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(54) **System for detecting breakages of the roving in a roving frame**

(57) A roving frame (1) of a spinning line, comprises a drawing device (12), a winding device (14) and a system for detecting breakages of the roving (20) comprising a plurality of detection sensors, a processing device (50) associated with each sensor according to a low-pass or timer filter, and a control device (70) connected to the processing devices (50) to stop the drawing device (12) and the winding device (14) in the presence of a breakage of the roving.

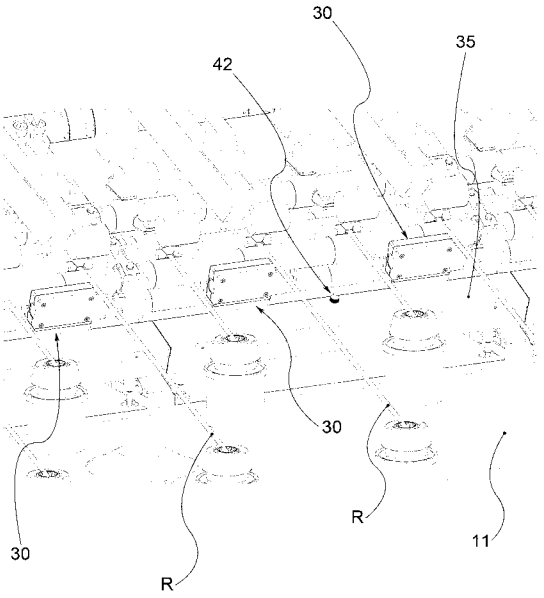

Fig. 2

EP 2 530 191 A1

Description

DESCRIPTION

[0001] The present invention relates to a roving frame on a spinning line and, in particular, an electronic device of the roving frame to detect breakage of the roving.

[0002] In a roving frame, the fibre web obtained by carding or combing, deposited in cans, is drawn in a drawing device, to obtain a roving. In a spool forming device, downstream of the drawing device, the roving is wound around tubes, to obtain the spools to be sent to the spinning unit.

[0003] The roving frame works contemporarily on a large number of machining points.

[0004] For example, the roving frame FTSN by Marzoli S.p.a., envisages 192 spools and extends for a length of about 25 metres.

[0005] The drawing which occurs on the roving frame is strongly driven, so that the speed of the roving downstream of the drawing device is very high, generally around 25 m/min. Moreover, the roving is subject to strong oscillations between the drawing device and the spool forming device, and therefore subject to breakage.

[0006] For the correct functioning of the roving frame, it is essential to promptly detect breakage of the roving. Such detection is accompanied by stopping of the entire machine, so as to enable intervention of an operator to join up the roving again and resume processing.

[0007] Numerous sensor solutions exist for detecting breakage of the roving.

[0008] However, such solutions are often very expensive, bearing in mind the large number of machining points where the sensors must be installed.

[0009] The purpose of the present invention is to make a roving frame provided with a particularly economical system for detecting breakage of the roving.

[0010] Such purpose is achieved by a roving frame according to claim 1.

[0011] The characteristics and advantages of the roving frame according to the present invention will be evident from the description given below made by way of a nonlimiting example with reference to the appended drawings, wherein:

[0012] - figure 1 shows a diagram of a roving frame according to the present invention;

[0013] - figure 2 shows a detail of an intermediate region of the roving frame;

[0014] - figure 3 shows a detection device of the roving frame according to the present invention;

[0015] - figure 4 shows a shell of the device in figure 3;

[0016] - figure 5 show a front view of the shell in figure 4;

[0017] - figure 6 shows a cover of the device in figure 3;

[0018] - figure 7 show a front view of the cover in figure 6;

[0019] - figure 8 shows a diagram of a roving frame system for detecting breakage of a roving, comprising the device in figure 3;

[0020] - figure 9 shows a detail of an intermediate region of the roving frame, according to a further embodiment of the present invention; and

[0021] - figure 10 shows a detail of an intermediate region of the roving frame, according to yet a further embodiment of the present invention.

[0022] With reference to the appended drawings, reference numeral 1 globally denotes a roving frame according to the present invention.

[0023] The roving frame 1 comprises a plurality of work stations, one alongside the other longitudinally, each able to make a roving.

[0024] In particular, the roving frame 1 comprises a feed device 2 of the web W, contained in cans 4.

[0025] The feed device 2 comprises a support frame 6 and deviation bars 8, preferably swivelling, for the deviation of the web coming out of the cans.

[0026] Preferably, the roving frame 1 comprises a plurality of web breakage sensors, suitable for detecting the breakage of the web W coming out of the cans.

[0027] The roving frame 1 further comprises a frame 10 which, at the top, supports a drawing device 12 suitable for drawing the web W to obtain a roving R.

[0028] For example, the drawing device 12 comprises at least two pairs of pressure coupled rollers, typically motorised lower rollers and non-motorised upper pressure rollers, each coupled to the respective lower roller.

[0029] For example, three pairs of rollers are envisaged, one downstream of the other. The difference in peripheral speed between the pairs of rollers in sequence determines the drawing of the web.

[0030] The roving frame 1 further comprises first means of moving to move the rollers of the drawing device 12.

[0031] The frame 10 comprises a perforated table 11, through which the rovings pass from the upper region to the lower region.

[0032] In addition, the roving frame 1 comprises a winding device 14, under the table 11, suitable for winding the roving R coming out of the drawing device 12 in spools S.

[0033] The roving frame 1 further comprises second means of moving for the winding device 14.

[0034] Downstream of the drawing device 12 and upstream of the winding device 14, an intermediate region 19 is defined at the upper part of the table 11, traversed by the rovings during normal operation of the roving frame.

[0035] In a preferred embodiment, moreover, the roving frame 1 comprises a substitution device 16 suitable for picking up the spools S upon completion of formation and inserting empty tubes in the spool forming device 14, for the formation of further spools, and transporting the spools S for subsequent processing, in particular to a ring spinning frame.

[0036] The roving frame 1 comprises a roving breakage detection system 20, suitable for detecting the breakage of a roving R coming out of the drawing device 12.

[0037] The roving breakage detection system 20 comprises a plurality of sensors suitable for detecting the presence of the roving in a detection zone of the intermediate region 19.

[0038] In particular, said sensors are suitable for generating a primitive detection signal Sp depending on the presence or absence of the roving in the detection zone.

[0039] Preferably, the sensors are digital, that is to say suitable for generating a primitive signal Sp having two logical states depending on the presence or absence of the roving in the detection zone.

[0040] Preferably, the sensors consist of photocells.

[0041] For example, the sensors consist of contact sensor photocells, that is to say based on the reflection of light by the roving which intercepts the luminous beam emitted.

[0042] In particular, preferably, the photocells are contact sensors with background suppression, suitable for discriminating objects of small sizes regardless of the adjacent background.

[0043] Preferably, a detection device 30 comprises a casing 32 provided with longitudinally opposite apertures 34, and said sensors, two per device, are housed in said casing and look out from the respective apertures 34.

[0044] In addition, the device 30 comprises connection means 38, integrated in the casing 32, for the releasable connection of the casing and the frame 10 of the roving frame 1.

[0045] In particular, the roving frame 1 comprises a sensor bar 35, made in several pieces, having a longitudinal extension all along the length of the frame 10 and positioned above the table 11 of the same.

[0046] The detection devices 30 are connected to the sensor bar 35, regularly distanced longitudinally, between one work station and another, so that each is situated between two rovings R.

[0047] According to an embodiment variation, the device comprises luminous signalling means, on the casing, operatively connected to the sensors, suitable to signal the presence and/or absence of the roving.

[0048] Preferably, the system comprises luminous signalling means operatively connected to the sensors, suitable for signalling the presence and/or absence of the roving.

[0049] For example, the signalling means comprise a presence LED 42, preferably positioned in the intermediate region 19 preferably above the table 11 of the frame 10.

[0050] Preferably, the presence LED 42 is positioned between two devices 30 alongside each other.

[0051] In particular, according to a preferred embodiment, individual signalling means are operatively connected to a plurality of sensors, that is to a plurality of photocells, so that the signalling of breakage of the roving is performed upon breakage of at least one roving of the plurality of rovings associated with the plurality of sensors connected to said signalling means.

[0052] In other words, a single signalling LED 42 is associated with the state of a group of rovings.

[0053] Advantageously, above all in the case of a roving frame with a large number of work stations, it is possible to identify the region where the broken roving is situated along the frame; conversely, providing an LED for each roving would make it impossible to monitor them all, on account of the high number of LEDs which would otherwise be present along the machine.

[0054] The system 20 further comprises a digital processing device 50 for each sensor of the detection device 30, operatively connected to the respective sensor to pick up the primitive signal Sp, process it and emit a respective processed signal.

[0055] In particular, said processing device 50 comprises a digital low-pass filter suitable for cutting out the high frequencies of the primitive signal Sp, to cancel out the influence of the oscillation of the roving, such as to bring it outside the detection zone.

[0056] Alternatively, said processing device 50 comprises a digital timer suitable for increasing the sampling range of the primitive signal Sp, again so as to cancel out the influence of the oscillation of the roving.

[0057] Preferably, a filter 60 comprises a plurality of processing devices 50, for example grouped into 8 detection devices 30 at time, corresponding to detection on 16 rovings (therefore grouped for 16 photocells at a time).

[0058] In addition, the roving frame 1 comprises an electronic control device 70 connected to the processing devices 50 or to the respective filters 60 and to the first and second movement means.

[0059] The control device 70 is suitable for picking up, among other things, the processed signals and for sending a command signal to the first and second moving means, to stop the drawing device and the winding device if at least one of the signals processed is indicative of the presence of a breakage of the roving.

[0060] According to a further embodiment, the system 20 comprises a comparison device 55 connected to the processing devices 50, suitable for picking up the processed signals from the processing devices and for generating a comparative signal Sc which indicates the presence of a breakage if at least one of the signals processed indicates the presence of a breakage.

[0061] In such embodiment, the control device 70 is operatively connected to the comparison device to pick up the comparative signal Sc, and to the first and second moving means to send command signals to these and stop the drawing device 12 and the winding device 14 in the presence of at least one comparative signal indicating the presence of a breakage of the roving.

[0062] Preferably, said comparison device 55 comprises a plurality of relays.

[0063] Preferably, moreover, the system 20 provides for a plurality of comparison devices 55, each comparison device being associated with only a predefined number of processing devices 50.

[0064] For example, the comparison device 55 is associated with a group 8 of processing devices 50.

[0065] Preferably, the control device 70 comprises a PLC.

[0066] When the rovings R coming out of the drawing device 12 advance regularly across the intermediate region 19, the sensors, focused on the detection zone, emit a highly oscillating primitive signal Sp on account of the oscillations of the roving, which even take it outside the detection zone.

[0067] The primitive signals Sp are picked up by the processing devices 50, which act as low-pass filters or timers, such as to emit regular processed signals, which identify the presence of the roving without breakage in the detection zone.

[0068] When a roving breaks, the processing device 50 affected by the breakage emits a regular processed signal which identifies the permanent absence of the roving in the detection zone (that is, the breakage of the roving).

[0069] Consequently, the control device 70 stops the drawing device 12 and the winding device 14, picking up the signals processed by the processing devices directly or picking up the comparative signal Sc emitted by the comparison devices.

[0070] Preferably, the detection system provides for a plurality of comparison devices in cascade, so as to progressively limit the number of signals to be transmitted to the processing device.

[0071] Preferably, moreover, the permanent absence of the roving in the detection zone, identified as breakage of the roving, corresponds to an electric signal, in other words the signal processed is non- null; while the permanent presence of the roving in the detection zone, identified as non-breakage of the roving, does not correspond to an electric signal, in other words the signal processed is null.

[0072] Advantageously, such characteristic makes it possible to limit the power supply voltage of the detection system, and in particular of the relay comparison devices.

[0073] According to a preferred embodiment, the casing 32 comprises a shell 32a and a cover 32b, coupling to each other to form the inner housing which the sensors are positioned in.

[0074] Preferably, the shell 32a and the cover 32b are made from plastic material, for example from antistatic polycarbonate, preferably transparent, for example frosted.

[0075] In particular, the sensors are positioned in the casing, or said casings are fitted to the sensor bar 35, so that the direction of emission E of the ray is inclined, for example downwards, in relation to a horizontal direction, preventing reciprocal interference.

[0076] Preferably, said direction of emission is inclined by an angle of 1° to 4°, preferably 1° to 3°, preferably equal to 2°.

[0077] According to a further embodiment, the sensors are positioned in the casing, or said casings are fitted to the sensor bar 35, so that the direction of emission E of the rays emitted by a sensor are misaligned with those of an adjacent sensor, so as to prevent interferences.

[0078] In particular, the detection device 30 (or sensors inside the casing) is inclined so that the main emission direction E of the rays is incident, not orthogonal to the direction of advancement of the rovings (figure 10).

[0079] In other words, the detection devices (or sensors inside them) are misaligned on an equatorial plane identified by the ideal trajectory of the rovings R.

[0080] According to yet a further embodiment, the roving breakage detection system 20 comprises at least one divider 100 suitable for forming a barrier to the emission of a sensor, so that one sensor does not interfere with the other sensors.

[0081] For example, in the embodiment variation envisaging the use of photocells, said divider 100 is a wall opaque to the rays emitted by the photocell and is positioned between one sensor and the adjacent sensor, so as to intercept the rays emitted by said sensor, preventing it from interfering with the adjacent sensor (figure 9).

[0082] Innovatively, the detection system for a roving frame according to the present invention makes it possible to considerably reduce realisation costs, in that the sensors used are commercially available.

[0083] At the same time detection is highly reliable, thanks above all to the presence of a filter associated with each sensor.

[0084] Advantageously, moreover, the detection device occupies a very limited space, without obstructing the positioning of the other components of the roving frame.

[0085] According to a further advantageous embodiment, the sensors are positioned so as not to interfere with each other, and in particular, in such a way that the ray emitted by one sensor does not intercept the emission aperture of the adjacent sensor.

[0086] It is clear that a person skilled in the art may make modifications to the roving frame described above so as to satisfy contingent requirements, all while remaining within the sphere of protection as defined by the following claims.

Claims

1. Roving frame (1) of a spinning line, comprising:

- a drawing device (12) comprising at least two pairs of pressure-coupled rollers, suitable for drawing a web (W) and making a roving (R);
- first means of moving to move the rollers of the drawing device ;
- a winding device (14), downstream of the drawing device (12) for winding the roving (R) in spools (S);
- second means of moving for the winding device;
- an intermediate region (19) positioned downstream of the drawing device (12) and upstream

of the winding device (14), traversed by the roving (R) during normal machining;
- a system for detecting breakages of the roving (20) comprising:

a) a plurality of sensors, positioned in the intermediate region, each associated with a roving (R) and each suitable for detecting the presence of the roving (R) in a relative detection zone of the intermediate region and for emitting a relative primitive signal (Sp);
b) a processing device (50) associated with each sensor, suitable for picking up the primitive signal (Sp) and for emitting a processed signal, able to act on the primitive signal (Sp) according to a low pass filter or a timer;

- a control device (70), operatively connected to the processing devices (50) to pick up the processed signals, and to the first and second moving means, to send command signals to these and stop the drawing device (12) and the winding device (14) in the presence of a processed signal indicating a breakage of the roving.

2. Roving frame (1) of a spinning line, comprising:

- a drawing device (12) comprising at least two pairs of pressure-coupled rollers, suitable for drawing a web (W) and making a roving (R);
- first means of moving to move the rollers of the drawing device;
- a winding device (14), downstream of the drawing device (12) for winding the roving (R) in spools (S);
- second means of moving for the winding device;
- an intermediate region (19) positioned downstream of the drawing device (12) and upstream of the winding device (14), traversed by the roving (R) during normal machining;
- a system for detecting breakages of the roving (20) comprising:

a) a plurality of sensors, positioned in the intermediate region, each associated with a roving (R) and each suitable for detecting the presence of the roving (R) in a relative detection zone of the intermediate region and for emitting a relative primitive signal (Sp);
b) a processing device (50) associated with each sensor, suitable for picking up the primitive signal (Sp) and for emitting a processed signal, suitable for acting on the primitive signal (Sp) according to a low pass filter or a timer;
c) a comparison device (55) connected to the processing devices (50), suitable for picking up the processed signals from the processing devices and for generating a comparative signal (Sc) which indicates the presence of a breakage if at least one of the signals processed indicates the presence of a breakage;

- a control device (70), operatively connected to the comparison device to pick up the comparative signal (Sc), and to the first and second moving means, to send command signals to these and stop the drawing device (12) and the winding device (14) in the presence of at least one comparative signal indicating the presence of a breakage of the roving.

3. Roving frame according to claim 2, wherein several comparison devices (55) are provided, each comparison device being associated with only a predefined number of processing devices (50).

4. Roving frame according to any of the previous claims, wherein the sensors are digital.

5. Roving frame according to any of the previous claims, wherein the control device (70) is a PLC.

6. Roving frame according to any of the previous claims, wherein the sensor is a photocell.

7. Roving frame according to claim 6, wherein the photocell is a contact sensor.

8. Roving frame according to claim 7, wherein the photocell is a background suppression photocell.

9. Roving frame according to any of the previous claims, comprising a detection device (30) associable in a detachable manner to the frame (10) of the roving frame, comprising:

- a pair of sensors;
- a casing (32) in which said sensors are housed, having longitudinally opposite apertures (34) from which said sensors look out.

10. Roving frame according to claim 9, wherein said casing comprises a shell (32a) and a cover (32b), in plastic material, suitable to be coupled to form the housing which receives the sensors.

11. Roving frame according to claim 9 or 10, wherein the sensors are positioned in the casing in such a way that the direction of emission of the sensor is inclined in relation to a horizontal direction.

12. Roving frame according to claim 11, wherein the direction of emission is inclined downwards in the direction of emission.

13. Roving frame according to claim 12, wherein said direction of emission is inclined by an angle of 1° to 4°, preferably 1° to 3°, preferably equal to 2°.

14. Roving frame according to any of the previous claims, wherein the roving breakage detection system comprises luminous signalling means operatively connected to the sensors, suitable to signal the presence and/or absence of the roving.

15. Roving frame according to claim 14, wherein the signalling means comprise a presence LED (42), for example positioned in the intermediate region (19) preferably above the table (11) of the frame (10).

16. Roving frame according to claim 14 or 15, wherein individual signalling means are operatively connected to a plurality of sensors to signal the breakage detected by one of said sensors.

17. Roving frame according to any of the previous claims, wherein the main emission direction of the rays emitted by a sensor is inclined so as to be incident to the direction of advancement of the rovings, rotated in the direction of advancement of the rovings or in the opposite direction.

18. Roving frame according to claim 17, wherein the main emission direction of the rays emitted by a sensor lies on an equatorial plane identified by the ideal trajectory of the rovings (R).

19. Roving frame according to any of the previous claims, wherein the roving breakage detection system (20) comprises at least one divider (100) suitable for forming a barrier to the emission of a sensor, so that one sensor does not interfere with the other sensors.

20. Roving frame according to claim 19, wherein said divider (100) is a wall opaque to the rays emitted by a sensor and is positioned between one sensor and the adjacent sensor, so as to intercept the rays emitted by said sensor, preventing it from interfering with the adjacent sensor.

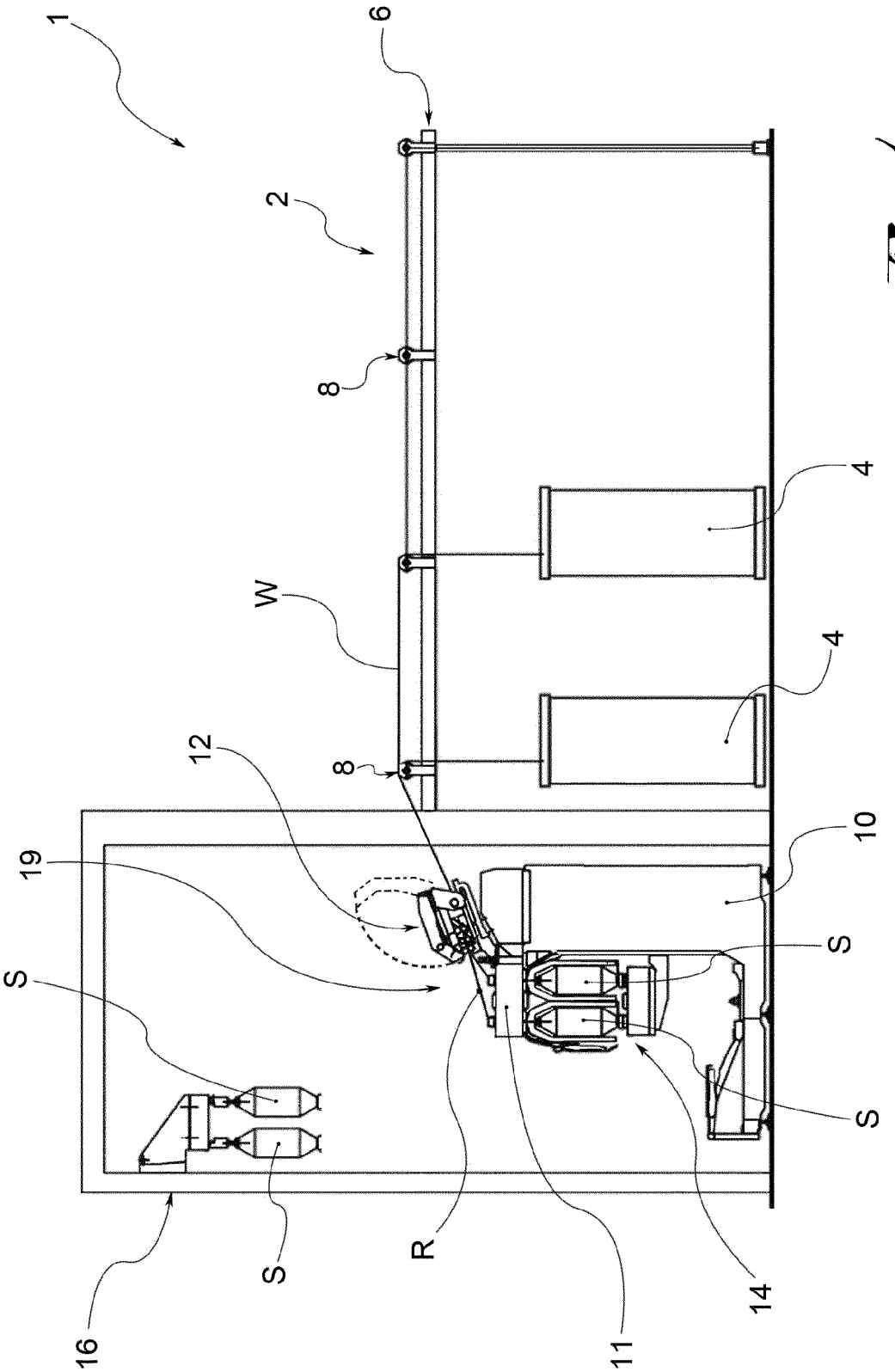

Fig.1

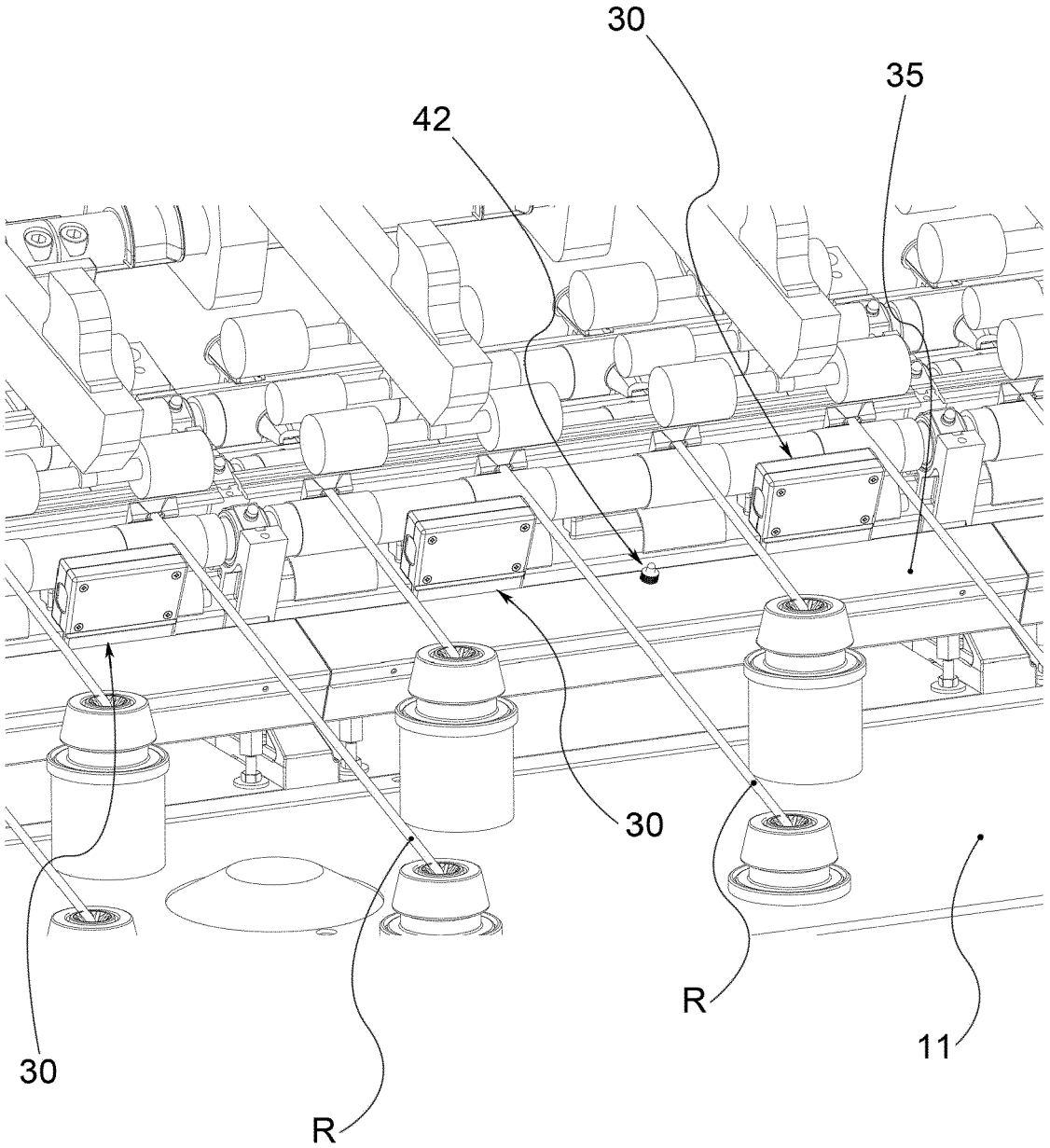

Fig. 2

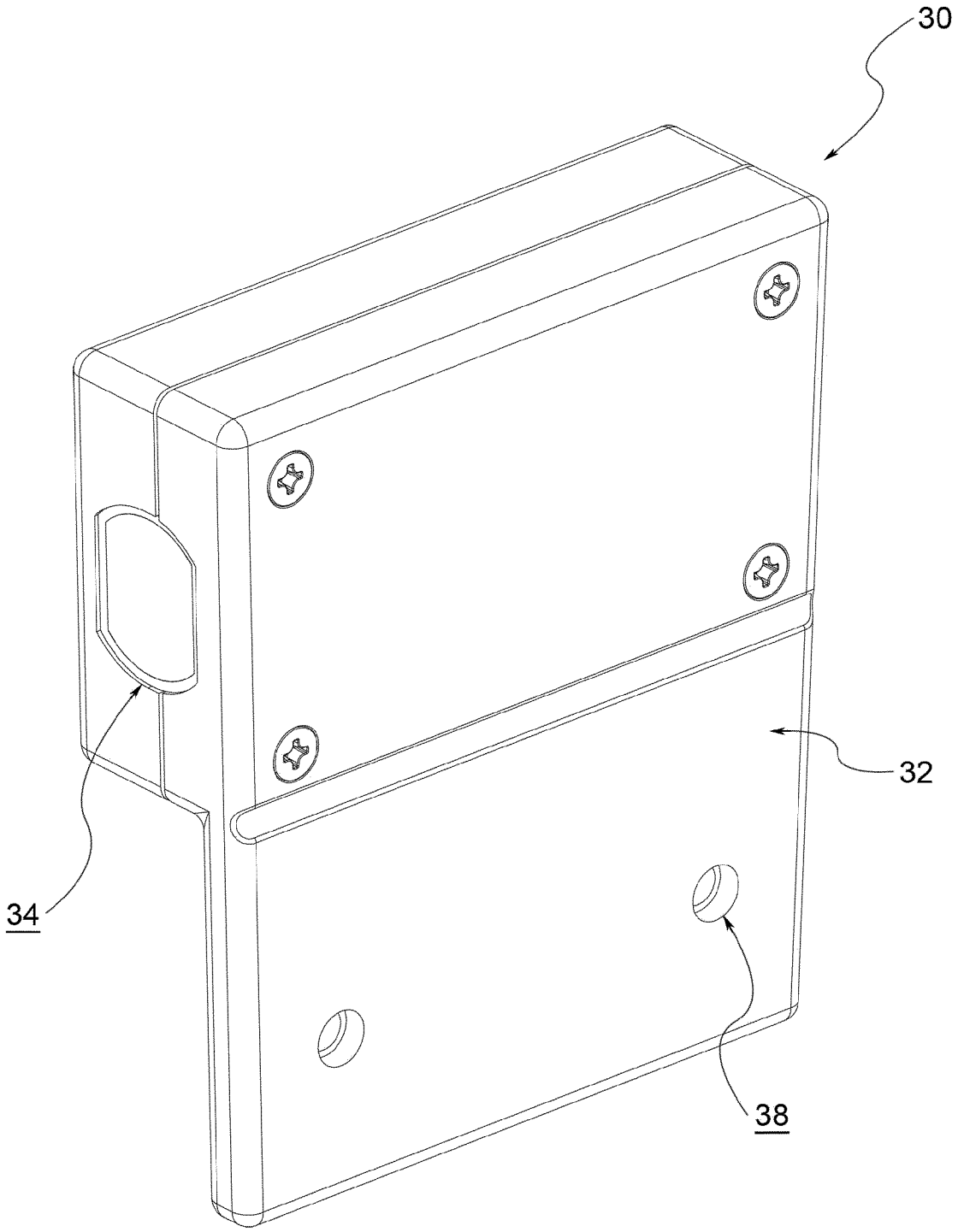

Fig.3

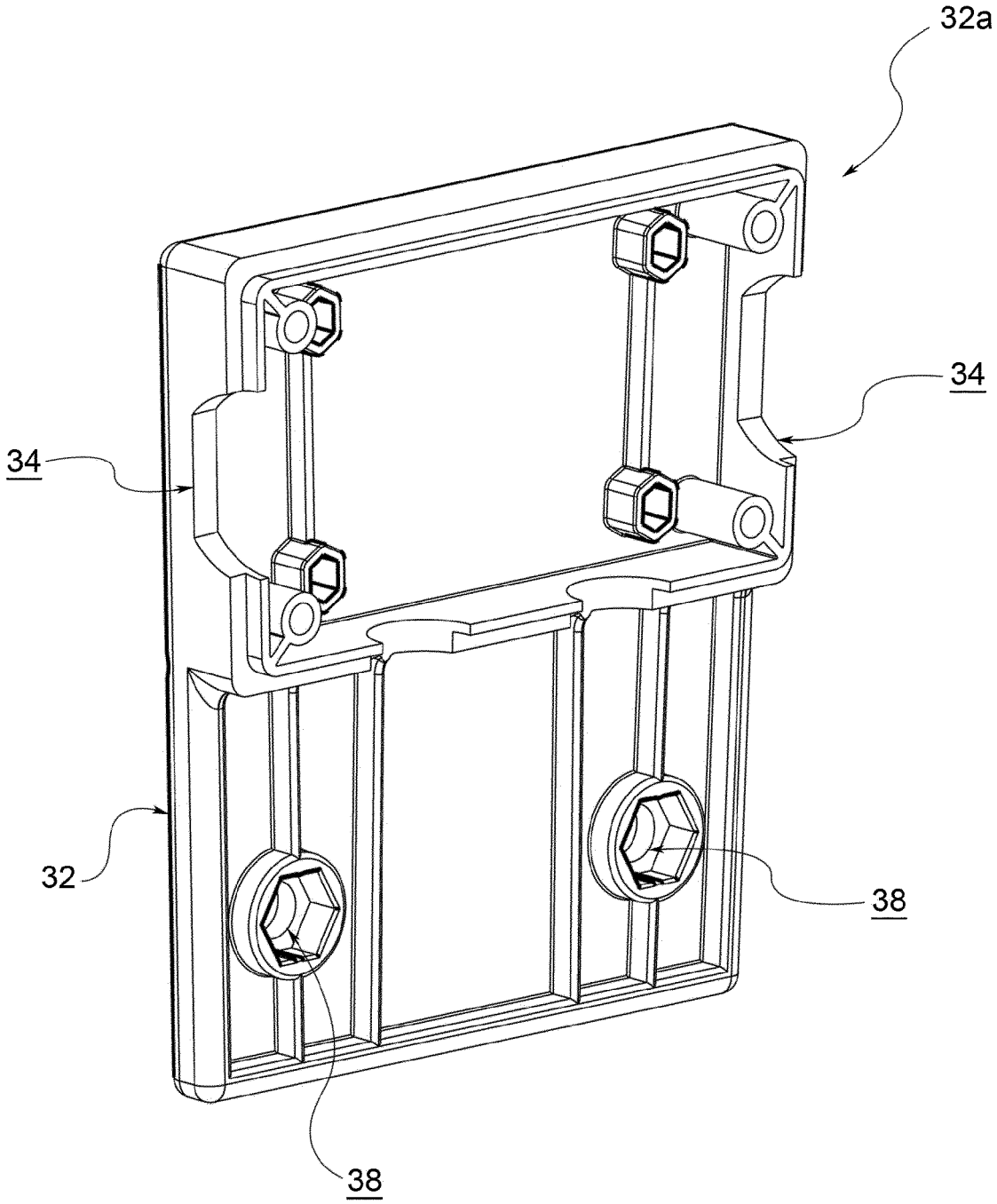

Fig. 4

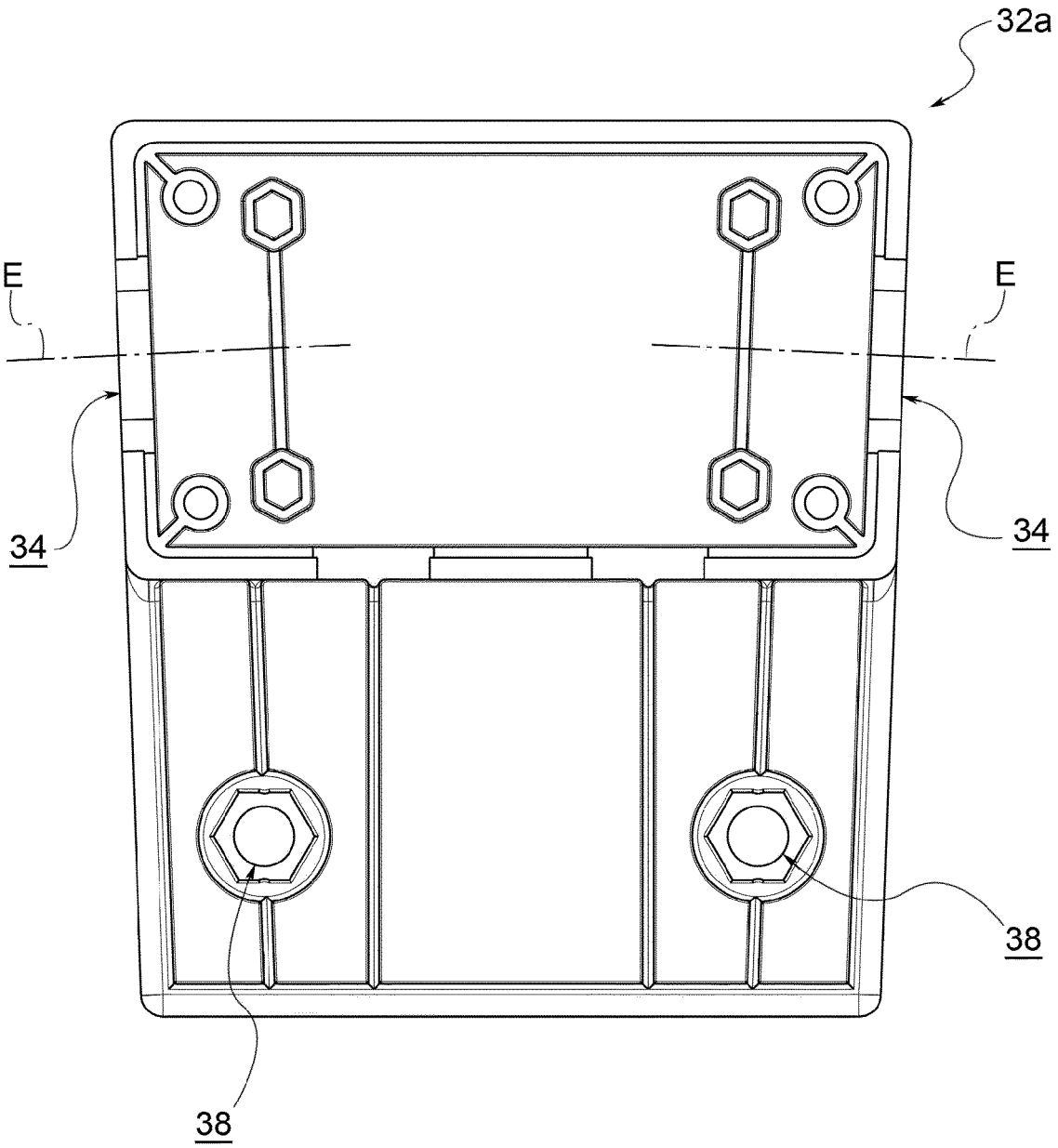

Fig. 5

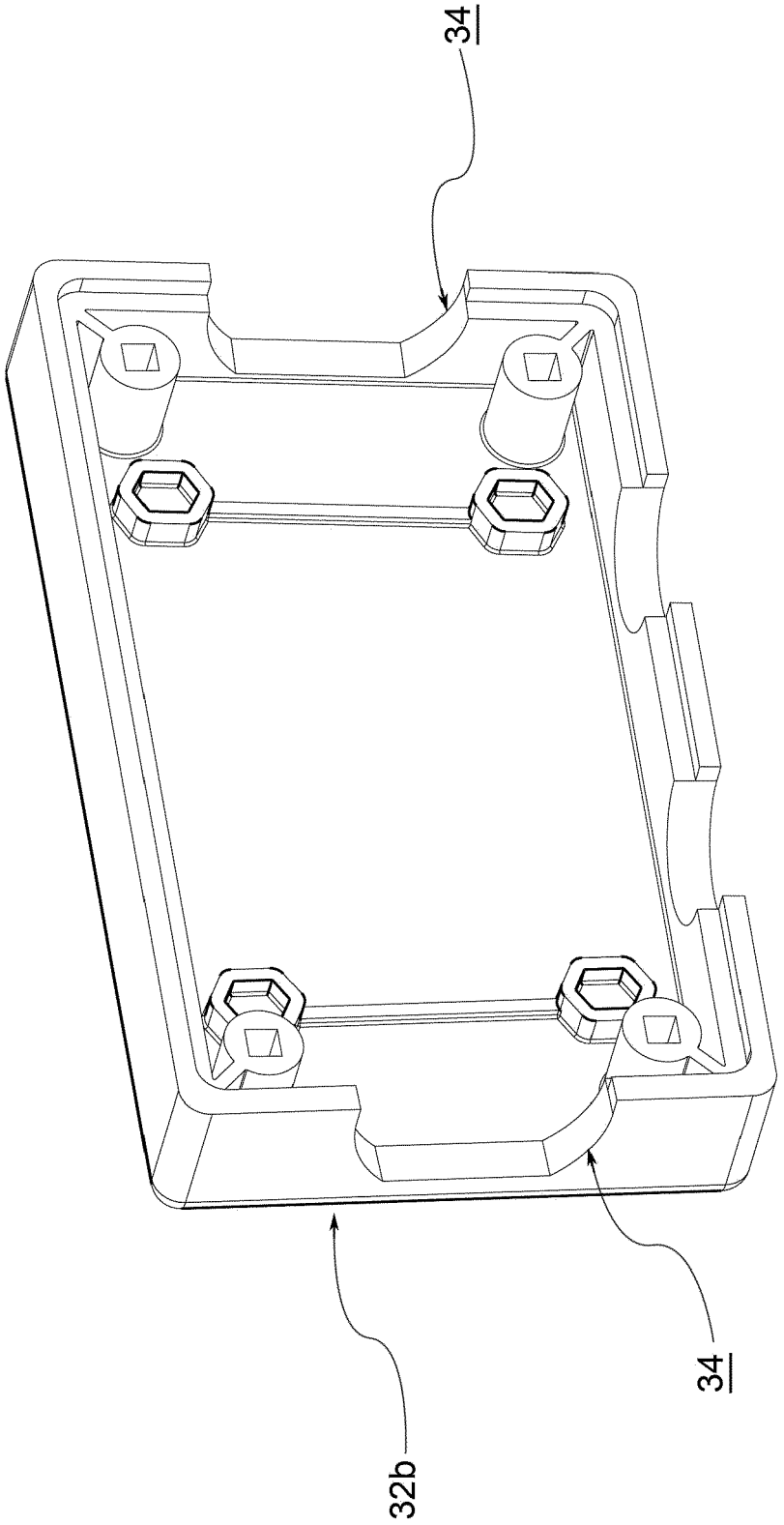

Fig.6

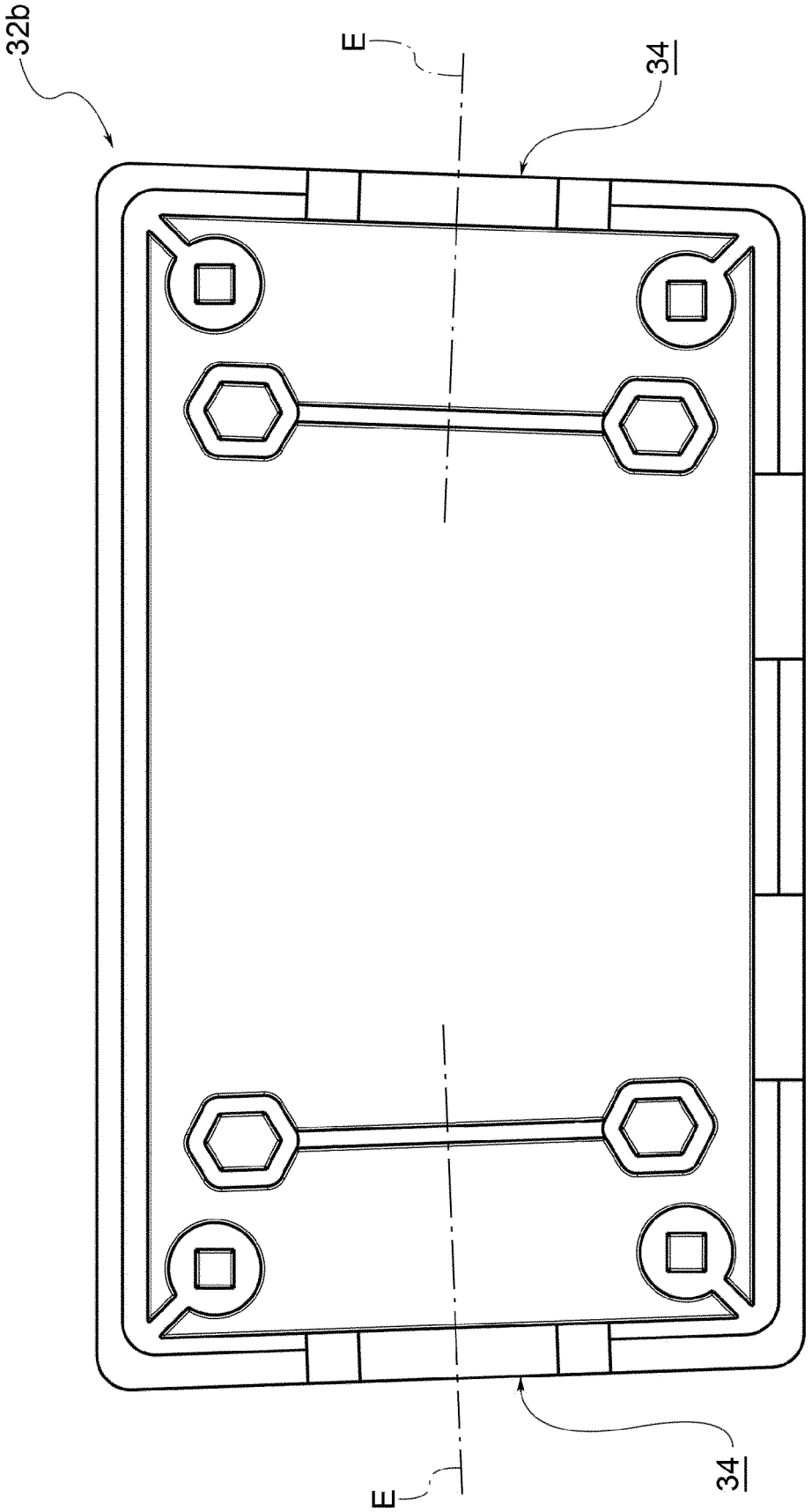

Fig.7

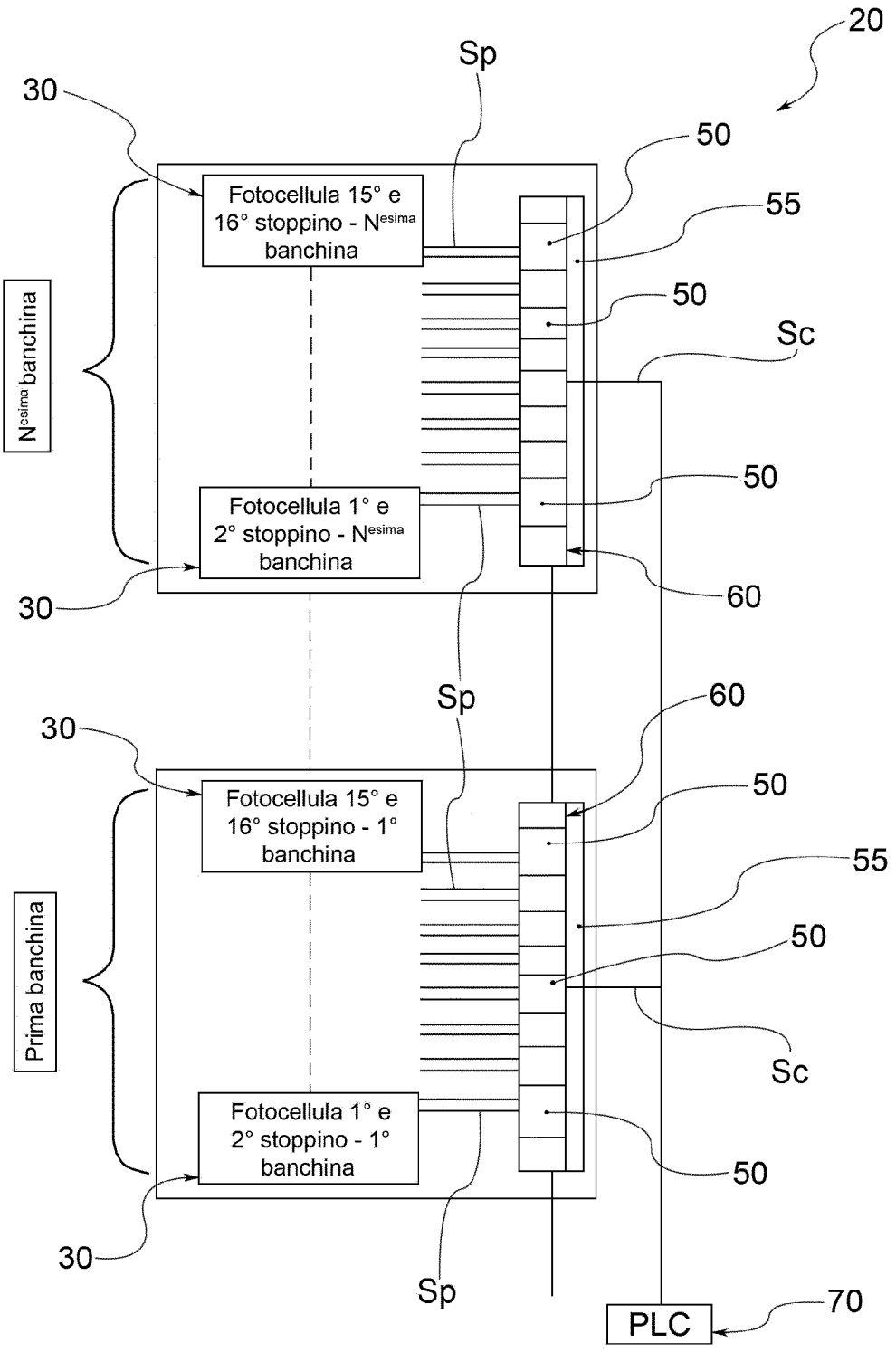
20
Sp
30
50
55
Fotocellula 15° e 16° stoppino - Nesima banchina
Nesima banchina
50
Sc
Fotocellula 1° e 2° stoppino - Nesima banchina
50
30
60
Sp
60
30
Fotocellula 15° e 16° stoppino - 1° banchina
50
55
Prima banchina
50
Sc
Fotocellula 1° e 2° stoppino - 1° banchina
50
30
Sp
PLC
70

Fig. 8

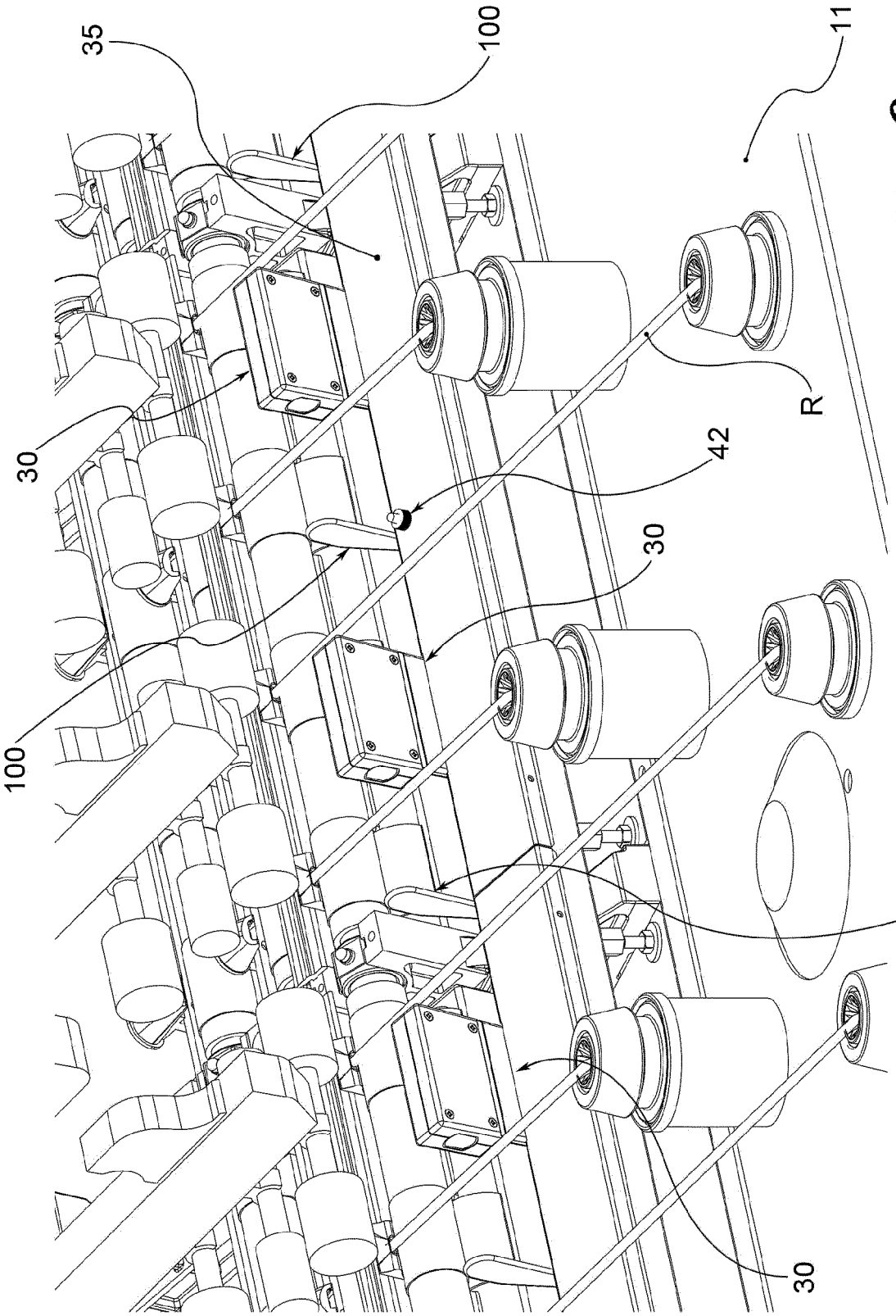

Fig.9

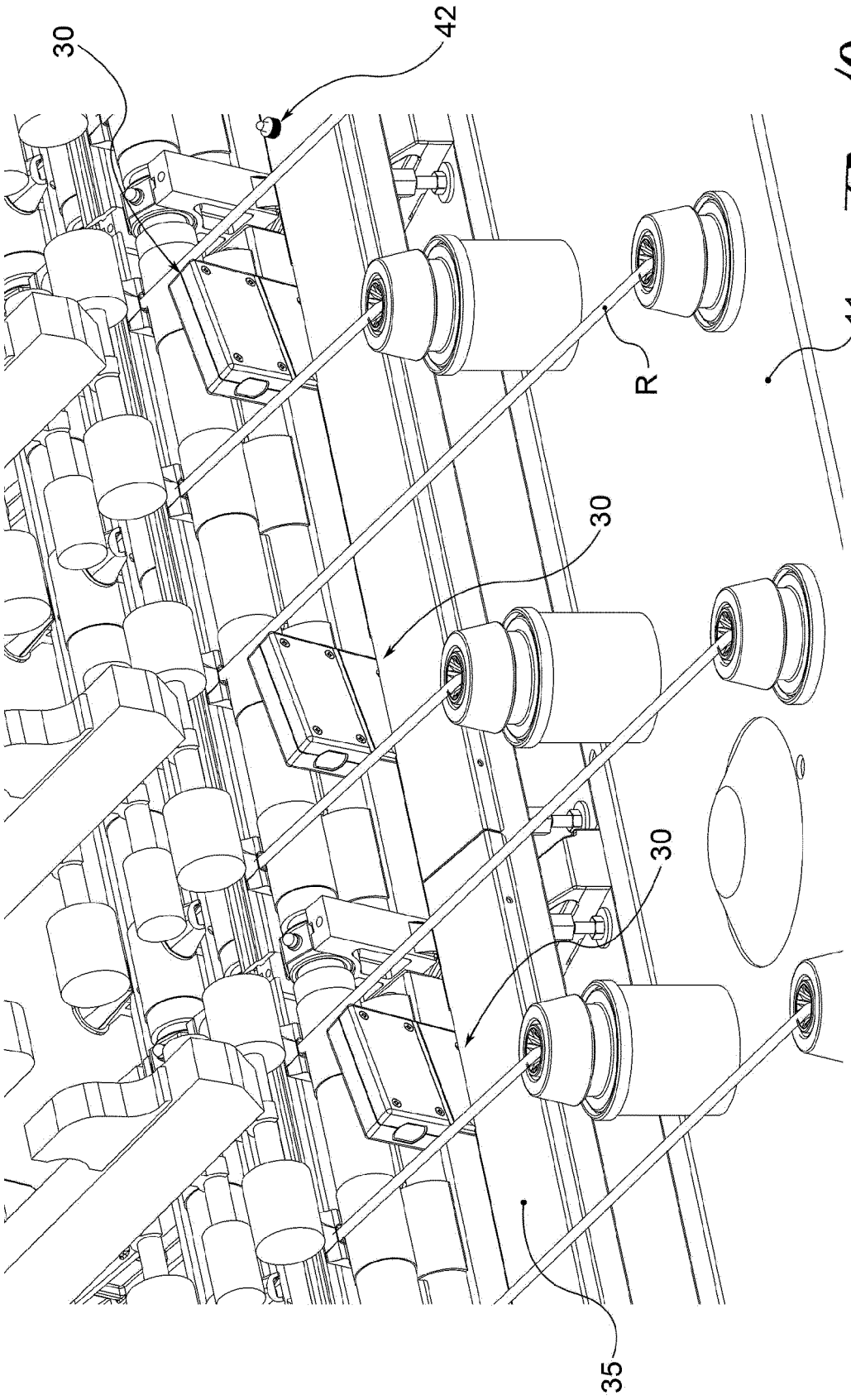

Fig. 10

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EUROPEAN SEARCH REPORT

Application Number
EP 12 16 2700

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	CH 658 080 A5 (WITSCHI & CO) 15 October 1986 (1986-10-15) * claim 1; figure 1 * -----	1-20	INV. D01H1/00 D01H13/16
X	EP 0 030 836 A1 (HIGHSMITH JAMES LINDSAY JR) 24 June 1981 (1981-06-24) * claim 1; figure 1 * -----	1-20	
A	JP 57 077329 A (DAIWA SPINNING CO LTD; NITSUTOU SHOJI KK; ATOU DENKI KK) 14 May 1982 (1982-05-14) * abstract * -----	1-20	
			TECHNICAL FIELDS SEARCHED (IPC) D01H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	7 September 2012	Dupuis, Jean-Luc

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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1

EPO FORM 1503 03.82 (P04C01)

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07-09-2012

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
CH 658080 A5	15-10-1986	NONE	
EP 0030836 A1	24-06-1981	BR 8007945 A	23-06-1981
		CA 1154942 A1	11-10-1983
		EP 0030836 A1	24-06-1981
		US 4300342 A	17-11-1981
JP 57077329 A	14-05-1982	NONE	

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