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(54) A Distribution Valve

(57) A device for controlling pressure fluid distribution, particularly in jet weaving machines in which opening of a valve member (6) with respect to a seating (10) is achieved by means of an eccentric (3) on which is mounted a bearing ring (4), the bearing ring (4) acting on a piston (14) having a stop (15), the piston (14) acting resiliently in a tie rod (12) which acts directly on the valve member (6) which is urged resiliently onto its seating (10).

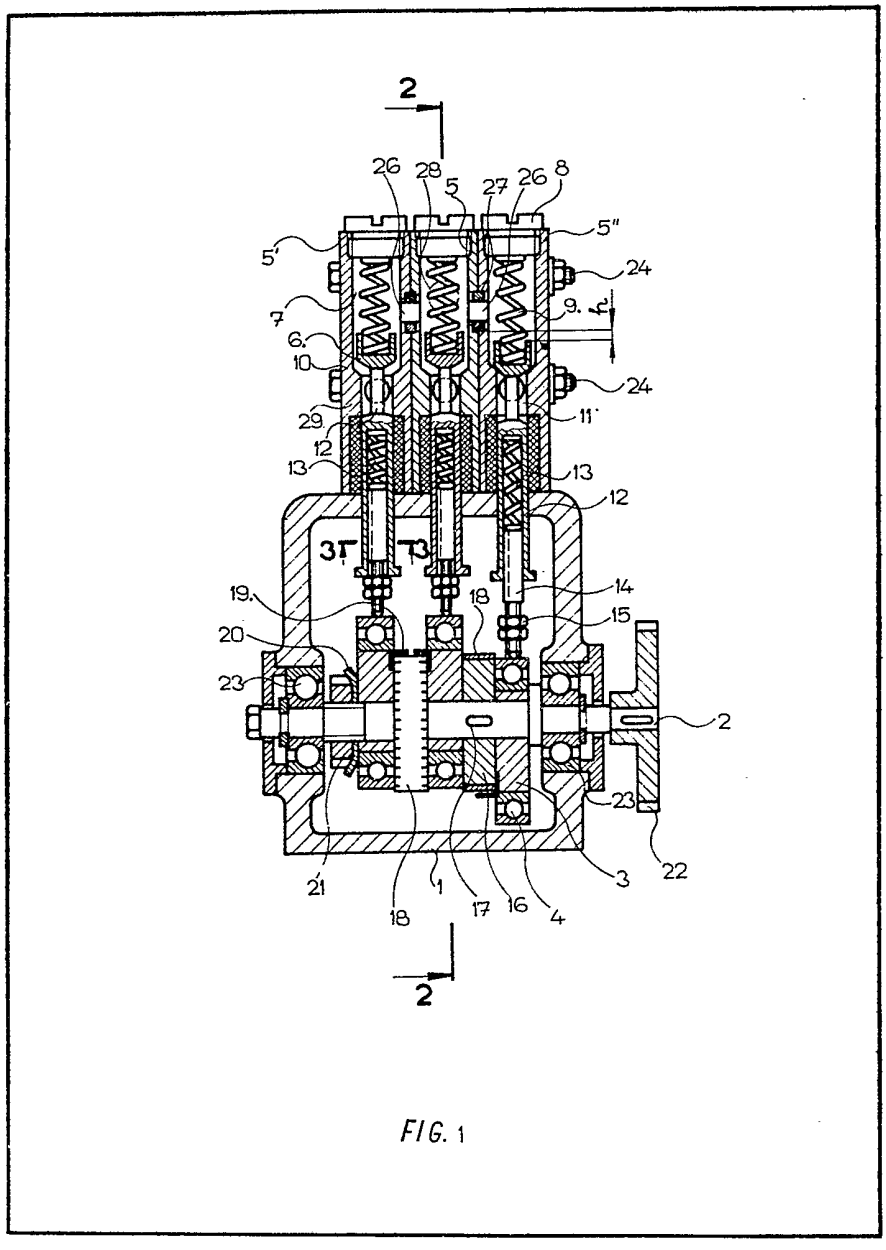

FIG. 1

The drawings originally filed were informal and the print here reproduced is taken from a later filed formal copy.

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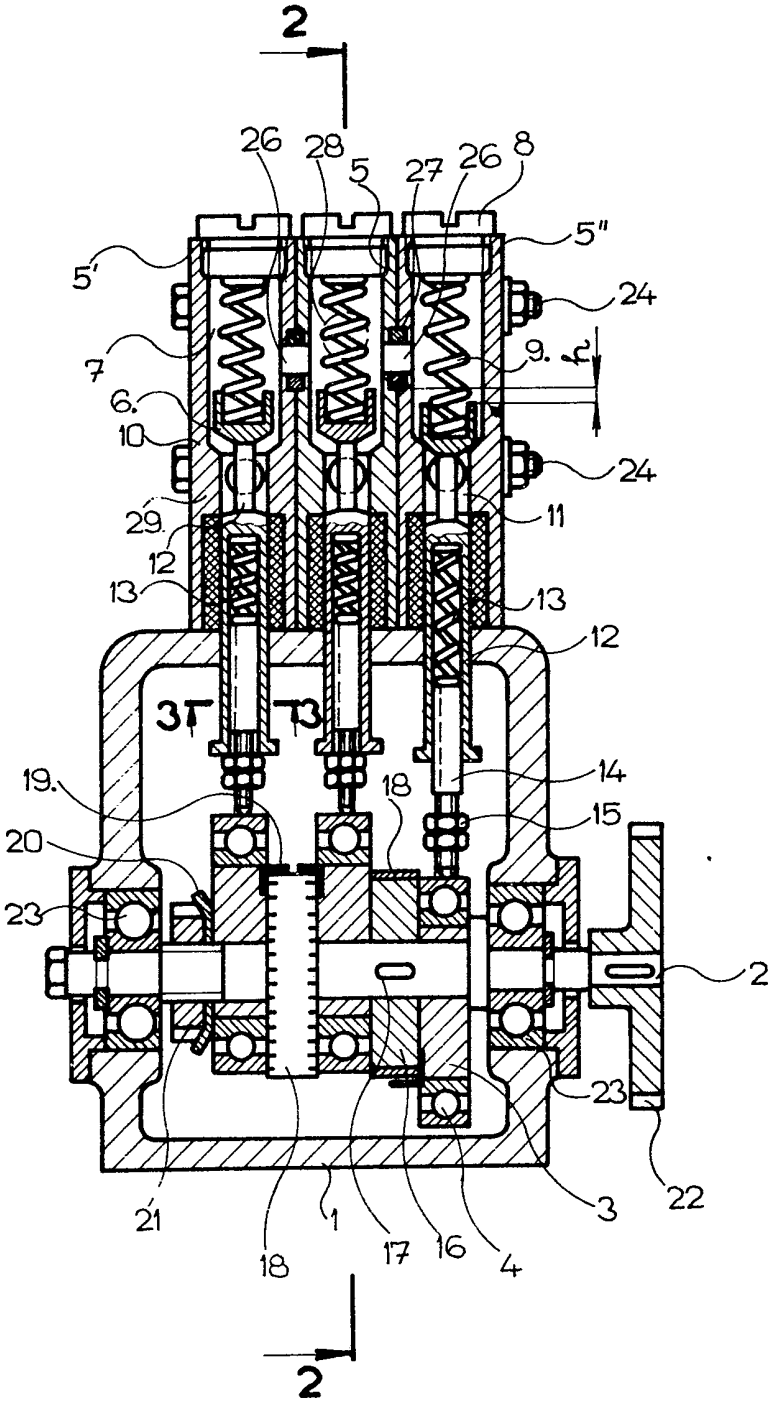

FIG. 1

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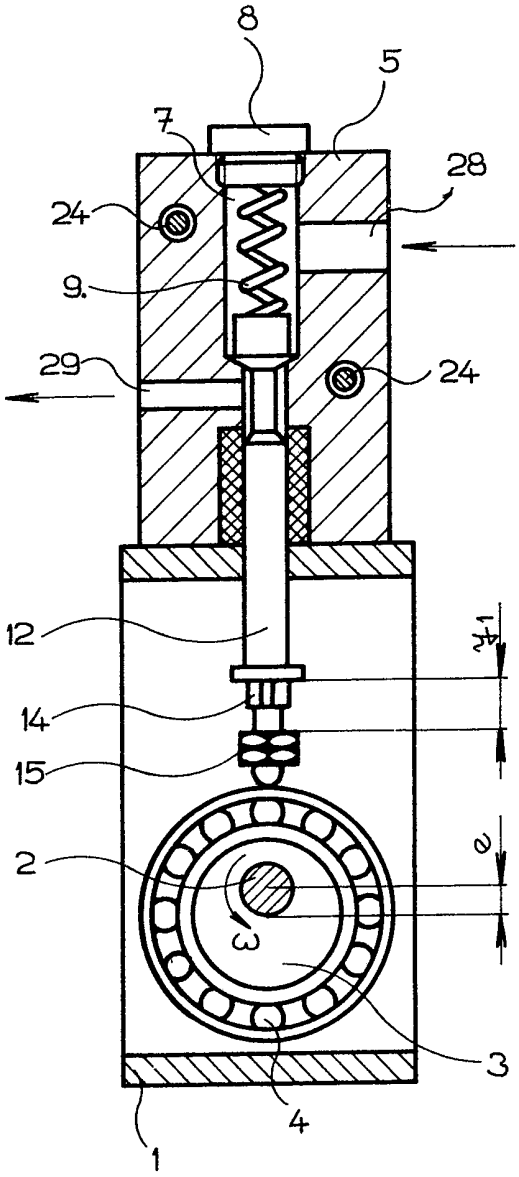

FIG. 2

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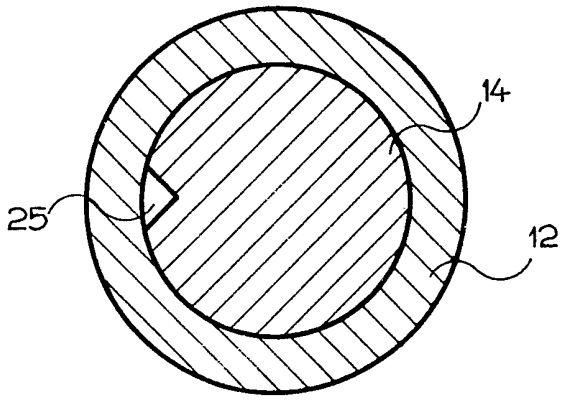

FIG. 3

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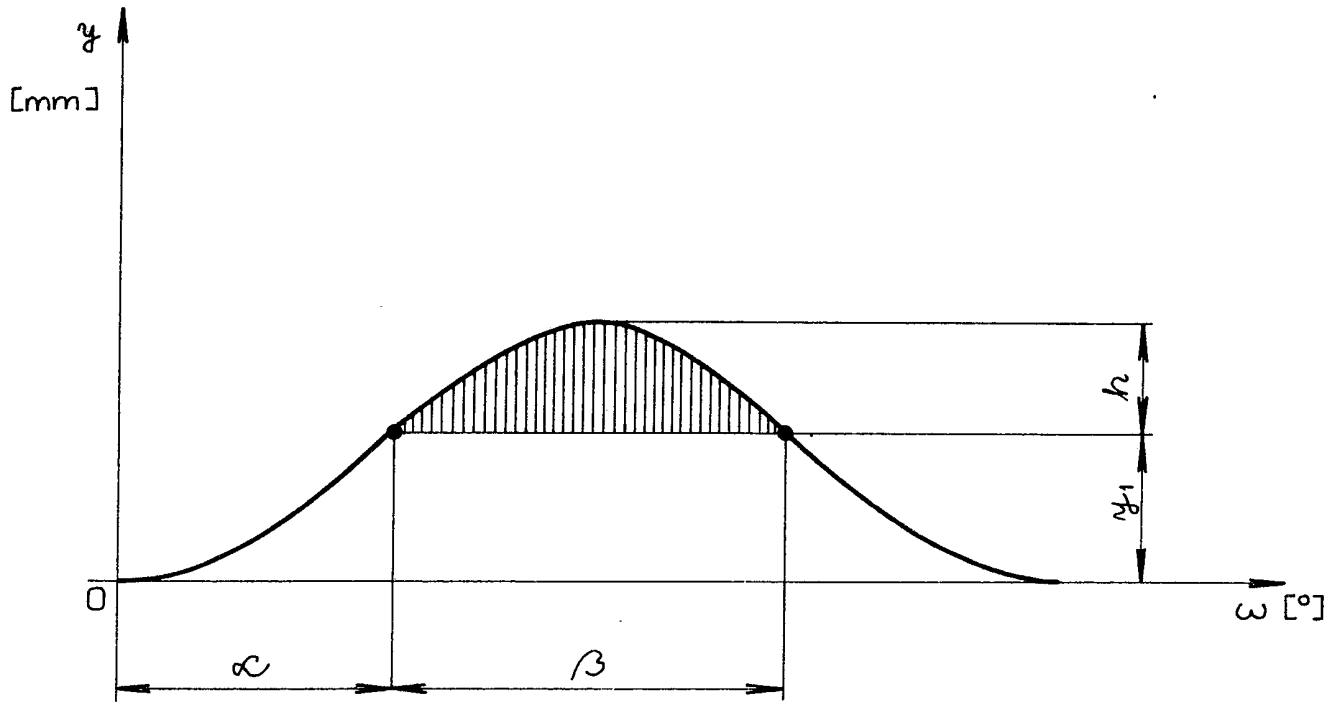

FIG. 4

SPECIFICATION

A Device for Controlling Pressure Fluid Distribution, Particularly in Jet Weaving Machines

The present invention relates to a device for controlling pressure fluid distribution, particularly in jet weaving machines.

Efficient weaving machines, particularly jet weaving machines use one inserting nozzle for a pulse weft insertion into the shed, but this is usually insufficient for larger weaving widths. Beside the main nozzle, which acts upon the weft so that is it withdrawn from the magazine by action of pressure fluid and accelerated in an inserting device, e.g. a confusor, the weft is acted upon by the pressure fluid by active elements distrubuted along the weft inserting device through the warp threads shed. By means of active elements with additional pressure fluid sources, the efficiency of weft insertion by the main mozzle is enhanced. A pressure wave is moreover formed, which acts upon the weft, particularly on its front part, which is given a part of the kinetic energy of the pressure wave, so that a motion is imparted to the weft. In order to control the pulses in the required rhythms of weft insertion and synchronously with the motion of the slay and the healdshafts of the weaving machine, it is necessary to control the output of the pressure fluid from both the nozzle and the active elements. Simultaneously, the purpose is to achieve a continuous weft motion, which must be controlled by a suitably built velocity field, particularly by intermediary of pressure fluid leaving the active elements, to obtain an optimum, e.g. a successive action upon the front part of the weft in the shed path. The adequate velocity field must be formed even in view of the yarn kinds and their mass, this influencing even the course of the insertion time.

Mechanisms for controlling the distribution of pressure fluid into the nozzle and the active elements, hitherto known for securing the appropriate activities usually use two arrangements best known.

In known mechanisms, used for distributing pressure fluid to the nozzle and to the active elements, spring elements with halves are used, which are controlled by cams. The transfer of the motion of the rotating cam to the valve cone is performed by means of a tie rod provided with a rotatable roller or a sliding block, which are in contact with the circumferential surface of the cam on a shaft coupled with the driving means of the weaving machine.

The outflow of the pressure fluid at the required moments and the time gap from the nozzle and the active elements is given by the shapes of the cams on the shaft of the mechanism for controlling the distribution of pressure fluid, a precise and particular adjustment of the angular positions of cams as well as operative changes of the elements coupled thereto being necessary.

The disadvantage of this known construction thus consists in a particular angular adjustment of the positions, in which the valve cone opens the inlet and closes the outlet of pressure fluid to the nozzle and the active elements. Simultaneously, no simple timing is achieved, i.e. the re-arrangement of means for prolonging or shortening the time gap for pressure fluid supply, particularly to the separately arranged active elements.

The known mechanism shows further disadvantages, which show themselves particularly in high efficiency weaving machines. When using a sliding block on the valve tie rod, both the cam and the sliding block, are subdued to wear, as they are in continuous contact. However, when replacing the sliding block by a roller, then due to higher speed of rotation of the roller not only the cam and the roller surface undergo wear, but also the rotating means e.g. the roller shaft. Due to excessive wear, the clearance between the connections of said means is bigger, this resulting in response delay in view of the required cycles of the weaving machine operation and in lower quality of the fabric produced.

Another known mechanism for controlling the distribution of pressure fluid for weft insertion is based on electronic control of solenoid valves responding to predetermined phases of operating cycles of the weaving machine. The rotating means, e.g. the main shaft of the weaving machine is substantially provided by a usually contactless scanning means of its angular position. The signals from said scanning means are brought by intermediary of signal shaping circuit to an electronic circuit, which comprises usually a plurality of monostable sweep circuits, in which the signals are distributed to amplifiers and the modified signals, or pulses, respectively are conducted to the controlling inputs of solenoid valves which are intended for controlling the moment of opening or closing the pressure fluid input, the time gaps of blowing by intermediary of the nozzle and active elements, e.g. additional blowing gliders along the weft inserting device of the weaving machine. A change of timing the pressure fluid input is made by modifying the time constants of the monostable sweep circuits by e.g. variable resistors.

The principle of the mechanism is, according to other known arrangements changed and improved by development, as this mechanism shows several disadvantages.

A substantial disadvantage consists in relatively considerable purchasing and maintenance costs and high requirements as to operation and lifetime of electrically controlled operating elements.

It is an object of the present invention that the above disadvantages are substantially mitigated.

According to the invention there is provided a device for controlling the distribution of pressure fluid, particularly for jet weaving machines

comprising a valve member pressed onto a seating by means of first resilient means, the valve member being acted on by an outer ring of an anti-friction bearing mounted on an eccentric by means of a piston mounted in a tie rod, a second resilient means acting between the tie rod and the piston, a stop being provided on the piston to limit movement of the piston with respect to the tie rod.

The eccentric with the anti-friction bearing may be made immovable on the shaft between rings, which are connected to the shaft by means of wedges and gripped by nuts. Preferably the stop is mounted adjustably on the piston, thus making possible to change the time of opening the cone. It is advantageous that the piston is in constant engagement, by action of spring, with the outer circumference of the anti-friction bearing. The ring may be provided at its circumference with a scale co-operating an arrow mounted on the front part of the eccentric.

An examplary embodiment of the present invention is shown in the accompanying drawings, of which:

Fig. 1 represents a longitudinal section through the device for controlling the distribution of pressure fluid in operative position, several elements being represented in view,

Fig. 2 is a vertical section through the embodiment as shown in Fig. 1, in the plane 2—2 as shown therein, several elements being represented in view. The embodiment is changed.

Fig. 3 is a cross section through the embodiment as shown in Fig. 1, in the plane 3—3 shown therein;

Fig. 4 is a diagram representing the dependence of piston strokes and tie rod cone stroked from the angular position of the eccentric.

The device for controlling the distribution of pressure fluid according to the present invention with reference to an exemplary embodiment as shown in the accompanying drawings, particularly as shown in Figs. 1, 2, 3 is arranged from the following parts:

In a housing 1, e.g. in the form of a right parallelepiped, made advantageously as a hollow lightmetal casting, transit openings are made in the walls in longitudinal direction, for the purpose of rotatably mounting shaft 2. Furthermore, openings are made in the upper wall in the vertical direction, for mounting displaceably tie rods 12. Said housing 1 is e.g. dismountable by parts, or provided in another, more advantageous embodiment, with an assembling opening, which has e.g. a rectangular profile, said opening being parallel to the horizontal arrangement of shaft 2 and being provided advantageously with a transparent cover with sealing, said parts being connected to the housing 1 by screws. The housing 1 can be advantageously provided in its support part with feet provided with openings for the connecting means for fastening to a weaving machine. Above shaft 2 in the upper part, bodies 5, 5′, 5″ are mounted on the housing 1, which are connected by connections, e.g. feet with screws countersunk in the wall of housing 1. The bodies 5, 5′, 5″ are mutually connected by connecting means, e.g. transversally arranged screws passing therethrough and provided with nuts. Housing 1 has coaxial openings in the opposite walls in longitudinal direction, in which shaft 2 is rotatably mounted. Shaft 2 projects with at least one of its ends from housing 1, and is provided in this part with a driving means 22, e.g. a gear mounted on shaft 2 by means of a wedge. Said driving means 22 is coupled by means of a transmission (not shown) with the driving unit of the weaving machine. Shaft 2 is mounted rotatably in bearings 23, fastened in openings of the walls of housing 1. The bearings 23 are secured in axial direction advantageously against displacement by means of bearing caps mounted outside the walls of housing 1, where said bearing caps are with their contact surfaces in contact with the front surface of the outer ring of bearing 23, which has its inner ring axially secured e.g. by a securing ring made in the groove of shaft 2, which has made for this purpose, in an alternative embodiment, a collar which forms moreover a gripping connection for further means mounted on shaft 2 in housing 1, by means of nut 21 with a securing element 20 on shaft 2, in its opposite part in axial direction relative to the collar.

Between nut 21 and securing element 20 and the collar, eccèntrics 3 are mounted axially gripped on shaft 2 in a rotatable manner, or mounted with their openings. Between said eccentrics 3 are mounted on shaft 2 rings 16, which are mounted with their openings on shaft 2 and fixed thereon by wedges 17. The eccentrics 3 are provided with anti-friction bearings 4, which are mounted stationarily, e.g. pressed on with their openings, or inner rings, respectively on eccentrics 3. On the circumferential surfaces of rings 16 are made scales 18 in angular degrees advantageously by 5°, within an angular range ω from 0° to 360°. These scales 18 on rings 16 are assigned indicators 19 made on the front surfaces of eccentrics 3. Indicator 19 is made advantageously in the form of a bent metal sheet, being L-shaped in its profile, connected with one surface to the front side of eccentrics 3 by a countersunk screw, or welded in another embodiment, or simply cemented, while its other surface is made bevelled, in an alternative embodiment with a visible scale line, advantageously coloured, for being distinguished from scale lines made for denoting the angle value on scales 18 or rings 16.

Bodies 5, 5′, 5″ arranged with their bearing parts on the upper part of housing 1, are substantially in the form of a right parallelepiped, each of said bodies having a vertical transit opening, of which the profile is enlarged in the upper part, thus forming a chamber 7, which forms in the transit to opening 11 of a smaller profile a saddle 10, made e.g. as a conical countersink, when chamber 7 and opening 11 are advantageously circular. Opening 11 has in its further part, or in the lower part of bodies 5, 5′, 5″, respectively, a

larger diameter with a sliding sleeve arranged, e.g. pressed therein, or a guide for tie rods 12. The chambers 7 of bodies 5, 5′, 5″ are interconnected by interconnecting openings 26, which are made horizontally and coaxially, and which are provided in the clamping contact of bodies 5, 5′, 5″ with sealing elements 27, e.g. rubber rings arranged in the recesses of interconnecting openings 26 forming in the contact of bodies 5, 5′, 5″ inner circular grooves.

Bodies 5, 5′, 5″ are provided in the upper parts of chambers 7 with sealing closures 8, advantageously screw plugs with sealing washers. Thus, bodies 5, 5′, 5″ are substantially made analogously and further means arranged therein are similar. However, body 5 has an intake 28, while the outlets 29 are made in all bodies 5, 5′, 5″ in the form of openings, to which are attached the appertinent intake and distributing means of the pressure fluid (not shown). These openings are made in a direction normal to the vertical transit opening, or the intake 28, respectively, is made in a direction normal to the chamber 7 of body 5, to which it is connected, the outlets 29 being made normal to openings 11 below saddle 10 of bodies 5, 5′, 5″ and being interconnected therewith. The profile of intake 28 is larger than that of outlet 29.

In the vertical direction of bodies 5, 5′, 5″, in chamber 7 with opening 11 made also in housing 1, a spring 9 is arranged between the sealing closure 8 and anti-friction bearing 4 with the cone 6 of tie rod 12, the tie rod 12 with spring 13 and piston 14 provided with a stop 15. E.g. body 5 has arranged in chamber 7 vertically a spring 9, which is in the upper part in contact with the front surface of sealing closure 8, and in the lower part, due to its prestress, is able to contact cone 6, bearing with its circumferential surface, which is advantageously conical, against saddle 10. The said cone 6 is provided advantageously in its upper part with a non-transit opening, inside which the spring 9 is arranged, or bears against its bottom, respectively. Cone 6 can be replaced in an alternative embodiment by a closing ball. However, it is advantageous, when cone 6 forms a compact integrity with tie rod 12, which are made as a body of circular profile. Below cone 6, the profile of tie rod 12 is changed relative to opening 11, in which e.g. is pressed a guiding sleeve. In this part of body 5, tie rod 12 with the guiding sleeve is displaceably mounted, and tie rod 12 is arranged at its end, or in its front part, respectively, with an attachable collar, e.g. a screw ring of larger outer profile than that of opening 11 of body 5. The tie rod 12 is provided in that part with an inner vertical non-transit opening, in which spring 13 is arranged, bearing with one part against its bottom and with its other part against the front surface of one end of piston 14, which is mounted displaceably in said opening of tie rod 12. Piston 14 has at its outer free end e.g. a screw joint of fastening stop 15, made advantageously as a pair of nuts. In an alternative embodiment, the end of piston 14 is provided with transversal transit openings at spacings distributed vertically above each other, for readjustment of stop 15, which is advantageously made in the form of a pin.

The end of the free part of piston 14 is made with an anti-friction bearing 4, or more precisely, the front surface of piston 14 is e.g. made as a spherical surface and is in contact with the circumferential surface of the outer ring of anti-frictional bearing 4. It is essential for forming a contact, that the spring 9 is constructed and arranged at higher prestress than spring 13. The said means which are e.g. arranged in body 5, are made also with bodies 5′, 5″ and are assigned to their anti-friction bearing 4 on eccentric 3. The eccentrics 3 on shaft 2 are angularly displaced relative to one another. An exact angular adjustment is made possible by adjusting each of the eccentrics 3 by means of their indicator 19 and scale 18 on rings 16. For securing operation of the device for controlling the distribution of pressure fluid, piston 14 is provided, namely in accordance with Fig. 3, at its circumference in longitudinal direction with a deaeration groove 25, advantageously of triangular profile, when piston 14 co-operates with spring 13 in the opening 11 of tie rod 12, in which piston 14 is displaceably mounted.

The device for controlling the distribution of pressure fluid according to the present invention operates in such manner that, before its starting, the adjustment of both the beginning and the length of time gaps of distributing the pressure fluid to the separate outlets 29 of bodies 5, 5′, 5″ is performed. This preparation is shown particularly in Fig. 4, in which diagram the following symbols are used:

y—stroke of piston 14 in mms
y_1—distance between the collar of the tie rod 12 and stop 15 of piston 14 in mms,
h—stroke of cone 6 in mms
α—angle at the initial phase of blowing pressure fluid in degrees
β—angle at the phase of blowing pressure fluid in degrees
ω—angle range from 0° to 360°.

It is essential, that the adjustment of eccentrics 3 is made possible by releasing nut 21 and securing element 20 on shaft 2 by means of a not shown, rectangular opening in the front surface of housing 1, which is advantageously provided with a transparent cover. The adjustment is performed in such manner, that the eccentric 3 is made in such manner that the piston 14 assigned thereto has stroke y equal zero. By adjusting stop 15 on piston 14 to the required time of blowing pressure fluid in angle, piston 14 is adjusted in such manner, that its stop 15 is re-adjusted relative to collar of tie rod 12 to stroke y_1. The said action is performed advantageously by means of Johanson's cubes of predetermined size in accordance of the elaborated methodic tables for

securing the required stroke h of cone 6. The stop 15 is thereafter secured and the adjustment of further means as performed in an analogous manner, i.e. in all bodies 5, 5′, 5″, whereupon the appertinent eccentrics 3 and rings 16 are clamped on shaft 2 by means of nut 21 with securing element 20.

Shaft 2 with eccentrics 3 and anti-friction bearings 4 with rings 16 made thereon, performs a rotary motion together therewith by means of driving means 22 with a not shown transmission to a driving unit of the weaving machine. The outer rings of anti-friction bearings 4, or their circumferential surface, respectively, is in continuous contact with the end of piston 14. This outer ring of anti-friction bearings does not rotate, which is advantageous for diminishing its mechanical abrasive wear, this applying also to the end of piston 14, which is pressed towards the circumferential surface of the outer ring of anti-friction bearing 4 by spring 13 acting by its second end upon the bottom of the opening in tie rod 12, in which piston 14 is displaceably moved, by means of a rotating eccentric 3, which imparts thereto the stroke by intermediary of said anti-friction bearing 4. Thus, the tie rod 12 is displaceably moved inside opening 11 and acts upon cone 6, which bears against saddle 10, particularly by action of spring 9. Pressure fluid is supplied into the chamber 7 of body 5 through intake 28, said chamber 7 being filled by said pressure fluid, which simultaneously, as shown in Fig. 2, presses cone 6 of tie rod 12, together with spring 9, into saddle 10. Spring 13 is in prestressed state, of which the force is sufficient at least for pressing piston 14 towards the circumferential surface of anti-friction bearing 4 on eccentric 3 at an angle position, at which the stroke y of piston 14 is equal zero. The pressure fluid on chamber 7 of body 5 is supplied, through intermediary of interconnecting openings 26 of bodies 5, 5′, 5″ into chambers 7 of bodies 5′, 5″, in which cones 6 are situated by action of tie rod 12 and particularly piston 14, upon which acts the outer surface of anti-friction bearing 4, at a changed angular position of eccentric 3 et angle α, the stroke h of cone 6 thus approaching at body 5′ (Fig. 1) the value of stroke y_1, i.e. the distance between the collar of tie rod 12 and the stop 15 of piston 14 adjusted preliminarily, when at that phase the angular position of eccentric 3 assigned to body 5″ at angular position α plus β, so that the stroke of cone 6 of tie rod 12 has a value h as shown in Fig. 4 and approaches the stroke of piston 14 in value y equal zero.

The said procedure of strokes y of piston 14 in dependence of the angular position of eccentrics 3 on shaft 2 is continuously changed in each of bodies 5, 5′, 5″. It is essential, that upon stroke h of cone 6 the force exerted by the pressure fluid in chamber 7 together with spring 9 for pressing cone 6 into saddle 10 is overcome on one hand by spring 13 acting upon piston 14 which moves upon eccentricity of eccentric 3 by intermediary of anti-friction bearing 4. The separation of cone 6 from saddle 10 is thereupon performed at a phase, at which the stop 15 of piston 14 contacts the end of tie rod 12, i.e. a stroke of value y_1 is achieved. By motion of piston 14 in the opening of tie rod 12, an undesired air compression takes place, which is withdrawn through the dearation groove 25 of piston 14 into the inner space of housing 1.

By the said changes of strokes y of piston 14 and the strokes h of cones 6 of bodies 5, 5′, 5″, the pressure fluid from chambers 7 is fed through their interconnecting openings 26 alternatively below the cones 6 into openings 11, from which the pressure fluid is alternatively distributed through outlets 29 to the active elements, i.e. the nozzle and e.g. the additive blowing gliders along the weft inserting device, or shed, respectively, of the weaving machine.

The device for controlling the distribution of pressure fluid is applicable particularly in jet weaving machines, however, it is also suitable for controlling the distribution of liquids even in other branches.

Claims

1. A device for controlling the distribution of pressure fluid, particularly for jet weaving machines comprising a valve member pressed onto a seating by means of first resilient means, the valve member being acted on by an outer ring of an anti-friction bearing mounted on an eccentric by means of a piston mounted in a tie rod, a second resilient means acting between the tie rod and the piston, a stop being provided on the piston to limit movement of the piston with respect to the tie rod.

2. A device as claimed in Claim 1, wherein the stop is mounted displaceably on the piston so that the opening of the valve member relative the seating may be adjusted.

3. A device as claimed in Claim 1, wherein the eccentric with the anti-friction bearing mounted thereon is made immovable on a shaft between rings connected to the shaft by keys and gripped by a nut.

4. A device as claimed in Claim 1, wherein the piston is urged into continuous engagement with the outer circumference of anti-friction bearing by resilient means.

5. A device as claimed in Claim 3, wherein at least one ring is provided on its circumference with a scale cooperating with an indicator mounted on the eccentric.

6. A device for controlling the distribution of pressure fluid substantially as described with reference to the accompanying drawings.

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