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(54) **FABRIC DRAW-OFF DEVICE**

WARENABZUGSVORRICHTUNG

DISPOSITIF DE TIRAGE DE TISSU

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Description

[0001] The invention relates to a fabric draw-off apparatus for rolling up fabric released by a circular knitting machine and for applying a defined longitudinal force to the fabric.

[0002] Circular knitting machines usually release tubular knitwear. In particular, large size knitting machines are known which produce endless tubular knitwear which is to be rolled up by a large roller. As well known the knitwear rotates around a vertical axis due to the rotational movement of the knitting cylinder of the circular knitting machine. It is necessary to have the horizontal shaft of the rolled up knitwear rotating around the vertical axis with a rotational speed which is equal to the rotational speed of the knitting cylinder. Therefore, known draw-off apparatuses comprise a mechanical transmission which connects the drive of the knitting cylinder to a rotating frame of the roll-up roller. When using this concept, the draw-off device contributes to the inertia of the knitting cylinder. This might have detrimental effects when starting and stopping or accelerating and decelerating the rotational movement of the knitting cylinder.

[0003] Moreover, the rotational movement of the rollers of the roll-up device, with respect to their horizontal axes, is usually taken from the main drive which primarily drives the knitting cylinder.

[0004] European document EP 1 087 048 A2 describes an automatic fabric density adjusting device and yarn feeding control mechanism for a circular knitting machine. The knitting machine includes a knit fabric take-up or reeling device.

[0005] A circular knitting machine where the knitted fabric is stacked in layers in a container is disclosed by the US document US 3,791,177. The container is provided with nozzles for air supply which are positioned at opposite sides of the container.

[0006] Swiss document CH 535 855 discloses a draw-off device comprising a transmission for rotating the draw-off rollers in response to the rotation of the rotating support frame of the rollers. The transmission defines the ratio of the rotational speeds of the rollers and the frame. If the operator needs to amend the gear ratio he ought to replace the gear sets which might be time consuming and cumbersome.

[0007] Therefore, a draw-off device is desirable which enables quick and easy adjustments of the rotational speeds of the draw-off rollers.

[0008] Another object of the invention is the reduction of the inertia to be handled by the main cylinder driving motor of the knitting machine.

[0009] These and other objectives and advantages are attained by the fabric draw-off device according to claim 1.

[0010] The inventive draw-off apparatus comprises roller means for winding up fabric produced and released by the circular knitting machine. The roller means comprises at least one roller, rotatably journalled by coaxial bearings defining a horizontal rotational axis. The draw-off roller is driven by draw-off drive motor. The roller and the motor are supported by the movable frame which in turn rotates about a vertical axis. Rotary electrical interface means are provided for supplying electricity from a non-rotating stationary base to the rotating frame and the draw-off drive motor carried by the frame.

[0011] Using this concept, the draw-off drive motor can be driven independently from the rotation of the main cylinder of the knitting machine. It is no longer necessary to replace gear sets if the rotational speed of the draw-off roller is to be readjusted.

[0012] Moreover, the inventive concept provides a simple, safe and precise adjustment of the rotational speeds of the draw-off rollers. If necessary, further functions may be included. It is possible to monitor the tension of the fabric and to control the rotational speed of the draw-off rollers aiming to keep the tension constant. Moreover it is possible to sense the weight of the bale consisting of rolled up fabric and to emit a signal if a limit is reached.

[0013] If the rolled up fabric is to be removed and an empty roller is to be inserted into the draw-off device the rotation of at least one of the draw-off rollers may be reversed, This removes any tension from the fabric between the draw-off rollers and the bale. The operator is no longer requested to do that by hand which shortens the time period necessary for removing the coil or bale and starting a new one.

[0014] The invention provides a way for winding up the fabric witch constant tension in high quality. It is possible to compensate for different radii of the coil formed by the fabric on the wind up shaft. Moreover, it is possible to compensate for the weight of the coil which is slowly increasing during operation.

[0015] The fabric draw-off device according to the invention comprises an air supply including a stationary duct associated to the stationary frame and a rotating head associated to the rotating frame. The electrical leads pass through the stationary duct and connect the stationary member of the rotary electrical interface means. This assembly provides a permanent supply of pressurized air and electrical power from the stationary part of the frame to the rotating part. Pressurized air can be used for operating at least one pneumatic actuator, at least one pneumatic cylinder. Blower nozzles for blowing the fabric into a desired shape or position and the like.

[0016] Preferably, the draw-off device comprises at least one roller for advancing the fabric for drawing it off the knitting machine and additionally at least another shaft or roller for rotating the bale for rolling up the fabric. Both types of rollers may be driven by one single electric drive motor. Preferably, however, separate motors are provided which may be energized independently. It is possible to operate the motor of the draw-off rollers tension controlled or position controlled while operating the motor of the wind up roller in a torque controlled, position controlled or tension controlled mode of operation.

[0017] The rotary electrical interface means supplies power from a non-rotating stationary base to the at least one draw-off drive motor. The electrical leads of the rotary electrical interface means may be directly connected to the at least one draw-off motor. A control unit controlling the operation of the motor may be placed on the non-rotating base frame.

[0018] Alternatively, a control unit may be placed on the rotating frame. This approach makes it possible to reduce the number of electrical connections of the rotary electrical interface means to a minimum which may be two or three. The electrical connections may be formed by brushes and slip rings. The control unit may control one, two or some electrical motors for driving the rollers carried by the rotating frame.

[0019] The control unit of the rotating frame may process signals and/or data received from outside, e.g. from another control unit which is located on the non-rotating base frame. Additionally or alternatively, the control unit may process signals or data supplied by sensor means carried by the rotating frame. Sensor means may include position sensors, resolvers current responsive sensors, voltage responsive sensors, switches, weighting cells, strain gauges or the like.

[0020] A radio transmitter system may be present which transmits signals and/or data from outside to the control unit located on the rotating frame and vice versa. The control unit of the rotating frame and the outside control unit may be in data communication permanently or from time to time. Thus the stationary control unit may have complete control over the roll-up process. However merely a two pole rotary electrical interface is necessary on the rotating frame.

[0021] Due to the individual drive of the rotating frame, the rotating frame and the elements it carries will not add to the inertia of the rotating cylinder of the knitting machine. The rotating frame is separately driven and not directly coupled to the cylinder. The control unit of the draw-off device will mainly keep the rotating frame and the rotating cylinder rotating in synchronism. However, the control unit may allow some degree of temporal differences of the rotational speeds. Thus it is possible to quicker start and stop the knitting machine.

[0022] Summarizing, some important features of embodiments of the invention are:

[0023] The draw-off motor(s) are installed on, and carried by, the rotating frame of the draw-off device and rotate together with the frame.

[0024] The movement of the rotating frame is electrically coupled to the rotation of the main cylinder of the knitting machine.

[0025] The speed ratio of the rotational speed of the rotating frame to rotational speed of the draw-off rollers can be controlled by a wireless communication system which connects the machine controller of the knitting machine to the control unit of the draw-off device. The rotary electrical interface means can be reduced to a system which provides only two electrical connections from the stationary frame to the rotating frame.

[0026] The control unit of the rotating frame may also comprise control sensors as there are tension sensors, position sensors, switches and the like as well as actuators as there are knives for cutting the fabric and the like.

[0027] The system is able to draw-off the fabric with controlled tension irrespective of the weight of the wound up coil of fabric.

[0028] Further details of embodiments of the invention are to be taken from the drawings, the description or claims. The description is reduced to main topics of the invention and related facts as well. Further details are to be taken from the drawing.

[0029] Embodiments of the invention will now be described by way of example with reference to the accompanying drawings in which:

Figure 1 is a schematic illustration of a rotary knitting machine and a draw-off device cooperating therewith,

Figure 2 is the inventive draw-off device of Fig. 1 in perspective view,

Figures 3 and 4 are rotary electrical interface means in cross-sectional views,

Figure 5 is an alternative embodiment of the inventive draw-off device,

Figure 6 is a block diagram of another embodiment of the inventive draw-off device, and

Figure 7 a cross sectional illustration of a base portion and a frame portion of the inventive draw-off device.

[0030] Referring to the drawings and in particular to figure 1, a circular knitting machine 1 is illustrated highly schematically. The rotary knitting machine 1 comprises a stationary frame 2, supporting a hollow knitting cylinder 3 which circumscribes a vertical rotational axis 4. A main drive is provided (not illustrated) for rotating the knitting cylinder 3 in a defined direction.

[0031] In operation, knitwear 5 leaves the cylinder 3 running downwards. The knitwear 5 is usually tubular shaped. It has to be rolled up for forming a bale 6 or coil. The knitwear 5 may be cut longitudinally and opened to a single sheet which will be rolled up. Alternatively the fabric tube may remain uncut. In the latter case, the knitwear forms a double layer in each winding of the bale 6.

[0032] A draw-off device 7 is located below the knitting cylinder 3 for drawing the knitwear downwards and for rolling up the knitwear 5. The draw-off device 7 pulls down and holds down the fabric 5 which supports the knitting process. A uniform draw-off force applied to the fabric by the draw-off apparatus will greatly contribute to the quality of the manufacturing process.

[0033] Each revolution of the cylinder 3 will cause one revolution of the knitwear 5. Consequently, the draw-off device 7 has to rotate the bale 6 about an axis which is coaxial to the tubular fabric in order to avoid warping of the knitwear 5. The axis may be arranged vertically and coaxial to axis 4.

[0034] The take-off device 7 comprises a rotatable frame 8 consisting of a horizontal beam 9 and vertical uprights 10, 11 located at the ends of beam 9 and being located in parallel one to another. The upright 10, 11 are arranged in parallel to the rotational axis of the frame 8.

[0035] Frame 8 supports roller means 12. At least, one, preferably three draw-off rollers 13, 14 and 15 having horizontal rotational axes are rotationally supported at their ends at the upper ends of uprights 10 and 11. At least one of the rollers 13, 14 and 15 is driven by an electric motor 16 which is carried by the movable frame 8. Preferably motor 16 is mounted on of uprights 10 and 11 in order to drive at least one of the rollers 13, 14 and 15. Most preferably, motor 16 is a DC motor coupled to an angular gear 17 which drives one, two or all of the rollers 13, 14 and 15.

[0036] Moreover, the rotating frame 8 rotationally supports a horizontal shaft 18 for receiving the fabric and rolling it up in order to form the bale 6. The ends of shaft 18 are rotatably supported on slider elements 19, 20 which may slide upwards and downwards on uprights 10 and 11.

[0037] The roller means 12 further comprise rollers 21, 22 rotatably supported on the frame 8. Rollers 21, 22 are adapted to receive the bale 6 which rests on them.

[0038] At least one of the rollers 21, 22, preferably both of them, is driven by an electric motor 23 to rotate in a defined direction. Motor 23 is connected to the rollers 21, 22 by means of an angular transmission 24 or any other suitable means.

[0039] Both motors 16 and 23 may be located at the same upright 11. Alternatively, motors 16 and 23 may be positioned at different locations. It is in particular possible to use electric motors built in into at least one of the rollers 13, 14, 15, 21 and 22 which motors are known as tubular motors.

[0040] Moreover, it is possible to impart a defined torque to shaft 18 by means of an electric drive or an electric drive together with spiral springs (not illustrated).

[0041] The rotating frame 8 is rotatably mounted on a base frame 25 which carries a frame drive motor 26. The frame drive motor 26 may include a transmission the output of which is connected to a pinion 27 for driving frame 8 by a belt 28. While figure 2 illustrates the overall structure, figure 3 more or less schematically illustrates bearing means 29 for journaling the rotating frame 8. As to be taken from figure 3 the bearing means 29 may include several bearings, in particular roller bearings as there are radial bearing 30, 31 and at least one thrust bearing 32. Adjacent to bearing means 29, a rotary electrical interface 33 is provided which electrically couples at least one motor 23 mounted on rotational frame 8 to a power supply 34 mounted stationary. At least optionally an air coupling (not illustrated in figure 3) may be provided which connect an pressurized air supply apparatus to pressurized air consuming units on the frame 8.

[0042] The rotary electrical interface 33 may comprise brushes 35, 36 and an insulating member which holds the brushes 35, 36. Slipper rings 37, 38 are carried by the rotational frame 8. The slipper sings 37, 38 are electrically insulated from the frame and one to another. The slipper ring arrangement may connect a stationary wire 39 to a rotating wire 40 and a stationary wire 41 to a rotating wire 42.

[0043] The slipper ring arrangement may have dry contacts. Alternatively, it may comprise wet contacts, at least partially consisting of liquid metal as there is mercury of gallium.

[0044] Alternatively, a rotational transformer 43 may form the rotational electrical interface 33, see figure 4. Transformer 43 comprises a stationary member 44 and a rotatable member 45 each consisting of an armature and at least one coil. Additionally a rotatable air coupling may be provided as previously mentioned in view of figure 3.

[0045] The motors 16, 23, 34 are controlled by a control which may consist of two control units 46, 47, one of them carried by the rotating frame 8 and the other one located stationary.

[0046] The electrical structure of the fabric draw-off device 7 is more closely illustrated in figure 6. As to be seen, stationary control unit 47 may directly control motor 26 according to signals or pulses received by line 48 and indicating the revolutions or increments of the main cylinder 3. Control unit 47 may include the power supply 34 for powering motors 16 and 23. The power supply may be directly connected to the motors 16 and 23 as indicated in figure 3 or power control unit 46 which is preferred. Control unit 46 in turn powers motors 16 and 23. Moreover, control unit 46 may be connected to at least one sensor 49 (or to several sensors alternatively). Sensors 49, 50 may be adapted to sense the force acting on the fabric in longitudinal direction thereof ore any other parameter or process variable. The sensors 49, 50 may sense the bearing forces of roller 13. Alternatively, a sensor for reading the current supplied to motor 16 may be provided. If motor 16 is a DC electric motor, the current will be indicative for the torque generated by the motor 16. The torque usually corresponds to the longitudinal force acting on the fabric.

[0047] Additional switches or sensors may be provided on or at frame 8 for sensing and reading parameters and conditions. Control unit 46 may operate motor 16 and 23 accordingly.

[0048] As to be seen from figure 6, a data link 51 may be provided which enables the control units 46 and 47 to communicate. The data link 51 may be formed by at least one electrical wire or an electric bus which leads via the rotary electrical interface 33. However, data link 51 is most preferably provided by a wireless data trans-

mission system which may be provided by transceivers 52, 53 connected to control units 46, 47 respectively. Transceivers 52, 53 may establish a short range coded data link. They may be part of a wireless local area network. In this case, the rotary electrical interface may be reduced to two electrical wires which just transmit power from the stationary power supply 34 to the control unit 46. It is noted, however, that it is possible to place the complete control unit at a stationary base and to run all feeding lines of all motors 16, 23 via the rotary electrical interface 33 which, in this case, comprises a plurality of electrical wires.

Operation:

[0049] During operation knitting cylinder 3 rotates in a given direction (clockwise or counter clockwise). The tubular fabric 5 rotates together with cylinder 3 and must be drawn downwards to safeguard a regular knitting process.

[0050] The draw-off device 7 provides the draw-off force desired. To this end, fabric 5 runs around rollers 13, 14 and 15 frictionally engaging them or being clamped between at least two of them. The torque of motor 16 is therefore transformed into a draw force acting on fabric 5. For controlling the torque and hence the draw-off force control unit 46 may control the energizing current of motor 16. Alternatively, sensor means 49, 50 may sense the draw-off force and supply signals indicative for the force to control unit 46. Control unit 46 may now keep the draw-off force constant by controlling the motor current.

[0051] The bale 6 is wound around shaft 18. The weight of the bale 6 rests on rollers 21, 22. Motor 23 drives rollers 21, 22 in order to rotate the bale 6 so that it takes up the fabric 5 drawn off the knitting machine 1 by rollers 13, 14 and 15. Control unit 46 may control motor 23 so that it winds up the fabric 5 with a constant tension. This is possible due to control of the current of the motor 23 or by controlling it otherwise.

[0052] While motors 16 and 23 draw up the fabric, control unit 47 will control motor 26 according to signals on line 48 which indicate the rotation of cylinder 3.

[0053] If the knitting machine starts or stops, control unit 47 will start or stop motor 26 accordingly. Most of the time, frame 8 will run in synchronism to cylinder 3. During start or stop of cylinder 3, the rotational position of frame 8 may somewhat differ from the rotational position of cylinder 3. However, this temporary error will only exist shortly and vanish quickly.

[0054] During the operation both control units 46, 47 may communicate and transmit data and signals e.g. start and stop signals, data characterizing the speed or force acting on the fabric or switch signals. Those switch signals may be produced by switches detecting the size of bale 6 and indicating if it reaches the desired diameter. Additionally or alternatively a switch may sense the weight of the bale.

[0055] Figure 7 illustrates a preferred embodiment of a combined rotary electrical and pneumatic interface 54. This interface 54 comprises the rotary electrical interface means 33 and a pressurized air rotary interface means 55. The interface 55 comprises a duct member 56, e.g. a pipe or the like, passing through a bearing support 57 carried by the base frame 25. The bearing support 57 carries at least one roller bearing 30, 31 which circumscribes the duct member 56. The outer races of the ball bearings 30, 31 are nested within a through bore of the rotational frame 8.

[0056] While the pipe 56 extends through the lower beam 9 of the rotational frame 8 it carries an air take-off head which is sealingly and rotatably located at the pipe 56. The inner channel of the pipe 56 communicates with an inner space of take-off head 58 which is connected to a tube member 59 for supplying pressurized air to air consumers located on the rotating frame 8.

[0057] The pipe member 56 is closed at its upper end by the stationary member 60 of the rotary electrically interface means 33. The rotatable member 61 of the interface means 33, however, is connected, and rotates together with, the rotating frame 8.

[0058] At the lower end of the duct member 56 a pressurized air supply duct 62 is provided which connects the tube 56 to a source of pressurized air or any other source of any fluid which is to be fed to consumers carried by the frame 8. Even vacuum may be applied to the supply duct 62, if desired.

[0059] The rotary electrical interface means 33 is provided for powering at least one electrical consumer on frame 8. Electrical leads 39, 41 connect the outer power supply 34 (not shown) to connectors of the stationary member 60. The leads pass through the inner duct of the pipe 56. The lower end of the pipe 56 may be closed by any suitable material, a curable resin or the like.

[0060] The combined rotary electrical and pneumatic interface means 54 avoids any need for providing a tank of pressurized air on or at the rotating frame 8 or any other storage means for fluids, electrical energy and the like. This dramatically reduces the need for maintenance and increases the reliability of the assembly.

[0061] An electrically driven fabric draw-off device 7 is disclosed which uses at least one electric motor 16 for driving at least one draw-off roller 13, 14, 15. The electric power is supplied via a rotary electrical interface which electrically connects the motor 16 on rotating frame 8 to the stationary electric supply 34. The rotational movement of frame 8 is caused by another electric motor 26 which is driven in response to a signal indicating the rotational movement of the cylinder 3 of knitting machine 1.

Parts List:

[0062]

1	rotary knitting machine
2	main frame

3	knitting cylinder
4	rotational axis
5	knitwear
6	bale
7	draw-off device
8	frame
9	beam
10, 11	uprights
12	roller means
13, 14, 15	rollers
16	motor
17	angular gear
18	shaft
19, 20	slides
21, 22	rollers
23	motor
24	angular gear
25	base frame
26	frame drive motor
27	pinion
28	belt
29	bearing means
30, 31	radial bearing, roller bearing, ball bearing
32	trust bearing, roller bearing, ball bearing
33	rotary electrical interface
34	power supply
35, 36	brushes
37, 38	slip rings
39 - 42	wires
43	transformer
44, 45	member
46, 47	control unit
48	line
49, 50	sensor
51	data link
52, 53	transceivers
54	rotary electrical and pneumatic interface means
55	pressurized air rotary interface
56	duct member
57	bearing support
58	take-off head
59	tube member
60	stationary member of the interface 33
61	rotational member of the interface 33
62	duct member
63, 64	electrical leads

Claims

1. Fabric draw-off device (7), in particular for a circular knitting machine (1), comprising:

roller means (12) for winding up fabric (5) released by a circular knitting machine (1);
a rotating frame (8) supporting the roller means (12) and being pivoted by a journal (29) defining a vertical axis of rotation;
at least one draw-off drive motor (16) supported by the rotating frame(8) and drivingly connected to the roller means (12);
a rotary electrical interface means (33) for providing electrical power from a source (34) located on a stationary base (25) to the draw-off drive motor (16);
characterized in that the fabric draw-off device (7) further comprises
an air supply (55) including a stationary duct member (56) associated to the stationary base (25) and a rotating head (58) associated to the

rotating frame (8),
wherein electrical leads associated to the stationary base (25) pass through the stationary duct member (56) which carries said rotating head (58) associated to the rotating frame (8), and which stationary duct member (56) carries a stationary member (60) of the electrical interface means (33); and
a rotating member (61) of the electrical interface means (33) being connected to the stationary member (60) of the electrical interface means (33) and to the rotating frame (8) as well.

2. Fabric draw-off device (7) according to claim 1, wherein the roller means (12) comprises at least one roller (21) for rotating a bale (6) while rolling up the fabric (5).

3. Fabric draw-off device (7) according to claim 1 or 2, wherein at least one draw-off drive motor (23) is drivingly connected to at least one roller (21) for winding up the fabric (5).

4. Fabric draw-off device (7) according to one of the claims 1 to 3,
wherein at least one draw-off drive motor (16) is drivingly connected to at least one roller (13) for advancing the fabric (5).

5. Fabric draw-off device (7) according to one of the claims 1 to 4, wherein a motor controller (46) is provided for controlling the draw-off drive motor (16) which motor controller (46) is located on the rotating frame (8).

6. Fabric draw-off device (7) according to claim 5, wherein the motor controller (46) is in communication with a stationary control unit (47), and wherein a wireless communication system (52, 53) is provided for providing a data communication between the controllers (46, 47).

7. Fabric draw-off device (7) according to one of the claims 1 to 6, wherein a sensor (49) is provided for generating a signal indicative for at least one of the tension, the speed, the weight, the presence, and the state of the fabric (5).

8. Fabric draw-off device (7) according to claim 7, wherein the draw-off drive motor (16) is controlled in response to the signal of the sensor (49).

9. Fabric draw-off device (7) according to one of the claims 1 to 8, wherein a rotary electrical interface means (33) comprises at least One slip ring arrangement comprising a slip ring (37) circumscribing the vertical center axis and comprising a brush (35) in frictional contact with the slip ring (37), one of them being located stationary and the other one being connected to the rotating frame (8).

10. Fabric draw-off device (7) according to claim 9, wherein the slip ring arrangement comprising a wat brush slip ring interface comprising a fluid metal.

11. Fabric draw-off device (7) according to one of the claims 1 to 10, wherein the rotary interface means (33) comprises a rotary transformer (43) comprising an energy sending member (44) and an energy receiving member (45) located coaxially relative to the vertical center axis.

12. Fabric draw-off device (7) according to one of the claims 1 to 11, wherein the frame drive motor (26) is drivingly connected to the rotating frame (8) for rotating the same around a vertical center axis.

13. Fabric draw-off device (7) according to claim 12, wherein the frame drive motor (26) is connected to a control unit (47) governing the rotational speed of the frame (8).

14. Fabric draw-off device (7) according to claim 13, wherein the control unit (47) sets the rotational speed of the frame (8) according to the rotational speed of a knitting cylinder (3) of a knitting machine (1).

Patentansprüche

1. Warenbahnabzugsvorrichtung (7), insbesondere für eine Rundstrickmaschine (1), umfassend:

Rollenmittel (12) zum Aufwickeln einer Warenbahn (5), die von einer Rundstrickmaschine (1) abgegeben wird;
einen sich drehenden Rahmen (8), der die Rollenmittel (12) trägt und von einem Zapfen (29), der eine senkrechte Drehachse definiert, gedreht wird;
mindestens einen Abzugsantriebsmotor (16), der vom Rahmen (8) gehalten wird und antreibend mit den Rollenmitteln (12) verbunden ist;
ein drehbares elektrisches Schnittstellenmittel (33), um den Abzugsantriebsmotor (16) von einer Quelle (34) aus, die sich an einem feststehenden Unterteil (25) befindet, mit elektrischer Leistung zu versorgen;
dadurch gekennzeichnet, dass die Warenbahnabzugsvorrichkung (7) ferner Folgendes umfasst:

eine Luftzuführung (55), umfassend ein feststehendes Kanalelement (56), das dem feststehenden Unterteil (25) zugeordnet ist, und einen sich drehenden Kopf (58), der

dem sich drehenden Rahmen (8) zugeordnet ist,
wobei elektrische Leitungen, die dem feststehenden Unterteil (25) zugeordnet sind, durch das feststehende Kanalelement (56) verlaufen, das den sich drehenden Kopf (58) trägt, der dem sich drehenden Rahmen (8) zugeordnet ist, und wobei das feststehende Kanalelement (56) ein feststehendes Element (60) des elektrischen Schriittstellenmittels (33) trägt; und
wobei ein sich drehendes Element (61) des elektrischen Schnittstellenmittels (33) mit dem feststehenden Element (60) des elektrischen Schnittstellenmittels (33) sowie mit dem sich drehenden Rahmen (8) verbunden ist.

2. Warenbahnabzugsvorrichtung (7) nach Anspruch 1, wobei das Rollenmittel (12) mindestens eine Rolle (21) umfasst, um einen Ballen (6) zu drehen, während die Warenbahn (5) aufgerollt wird.

3. Warenabzugsvorrichtung (7) nach Anspruch 1 oder 2, wobei mindestens ein Abzugsantriebsmotor (23) antreibend mit mindestens einer Rolle (21) zum Aufwickeln der Warenbahn (5) verbunden ist.

4. Warenbahnabzugsvorrichtung (7) nach einem der Ansprüche 1 bis 3,
wobei mindestens ein Abzugsantriebsmotor (16) antreibend mit mindestens einer Rolle (13) zum Vorwärtsbewegen der Warenbahn (5) verbunden ist.

5. Warenbahnabzugsvorrichtung (7) nach einem der Ansprüche 1 bis 4, wobei eine Motorsteuerung (46) zum Steuern des Abzugsantriebsmotors (16) vorgesehen ist, wobei sich die Motorsteuerung (46) an dem sich drehenden Rahmen (8) befindet.

6. Warenbahnabzugsvorrichtung (7) nach Anspruch 5, wobei die Motorsteuerung (46) mit einer feststehenden Steuereinheit (47) in Verbindung steht, und wobei ein drahtloses Kommunikationssystem (52, 53) vorgesehen ist, um für eine Datenkommunikation zwischen den Steuerungen (46, 47) zu sorgen.

7. Warenbahnabzugsvorrichtung (7) nach einem der Ansprüche 1 bis 6, wobei ein Sensor (49) bereitgestellt ist, um ein Signal zu erzeugen, das die Spannung, die Geschwindigkeit, das Gewicht, das Vorhandensein und/oder den Zustand der Warenbahn (5) anzeigt.

8. Warenbahnabzugsvorrichtung (7) nach Anspruch 7, wobei der Abzugsantriebsmotor (16) als Reaktion auf das Signal des Sensors (49) gesteuert wird.

9. Warenbahnabzugsvorrlchtung (7) nach einem der Ansprüche 1 bis 8, wobei ein sich drehendes elektrisches Sehnittsteiienmittei (33) mindestens eine Schleifringanordnung umfasst, die einen Schleifring (37) umfasst, der die senkrechte Mittelachse umschreibt, und eine Bürste (35) umfasst, die mit dem Schleifring (37) über Reibung in Kontakt steht, wobei ein Element davon feststeht und das andere mit dem sich drehenden Rahmen (8) verbunden ist.

10. Warenbahnabzugsvorrichtung (7) nach Anspruch 9, wobei die Schieifringanordnung eine nasse Bürste-Schleifring-Schnittstelle umfasst, die ein Flüssigmetall umfasst.

11. Warenbahnabzugsvorrichtung (7) nach einem der Ansprüche 1 bis 10, wobei das sich drehende Schnittstellenmittel (33) einen sich drehenden Transformator (43) umfasst, der ein Energie abgebendes Element (44) und ein Energie aufnehmendes Element (45) umfasst, die koaxial zur senkrechten Mittelachse angeordnet sind.

12. Warenabzugsvorrichtung (7) nach einem der Ansprüche 1 bis 11, wobei der Rahmenantriebsmotor (26) antreibend mit dem sich drehenden Rahmen (8) verbunden ist, um diesen um eine senkrechte Mittelachse zu drehen.

13. Warenbahnabzugsvorrichtung (7) nach Anspruch 12, wobei der Rahmenantriebsmotor (26) mit einer Steuereinheit (47) verbunden ist, die die Drehzahl des Rahmens (8) einstellt.

14. Warenbahnabzugsvorrichtung (7) nach Anspruch 13, wobei die Steuereinheit (47) die Drehzahl des Rahmens (8) nach der Drehzahl eines Strickzylinders (3) einer Strickmaschine (1) festlegt.

Revendications

1. Dispositif de tirage de tricot (7), en particulier pour un métier circulaire (1), comprenant :

des moyens formant rouleau (12) destinés à enrouler le tricot (5) libéré par un métier circulaire (1) ;
un cadre rotatif (8) portant les moyens formant rouleau (12) et entraînés à pivoter par un tourillon (29) définissant un axe vertical de rotation ;
au moins un moteur d'entraînement de tirage (16) porté par le cadre rotatif (8) et relié par entraînement aux moyens formant rouleau (12) ;
un moyen formant interface électrique rotative (33) destiné à fournir de l'énergie électrique d'une source (34) située sur une base fixe (25) au moteur d'entraînement de tirage (16) ;

caractérisé en ce que le dispositif de tirage de tricot (7) comprend en outre une admission d'air (55) comprenant un élément formant conduit fixe (56) associé à la base fixe (25) et une tête rotative (58) associée au cadre rotatif (8),
dans lequel des fils de sortie associés à la base fixe (25) passent à travers l'élément formant conduit fixe (56) portant ladite tête rotative (58) associée au cadre rotatif (8), lequel élément formant conduit fixe (56) portant un élément fixe (60) du moyen formant interface électrique (33) ; et
un élément rotatif (61) du moyen formant interface électrique (33) étant relié à l'élément fixe (60) du moyen formant interface électrique (33) de même qu'au cadre rotatif (8).

2. Dispositif de tirage de tricot (7) selon la revendication 1, dans lequel les moyens formant rouleau (12) comprennent au moins un rouleau (21) destiné à faire tourner une balle (6) tout en enroulant le tricot (5).

3. Dispositif de tirage de tricot (7) selon la revendication 1 ou 2, dans lequel au moins un moteur d'entraînement de tirage (23) est relié par entraînement à au moins un rouleau (21) destiné à enrouler le tricot (5).

4. Dispositif de tirage de tricot (7) selon l'une quelconque des revendications 1 à 3, dans lequel au moins un moteur d'entraînement de tirage (96) est relié par entraînement à au moins un rouleau (13) destiné à faire avancer le tricot (5).

5. Dispositif de tirage de tricot (7) selon l'une quelconque des revendications 1 à 4, dans lequel un dispositif de commande de moteur (46) sert à commander le moteur d'entraînement d'étirage (16), ledit dispositif de commande de moteur (46) étant situé sur le cadre rotatif (8).

6. Dispositif de tirage de tricot (7) selon la revendication 5, dans lequel le dispositif de commande de moteur (46) est en communication avec une unité de commande fixe (47), et dans lequel un système de communication sans fil (52, 53) sert à fournir une communication de données entre les dispositifs de commande (46, 47).

7. Dispositif de tirage de tricot (7) selon l'une quelconque des revendications 1 à 6, dans lequel un capteur (49) sert à produire un signal indiquant au moins la tension et/ou la vitesse et/ou le poids et/ou la présence et/ou l'état du tricot (5).

8. Dispositif de tirage de tricot (7) selon la revendication 7, dans lequel le moteur d'entraînement de tirage (16) est commandé en réponse au signal du capteur (49).

9. Dispositif de tirage de tricot (7) selon l'une quelconque des revendications 1 à 8, dans lequel un moyen formant interface électrique rotative (33) comprend au moins un agencement formant bague collectrice comprenant une bague collectrice (37) circonscrivant l'axe central vertical et comprenant une brosse (35) en contact frictionnel avec la bague collectrice (37), l'une d'entre elles étant fixe et l'autre étant reliée au cadre rotatif (8).

10. Dispositif de tirage de tricot (7) selon la revendication 9, dans lequel l'agencement formant bague collectrice comprend une interface de bague collectrice et de brosse humide comprenant un métal fluidique.

11. Dispositif de tirage de tricot (7) selon l'une quelconque des revendications 1 à 10, dans lequel le moyen formant interface rotative (33) comprend un transformateur rotatif (43) comprenant un élément d'émission d'énergie (44) et un élément de réception d'énergie (45) situé coaxialement à l'axe central vertical.

12. Dispositif de tirage de tricot (7) selon l'une quelconque des revendications 1 à 11, dans lequel le moteur d'entraînement de cadre (26) est relié par entraînement au cadre rotatif (8) destiné à faire tourner celui-ci autour d'un axe central vertical.

13. Dispositif de tirage de tricot (7) selon la revendication 12, dans lequel le moteur d'entraînement de cadre (26) est relié à une unité de commande (47) gouvernant la vitesse de rotation du cadre (8).

14. Dispositif de tirage de tricot (7) selon la revendication 13, dans lequel l'unité de commande (47) établit la vitesse de rotation du cadre (8) en fonction de la vitesse de rotation d'un cylindre de tricotage (3) d'un métier à tricoter (1).

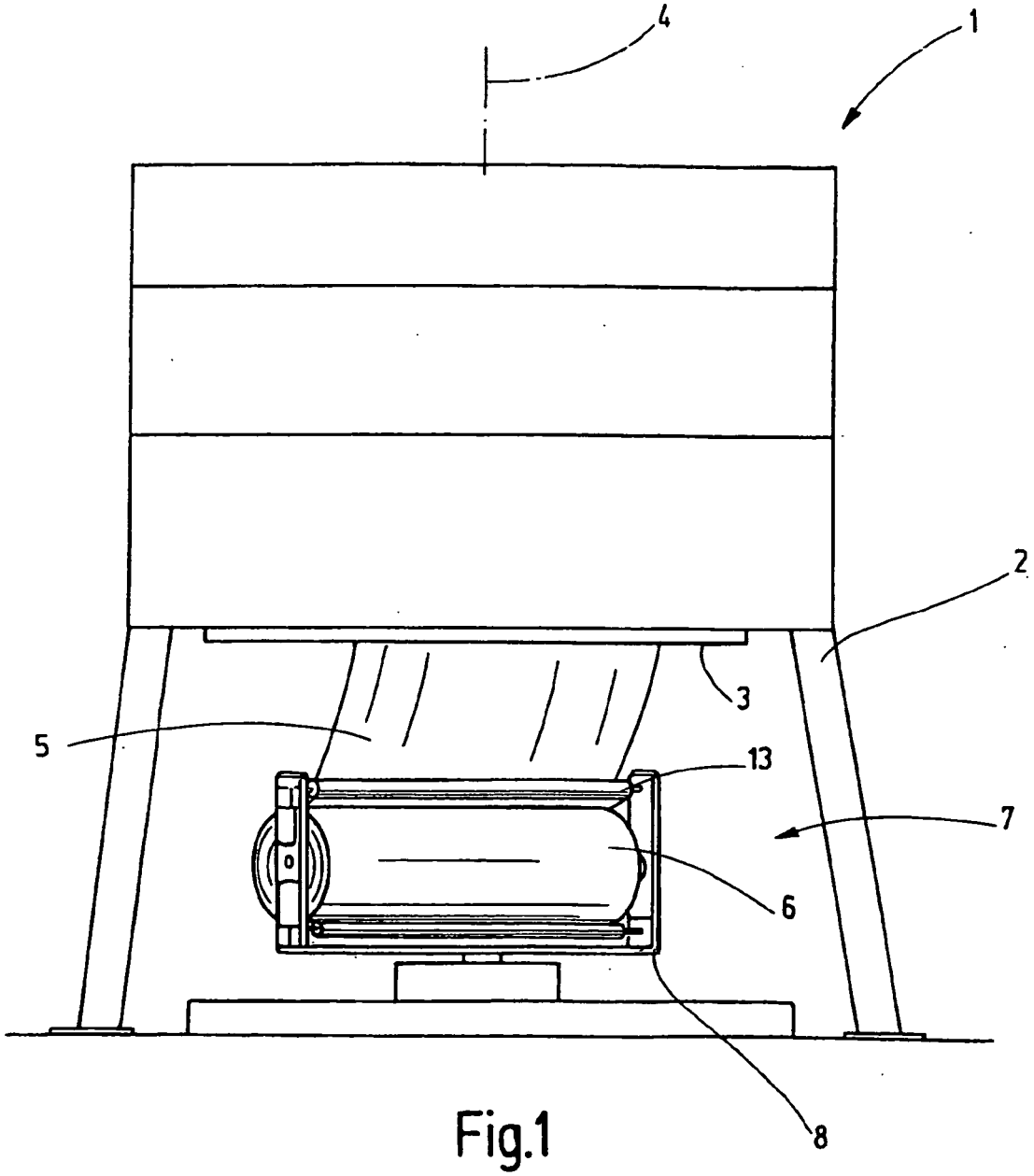

Fig.1

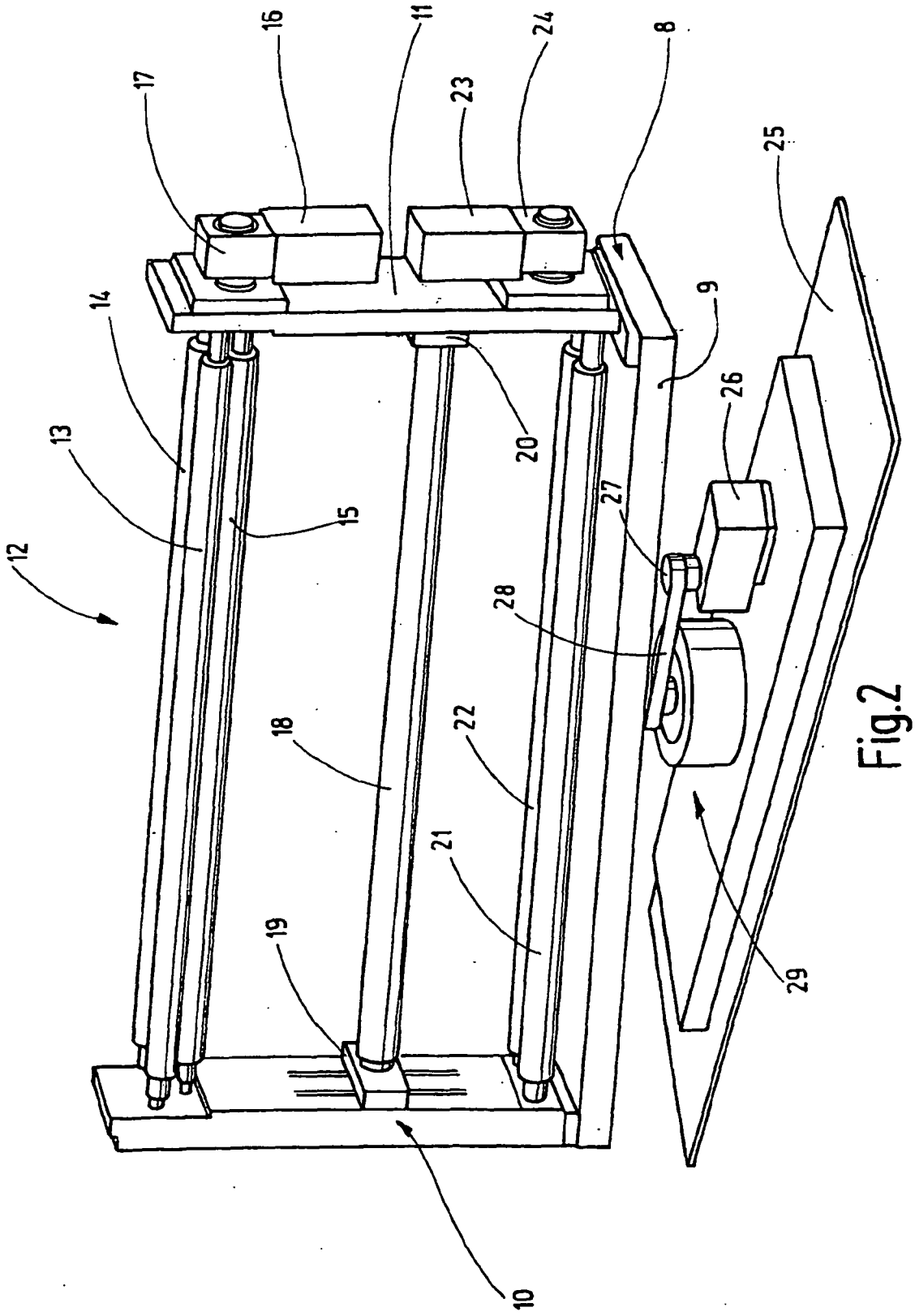

Fig.2

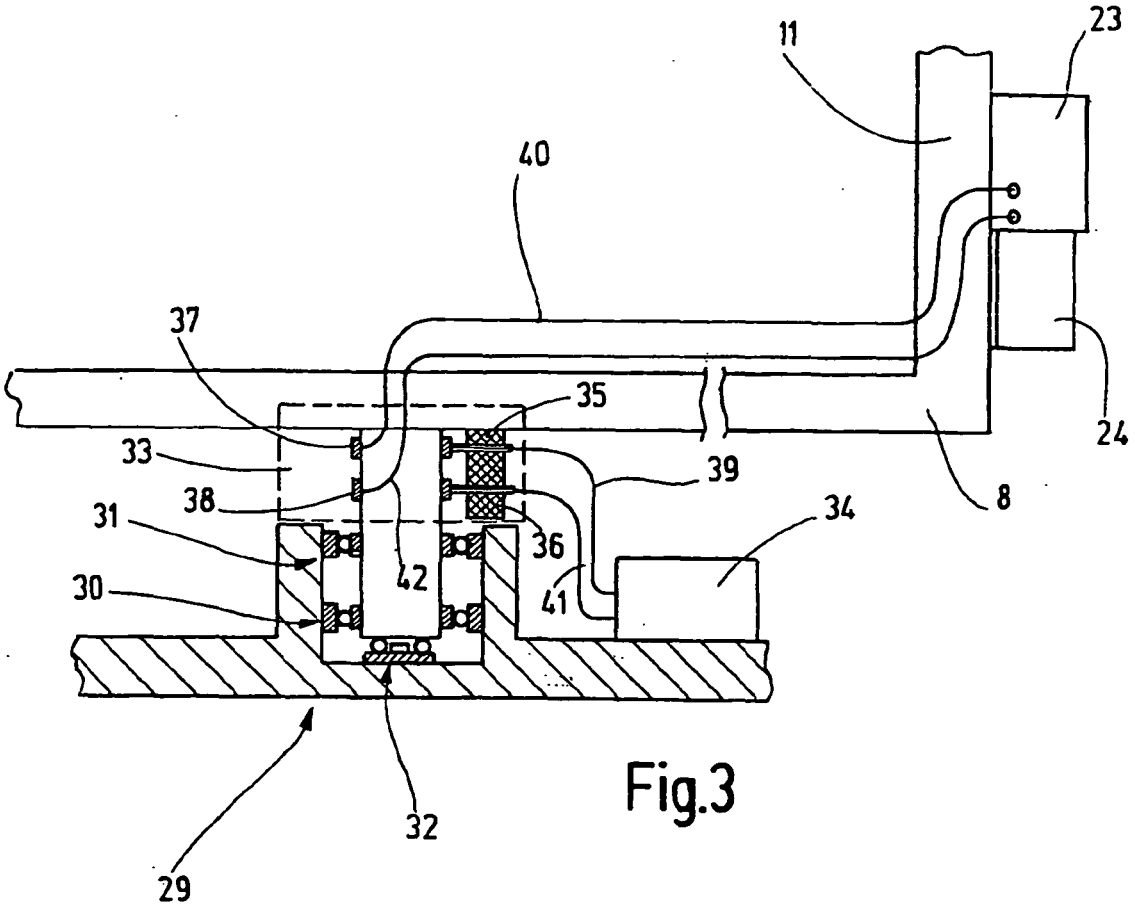

Fig.3

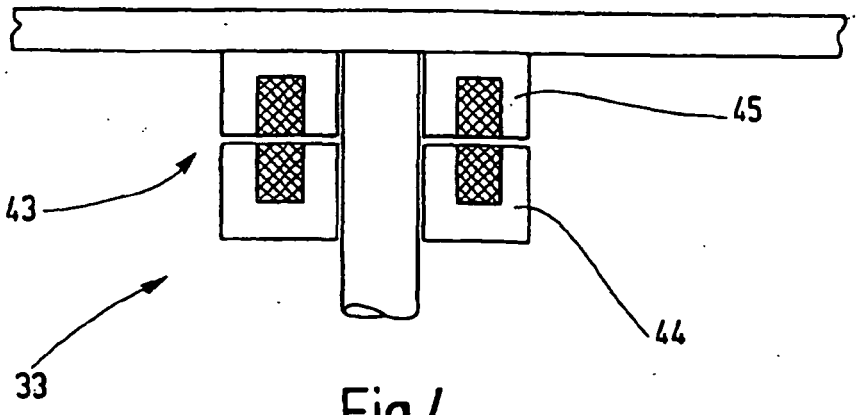

Fig.4

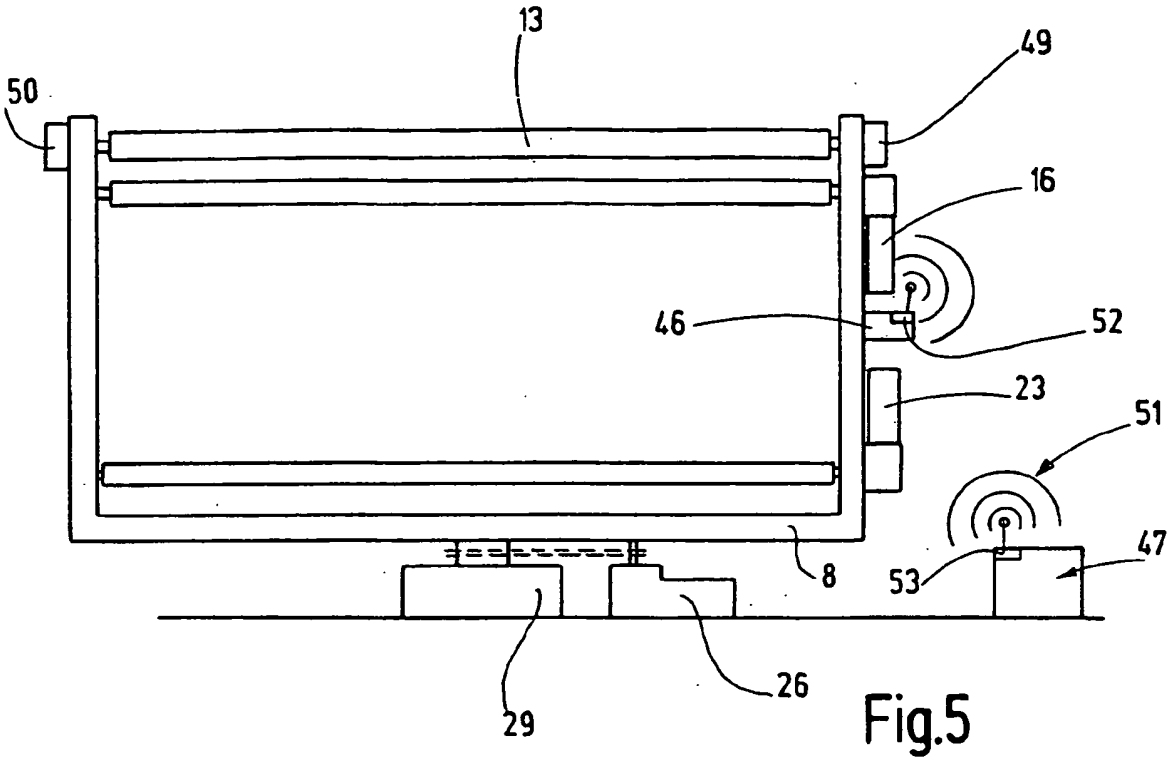

Fig.5

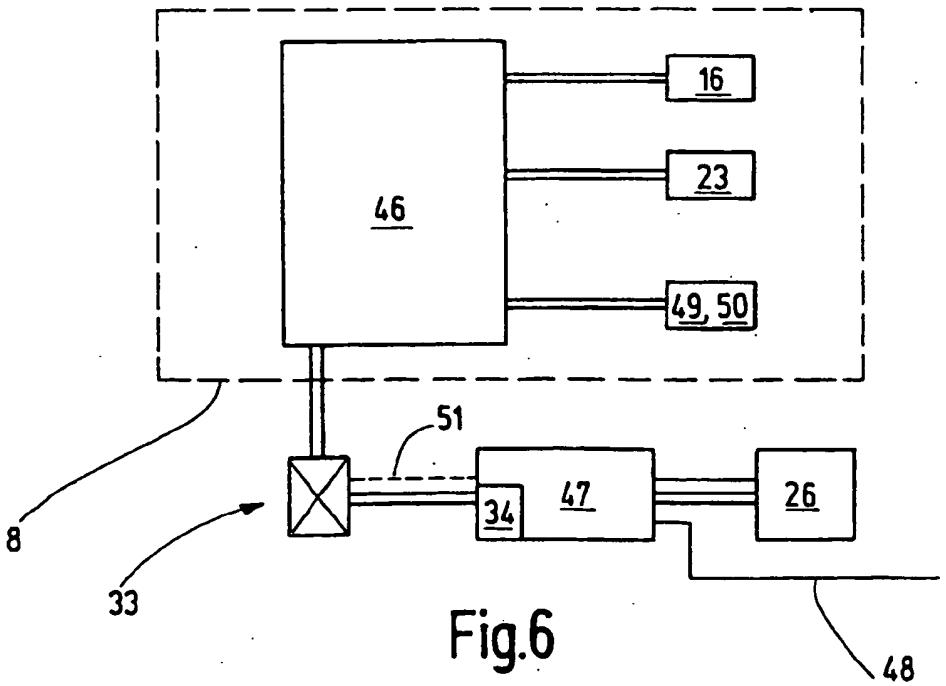

Fig.6

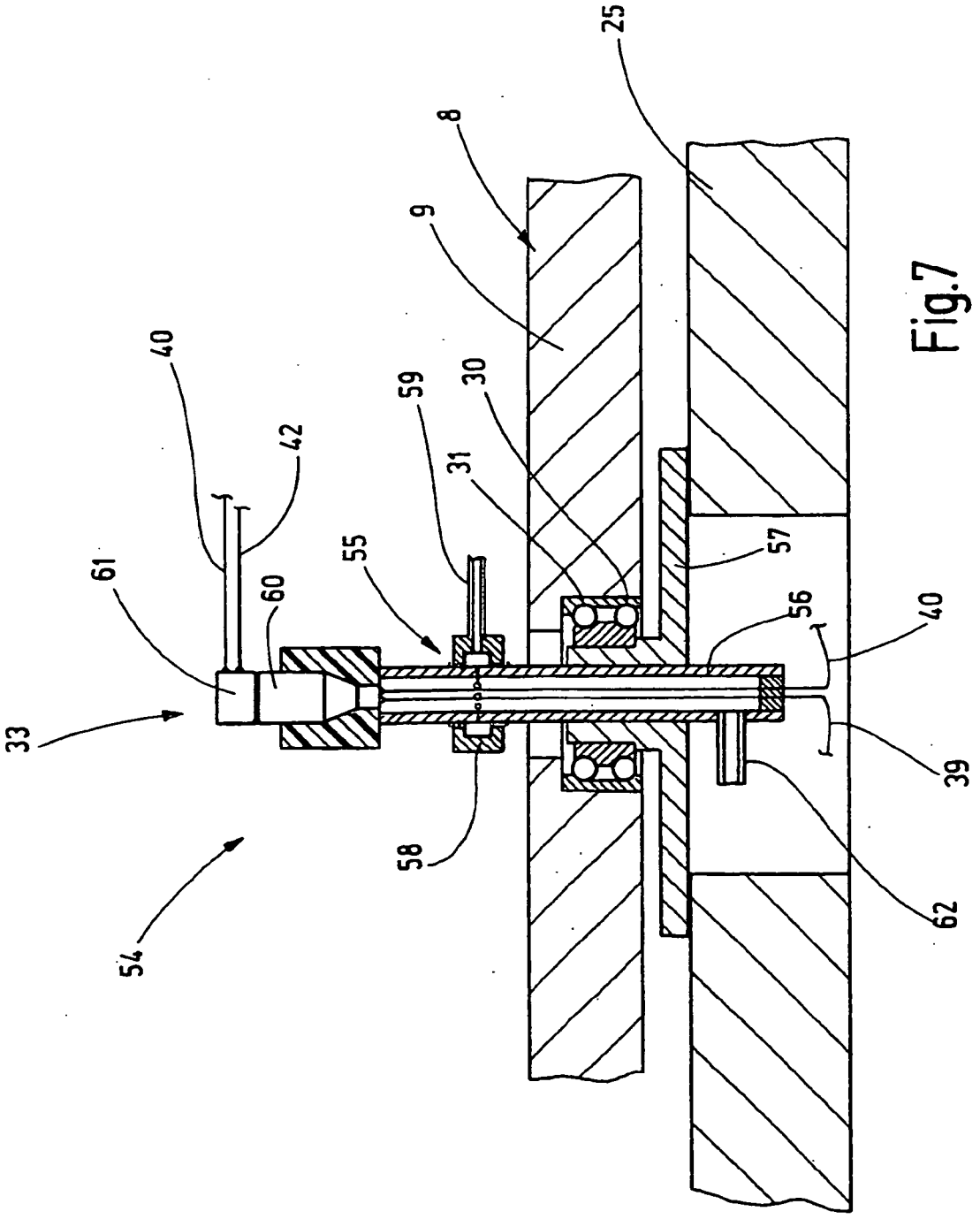

Fig.7

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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- US 3791177 A **[0005]**
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