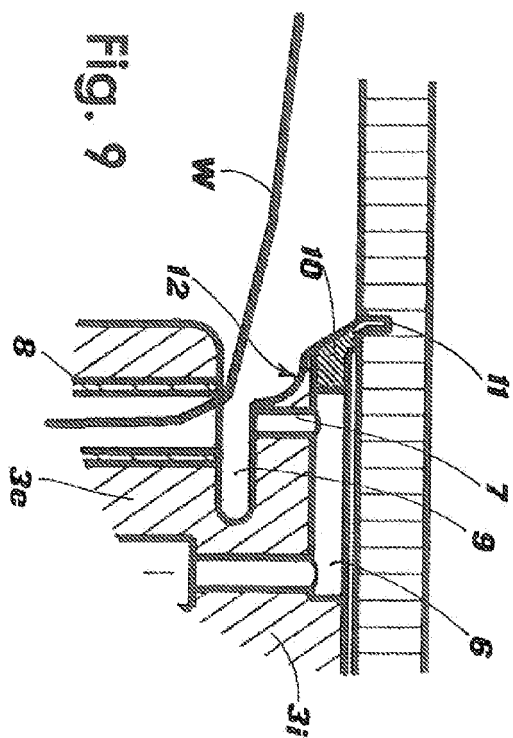


Fig. 9





EUROPEAN SEARCH REPORT

Application Number
EP 10 15 1719

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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Place of search Munich		Date of completion of the search 16 June 2010	Examiner Louter, Petrus
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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