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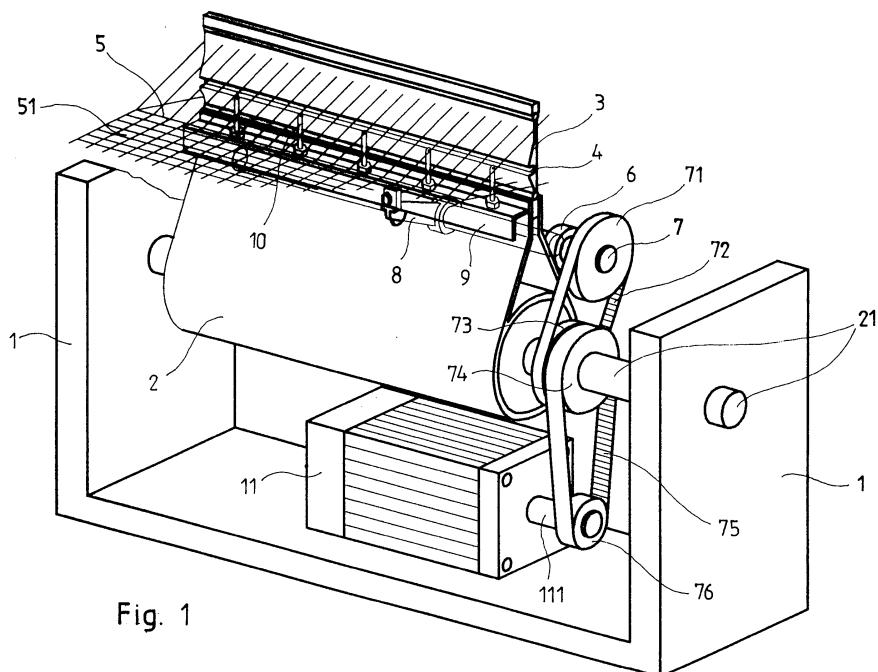
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(54) Control unit for auxiliary jets of a pneumatic weaving machine

(57) Control unit for auxiliary jets (10) of a pneumatic weaving machine comprising a batten (2) coupled with a main drive and having situated thereon a reed (3) with a direct pick channel (4) provided in said reed (3) and having an open side oriented towards a batten line (5), the auxiliary jets (10) being arranged on the weaving

machine batten (2) adjustably in relation to the pick channel (4) and adapted to take up the beat-up position of the auxiliary jets (10) and the pick position of the auxiliary jets (10). The auxiliary jets (10) are coupled with an auxiliary drive (11) separated from the main shaft of the weaving machine.



Description**Technical field**

[0001] The invention relates to a control unit for auxiliary jets of a pneumatic weaving machine comprising a batten coupled with a main drive and having situated thereon a reed with a direct pick channel provided in said reed and having an open side oriented towards a batten line, the auxiliary jets being arranged on the weaving machine batten adjustably in relation to the pick channel and adapted to take up the beat-up position of the auxiliary jets and the pick position of the auxiliary jets.

Background art

[0002] In well-known pneumatic weaving machines comprising a reed consisting of dents having situated therein a direct pick channel with an open profile whose open section is oriented towards the beat-up place, such as described in the CS 249568, the auxiliary jets are firmly fixed to the batten in front of the reed, and the ends of the auxiliary jets with their outlet holes are situated at a small distance in front of the lower forwards protruding reed tooth. During the beat-up movement of the batten, said forwards protruding lower tooth of the reed and the auxiliary jets arranged in position thereto subsequently move from the shed across the lower warp threads and, at the beat-up, take up the position under the edge of the fabric in process of formation. The drawback of the described arrangement of the auxiliary jets and of the pick channel of the reed consists in the influence exerted on the air streams leaving the auxiliary jets due to the obstacle presented to them by the lower protruding tooth of the reed so that a portion of the air of each auxiliary stream gets dispersed without any useful effect into the surroundings of the pick channel of the reed thus decreasing the useful effect of the stream on the weft and, consequently, the reliability of the weft insertion.

[0003] Another well-known device, described in the CZ 213078, also comprises a reed with a direct pick channel with an open profile whose open section is directed towards the beat-up place. The auxiliary jets are arranged on the batten adjustably in the direction of their longitudinal axes so that, in the pick position, they are extended to a position in which their end sections comprising the outlet holes come to lie in front of the open section of the pick channel whereas in the beat-up position they get retracted in front of the lower tooth of the pick channel so that they do not obstruct the beat-up of the weft. The reversible extending/retracting movement of the auxiliary jets is synchronized with the reversible movement of the pick channel and is controlled by mechanisms coupled with the main shaft of the weaving machine. Although the auxiliary jets can be adjusted in relation to the pick channel so as to ensure good auxiliary air momentum transmission to the weft, said adjust-

ment takes place only at the relative rest of the two mechanisms, i.e., at the moment in which the auxiliary jets are in their upper dead positions. Outside this one moment the effectiveness of the auxiliary air streams is

5 subject to variations and in actual application on the weaving machines the air stream momentum transmission to the weft is even in this solution not sufficient.

[0004] In view of the above said, the invention aims to create a control unit for auxiliary jets of a pneumatic weaving machine with a high momentum transmission 10 of the auxiliary air streams coming from the auxiliary jets on the weft moving in the pick channel during the pick operation.

15 Principle of the invention

[0005] The aim of the invention has been reached by a control unit for auxiliary jets of a pneumatic weaving machine according to the invention whose principle consists in that the auxiliary jets are coupled with an auxiliary drive separated from the main shaft of the weaving machine.

[0006] The advantage of the solution consists in the independence of the movement of the auxiliary jets in 25 relation to the pick channel of the reed from the movement of the main shaft of the weaving machine thus permitting the auxiliary jets to keep their optimum position in relation to the pick channel throughout the time interval of the weft pick operation regardless of the fact that 30 the pick channel of the reed moves during the weft pick operation.

[0007] From the point of view of the simplicity of the control unit, it is advantageous to arrange the auxiliary drive as a common one for all the auxiliary jets.

[0008] The auxiliary jets are preferably seated on a 35 rocking shaft which is in its turn mounted on the batten of the weaving machine and coupled with the auxiliary drive. Said rocking shaft coupled with the auxiliary drive provides for the movement of the auxiliary jets in relation to the pick channel.

[0009] Preferably, the auxiliary jets are mounted on a supporting rail fixed to the rocking shaft by means of slay swords.

[0010] To optimize the path of the auxiliary jets in 45 relation to other parts of the weaving machine, the rocking shaft is mounted on the rear part of the batten, and the slay swords pass through the slots in the batten into the space in front of the front side of the batten where they carry the supporting rail with the auxiliary jets.

[0011] In a design arrangement of the weaving machine, the rocking shaft is mounted on the front side of the batten.

[0012] From the point of view of the design arrangement of the pneumatic weaving machine, the auxiliary 55 drive can be mounted coaxial either with the batten or with the rocking shaft, or also it can be mounted on the weaving machine frame and in a suitable manner coupled with the rocking shaft.

[0013] In all the variants, the auxiliary drive is preferably made as a servomotor or as a stepping motor.

Description of the drawings

[0014] The examples of embodiment of the control unit according to the invention are schematically shown in the accompanying drawings in which Fig. 1 is an axonometric view of the weaving machine batten with a reed and with auxiliary jets mounted on a rocking shaft which is coupled with an auxiliary drive separated from the main shaft of the weaving machine, Fig. 2 is a cross section of the device shown in Fig. 1 showing actual positions of the auxiliary jets and of the pick channel of the reed at a given stage of operation, Fig. 3 is a variant with the auxiliary drive mounted coaxial with the rocking shaft, and Fig. 4 is a variant with the auxiliary drive mounted on the machine frame coaxial with the batten.

Specific description

[0015] The invention will be described on a well-known pneumatic weaving machine out of which only the parts relevant to the control of the auxiliary jets will be described.

[0016] The pneumatic weaving machine comprises a frame 1 in which there is in a well-known manner mounted for rotation a shaft 21 of a batten on which a batten 2 is fixed. The shaft 21 of the batten 2 is in a well-known manner coupled with a not shown main drive of the pneumatic weaving machine providing for the reversible swinging movement of the batten 2. Fixed to the batten 2 is a well-known reed 3 in whose gliders there is in a well-known manner provided a direct pick channel 4 whose open side is oriented towards a beat-up straight line 5 of a woven fabric 51.

[0017] Mounted on the batten 2 are at least two brackets 6 housing by means of bearings a well-known rocking shaft 7 mounted in the shown example of embodiment on the rear part of the batten 2, i.e., on the side turned away from the beat-up straight line 5. Fastened to the rocking shaft 7 are slay swords 8 passing through slots 22, 23 in the batten 2 into the space situated in front of the front side of the batten 2 where they carry supporting rails 9 fixed to them. To the supporting rail 9 there are in one of the well-known ways adjustably fixed auxiliary jets 10 which are in a well-known manner such as by means of not shown tubes connected to a pressure air distribution system.

[0018] The actual embodiments of the brackets 6, their number, the dimensions of the rocking shaft 7 or the number, and the dimensions of the slay swords 8 do not fall within the scope of the invention, vary in accordance with the technical solution chosen, and depend in particular on the value of the dynamic forces. In all possible examples of embodiment, the rotation axis of the rocking shaft 7 lies below the weaving plane 52, and its actual position can be determined by calculation so as

to permit the realization of the required path 102 of the absolute motion of the the outlet holes 101 of the auxiliary jets 10 at a technologically acceptable angular velocity ω_u of the feeding movement of the batten 2 and angular velocity ω_R of the relative movement of the rocking shaft 7.

[0019] In the embodiment shown in Fig. 1, one end of the rocking shaft 7 carries a secondary driven pulley 71 fixed thereto and embraced by a secondary toothed belt 72 by means of which it is coupled with a secondary driving pulley 73 which is in a well-known manner freely mounted on the shaft 21 of the batten 2 so that it can freely rotate in relation to the shaft 21. Also freely mounted on the shaft 21 of the batten 2 is a primary driven pulley 74 connected with the secondary driving pulley 73 in one of the well-known manners ensuring a slip-free torque transmission from the primary driven pulley 74 to the secondary driving pulley 73 independently from the rotation of the shaft 21 of the batten 2. The primary driven pulley 74 is embraced by a primary toothed belt 75 by means of which it is coupled with a primary driving pulley 76 fixed on an auxiliary drive shaft 111 of an auxiliary drive 11 mounted on the weaving machine frame 1 and made in the shown embodiment as a servomotor. The auxiliary drive 11 is separated from the main shaft of the weaving machine and is thus independent from the main drive of the weaving machine. To reduce the influence of the torsion of the rocking shaft 7, another not shown servomotor can be coupled with the other end of the rocking shaft 7. The movements of the two servomotors 7 will be mutually synchronized.

[0020] In the example of embodiment shown in Fig. 3, the auxiliary drive shaft 111 is arranged coaxial with the rocking shaft 7 with which it is coupled in one of the well-known methods ensuring slip-free transmission of the torque from the auxiliary drive 11 to the rocking shaft 7. The auxiliary drive 11 is by a fixing means 12 fixed to the batten 2 of the weaving machine. In this embodiment, as well, synchronized auxiliary drives can be provided on each end of the rocking shaft 7.

[0021] In the example of embodiment shown in Fig. 4, the auxiliary drive 11 is fixed to the weaving machine frame 1, and the shaft 111 of the auxiliary drive 11 is arranged coaxial with the shaft 21 of the batten 2. The shaft 21 of the batten 2 is in a well-known manner coupled with the not shown main drive of the weaving machine.

[0022] In the shown example of embodiment, the shaft 111 of the auxiliary drive 11 is mounted for rotation in a bearing 24 provided in the batten 2. The shaft 111 of the auxiliary drive 11 is free to rotate independently from the rotation of the shaft 21 of the batten 2. Fixed to the shaft 111 of the auxiliary drive 11 is a driving pulley 761 embraced by a toothed belt 751 by means of which it is coupled with a driven pulley 711 fixed to the end of the rocking shaft 7.

[0023] The invention is not limited to the described examples of embodiment but includes also their equiva-

lents and modifications in which the rocking shaft can be seated in the cavity of the batten or on its front part.

[0024] According to a not shown example of embodiment, the auxiliary jets are seated on the batten 2 adjustably in the direction of their longitudinal axes and are coupled with a mechanism providing for their reversible straight movement. The mechanism is coupled with at least one servomotor or with another auxiliary drive separated from the main shaft of the weaving machine.

[0025] In an alternative embodiment of this solution, each auxiliary jet is coupled with an independent drive so that the auxiliary drive is made as a system of mutually synchronized individual drives.

[0026] In all the alternative embodiments, the auxiliary drive can be made as a servomotor, a stepping motor or another suitable motor separated from the main shaft of the weaving machine.

[0027] During the weaving process, the shaft 21 of the batten 2 is in a well-known manner, for instance by means of a cam or joint mechanism, coupled with the not shown main machine drive and carries out a reversible rotation movement characterized by an angular velocity ω_y of the feeding movement of the batten 2. The movement of the shaft 21 is shared by the batten 2, the reed 3, and the rocking shaft 7. During the weaving process, the batten 2, the reed 3, and the rocking shaft 7, when reaching their respective dead positions, take up a pick position A1 and a beat-up position B1, as is shown in Fig. 2. At the same time, the rocking shaft 7 is driven by the auxiliary drive 11 imparting to it a reversible rotary movement characterized by an angular velocity ω_R of the relative movement of the rocking shaft 7. Said movement of the rocking shaft 7 is shared by the components fixed to it, i.e., by the slay swords 8, by the supporting rail 9, and by the auxiliary jets 10. During the weaving process, the auxiliary jets 10 carry out a reversible movement whose components are, on the one side, the reversible rotary movement of the batten 2 imparted to the rocking shaft 7 and, on the other side, the additional reversible rotary movement of the rocking shaft 7. In the pick position A1 of the reed 3, the auxiliary jets 10 are in a well-known manner arranged to a well-known optimum position A21 of their outlet holes 101 in relation to the direct pick channel 4 of the reed 3 and take up their pick position A2. At this stage, the warp threads create the shed in the well-known way. At the first stage of the movement of the reed 3 from the pick position A1 to the beat-up position B1 generated by the forward rotary movement of the shaft 21 of the batten 2, the auxiliary drive 11 remains at rest, the auxiliary jets 10 are carried by the batten 2, and their outlet holes 101 take up the same position in relation to the direct pick channel 4 of the reed 3 as in the pick position A1, A2 which will be hereinafter referred to as the optimum position A21 of the auxiliary jets 10 in relation to the direct pick channel 4.

[0028] Only in the end stage of the movement of the reed 3 from the pick position A1 to the beat-up position

B1 is activated the auxiliary drive 11 which then begins to impart to the rocking shaft 7 a forward rotary movement transmitted by way of the slay swords 8 and of the supporting rail 9 fixed to them to the auxiliary jets 10 that

5 receive in this way additional forward rotary movement resulting in increasing the distance between the outlet holes 101 of the auxiliary jets 10 and the direct pick channel 4 of the reed 3 and, consequently, in evacuating the space in front of the open side of the direct pick channel 4 for the weft beat-up into the beat-up line 5. The auxiliary jets 10 move below the weaving plane 52 and take up their beat-up position B2.

[0029] During the backward rotary movement of the shaft 21 of the batten 2, the reed 3 moves from the beat-up position B1 to the pick position A1. Also the auxiliary drive 11 of the rocking shaft 7 is set to its backward run so that the outlet holes 101 of the auxiliary jets 10 begin to approach the open side of the direct pick channel 4 of the reed 3 and reach their optimum positions A21 in 10 relation to the pick channel 4 before the auxiliary jets 10 reach their beat-up positions A1, A2.

[0030] Due to the independence of their additional reverse movement, the auxiliary jets 10 remain in their optimum position A21 in relation to the direct pick channel 25 4 for the predetermined part of the weaving cycle in which the weft pick takes place.

Claims

- 30 1. Control unit for auxiliary jets (10) of a pneumatic weaving machine comprising a batten (2) coupled with a main drive and having situated thereon a reed (3) with a direct pick channel (4) provided in said reed (3) and having an open side oriented towards a batten line (5), the auxiliary jets (10) being arranged on the weaving machine batten (2) adjustably in relation to the pick channel (4) and adapted to take up the beat-up position of the auxiliary jets (10) and the pick position of the auxiliary jets (10), characterized by that the auxiliary jets (10) are coupled with an auxiliary drive (11) separated from the main shaft of the weaving machine.
- 35 2. Control unit as claimed in Claim 1, characterized by that the auxiliary drive (11) is common for all of the auxiliary jets (10).
- 40 3. Control unit as claimed in Claim 2, characterized by that the auxiliary jets (10) are mounted on a rocking shaft (7).
- 45 4. Control unit as claimed in Claim 3, characterized by that the auxiliary jets (10) are mounted on a supporting rail (9) which is fixed on slay swords (8) which in their turn are fixed on the rocking shaft (7).
- 50 5. Control unit as claimed in Claim 4, characterized by

that the rocking shaft (7) is mounted on the rear side of the batten (2), and the slay swords (8) pass through the slots (22,23) in the batten (2) into the space in front of the front side of the batten (2) where they (8) carry the supporting rail (9) with the auxiliary jets (10). 5

6. Control unit as claimed in Claim 4, characterized by that the rocking shaft (7) is mounted on the front side of the batten (2). 10
7. Control unit as claimed in any of Claims 3 to 6, characterized by that the auxiliary drive (11) is mounted coaxial with the batten (2). 15
8. Control unit as claimed in any of Claims 3 to 7, characterized by that the auxiliary drive (11) is mounted coaxial with the rocking shaft (7). 20
9. Control unit as claimed in any of Claims 3 to 7, characterized by that the auxiliary drive (11) is mounted on the weaving machine frame (1) and is coupled with the rocking shaft (7) by means of a countershaft mounted coaxial with the batten (2). 25
10. Control unit as claimed in any of Claims 1 to 9, characterized by that the auxiliary drive (11) is made as a servomotor or as a stepping motor. 30

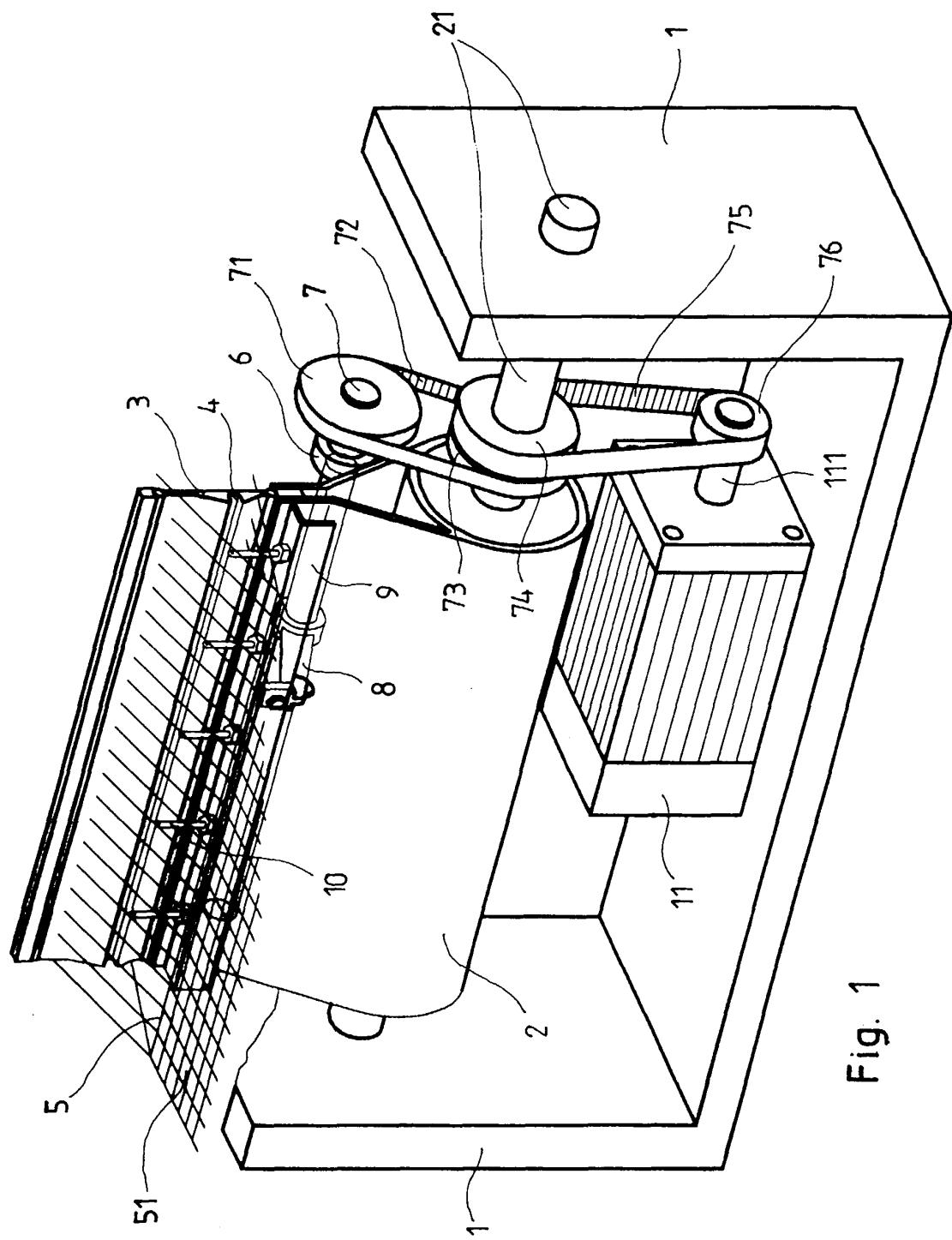
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Fig.

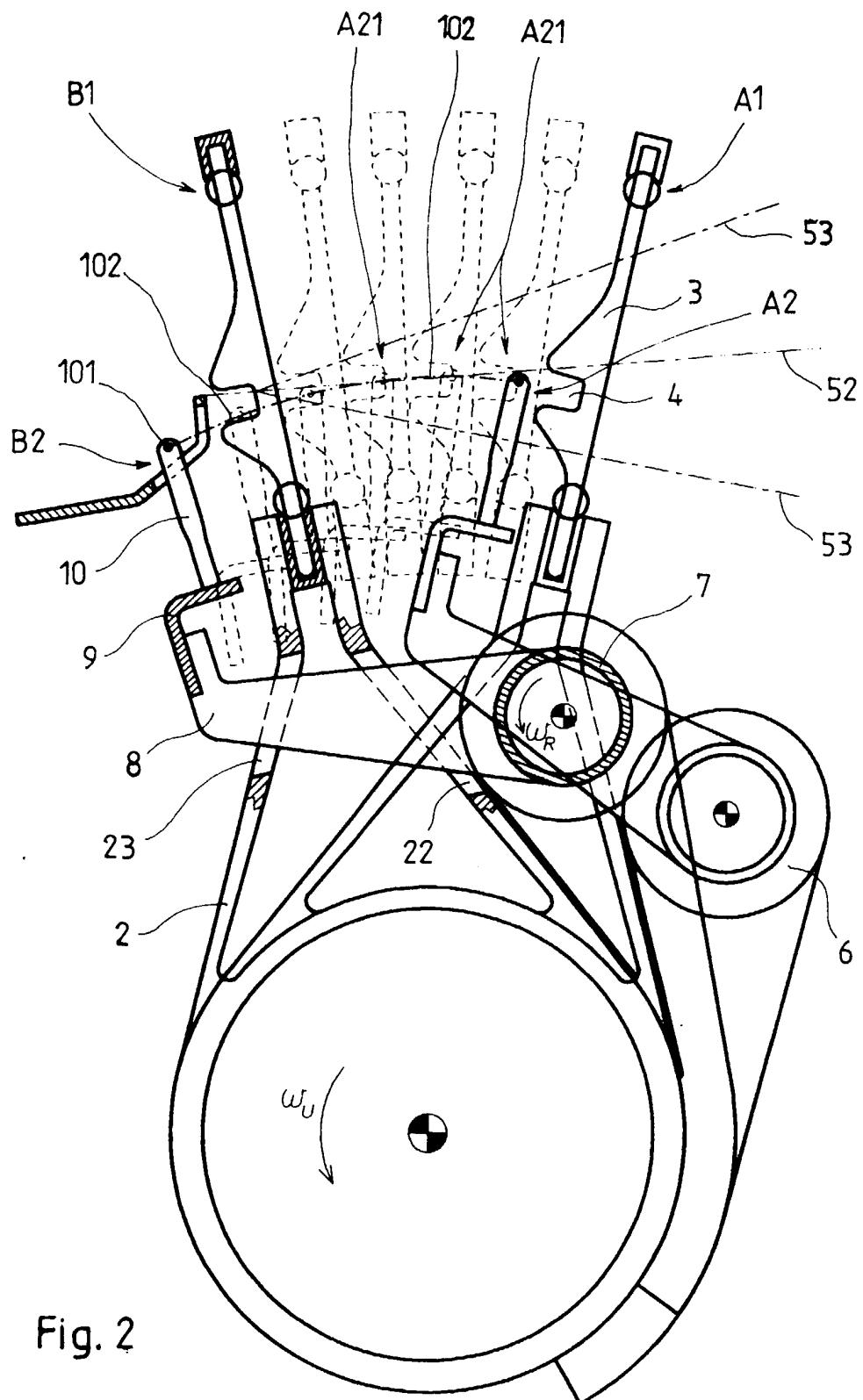
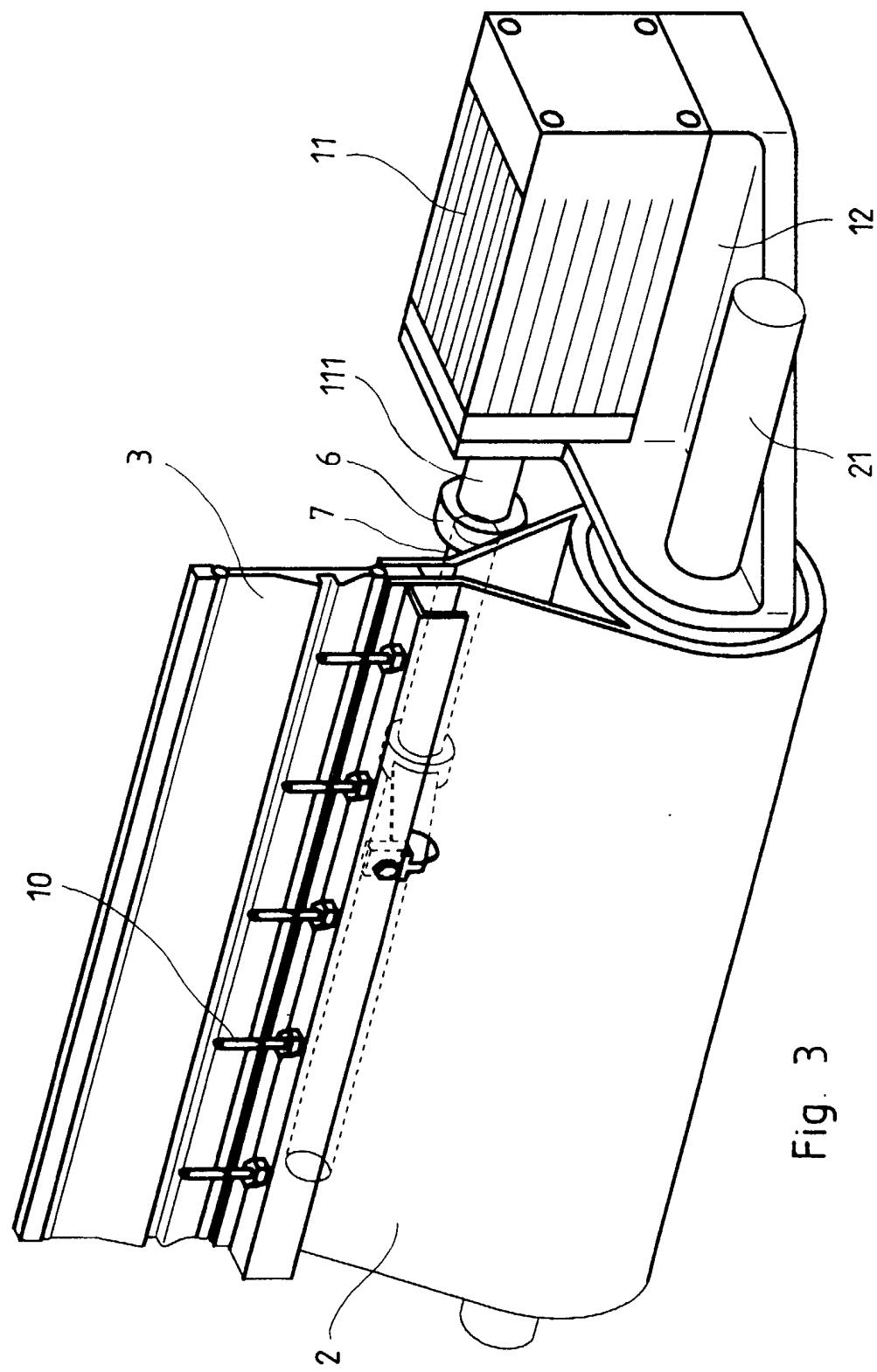


Fig. 2



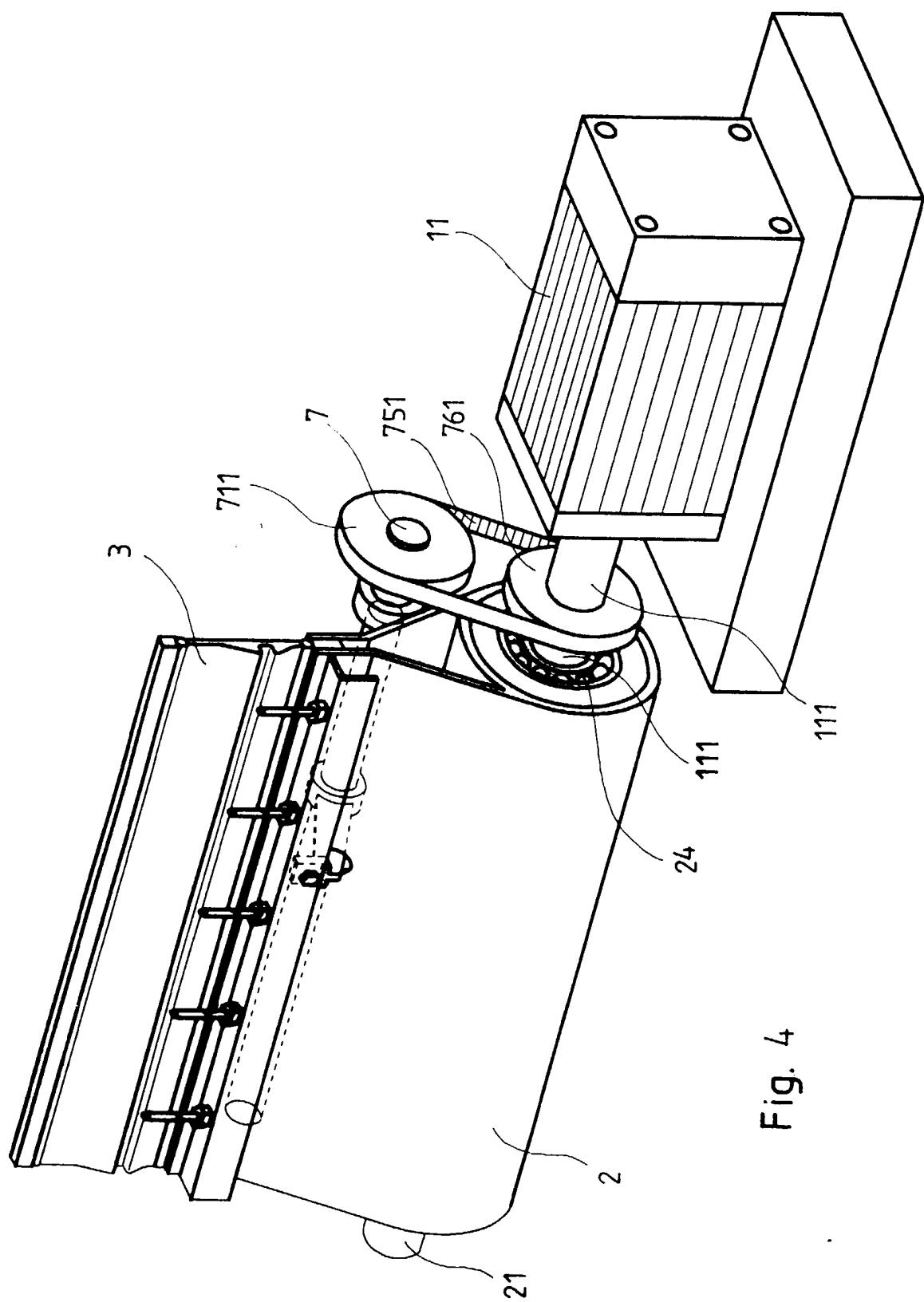


Fig. 4



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Application Number
EP 00 50 0010

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim							
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<p>The present search report has been drawn up for all claims</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 33%;">Place of search</td> <td style="width: 33%;">Date of completion of the search</td> <td style="width: 34%;">Examiner</td> </tr> <tr> <td>THE HAGUE</td> <td>19 April 2000</td> <td>Boutelegier, C</td> </tr> </table>				Place of search	Date of completion of the search	Examiner	THE HAGUE	19 April 2000	Boutelegier, C
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CATEGORY OF CITED DOCUMENTS		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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**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 00 50 0010

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