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(54) A CORNER CRIMPING MACHINE AND A METHOD FOR CRIMPING CORNERS

(57) A method for crimping corners, in particular for crimping corners of window frames made of aluminum profiles, comprising the steps of: arranging two profiles on a worktop of a crimping machine and next performing the crimp by means of crimping tools of the crimping machine, characterized by using at least two crimping tools (515A-515B, 515C-515D), wherein the first crimping tool is located at a side of the first profile, and the second crimping tool is located at a side of the second profile, and performing the crimp in at least two stages, such that in each subsequent crimping stage the crimp is performed at a different position of a single profile or the crimp is performed simultaneously in two profiles.

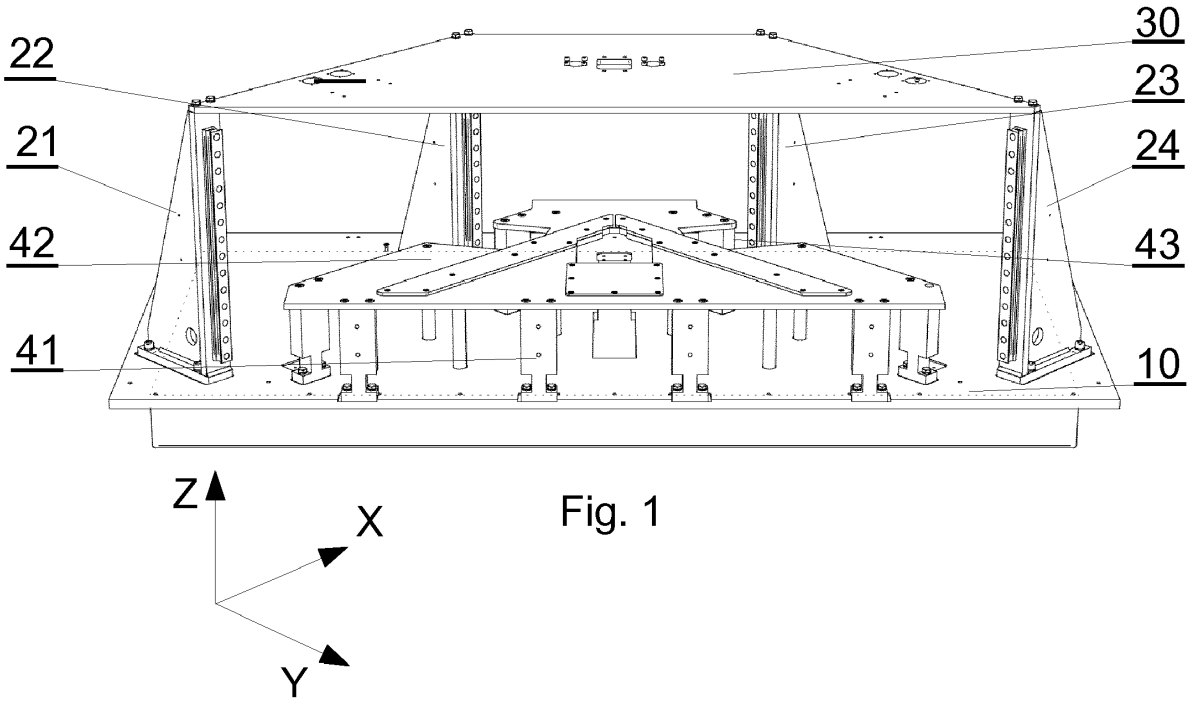

Fig. 1

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Description

[0001] The present disclosure relates to a corner crimping machine and a method for crimping corners, in particular for crimping corners of windows frames made of aluminum profiles.

[0002] Conventional corner crimping machines comprise a support base with a worktop, by which two heads with crimping tools move. The heads are usually mechanically coupled with each other and are driven by means of a single pneumatic or hydraulic cylinder. The required stiffness of the structure is achieved by selecting adequately massive and possibly less deformable elements in a system: worktop - crimping heads. A disadvantage of such solution is its high mass and insufficient stiffness of the structure which results in difficulties in repeatable setting of a crimping geometry. Another disadvantage is lack of crimping force control exerted by individual crimping tools at the moment when a stroke of the tool is too high, a depth of entry into a material is too high or the tool strikes at an inappropriate position - then a value of the force is equal to a maximum available force generated by a cylinder mechanism.

[0003] In a typical method for crimping corners, after arranging two profiles on the worktop and their precise adjustment with respect to each other, the process of crimping is started, during which the crimping tools are simultaneously pressed to the profiles at both sides with equal force. In case, when the profiles are not precisely positioned with respect to each other, the crimp may be non-uniform - for example the crimp in the first profile is deeper than the crimp in the second profile.

[0004] It would be therefore advantageous to develop a new structure of a crimping machine and an alternative method for crimping corners.

[0005] The object of the invention is a method for crimping corners, in particular for crimping corners of window frames made of aluminum profiles, comprising the steps of: arranging two profiles on a worktop of a crimping machine and next performing the crimp by means of crimping tools of the crimping machine, characterized by using at least two crimping tools, wherein the first crimping tool is located at a side of the first profile, and the second crimping tool is located at a side of the second profile, and performing the crimp in at least two stages, such that in each subsequent crimping stage the crimp is performed at a different position of a single profile or the crimp is performed simultaneously in two profiles.

[0006] Preferably, in a subsequent cycle the crimp is performed by means of the same crimping tool at a positon distanced from the previous crimp position by a distance not greater than a size of the crimping tool.

[0007] Preferably, the method comprises using two pairs of the crimping tools, wherein the crimp is performed in at least two stages, such that in the first crimping stage the crimp is performed at a first position by means of the first pair of the crimping tools, and in the second stage the crimp is performed at a second position by means of the second pair of the crimping tools.

[0008] Preferably, the method is performed by means of a crimping machine is utilized which comprises a base support, on which is there is mounted a worktop and heads with crimping tools, displaceable with respect to the worktop, and wherein on the support base there are mounted two pairs of support columns, and to each pair of the support columns there is slidably and vertically mounted at least one support of a trolley of the crimping tool driven by a motor.

[0009] Another object of the invention is a corner crimping machine comprising a base support on which there are mounted a worktop and heads with crimping tools which are displaceable with respect to the worktop, characterized in that on the base support there are mounted two pairs of support columns, and to each pair of the support columns there is slidably and vertically mounted at least one support of a trolley of the crimping tool driven by a motor.

[0010] Preferably, tops of the support columns are connected by a top stiffening structure.

[0011] Preferably, to each pair of the support columns there are slidably and vertically mounted two independently driven trolley supports of the crimping tools.

[0012] Preferably, the trolley support of the crimping tool has a form of a bar comprising at its ends linear guides for mounting the bar to guiding rails on a pair of support columns.

[0013] Preferably, the trolley of the crimping tool has a form of a profile, and on a first end of the profile there is mounted the crimping tool and a second end of the profile is driven by the motor.

[0014] Preferably, the trolley is mounted to the support on a linear guide by means of an angled bracket and is driven by a motor.

[0015] Preferably, the worktop has a form of a plate with indentations in which arms of the trolleys are displaceable.

[0016] The device and the method presented herein are presented by means of example embodiments on a drawing, wherein:

Fig. 1 presents in general a structure of a working space of a crimping machine to be utilized in a method according to the invention;
Fig. 2 presents the structure the working space of the crimping machine, with crimping tools trolleys supports;
Fig. 3 presents a view of a single support column;
Figs. 4A, 4B and 4C present the crimping tool trolley support, correspondingly in a front view and a back view.

[0017] For increasing clarity, some of the detailed drawings may present just a portion of crimping machine elements, while some elements are hidden.

[0018] Figs. 1-4 present an exemplary crimping machine, which may be used for performing the method ac-

cording to the invention.

[0019] A working space of a crimping machine is presented in Figs. 1 and 2, wherein for clarity reasons, Fig. 1 presents an intermediate plate while supports of crimping tools trolleys are hidden, and Fig. 2 presents supports of the crimping tools trolleys, while the intermediate plate and a top plate are hidden.

[0020] In the working space of the crimping machine is located a bottom plate 10, on which two pairs of support columns 21-22, 23-24 are mounted, wherein on tops of the support columns is mounted a top stiffening structure 30. The top stiffening structure 30 immobilizes (fixes) the tops of the support columns with respect to each other, contributing to the stiffness of the structure. The stiffening structure may have a form of beams connecting the tops of the columns or the form of a plate, as shown in Fig. 1. Moreover, the intermediate plate 42 constituting a worktop for positioning and fixing an element for crimping, is mounted on the bottom plate 10 on columns 41.

[0021] As presented in Fig. 3, the support column 21-24, may have a form of two flat bars 211, 212 connected to each other at right angle to form a letter L, and between the flat bars may be mounted a strengthening plate 213, preferably having a form of a triangle. To the vertical flat bar 213 is mounted a guide rail 214, on which a support 511 of the crimping tool trolley moves, wherein the trolley is displaced by means of a lead screw 517 driven by a motor 518, preferably an electric stepper motor (presented in Fig. 4B).

[0022] Fig. 4A presents the support 511 of the crimping tool trolley, has a form of a bar 511 comprising at its ends linear guides 512, 513 for mounting the bar 511 to the guide rails 214 of two neighboring support columns 21, 22 or 23, 24. On the guide rail 214 is mounted a trolley 514 having a form of a profile, preferably a U-profile, wherein on its first end is mounted a crimping tool 515 and its second end is driven by a motor 516, preferably with a servomechanism. The trolley 514 is mounted to the support 511 on a linear guide 521 by an angled bracket 522, defining an angle of entry of the crimping tools 515 into the material, driven by a motor 523, preferably an electrical stepper motor (presented in Fig. 4C).

[0023] Such construction allows to mount four independent supports 511, such that arms of the U-shaped bottom trolleys 514 are directed upwards, and arms of the U-shaped upper trolleys 514 are directed downwards. Owing to this it is possible to bring the tools mounted on the bottom trolleys close to the tools mounted on the upper trolleys. The intermediate plate 42 comprises indentations 43, which allow the arms of the bottom trolleys 514 holding the tools 515 for crimping the element (window profile), to get closer to the crimped element.

[0024] Such construction allows to independently control the motion of each crimping tool 515. The movement of the tool 515 in Z axis is achieved by displacement of the support bar 511 on the guide rails 214 of the support columns by means of the motor 518. The horizontal movement of the tool 515 (axes X, Y) is achieved by displacement of the trolley 514 along the bar 511 by means of the motor 217 and by displacement of the trolley 515 by means of the motor 516, pressing or retracting the tool with respect to the crimped element.

[0025] Owing to the presented solution, each of the four tools of the crimping machine has three degrees of freedom and may be precisely and independently positioned in the working space. Each crimping tool performs the crimp with a force which is independent on the crimping force of the remaining crimping tools.

[0026] The bottom plate connected to the top plate by means of the support columns provide very high stiffness of the structure and uniform distribution of forces occurring during the process of corner crimping.

[0027] A method according to the disclosure consists in that after arranging two profiles on the worktop and positioning them with respect to each other, the process of crimping is started. The crimping process is performed in at least two cycles by means of each crimping tool: upper crimping tools (515A, 515B) and lower crimping tools (515C, 515D - as presented in Fig. 2).

[0028] In consecutive cycles the crimp on the profile is performed by means of only a single crimping tool, or by a pair of crimping tools, or even by three or four crimping tools simultaneously, such that the crimping tool is pressed towards the profile, performing the recess (crimp) in the profile by means of the crimping tool.

[0029] A size of the crimp is determined by the size of the crimping tool. If it is required to perform the crimp having a bigger size, then in the next cycle by using a single crimping tool it is possible to perform a crimp at a position distanced from the position of the previous crimp, by the distance not greater than the size of the crimping tool. For example, if the height of the crimping tool is equal to 4mm and a desired crimp is to be 6mm high, then after performing the crimp in the first cycle, in the next cycle the crimping tool is displaced by 2mm and the crimp is performed at a position which in half coincides with the position of the first crimp and in half coincides with the surface of the profile, forming the final crimp with a height equal to 6mm.

[0030] Preferably, if two crimps are performed symmetrically in a first and the second profile (for example in an upper and a lower part of the profiles), then in the first cycle the crimp is performed at the first position on the profiles by the first pair of the crimping tools, and in the second cycle the crimp is performed at the second position on the profiles by the second pair of the crimping tools.

[0031] Owing to the independent operation of each motor, when the maximal pressing force (maximal torque) is obtained, the motor stops. Therefore, the situation of "concentration of force" known from the state of the art does not occur. For example, if for each of the four tools a pressing force equal to 1 ton is needed, then in the solution according to the disclosure, four independent motors each generating the pressing force equal to 1 ton, may be utilized. In typical solutions known from the state

of the art, a single motor generating the pressing force equal to 4 tones is utilized for operating all four crimping tools, which in an extreme situation of wrong positioning of the profile, could cause transferring of total or most of the force to a single crimping tool, which could cause damaging the profile and the machine.

Claims

1. A method for crimping corners, in particular for crimping corners of window frames made of aluminum profiles, comprising the steps of: arranging two profiles on a worktop of a crimping machine and next performing the crimp by means of crimping tools of the crimping machine, **characterized by** using at least two crimping tools (515A-515B, 515C-515D), wherein the first crimping tool is located at a side of the first profile, and the second crimping tool is located at a side of the second profile, and performing the crimp in at least two stages, such that in each subsequent crimping stage the crimp is performed at a different position of a single profile or the crimp is performed simultaneously in two profiles.

2. The method according to claim 1, **characterized in that** in a subsequent cycle the crimp is performed by means of the same crimping tool at a positon distanced from the previous crimp position by a distance not greater than a size of the crimping tool.

3. The method according to claim 1, **characterized by** using two pairs of the crimping tools (515A-515B, 515C-515D), wherein the crimp is performed in at least two stages, such that in the first crimping stage the crimp is performed at a first position by means of the first pair of the crimping tools, and in the second stage the crimp is performed at a second position by means of the second pair of the crimping tools.

4. The method according to claim 1, **characterized by** performing the method by means of a crimping machine is utilized which comprises a base support (10), on which is there is mounted a worktop (42) and heads with crimping tools (515), displaceable with respect to the worktop (42), and wherein on the support base there are mounted two pairs of support columns (21-22, 23-24), and to each pair of the support columns (21-22, 23-24) there is slidably and vertically mounted at least one support (511) of a trolley (514) of the crimping tool (515A-515B, 515C-515D) driven by a motor (518).

5. A corner crimping machine comprising a base support (10) on which there are mounted a worktop (42) and heads with crimping tools (515) which are displaceable with respect to the worktop (42), **characterized in that** on the base support (10) there are mounted two pairs of support columns (21-22, 23-24), and to each pair of the support columns (21-22, 23-24) there is slidably and vertically mounted at least one support (511) of a trolley (514) of the crimping tool (515) driven by a motor (518).

6. The crimping machine according to claim 5, **characterized in that** tops of the support columns (21-22, 23-24) are connected by a top stiffening structure (30).

7. The crimping machine according to any of claims 5-6, **characterized in that** to each pair of the support columns (21-22, 23-24) there are slidably and vertically mounted two independently driven trolley (514) supports (511) of the crimping tools (515).

8. The crimping machine according to any of claims 5-7, **characterized in that** the trolley (514) support (511) of the crimping tool (515) has a form of a bar (511) comprising at its ends linear guides (512, 513) for mounting the bar (511) to guiding rails (214) on a pair of support columns (21-22, 23-24).

9. The crimping machine according to any of claims 5-8, **characterized in that** the trolley (514) of the crimping tool (515) has a form of a profile, and on a first end of the profile there is mounted the crimping tool (515) and a second end of the profile is driven by the motor (516).

10. The crimping machine according to any of claims 5-9, **characterized in that** the trolley (514) is mounted to the support (511) on a linear guide (521) by means of an angled bracket (522) and is driven by a motor (523).

11. The crimping machine according to any of claims 5-10, **characterized in that** the worktop (42) has a form of a plate with indentations (43) in which arms of the trolleys (514) are displaceable.

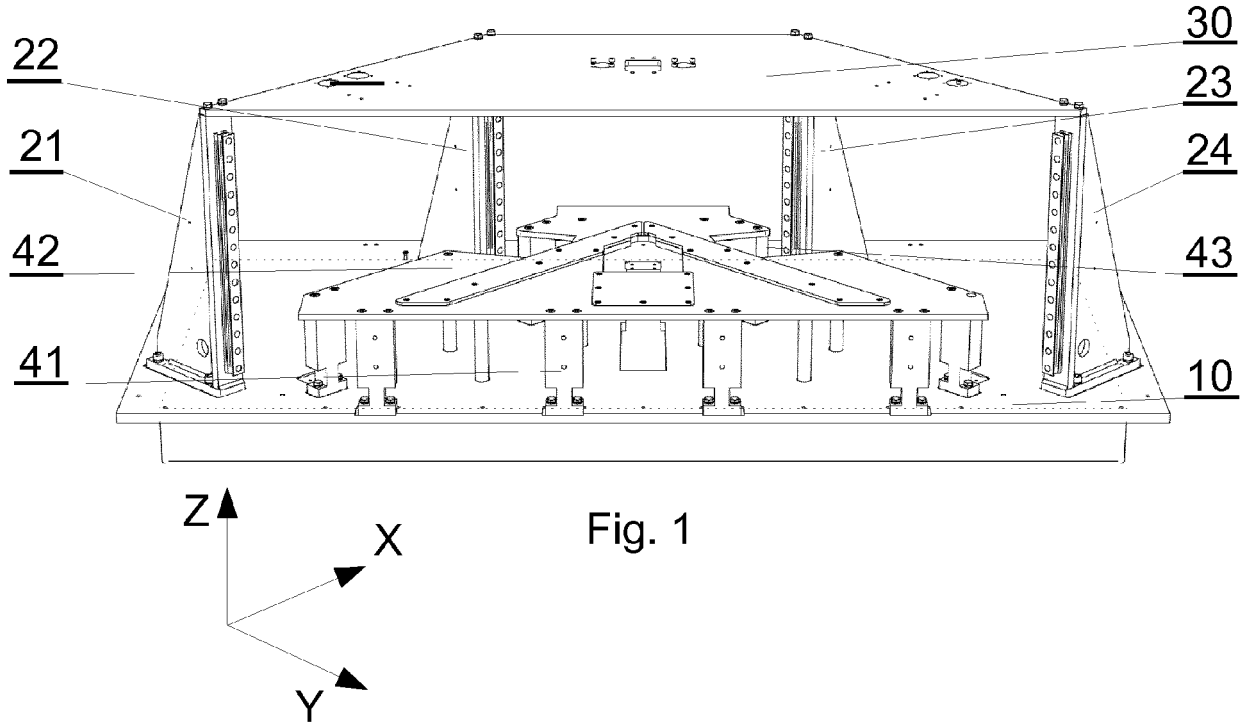

Fig. 1

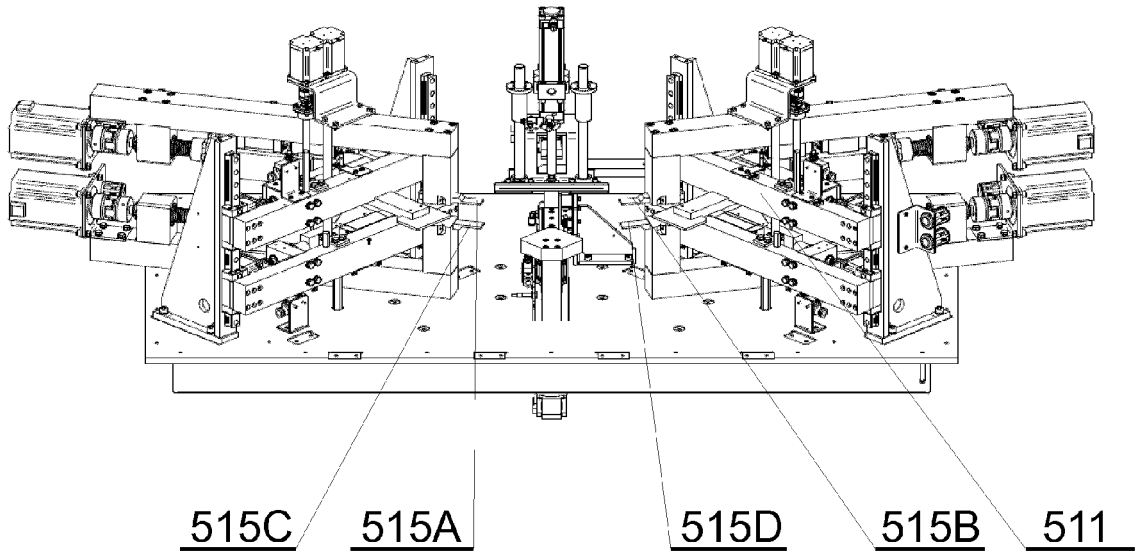

Fig. 2

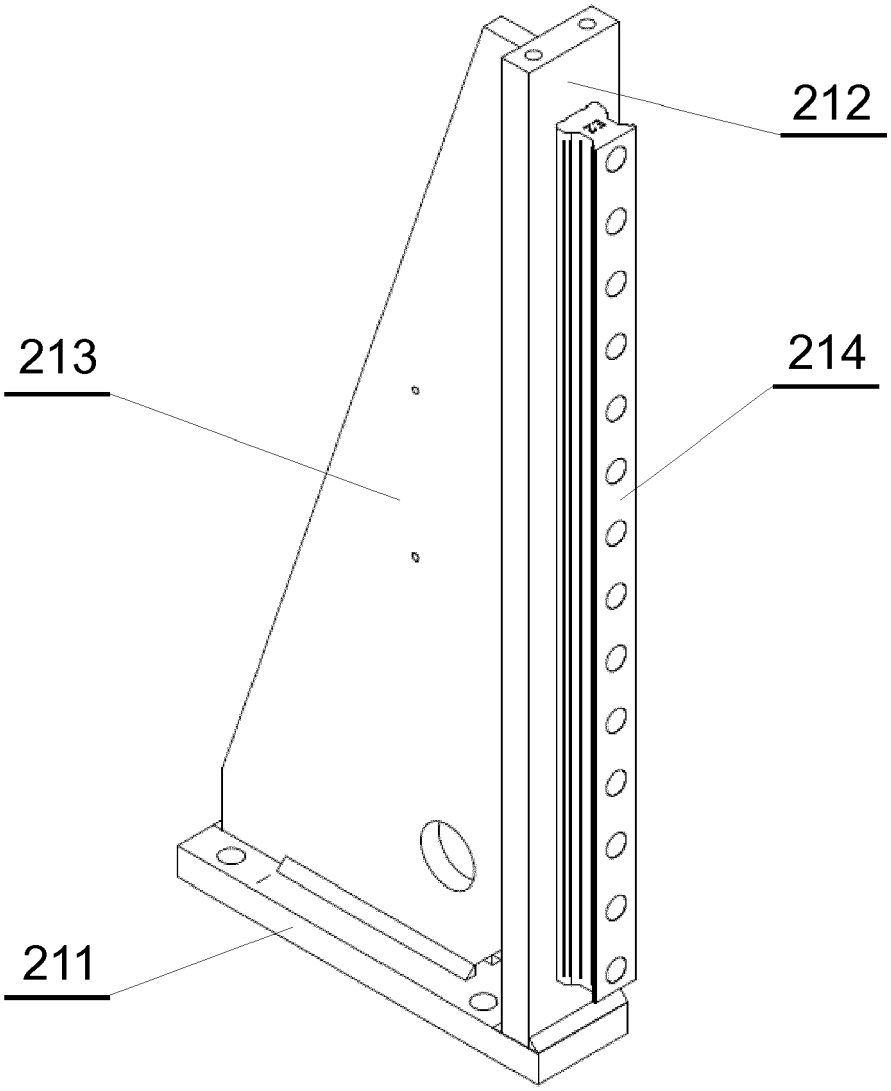

Fig. 3

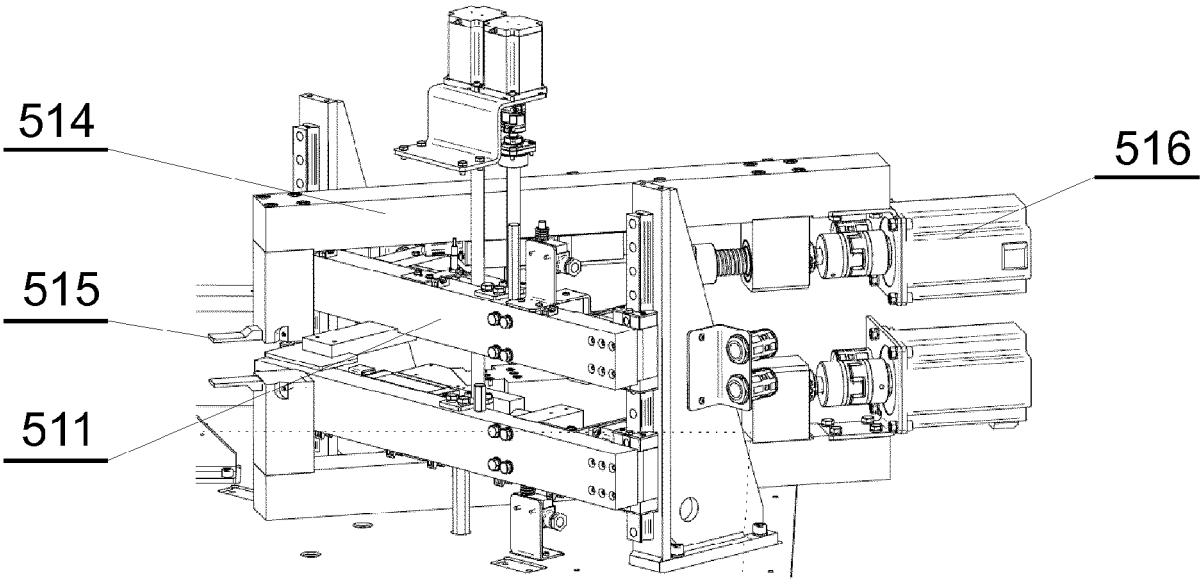

Fig. 4A

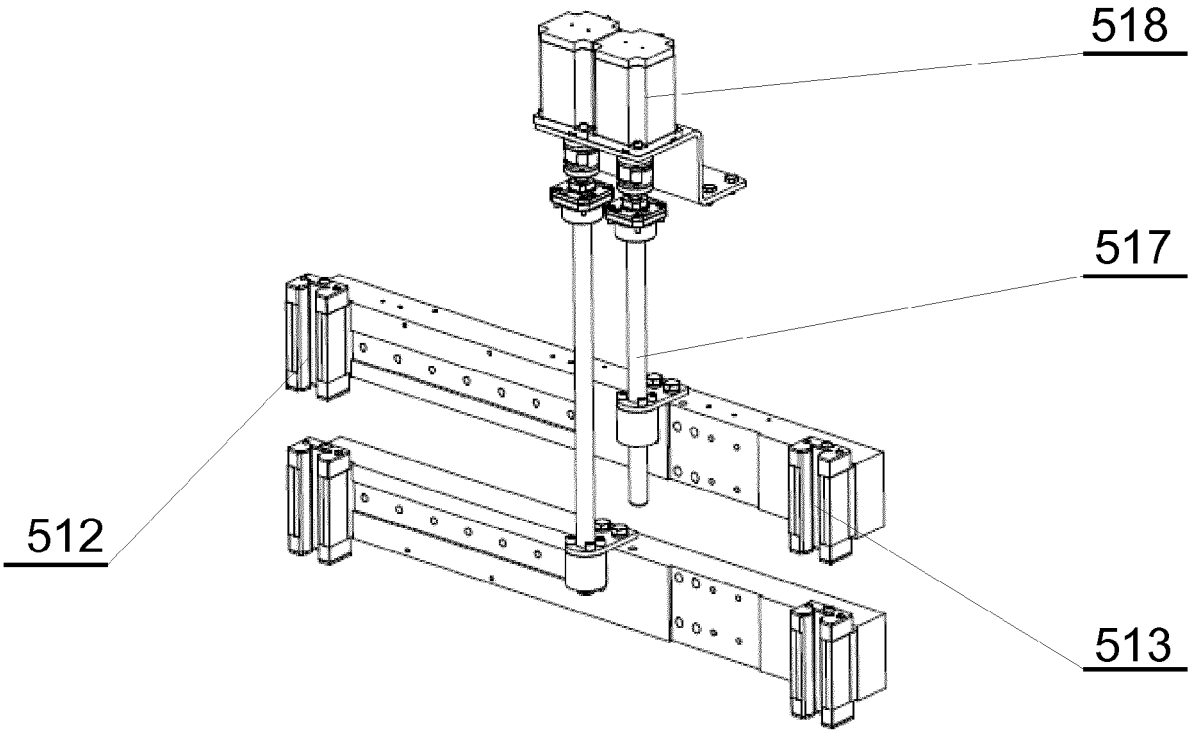

Fig. 4B

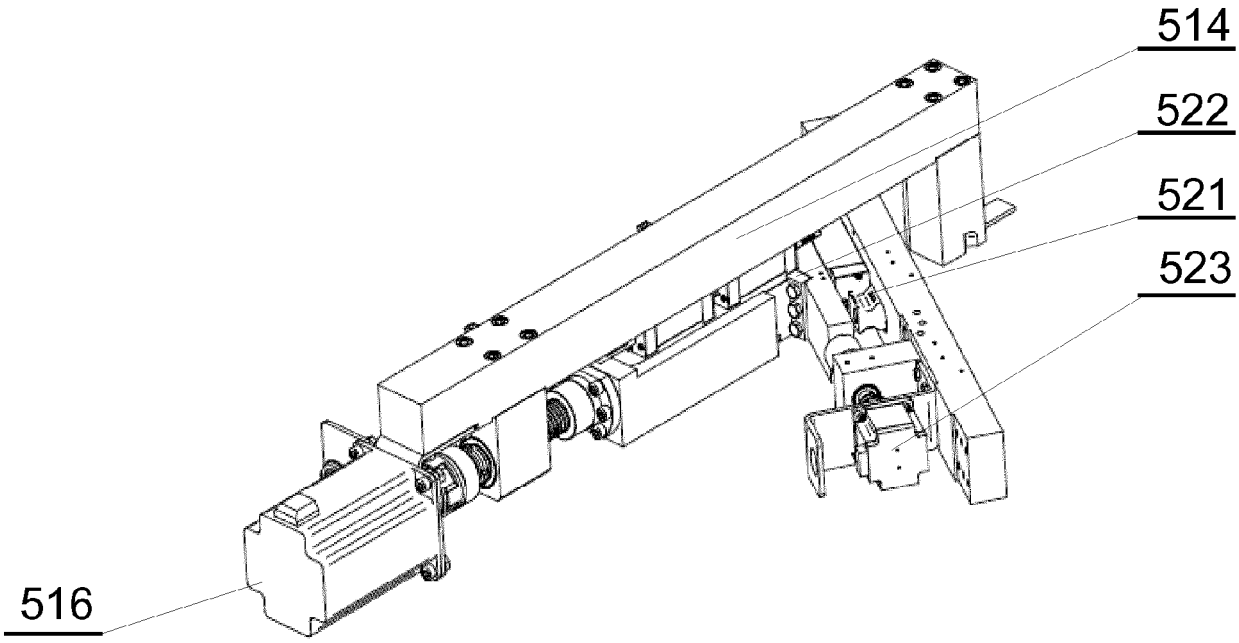

Fig. 4C

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EUROPEAN SEARCH REPORT

Application Number
EP 18 18 5371

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 A	EP 1 459 821 A1 (ATLA COOP S C R L [IT]) 22 September 2004 (2004-09-22) * paragraphs [0025] - [0028]; figures 12A, 13a-13d *	5,6,8-11 1-4	INV. B21D53/74
A	DE 27 39 731 A1 (FRITSCH JOHANN) 15 March 1979 (1979-03-15) * figures 1, 3, 9A, 9B *	1-11	
A	DE 20 15 414 A1 (SCHENNING T) 14 October 1971 (1971-10-14) * figures 1-6 *	1-11	

TECHNICAL FIELDS SEARCHED (IPC)

B21D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	2 November 2018	Vassoille, Philippe

CATEGORY OF CITED DOCUMENTS

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 1459821 A1	22-09-2004	NONE	
DE 2739731 A1	15-03-1979	NONE	
DE 2015414 A1	14-10-1971	NONE	

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