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(54) **AUTONOMOUS DEVICE FOR WINDING CABLE WIRES**

(57) Autonomous device for winding cable cables that cooperates with various cutting-stripping machines and which does not require to exchange control signals between the device and cutting-stripping machine according to the invention comprises a steel profile frame (1), legs (4) equipped with leveling feet (2) and aluminum countertop (3), is characterized in that on the countertop (3) there is arranged a detecting-buffering module (6), which at the cable input (A) comprises a curtain sensor (11) set on a plate (10), said sensor comprising a transmitter (11a) and a receiver (11b) placed on both sides of the cable and connected via electrical cable (12) to a signal amplifier and PLC controller which are located in the control cabinet (5), and cable guides: an input guide (13) attached to a block (14) under which the input roller (15) is located, a main guide (16) attached to the aluminum sheet (9) that is attached to the movable trolley (8) of the linear drive (7), wherein the main guide cooperates with the buffering roller attached to aluminum sheet that is attached to movable trolley of the linear drive, and an output guide (18) attached to the block, under which the

output roller is located, wherein each roller is fastened with bearings, is low-speed and is not driven by an external drive and its peripheral working section is U-shaped to enable holding the transported cable within plane of symmetry of the roller, wherein the input guide, the main guide and the output guide comprise U-shaped channel for the cable (A), which is open on the side facing the rollers, and wherein encoder module comprising a measuring roller (26) mounted on bearings (27) is secured to the block (14) of the input guide (13) via trolley (23) of the linear guide (24), said encoder module is connected to the PLC controller via electrical cable (25), wherein an optical curtain sensor (20) that comprises transmitter (20a) and receiver (20b) located on both sides of the cable and connected to signal amplifier and PLC controller that are located in the control cabinet, is mounted at the output of the output guide, wherein a cable guiding module that controls guiding the cable during winding on the winding plate (29) is located downstream the detecting-buffering module.

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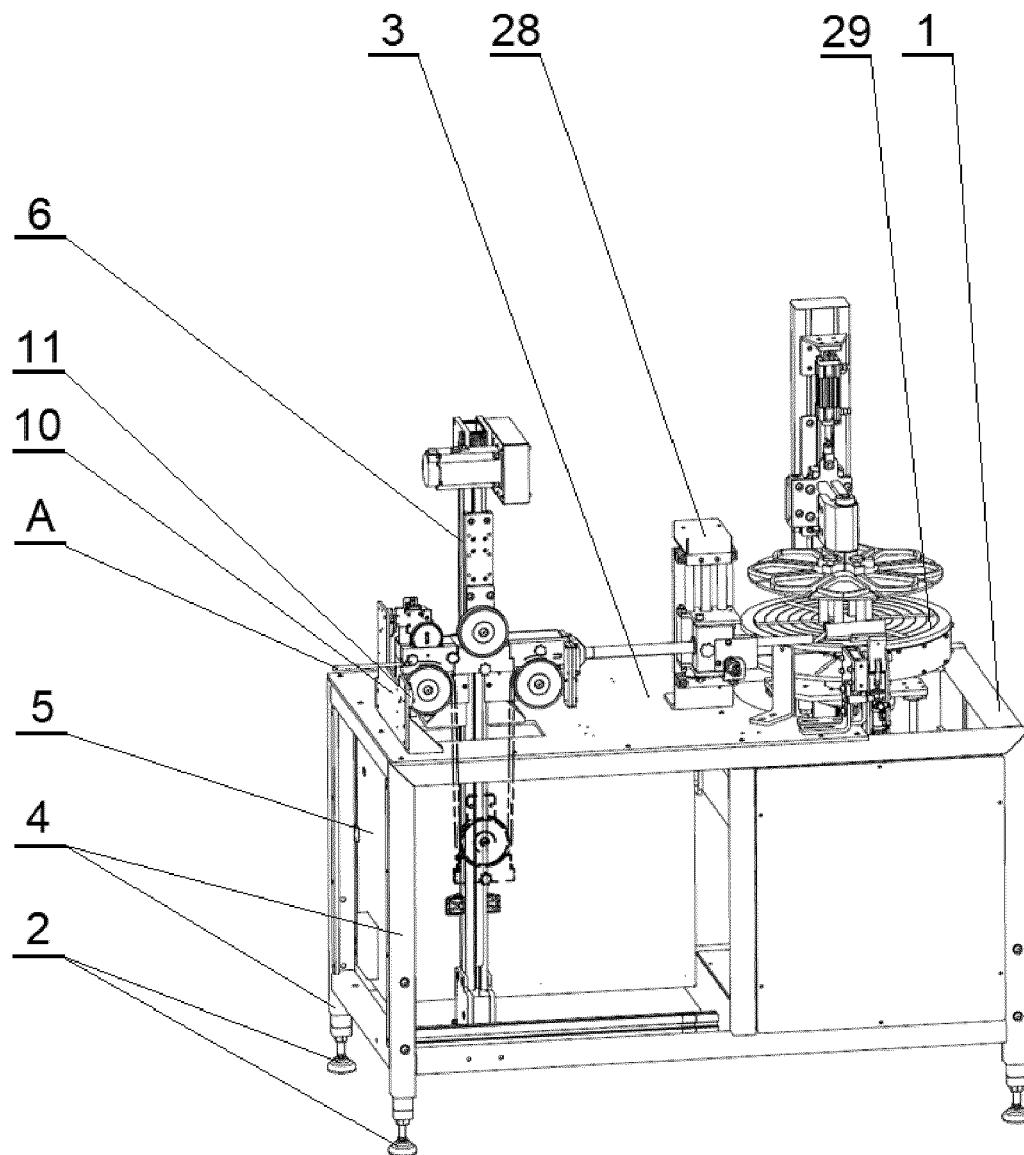


Fig. 1

Description

[0001] The object of the invention is autonomous device for winding cable wires that cooperates with various cutting-stripping machines without transferring control signals between the device and cutting-stripping machine.

[0002] Winding devices that are currently available on the market do not comprise a detecting-buffering module and hence are dedicated for specific cutting-stripping machines, with which they can exchange, via signal wire, control signals that are necessary to select the correct operation parameters of the winding device. The control signals that are exchanged include e.g. transport speed of the cable through the cutting-stripping machine, current position of the cable, length of the cable, information regarding current cable displacement or stopping the cable to perform stripping and processing operation, or information about retracting the cable to perform the operation of removing the outer sheath. Current cutting and stripping devices manufacturers do not allow to exchange the information between cable winding devices except devices of their own manufacture or dedicated cable winding devices produced by other manufacturers, which means that the clients must use winding devices specified by the cutting-stripping machine manufacturer.

[0003] On the market, there are also winding devices available that comprise, as an additional equipment, a module equipped with sensors that provide information on the speed of the cable being fed by the cutting-stripping machine, but they are not equipped with buffering module that would "store" the excess of the cable when the winding plate starts and release the stored cable when the cutting-stripping machine stops feeding the cable. Buffering module is necessary for winding cables that are fed at a feed rate above about 1 m/s since it eliminates delay during starting and stopping of the winding plate.

[0004] Moreover, clients often need to use one winding device for two, three different cutting-stripping machines to freely shape their manufacturing capabilities and to optimally plan the loading and production order for every cable processing line, and, as it is clear from the above, this would force them to buy a whole set of devices.

[0005] The US patent specification US3951355A discloses an automatic cable winding apparatus comprising a traverse arm mounted to the traverse block sliding on a traverse base that guides cables to be wound on the drum and provided near the top thereof with guide rollers guiding said cables while supporting them from the upper and the lower sides thereof and a presser roller pressing the cables sideways, a device giving pressing force to said traverse arm, proximity switches detecting that the cables are wound up to the vicinity of the flange of the drum, a rotation angle detector which causes said traverse base to stop by the detection signals generated from said proximity switches and detects the rotation angle of the drum, another device for quickly advancing and

retracting said traverse block relative to the flanges of the drum when said rotation angle detector detects that the drum has been rotated by a predetermined angle, and a device for raising the traverse apparatus by the height of the outer diameter of the cable every time a new layer of cable is wound on the drum.

[0006] International patent application WO2015113763A1 discloses a laying arm (27) for an apparatus (1) for helically winding an endless material (3) that is to be wound up, in which a winding drum (5) is rotationally driven. The laying arm (27) transfers the material (3) to be wound up to the winding drum (5) when the laying arm (27) performs an especially substantially linear back-and-forth laying motion. According to the invention, in a contact zone (38) which lies at the end (33) of the laying arm closer to the winding drum and which faces a sidewall flange (11a, 11b) of the winding drum (5), the laying arm (27) comes in direct contact, in particular in direct sliding contact, with said sidewall flange (11a, 11b), especially when the laying arm performs a turning operation. Furthermore, a distance sensor (36), such as a contactor (37), which is located at the end of the laying arm closer to the winding drum, emits a control signal, such as a turning operation-triggering signal, at least when the end (33) of the laying arm closer to the winding drum reaches at least one predefined position. Also, in the area of each contact zone (38), the laying arm comprises an actuating projection (101a, 101b) which, in an inactive position, projects from the respective contact zone in the direction of the back-and-forth laying motion and is mounted on the laying arm (27) so as to be movable, in particular pivotable in such a way that in an open position, the actuating projection (101a, 101b) opens said contact zone (38) to allow for the direct contact.

[0007] American patent specification US5535579A discloses a method and an apparatus for precisely adjusting the back tension applied to a stranded conductor after the conductor has been formed and as it is being collected on a bobbin. Unlike a typical strander which uses a single source of power to drive both the twisting portion of the strander as well as the take-up function, the present invention uses a main power source to drive the twisting portion of the strander and it uses a smaller, independently controlled, variable speed, direct current, motor to drive the take up reel. By controlling the reel take up speed, you thereby control the tension that the reel exerts on the conductor being collected thereon. The means for independently controlling the speed of the direct current, variable speed motor that drives the take-up reel is a strain gage which directly measures the tension on the conductor being collected and signals the reel drive motor by way of a controller unit.

[0008] Chinese patent specification CN103662967A discloses an automatic wire arranging device. The existing wire arranging method is prone to notches, wire accumulation and wire jumping. The device comprises a portal frame, a transverse moving platform, a mechanical

arm, a lifting mechanism, a horizontal moving mechanism, a dynamic complementing mechanism, an automatic reversing mechanism, a wire winding mechanism, a portal auxiliary frame, a controller and an encoder. Wire arranging is conducted according to a set pitch, in a wire arranging process, the wire arranging device can conduct position complementing control according to actual production conditions, a sheathed line and a designed mechanism structure are arranged in a set angle range.

[0009] US patent specification US4022391A discloses a controlled spooling machine system for layer windings of elongated materials having circular, elliptical, or polygonal cross section, on a rotating spool having a predetermined axial extent, comprising winding speed sensing means sensing the speed of the spool and deriving a winding speed signal representative of speed of rotation of the spool, and means providing a material size signal representative of the width of the material, a guide means guiding the material towards the spool so that the material will define an angle of attitude with respect to a plane transverse to the axis of rotation of the spool, means sensing the attitude angle of the material as it is supplied to the spool, at any instant, and providing an attitude signal, traverse means effecting relative axial traverse movement between the spool and the guide means to effect progressive adjacent winding of the material on the spool and the formation of superimposed layers between the axial limits of the spool, and traverse control means controlling said traverse means and having said winding speed signal, said material size signal and said attitude signal applied thereto and providing a command output signal to said traverse means to command the relative position between said guide means and the instantaneous axial position of the spool such that the material, as it is wound on the spool, is pressed against the next previously applied winding on the spool, by controlling the attitude angle of the material with respect to the spool, as the material is wound on the spool, to reach a predetermined value, and to change the speed of the relative traverse movement in predetermined axial ranges of material placement on the spool, and occurring just before, and after the formation of superimposed windings adjacent the axial ends of the spool such that the attitude angle will tend to become zero as the wire is wound on the spool and approaches an axial end thereof, and, then after formation of a new winding layer, the attitude angle is again controlled to reach said predetermined value.

[0010] However none of the solutions known in the prior art satisfied inventors expectations regarding autonomous device that is able to cooperate with any cutting-stripping machine without transferring control signals between the device and cutting-stripping machine.

[0011] The aim of the invention is to develop autonomous, fully automated device for winding cable wires that cooperates with various cutting-stripping machines without to exchange control signals between the device and cutting-stripping machines, that allows to inspect input

and output state, wherein collected information would allow to control the device based on predetermined parameters, in particular the cable displacement speed.

[0012] Autonomous device for winding cable cables that cooperates with various cutting-stripping machines, and which does not require to exchange control signals between the device and cutting-stripping machine according to the invention comprises a steel profile frame, legs equipped with leveling feet and aluminum countertop, characterized in that on the countertop there is arranged a detecting-buffering module which at the cable input comprises a curtain sensor set on a plate, said sensor comprising a transmitter and a receiver placed on both sides of the cable and connected via electrical cable to a signal amplifier and PLC controller which are located in the control cabinet, and cable guides: an input guide attached to a block, under which the input roller is located, a main guide attached to the aluminum sheet that is attached to the movable trolley of the linear drive, wherein the main guide cooperates with the buffering roller attached to the aluminum sheet attached to movable trolley of the linear drive, and an output guide attached to the block, under which the output roller is located, wherein each roller is fastened with bearings, is low-speed and is not driven by an external drive, and its peripheral working section is U-shaped to enable holding the transported cable within the plane of symmetry of the roller, wherein the input guide, the main guide and the output guide comprise U-shaped channel for the cable, which is open on the side facing the rollers, and wherein encoder module comprising a measuring roller mounted on bearings is secured to the block of the input guide via trolley of the linear guide, said encoder module is connected to the PLC controller via electrical cable, wherein an optical curtain sensor that comprises transmitter and receiver located on both sides of the cable and connected to signal amplifier and PLC controller that are located in the control cabinet, is mounted at the output of the output guide, wherein a cable guiding module that controls guiding the cable during winding on the winding plate, is located downstream the detecting-buffering module.

Drawings

[0013] The object of the invention according to the example is presented in the drawing, in which:

- fig. 1 shows the perspective view of the device;
- fig. 2 shows the perspective view of the detecting-buffering module;
- fig. 3 shows the perspective view of the detecting-buffering module from the sensors side;
- fig. 4 shows the perspective view of the detecting-buffering module from the back side of the encoder;
- fig. 5 shows the cross-section of the encoder that is secured on the linear guide;
- fig. 6 shows the cross-section of the output roller;

Example

[0014] Autonomous device for winding cable cables that cooperates with various cutting-stripping machines and which does not require to exchange control signals between the device and cutting-stripping machine, comprises a steel profile frame 1, legs 4 equipped with leveling feet 2 and aluminum countertop 3, characterized in that on the countertop 3 there is arranged a detecting-buffering module 6 which at the cable input comprises a curtain sensor 11 set on a plate 10, said sensor comprising a transmitter 11a and a receiver 11b placed on both sides of the cable A and connected via electrical cable 12 to a signal amplifier and PLC controller, which are located in the control cabinet 5, and cable guides: an input guide 13 attached to a block 14, under which the input roller 15 is located, a main guide 16 attached to the aluminum sheet 9 that is attached to the movable trolley 8 of the linear drive 7, that cooperates with the buffering roller 17 attached to the aluminum sheet 9 that is attached to movable trolley 8 of the linear drive 7, and an output guide 18 attached to the block 19, under which the output roller 21 is located, wherein each roller is fastened with bearings, is low-speed and is not driven by an external drive, and its peripheral working section is U-shaped to enable holding the transported cable within plane of symmetry of the roller, wherein and the input guide 13, the main guide 16 and the output guide 18 comprise U-shaped channel for the cable A, which is open on the side facing the rollers 15, 17 and 21, and wherein encoder module 22 comprising a measuring roller 26 mounted on bearings 27 is secured to the block 14 of the input guide 13 via trolley 23 of the linear guide 24, said encoder module is connected to the PLC controller via electrical cable 25, wherein an optical curtain sensor 20 that comprises transmitter 20a and receiver 20b located on both sides of the cable A and connected to signal amplifier and PLC controller that are located in the control cabinet 5, is mounted at the output of the output guide 18, wherein a cable guiding module 28 that controls guiding the cable A during winding on the winding plate 29 is located downstream the detecting-buffering module 6.

[0015] Such solution enables the device according to the invention to cooperate with any cutting-stripping machine, wherein it is not required to connect the devices with signal cables. It is sufficient to put the device according to the invention next to cutting-stripping machine and switch on the device, while the device will select operating parameters by itself and automatically winds the supplied cable.

[0016] The device allows users to use it for various cutting-stripping machines - it gives the possibility to shift the device between manufacturing lines depending on the planned production orders as well as the parameters of manufactured and processed cables. Such solution gives companies the freedom of choosing the suitable machinery resources, the possibility of negotiating prices as well as the possibility of obtaining a competitive offer

on the market, both in terms of prices and technology.

Claims

1. Autonomous device for winding cable cables that cooperates with various cutting-stripping machines and which does not require to exchange of control signals between the device and cutting-stripping machine, **characterized in that** it comprises a steel profile frame (1), legs (4) equipped with leveling feet (2) and aluminum countertop (3), **characterized in that** on the countertop (3) there is arranged a the detecting-buffering module (6) which at the cable input (A) comprises a curtain sensor (11) set on a plate (10), said sensor comprising a transmitter (11a) and a receiver (11b) placed on both sides of the cable (A) that are connected via electrical cable (12) to a signal amplifier and PLC controller, which are located in the control cabinet (5), and a cable guides: an input guide (13) attached to a block (14), under which the input roller (15) is located, a main guide (16) attached to the aluminum sheet (9) that is attached to the movable trolley (8) of the linear drive (7), that cooperates with the buffering roller (17) attached to aluminum sheet (9) that is attached to movable trolley (8) of the linear drive (7) and an output guide (18) attached to the block (19), under which the output roller (21) is located, wherein each roller is fastened with bearings, is low-speed and is not driven by an external drive, and its peripheral working section is U-shaped to enable holding the transported cable within plane of symmetry of the roller, wherein the input guide (13), the main guide (16) and the output guide (18) comprise U-shaped channel for the cable (A), which is open on the side facing the rollers (15), (17) and (21), and wherein encoder module (22) comprising a measuring roller (26) mounted on bearings (27) is secured to the block (14) of the input guide (13) via trolley (23) of the linear guide (24), said encoder module is connected to the PLC controller via electrical cable (25), wherein an optical curtain sensor (20) that comprises transmitter (20a) and receiver (20b) located on both sides of the cable (A) and connected to signal amplifier and PLC controller that are located in the control cabinet (5) is mounted at the output of the output guide (18), wherein a cable guiding module (28) that controls guiding the cable (A) during winding on the winding plate (29) is located downstream the detecting-buffering module (6).

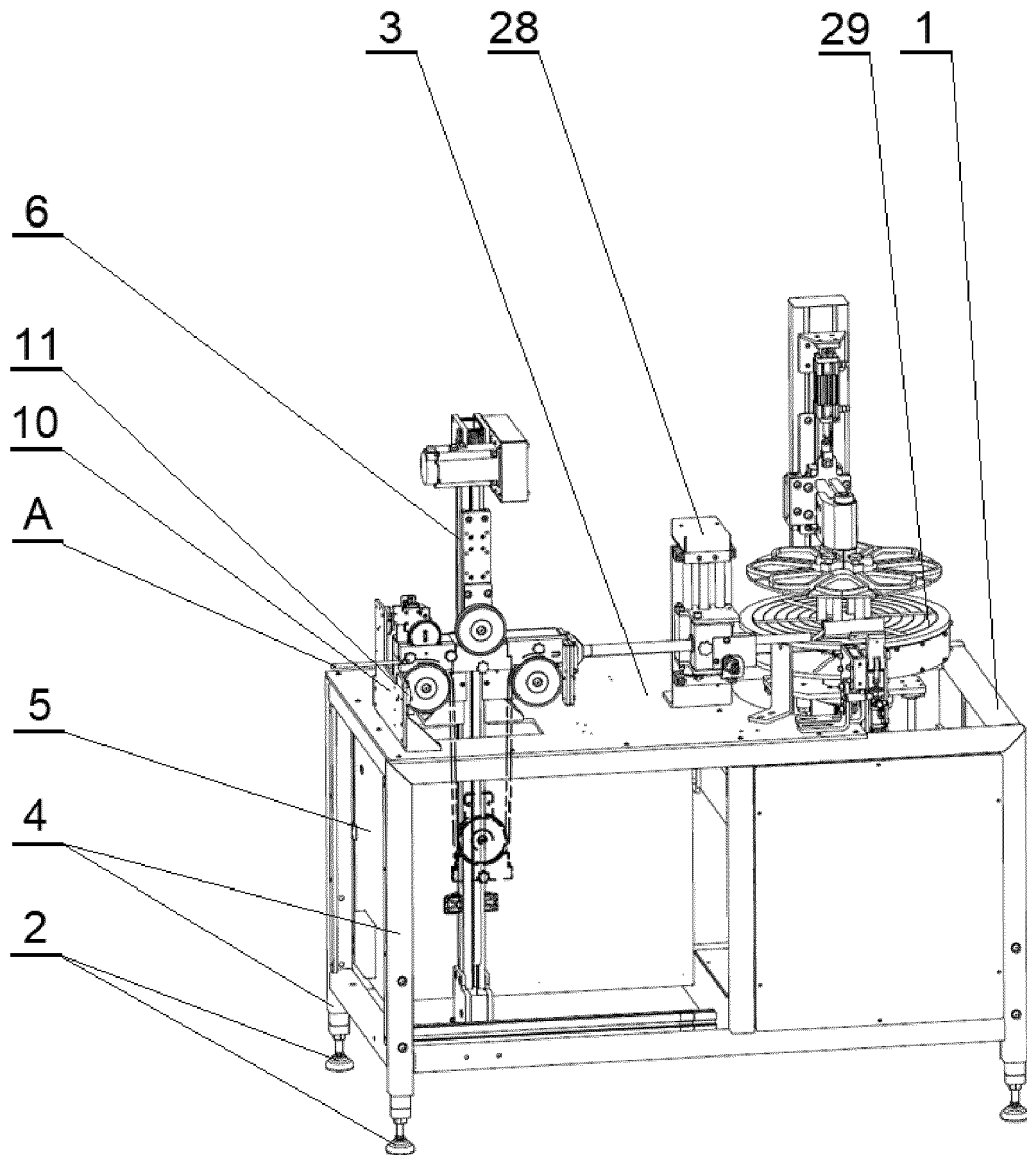


Fig. 1

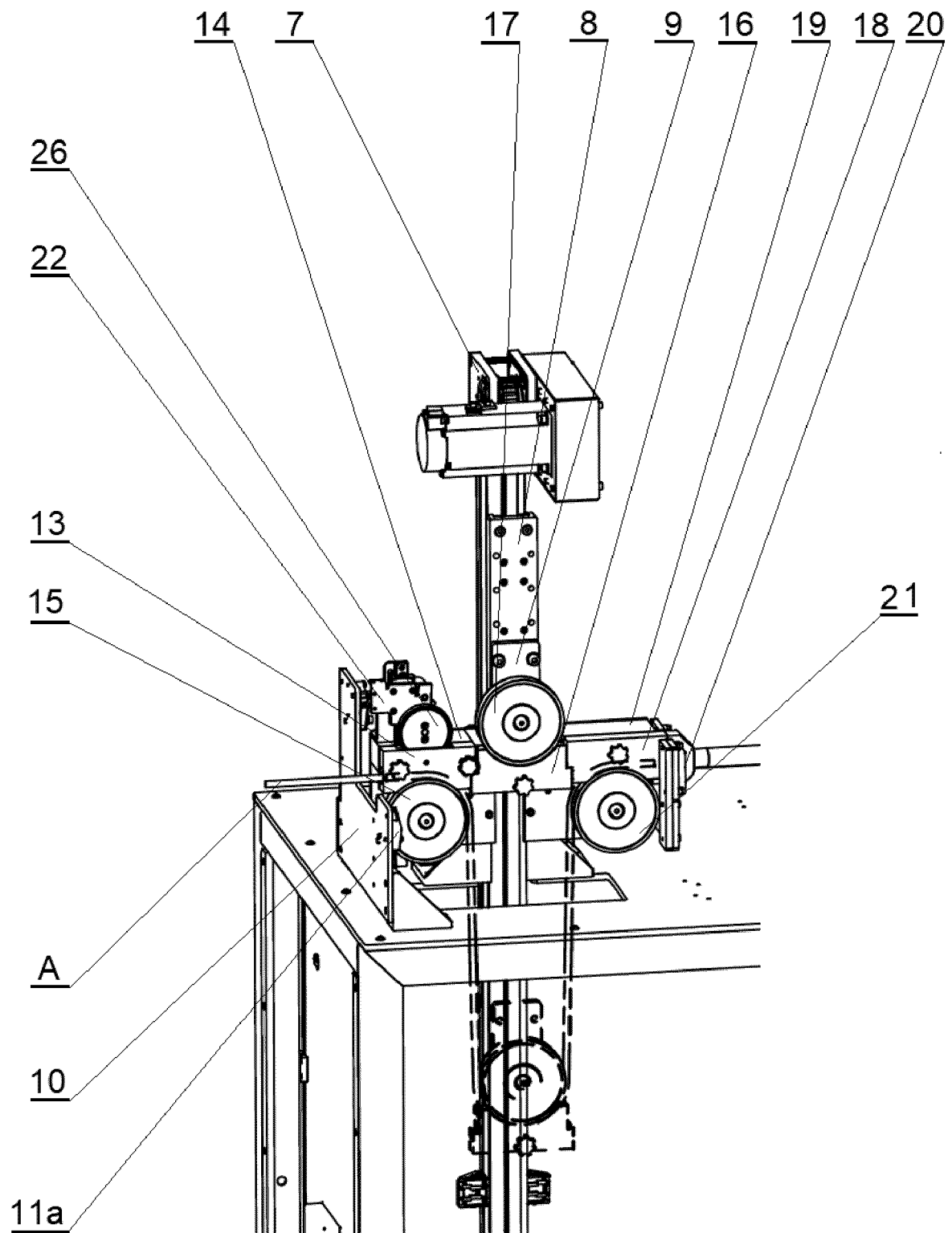


Fig. 2

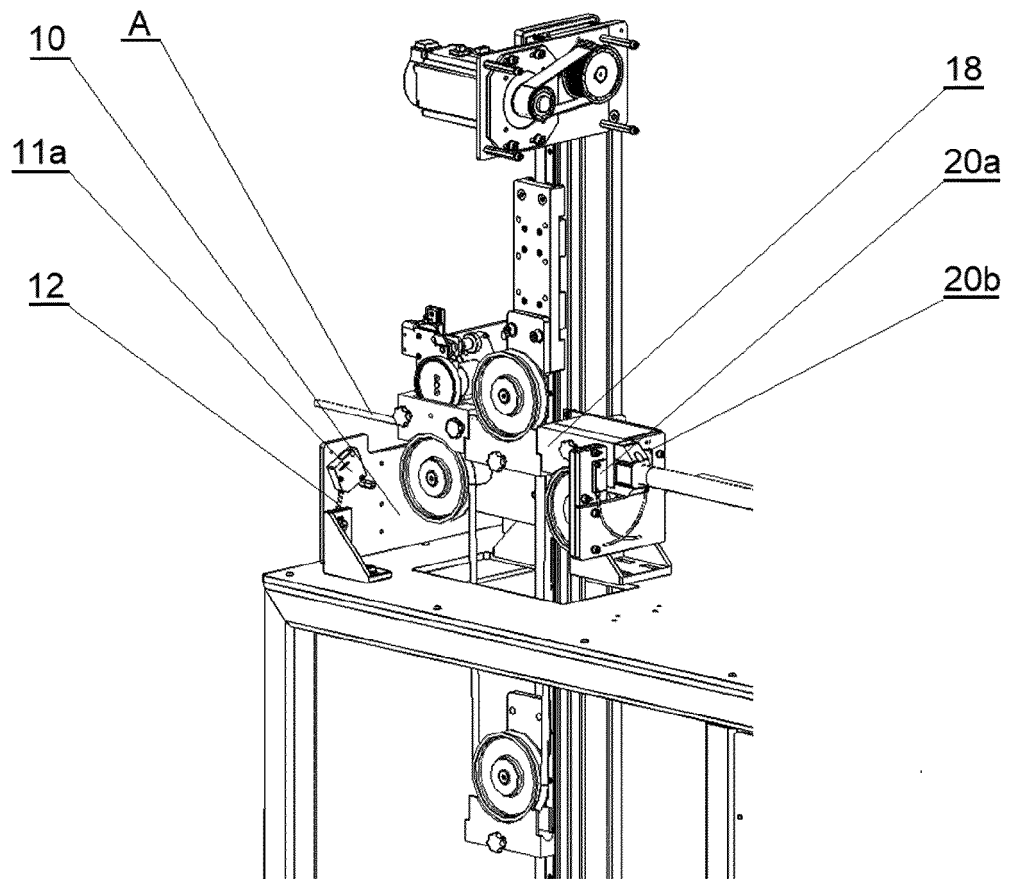


Fig. 3

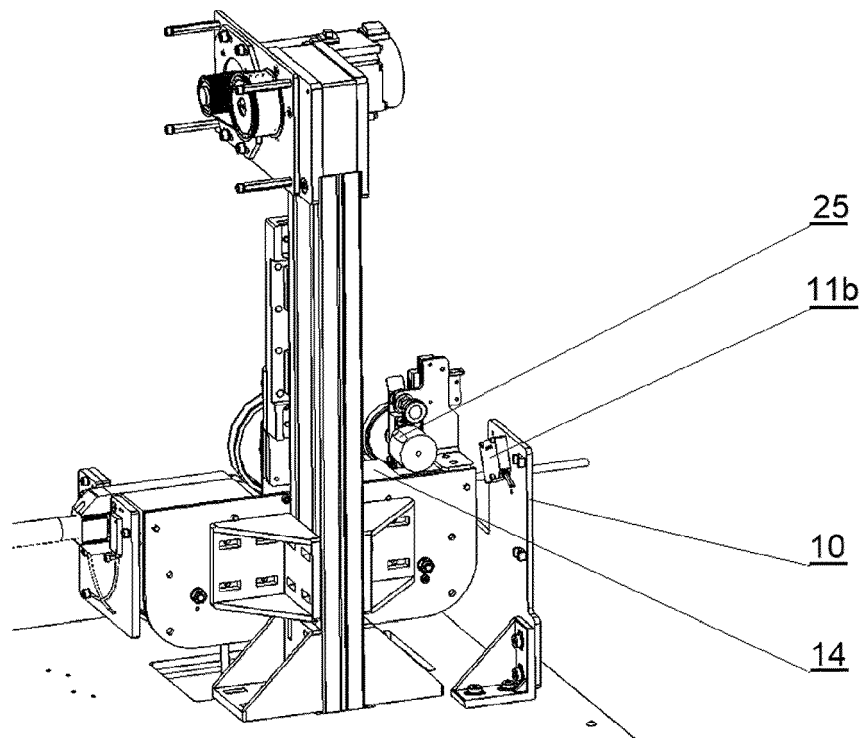


Fig. 4

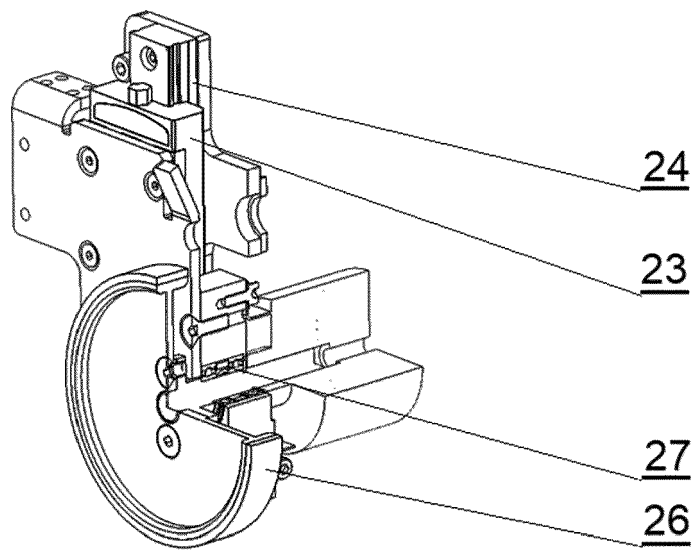


Fig. 5

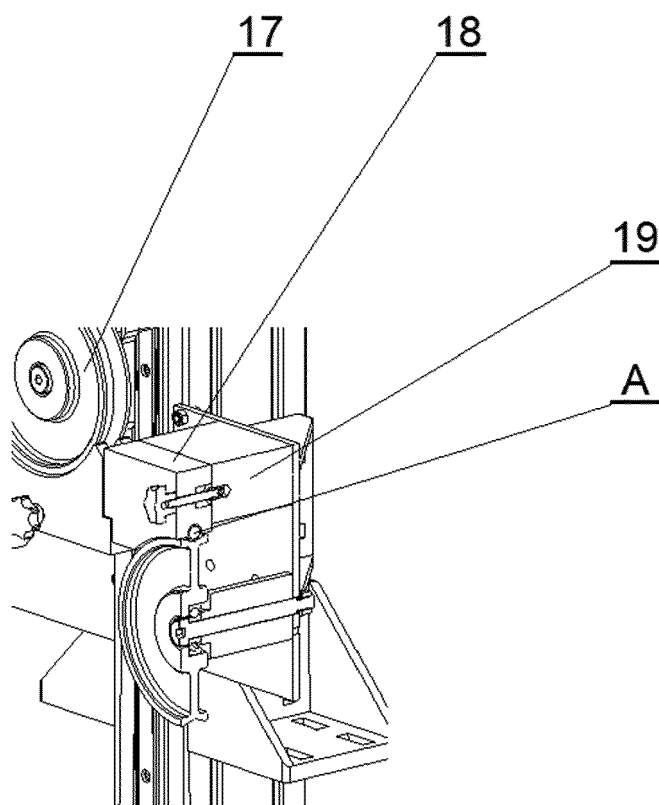


Fig. 6



EUROPEAN SEARCH REPORT

Application Number

EP 22 46 1632

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	EP 1 604 932 A1 (KABELMAT GMBH [DE]) 14 December 2005 (2005-12-14) * the whole document *	1	INV. B65H51/20
A	EP 0 059 833 A1 (GROTE & HARTMANN [DE]) 15 September 1982 (1982-09-15) * claim 1; figure 1 *	1	

TECHNICAL FIELDS SEARCHED (IPC)

B65H
H01R
H02G
B21C

The present search report has been drawn up for all claims

1

Place of search

The Hague

Date of completion of the search

25 April 2023

Examiner

Pussemier, Bart

CATEGORY OF CITED DOCUMENTS

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ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.

EP 22 46 1632

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25-04-2023

10	Patent document cited in search report	Publication date	Patent family member(s)	Publication date
	EP 1604932 A1	14-12-2005	NONE	
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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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