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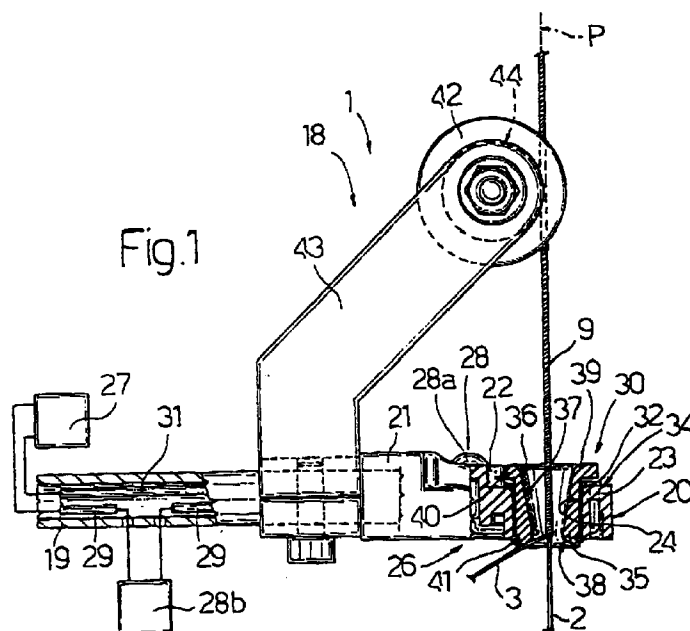
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(54) **Unit for detecting the integrity of textile yarns**

(57) A unit (1) for detecting the integrity of textile yarns (2, 3), which can be installed on a spiral covering machine (4) which is suitable to spirally wind a spiral covering textile yarn (3) on a conducting textile yarn (2) which is fed along a preset path (P), wherein a device (18, 45, 61) for controlling the textile yarns (2, 3), arranged along the path (P), has an electric circuit (26) provided with a normally-closed switch (30) and formed

by a fixed contact (32) and by a movable armature (35) which is coupled by friction to the textile yarns (2, 3) and is spaced from the fixed contact (32) when, during use, the textile yarns (2, 3) are continuous and in motion; the electric circuit is furthermore provided with a signaling device (28) which is active when the switch (30) is closed.



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Description

The present invention relates to a unit for detecting the integrity of textile yarns.

In particular, the present invention relates to a unit which can be advantageously used in a spiral covering machine provided with a plurality of spiral covering devices, in which a spiral covering textile yarn is wound spirally around a conducting yarn to produce a spirally covered textile yarn.

Detection of the integrity of textile yarns in a spiral covering machine is usually performed by one or more operators who, at substantially uniform time intervals, monitor the machine, visually checking whether the textile yarns are damaged, in which case they interrupt the operation of the spiral covering device in which the anomaly has occurred and restore the normal operating conditions.

Owing to the large number of spiral covering devices with which each spiral covering machine is normally provided, the monitoring operations are not only relatively time-consuming but also scarcely effective to the point that detection of the anomalies of the textile yarns is untimely and highly demanding.

The aim of the present invention is to provide a unit for detecting the integrity of textile yarns which allows to detect the integrity of the textile yarns simply, reliably and promptly.

According to the present invention, a unit for detecting the integrity of textile yarns is provided which is characterized in that it includes a means for controlling the textile yarns which in turn includes an electric circuit provided with a normally-closed switch; the switch includes a fixed contact and a movable armature formed by a bush which is coupled by friction to the textile yarns and is spaced from the fixed contact when, during use, the textile yarns are continuous and are moving.

Preferably, the above defined unit can be installed in a spiral covering machine which includes a feeder means for feeding a conducting textile yarn along a preset path and a winding means arranged along the path in order to spirally wind a spirally covering textile yarn on the conducting textile yarn so as to form a spirally covered textile yarn.

The invention will be now described with reference to the accompanying drawings, which illustrate a non-limitative embodiment thereof, wherein:

FIG. 1 is a lateral elevation view, with some parts shown in cross-section and some parts removed for the sake of clarity, of a first detail of a preferred embodiment of the unit according to the present invention;

FIGs. 2 and 3 are respectively a bottom plan view and a top plan view, with some parts shown in cross-section and some parts removed for the sake of clarity, of the detail of FIG. 1;

FIG. 4 is a sectional view, with some parts removed for the sake of clarity, taken along the plane IV-IV of FIG. 3;

FIG. 5 is a lateral elevation view of a second detail of the unit according to the present invention;

FIGs. 6 and 7 are respectively a top plan view and a bottom plan view, with some parts shown in cross-section and some parts removed for the sake of clarity, of the detail of FIG. 5;

FIG. 8 is a lateral elevation view, with some parts shown in cross-section and some parts removed for the sake of clarity, of the detail of FIG. 5;

FIG. 9 is a lateral elevation view of a third detail of the unit according to the present invention;

FIGs. 10 and 11 are respectively a bottom plan view and a top plan view, with some parts shown in cross-section and some parts removed for the sake of clarity, of the detail of FIG. 5;

FIG. 12 is a lateral elevation view, with some parts shown in cross-section and some parts removed for the sake of clarity, of the detail of FIG. 9;

FIG. 13 is a schematic view, with some parts shown in cross-section and some parts removed for the sake of clarity, of a preferred example of installation of the unit according to the present invention;

FIGs. 14 and 15 are respectively a lateral elevation view and a plan view of a different embodiment of the unit; and

FIG. 16 is a view similar to FIG. 13 of a further example of installation of the unit according to the invention.

With reference to FIGs. 1, 5, 9 and 13, the numeral 1 generally designates a unit for detecting the integrity of the textile yarns 2 and 3, which can be installed preferably, but not necessarily, on a spiral covering machine, which is shown schematically in FIG. 13 and generally designated by the reference numeral 4. The spiral covering machine includes a frame, formed by at least two mutually superimposed horizontal bearings 5 and 6 and a plurality of spiral covering devices 7a (only two of which are shown) which in turn include a respective feeder 7 for feeding a conducting textile yarn 2 along a preset path P which passes through the bearings 5 and 6 transversely thereto. The machine also includes a respective winding device 8 which is supported by the bearings 5 and 6 for spirally winding a spiral covering textile yarn 3 on the corresponding conducting textile yarn 2 so as to form a respective spi-

ral covered textile yarn 9.

In particular, each winding device 8 includes at least one rotating spindle 10 for supporting a respective reel 11 of textile yarn 3 and a vertical tube 12 which is supported, along the path P and in vertical alignment with the corresponding spindle 10, by the bearing 5 or by the bearing 6, depending on whether the spindle 10 is supported by the bearing 6 or respectively by the bearing 5, and has a through hole 13 which forms part of the path P. Each feeder 7 is suitable to feed the corresponding textile yarn 2 through the hole 13 of the corresponding tube 12 and through the corresponding spindle 10, and includes two motorized rollers 14, which are common to the feeders 7 and are arranged below the bearings 5 and 6. Rollers 14 are suitable to rotate a respective reel 15 of textile yarn 2 to unwind the textile yarn 2. A respective guiding and tensioning roller 16 for the textile yarn 2 which is arranged between the rollers 14 and the bearings 5 and 6 and is connected to rollers 14 by means of a transmission of a per se known type and which is not shown in the drawings, and by means of a takeup roller (of a per se known type which is not shown in the drawings), suitable to rotate a respective takeup reel 17 for winding the spiral covered textile yarn 9 on the reel 17.

As shown in FIGs. 2, 3 and 4, unit 1 includes, for each feeder 7 and 8, a respective control device 18, which is suitable to check the integrity of the corresponding textile yarn 3 and is supported, in a per se known manner by the frame above the corresponding spindle 10. Control device 18 includes a tubular supporting rod 19, which is connected to the frame and extends substantially toward the outside of the machine 4, and a contoured plate 20.

In particular, the plate 20 is mounted on a free end of the rod 19 and is formed by an inner portion 21, which is coupled to the rod 19 and has a triangular tooth 22, and by an outer end portion 23, which is lower than the portion 21 in order to form the tooth 22 and has two through holes 24 and 25; the hole 24 has a larger diameter than the hole 25 and is arranged centrally to the portion 23, while the hole 25 is arranged substantially to the side of the tooth 22.

Control device 18 also includes an electric circuit 26 which in turn includes an electric power source 26, a signaling device 28 which is connected to the source 27 by means of an electric cable 29, which is arranged inside the tubular rod 19, and a switch 30, which is normally closed, is seriesconnected to the device 28, and is connected to the source 27 by means of a respective electric cable 31 which is arranged inside the rod 19. In particular, device 28 includes a lamp 28a, which is mounted in the hole 25, and an emitter 28b of signals which can be received by means of a controller (which is per se known and not shown in the drawings) located proximate to a monitoring point occupied by the operators, while the switch 30 includes a fixed contact formed by two semi-annular conducting plates 32 and 33 which

are mounted separately from each other on an upper surface 34 of the portion 23 around the hole 25 and are respectively connected to the device 28 and to the source 27, and a bush 35, which forms a movable armature of the switch 30, is preferably but not necessarily made of a conducting material, and is slidingly mounted inside the hole 24.

Bush 35 has a central contoured hole 36, which is formed by two frustum-shaped surfaces 37 and 38 arranged so that their respective shorter edges are in contact with each other and is suitable to be slidingly engaged by the yarns 2 and 3. Bush 35 also has an upper collar 39, which prevents the downward extraction of the bush 35 from the hole 25 and is usually arranged in contact with the plates 32 and 33 to close the circuit 26. For this purpose, if the bush 35 is made of a dielectric material, the collar is made of a conducting material. Collar 39 finally has a triangular recess 40 which is engaged by the tooth 22 to prevent rotation of the bush 35 inside the hole 25 during the operation of the winding device 8.

Finally, the bush 35 has an elastic ring 41 which is mounted on the outside of the bush 35 and of the hole 25 on the opposite side of the plate 20 with respect to the collar 39 and is suitable to limit an upward sliding of the bush 35 caused by the friction between the bush 35 and the textile yarns 2 and 3. In particular, when the spiral covering of the textile yarn 2 is performed by virtue of the textile yarn 3, during use, the textile yarn 3 forms a so-called "balloon", whose centrifugal force applies to the bush 35 an upward thrust which causes the bush 35 to "float" inside the hole 25 and lifts the collar 39 from the plates 32 and 33 to open the electric circuit 26, which if the textile yarn 3 breaks is thus closed again, consequently activating the device 28, that is to say, emitting a fault signal by virtue of the emitter 28b and lighting the lamp 28.

Device 18 includes a return pulley 42 which is vertically supported above the bush 35 by a respective arm 43 which is mounted along the rod 19, has a respective groove 44 which is suitable to be engaged by the textile yarn 9, and is suitable to align the textile yarn 9 with the hole 13 of the tube 12 if the tube 12 is mounted on the bearing 5 above the spindle 10 or, if the spindle 10 is mounted on the bearing 6 above the tube 12, with a thread guide (of a known type which is not shown) which is a part of the machine 4 and is suitable to distribute the textile yarn 9 on the takeup reel 17 according to a preset distribution criterion.

As shown in FIGs. 5, 6, 7 and 8, the unit 1 also includes an additional control device 45 which is substantially similar to the control device 18, from which the device 45 differs first of all in that it is suitable to check the integrity of the textile yarn 2 alone and for this reason is mounted along the path P below the spindle 10 rigidly with the spindle 10, and secondly in that the bush 35 is replaced by a cylinder 46, which is made of dielectric material, is movably supported inside the corre-

sponding hole 25 by a rocker 47, and has a conducting ring 48 which is mounted at its upper end and is normally arranged in contact with the plates 32 and 33.

Control device 45 includes a supporting bracket 49 which has two jaws 50 which form, between them, a central hole 51 and are clamped onto a lower tubular portion 52 of the spindle 10 which extends below the bearing 8, 9 and a supporting arm 53 for the device 28, in particular for the lamp 28a which protrudes from one of the jaws 50 parallel to the jaw 50 and has the hole 25 at its free end.

In addition to the cylinder 46, device 45 includes a rocker 47, which in turn includes a fork 54 formed by a central cross-member 55 and by two arms 56 which are arranged transversely to the cross-member 55 and are connected by virtue of respective pivots 57 laterally to the jaws 50 and are mounted so that they can rotate with respect to the jaws 50, and an additional arm 58 which is formed by a plate which is rigidly coupled to the cross-member 55 and supports a pulley 59 at its lower end, and the cylinder 46 at its upper end, which is folded at 90° with respect to a plane of arrangement of the plate.

The pulley 59 is suitable to oscillate about the pivots 57 under the action of a textile yarn 2, which engages a groove 60 of the pulley 59, and has an elasticity which lifts the conducting ring 48 off the plates 32 and 33 and opens the circuit 26.

As shown in FIGs. 9, 10, 11 and 12, unit 1 includes a control device 61 which is suitable to check the integrity of the textile yarn 2 alone and is substantially similar to the control device 45. Control device 61 is mounted on the machine 4 as an alternative to the device 45 if the spindle 10 is arranged above the corresponding tube 12. The device 61 differs from the device 45 first of all in that it is mounted along the path P below the tube 12 rigidly with the tube 12 and secondly in that the rocker 47 is formed by a contoured plate which includes a lateral portion 62 which is pivoted by virtue of a pivot 63 which passes through the bracket 49 on the opposite side of the arm 53 with respect to the hole 51, an additional lateral portion 64 which is folded at 90° with respect to the plane of arrangement of the contoured plate, and supports the cylinder 46, and a portion 65 which is intermediate between the portions 62 and 64 and supports the pulley 59, the groove 60 of which is usually aligned with the hole 13 of the tube 12 during use.

Currently used spiral covering machines 4 have a considerable number of spiral covering devices 7a arranged side by side. During the operation, once the control devices 18, 45 and 61 have been installed in the machines 4, respectively, above the spindles 10 (regardless of their position on the bearings 5 and 6), below the spindles 10, and below the tubes 12, the operations for loading the textile yarns 2 and 3 begin.

In particular, in each spiral covering device 7a the conducting textile yarn 2 is unwound from the respective reel 15, is wound around the pulley 16 and, according to

the position of the spindles 10 with respect to the tubes 12, is partially wound around the pulley 59 of the device 45, passed through the hole 51, through the spindle 10, through the contoured hole 36 of the bush 35 of the device 18, through the hole 13 and finally is partially wound around the reel 17; otherwise, after being wound around the pulley 16, it is partially wound around the pulley 59 of the device 61, passed through the hole 13, through the spindle 10, through the contoured hole 36 of the bush 35 of the device 18 and is finally partially wound around the reel 17.

Once the textile yarn 2 has been partially wound around the reel 17, the textile yarn 3 is joined in a per se known manner to the textile yarn 2 at the bush 35. At this point, the feeders 7 and 8 are actuated and, after a brief transient, the textile yarn 2 reaches a set tension value which raises the conducting rings 48 off the plates 32 and 33 through the rockers 47 of the devices 45 and 61 so as to open corresponding electric circuits 26. Simultaneously, the rapid rotation of the spindles 10 causes the corresponding textile yarns 3 to form, between the corresponding reels 11 and the corresponding bushes 35, the so-called "balloon", whose centrifugal force, together with the friction between the textile yarn 3 and the surfaces 38 of the corresponding holes 36, is such as to raise the bushes 35 and separate the collars 39 from the plates 32 and 33, consequently opening the circuits 26.

If a textile yarn 3 breaks, the action of the textile yarn 3 itself on the corresponding bush 35 ceases immediately; the bush 35, by descending vertically, moves the collar 39 into contact with the plates 32 and 33, closing the electric circuit 25 and activating the device 28, consequently causing the emitter 28b to emit a fault signal and the lamp 28a to light up. At this point, the signal is received by the controller and the operators monitoring the controller are immediately alerted as to the presence of an anomaly in the operation of one of the spiral covering devices and also immediately identify which spiral covering device is affected by the anomaly.

Likewise, if a textile yarn 2 breaks, the elastic thrust of the textile yarn 2 on the pulleys 59 immediately ceases, consequently rotating the rockers 47 about the pivots 57, or 63, and immediately lowering the cylinders 46 inside the respective holes 24. In this case too, the lowering of the cylinders 46 produces contact between the rings 48 and the plates 32 and 33 and the closure of the corresponding circuits 25, activating the corresponding devices 28.

As shown in FIGs. 14 and 15, which illustrate a different embodiment of the unit 1, the control devices 18, 45 and 61 have, on the electric circuit 26, a switch 30 which is constituted by a bush, again designated by the reference numeral 35 for the sake of clarity, which is freely coupled to the textile yarns 2 and 3 as shown above, and a photoelectric cell 70 which is suitable to detect the position of the bush 35. Photoelectric cell 70

is constituted, in a per se known manner, by a light beam emitter 71 and by a receiver 72 which are arranged in diametrically opposite positions with respect to the hole 24 in which the bush 35 is arranged so that it can slide axially on a supporting plate 66.

The bush 35 can move between a lowered position, in which the elastic ring 67, associated with a groove formed in an upward region in the bush 35, is arranged in abutment against the upper surface of the plate 66, and a position which is raised by virtue of the upward thrust applied, during use, by the continuous and moving textile yarns 2 and 3 until the lower collar 39 of the bush 35 abuts against the lower surface of the plate 66.

The photoelectric cell 70 is suitable to detect the presence of the bush 35 in the raised position, in which the bush 35 blocks the light beam emitted by the photoelectric cell 70. If the textile yarn 2, 3 being monitored breaks and the thrust ceases, the bush 35 moves by gravity into the lowered position, allowing activation of the photoelectric cell 70, which actuates the closure of the electric circuit 26.

In this case, the bush 35 can be made entirely of dielectric material.

Conveniently, the ring 67 associated with the bush 35 forms a fork 67a which is suitable to engage a tooth 22 which protrudes vertically from the plate 66 to prevent the rotation of the bush 35. The same function can of course be provided by a different kind of means for guiding the bush 35.

Claims

1. A unit for detecting the integrity of textile yarns (2, 3), characterized in that it comprises a control means (18, 45, 61) for controlling respective textile yarns (2, 3) and having an electric circuit (26) provided with a switch (30), said switch (30) comprising a bush (35, 46) which is suitable to be freely coupled by friction to said textile yarns (2, 3) and is adapted to move between a closing position for closing said electric circuit (26) and an operating position which is spaced from the closing position, under the thrust which is applied during use by said continuous and moving textile yarns (2, 3), said switch being adapted to open said electric circuit (26).
2. A unit according to claim 1, characterized in that it comprises a photoelectric means (70) which is suitable to detect the presence of said bush (35, 46) in said operating position so as alternately actuate the closure of said electric circuit (26) when said bush (35, 46) is moved in said closure position, owing to the end of the action of said textile yarns (2, 3).
3. A unit according to claim 1, characterized in that said electric circuit (26) comprises a signaling means (28) which is active when the switch (30) is closed and comprises an optical signaling means (28a) and a transmission means (28b) for transmitting a fault signal.
4. A unit according to claim 1, characterized in that said control means (18, 45, 61) comprises a support (19, 20; 49; 66) for said electric circuit (26) provided with a through hole (24) for accommodating said bush (35, 46).
5. A unit according to claim 1, characterized in that said switch (30) comprises a fixed contact (32, 33) which is formed by a pair of conducting portions (32, 33) which are mounted so as to be mutually separate in positions which are adjacent to a hole (24) for accommodating said bush (35) and are suitable to be connected, in said closure position of said switch (30), by a collar (39) of said bush (35) made of conducting material.
6. Unit according to claim 1, characterized in that said control means (45, 61) comprises a rocker means (47) for supporting said bush (46) and a return means (59) which is connected to said rocker means (47) to guide at least one textile yarn (2).
7. A unit according to claim 1, characterized in that it comprises a guiding means (22) which is suitable to engage said bush (35, 46) so as to prevent the rotation of said bush (35, 46).
8. A spiral covering machine (4) comprising a unit for detecting the integrity of textile yarns (2, 3), characterized in that it comprises a control means (18, 45, 61) for controlling respective textile yarns (2, 3) and having an electric circuit (26) provided with a switch (30), said switch (30) comprising a bush (35, 46) which is suitable to be freely coupled by friction to said textile yarns (2, 3) and is adapted to move between a closing position for closing said electric circuit (26) and an operating position which is spaced from the closing position, under the thrust which is applied during use by said continuous and moving textile yarns (2, 3), said switch being adapted to open said electric circuit (26), said covering machine further comprising a spiral covering means (7a) respectively provided with a feeder means (7) for feeding a conducting textile yarn (2) along a preset path (P), and a winding means (8) arranged along said path (P), in order to spirally wind a spiral covering textile yarn (3) on said conducting textile yarn (2), so as to produce a spirally covered textile yarn (9), said bush (35, 46) having a respective axial hole (36) for the passage of said textile yarns (2, 3), at least one of which is suitable to act by friction on said bush (35, 46) in order to keep said bush (35, 46) in said operating position for the opening of said electric circuit (26) during

use.

9. A machine according to claim 8, characterized in that said winding means (8) comprises a spindle (10) for a reel (11) of spiral covering textile yarn (3), which is suitable to act by friction on said bush (35, 46), a support (19, 20; 49) for said electric circuit (26) being mounted after said spindle (10) in the advancement direction of said conducting textile yarn (2), along said path (P).
10. A machine according to claim 8, characterized in that said winding means (8) comprises a tube (12) for the passage of said conducting textile yarn (2), a support (49) for said electric circuit (26) being mounted ahead of said tube (10) in the advancement direction of said textile yarn (2).

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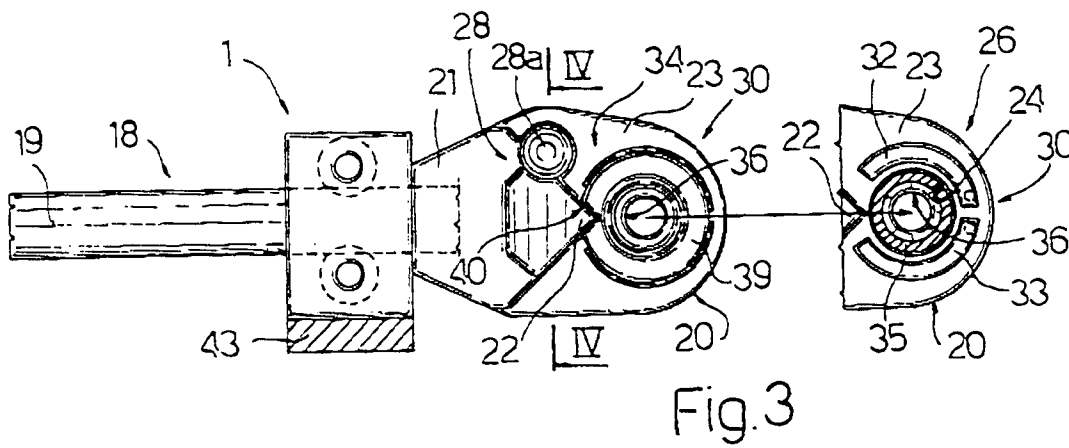
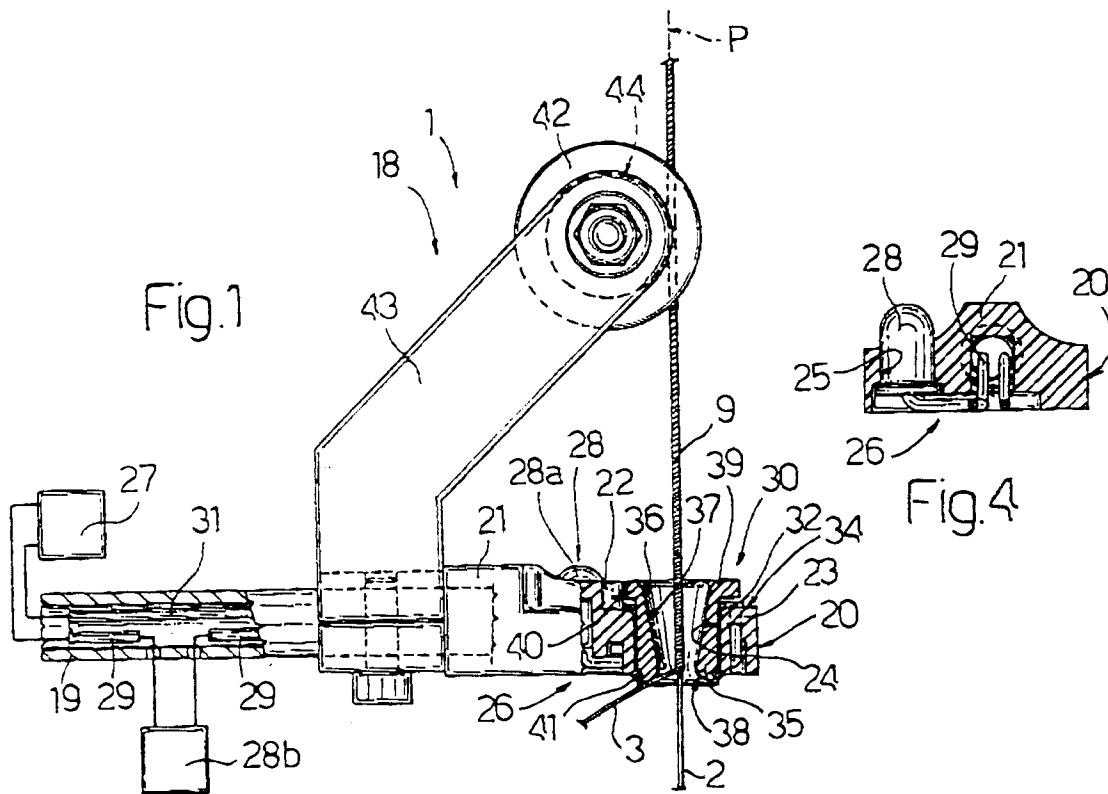
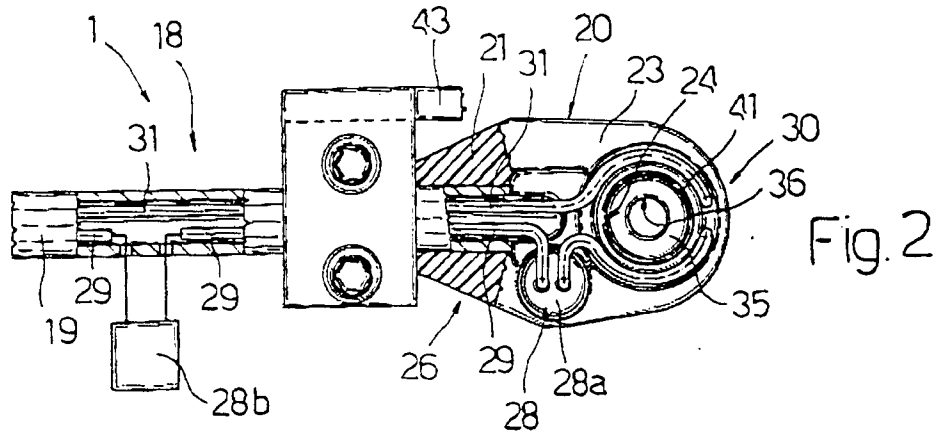
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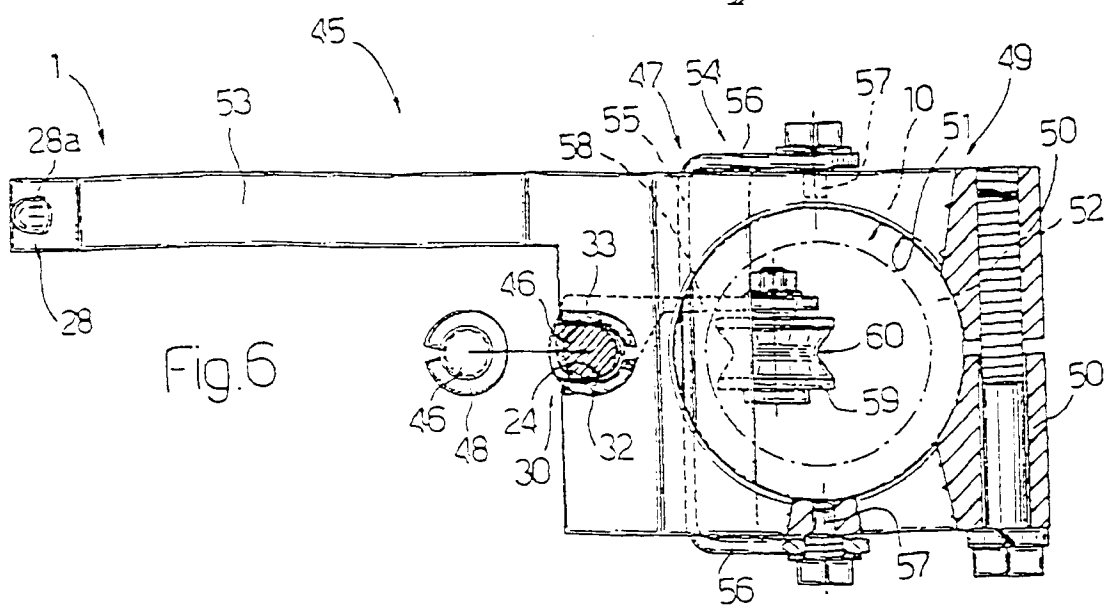
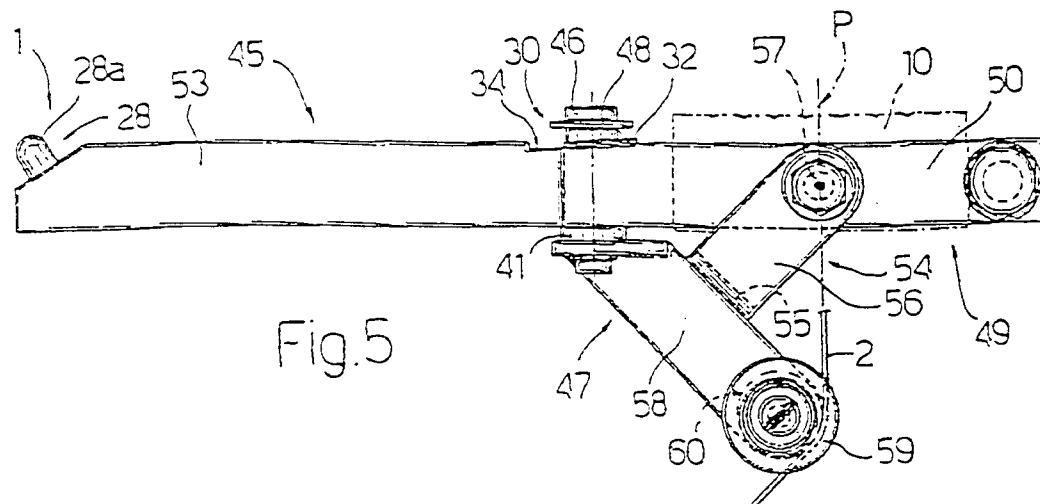
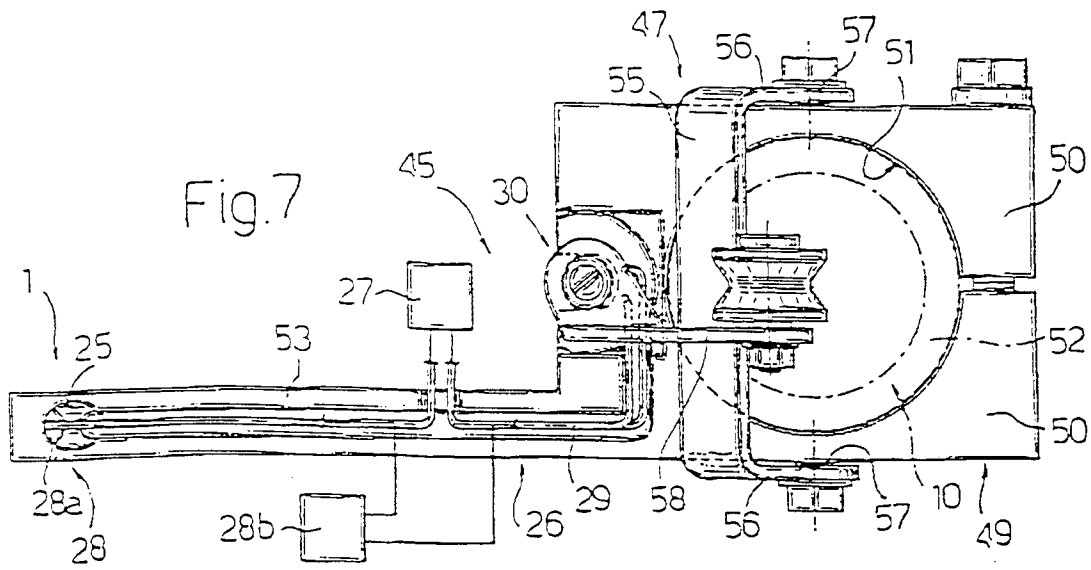
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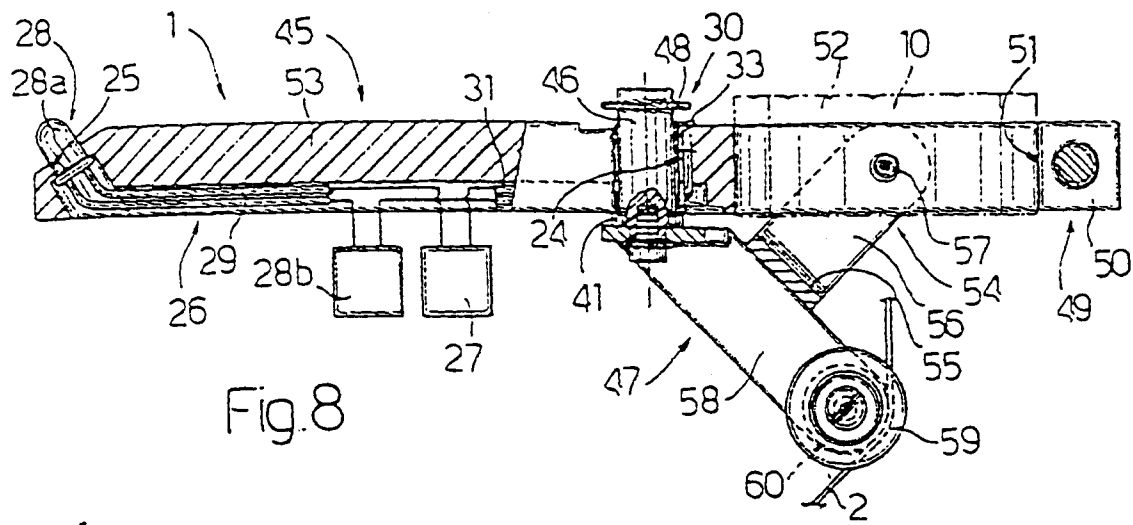


Fig. 8

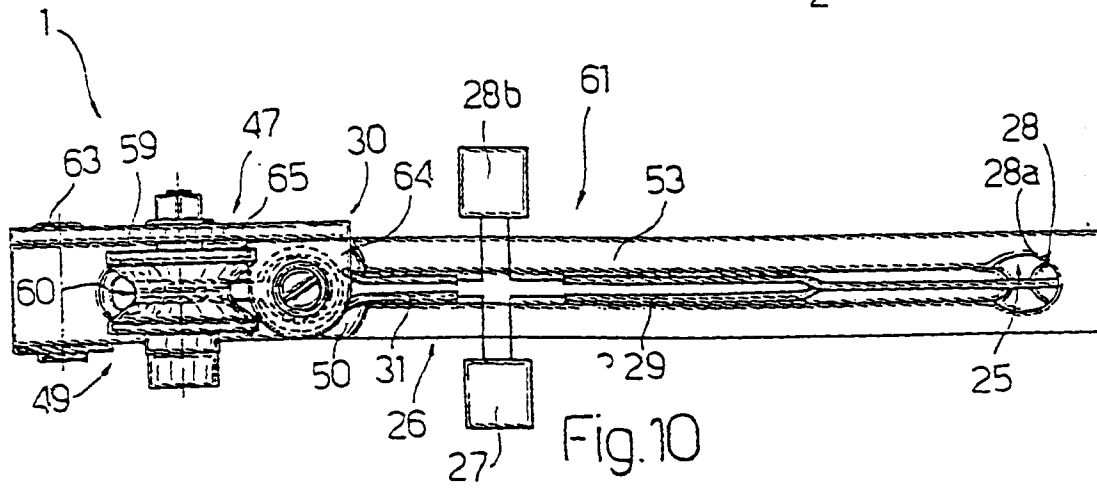


Fig. 10

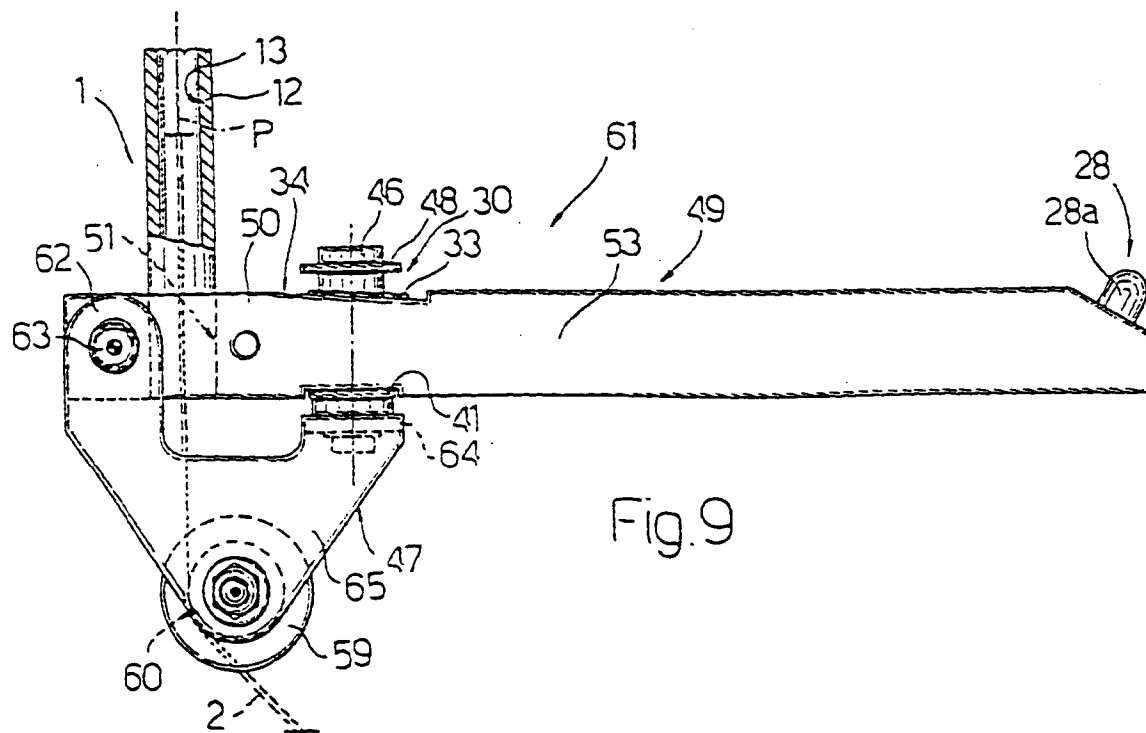
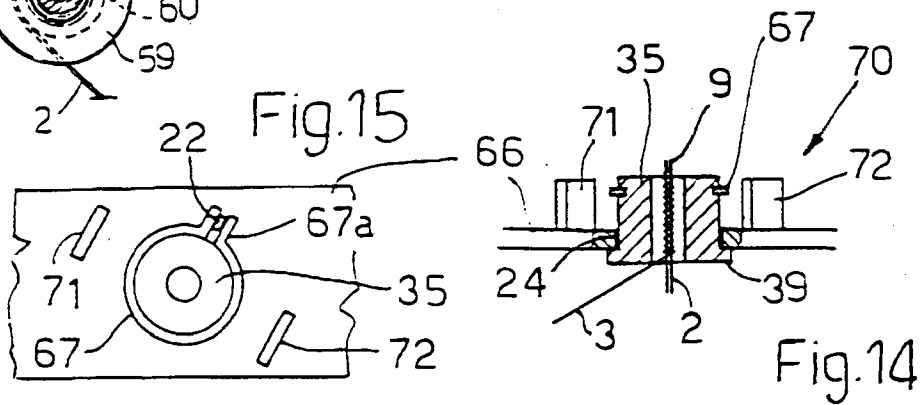
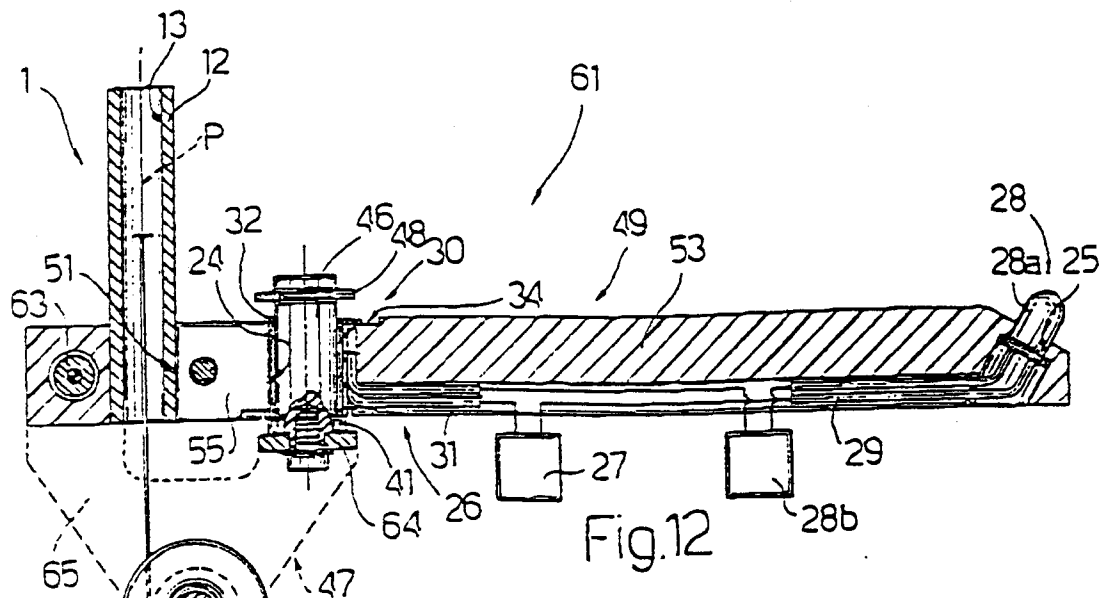
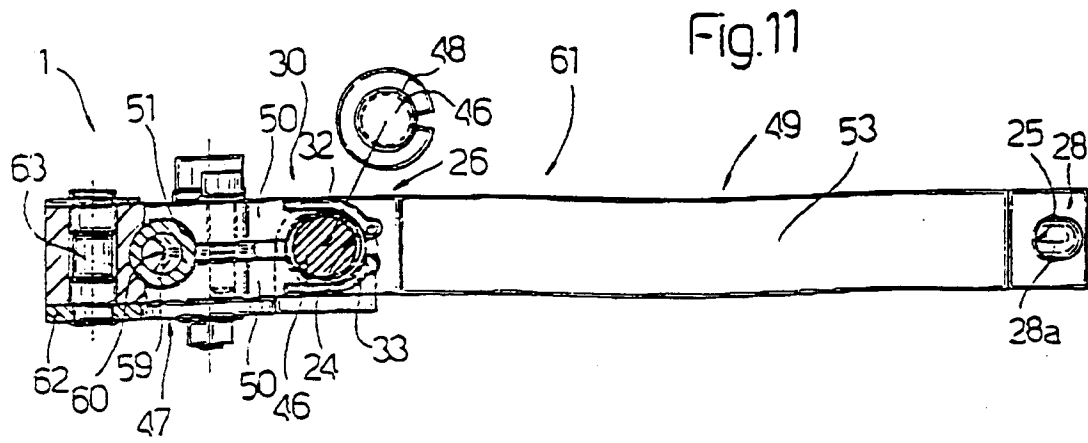


Fig. 9



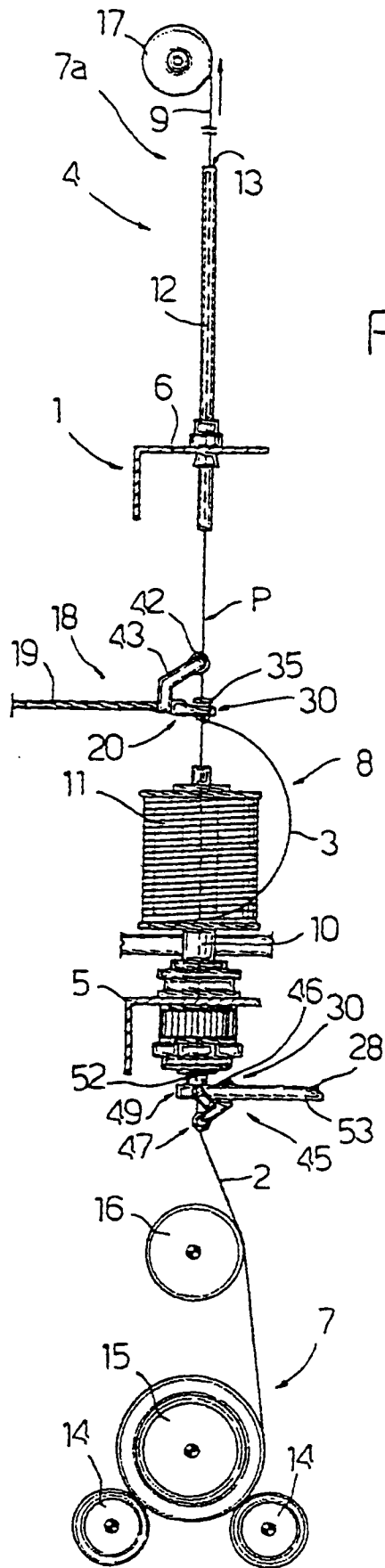


Fig. 13

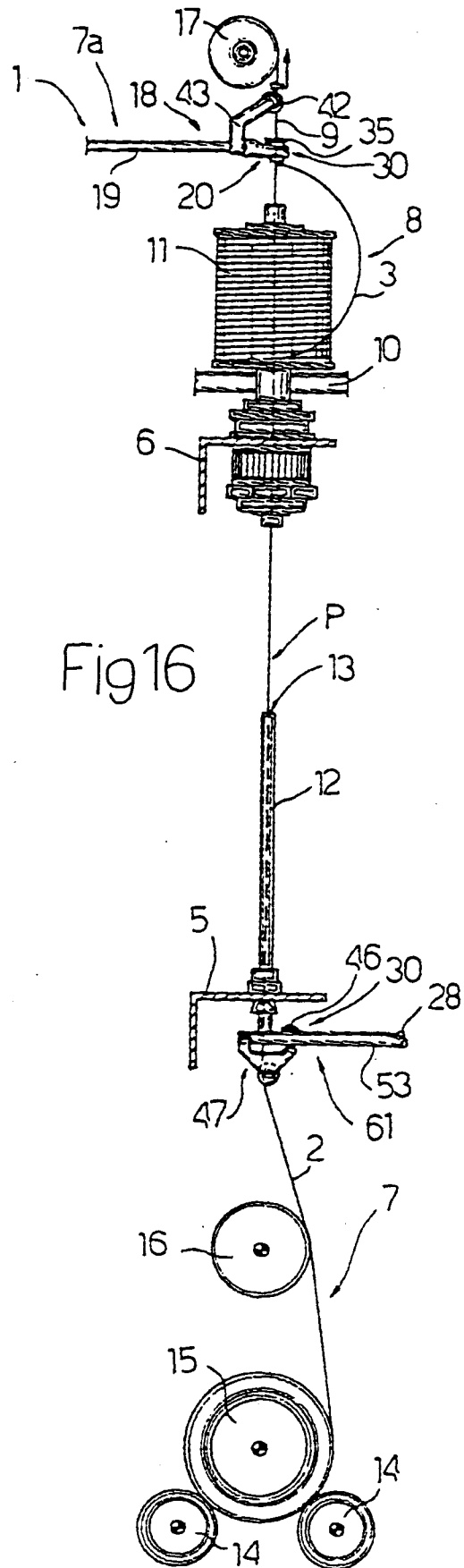


Fig 16