



Europäisches Patentamt
European Patent Office
Office européen des brevets



(11)

EP 1 700 649 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:

13.09.2006 Bulletin 2006/37

(51) Int Cl.:

B21D 53/74 (2006.01)

(21) Application number: **06110943.5**

(22) Date of filing: **10.03.2006**

(84) Designated Contracting States:

**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR
HU IE IS IT LI LT LU LV MC NL PL PT RO SE SI
SK TR**

Designated Extension States:

AL BA HR MK YU

(30) Priority: **11.03.2005 IT FI20050039**

(71) Applicant: **Atla Coop. Societa' Cooperativa di
Produzione
e Lavoro
50037 San Piero a Sieve (IT)**

(72) Inventors:

- **Parigi, Stefano
50041, Calenzano (IT)**
- **Lenci, Luciano
50019 Sesto Fiorentino (IT)**

(74) Representative: **Gervasi, Gemma et al
Notarbartolo & Gervasi S.p.A.,
Corso di Porta Vittoria, 9
20122 Milano (IT)**

(54) **Method and device for automatic beader machine feeding**

(57) The scope of the present invention introduces a method and a device for the automatic loading of beader machines (60).

EP 1 700 649 A1

Description**TECHNICAL FIELD**

5 [0001] The device and the method according to the present invention belong to the field of beader machines and the like.

STATE OF THE ART

10 [0002] The operation of joining the corners of a door-or window-frame, made of metal or using mixed materials, within industrial type production, takes place with operations known as caulking.

[0003] The operations described above are performed by dedicated machines, known as beader machines, constituted essentially by a fixed seat (provided with the relative runners, clamps, etc.), on which the section bars to be caulked are positioned, and by two mobile units (known as "thrust mass units" or caulk heads) to which the knife/knives or punches that perform caulking are applied.

15 [0004] The loading of these beader machines is performed by one or more operators having the task of maintaining the section bars composing the frame in the correct mutual position and of placing the frame on the machine in order to perform the subsequent caulking. It is evident that these manual operations entail risks for the operator who must perform them and they present a certain degree of risk due to the incidence of human error and a certain degree of difficulty due to the fact that the frame to be machined presents a considerable degree of instability being composed of
20 four separate metal section bars, connected to one another only by four corner joints inserted in the recesses of the profiles - at the four vertexes of the frame - without any fastening.

[0005] The scope of the present invention overcomes these drawbacks by introducing a method and a device for the automatic loading of said beader machines.

SUMMARY OF THE INVENTION

25 [0006] A method and device for the automatic feeding of beader machines and the like is described.

BRIEF DESCRIPTION OF DRAWINGS

30

[0007]

Fig. 1 Overview of the device according to the present invention

Fig. 2 View of the centring unit of the device according to the present invention

35

Fig. 3 View of the grasping unit of the device according to the present invention

DETAILED DESCRIPTION OF THE INVENTION

40 [0008] With reference to the attached drawings, the device according to the present invention comprises four separate sections, corresponding to the various steps of the method representing a further scope of the present invention. It is possible to distinguish, in order: a loading unit 10, a centring unit 20, a gripping and manoeuvring unit 30 and an unloading unit 50.

[0009] The loading unit 10, shown in greater detail in Fig. 1, is composed of a cross member 13 on which there are two supports 11, 12 and a transport unit 16 comprising two belts 14, 15 connected to said cross member and having
45 the same height. Said faces can be regulated width wise and are provided with two right angle edges adhering to the exterior of the two back corners of said frame. Said faces serve the dual function of supporting the two corners of the frame, which are in a rear position with respect to the direction of advance of the frame, and of pushing and holding centred the frame with respect to the transport system.

[0010] The centring unit 20, illustrated in Fig. 2, comprises two ledges 21, 22 each one provided with a joint suited to receiving the front corners (again according to the direction of advancing of the frame) of the frame. The two ledges are positioned on two sliders 24 and 25 that can slide on runners placed on the bar 23. Said bar 23 rests on two sliders 26 and 27 that can slide on runners 28 and 29. The motor 210 and the manoeuvre screw 211 displace the bar 23. The right-hand 213 and the left-hand screw 214, connected to the motor 212, move the two sliders 24 and 25. This unit makes it possible to position the frame so that it is perfectly centred with respect to the gripping unit.

55 [0011] With reference to Fig. 3, we see the gripping and manoeuvring unit 30 or "spider" unit, responsible for picking up the frame from its position on the loading unit.

[0012] Said gripping and manoeuvring unit is supported by columns and cross members associated to the runners 314, 315 and the trolley 316 and comprises four fixed support means 31, 32, 33, 34 connected to a central unit 39

associated to manoeuvring means 310, 3232 suited to transmitting to said central unit a rotary and a raising and lowering translatory motion with respect to the loading unit. Said central unit is also connected to the trolley 311 which can slide with its own sliding elements along the runners 312 and 313. Said runners 312, 313, are part of the trolley 316 that, in turn, is free to slide along runners 314 and 315.

[0013] Said trolleys 311, 316 are provided with suitable manoeuvring means, 317 and 318 respectively, which can be constituted, for example, by electric motors associated to screws engaging on nut screws or by electric motors associated to rack and pinion pairs, or to belt-driven kinematic mechanisms or by pneumatic or hydraulic cylinders.

[0014] Said gripping and manoeuvring unit 30 further comprises four mobile elements 35, 36, 37, 38 allowing the spider to assume two positions, one of minimum and one of maximum extension. Said mobile elements 35, 36, 37, 38 are connected respectively to fixed supports 31, 32, 33 and 34 and may slide with respect to them by means of suitable runners and by means of suitable manoeuvring means, such as, for example, the activation devices 319, 320, 321 and 322 that can be constituted by pneumatic or hydraulic cylinders.

[0015] Each of the aforesaid mobile elements is provided with a slider 324 provided with suitable frame grasping means 325, 326, in turn provided with stroke plates 328, preferably clad in non-slip material such as rubber and the like so as to facilitate and make more certain the adhesion to the frame.

[0016] Furthermore, each pair of sliders on the same axis is provided with suitable manoeuvring means in order to place in the right position the sliders and the relative grasping means 325, 326. For example, said manoeuvring means may be constituted by electric motors 327, 330 associated to mechanisms for the transmission of momentum such as a pair of screws, one right hand and the other left hand.

[0017] In a preferred embodiment of the present invention, the grasping element 326 is constituted by a pneumatic cylinder activating an element connected to a rubber pad 329. During normal functioning, the gripping of the frame takes place in the following way, said grasping means 325 pull the four plates 328 - that in turn carry the elements 326 - against the frame whilst the other grasping elements 326 prevent during the clamping of the frame by means of the aforesaid four plates 328, that the section bar parts composing the frame rotate being subject to a gripping force not centred around the midline axis of the section bar. Said elements 326 act so as to grasp the section bar in further points with respect to the points of action of the grasping means 325 and therefore make it possible to prevent any undesired rotation of the individual parts of the frame section bars.

[0018] In a preferred embodiment of the present invention, said grasping means 325 and 326 are in total four each.

[0019] Once frame gripping has been performed, the gripping and manoeuvring unit 30 raises and transports the frame to the work position of the machine for joining the corners 60 by means of the system of actuators 317, 318 acting on the trolleys 311, 316. The exact positioning of the frame is assured by a series of sensors controlling the functioning of the actuators 317, 318.

[0020] With reference to Fig. 1, the unloading unit 50 comprises two forks 51 and 52 suited to wedge between the spider in high position and the surface where the frame is picked up. The forks are fastened on a trolley 53 that with its own sliding means travels along the runners 54 and 55. Momentum is given to trolley 53 by the motor 56 by means of, for example, a belt-driven kinematic mechanism.

[0021] The operation of placing relative to the device according to the present invention, i.e. the set of preliminary operations that must be performed before being able to operate said device, consists in the following steps:

h) positioning of the supports 11 and 12 depending on the width of the frame

i) positioning of the pawls 21 and 22 depending on the width and length of the frame to be machined; these must have the same position width wise of the supports 11 and 12 and must displace in the direction of load movement so that the centre of the frame corresponds with the centre of the gripping and manoeuvring unit 30 or spider

j) positioning of the mobile elements 35, 36, 37, 38 and the sliders 324 depending on the length and width dimensions of the frame to be machined;

[0022] With regard to the functioning of the device according to the present invention as described previously, the method for the automatic feeding of beader machines according to the present invention is performed through the following sequence of steps:

a) Placing of the automatic feeding device. This operation is performed according to the three steps h) - j) described previously

b) Introduction of the frame in the loading station. The frame is composed of four metal section bars and four joints. The joints are inserted into the recesses of the section bars without any fastening, so the frame presents a considerable degree of instability. The introduction of the frame into the load station is an operation performed by a mechanical system or by an operator before the automatic positioning system is started.

c) Starting, by the operator, of the automatic positioning system.

d) Transport of the frame from the loading to the grasping area. The transport is performed with particular care in

order to avoid the frame being scratched. The frame reaches the grasping area with the corners closed, with the sides orthogonal to one another and with the external perimeter of the frame centred with respect to the gripping mechanism

e) Frame grasping and positioning of the four corners of the frame on the joining machine. The gripping mechanism grasps the frame in such a way as to keep the corners perfectly matching during the operations of positioning on the joining machine. The gripping mechanism performs the movements and the rotations necessary to position the four corners on the joining machine

f) Corner junction operation. This operation is performed by the joining machine tool connected to the automatic feeding system according to the present invention. The joining operation is completed after a corner of the frame has been positioned in the machine work point. At the end of the operation, the frame is taken by the grasping and positioning system to a suitable area where 90° rotation is performed, without possibility of collisions. At the end of this rotation, a new corner to be machined is positioned in the work point of the corner-joining machine. This is repeated until the joining of the fourth corner

g) Unloading of the finished frame. This is the operation that makes it possible to transport the finished frame from the work area to an area where the frame joined at the corners is picked up.

The previous step d) is performed according to the following steps:

k) The bar 13 moves forward pushing the frame against the pawls 21 and 22

l) A stopswitch sensor positioned on the line connecting the pawls 21 and 22 blocks the bar 13 and gives consent to the grasping system to descend

In the same way, the previous step e) is performed, in detail, according to the following steps:

m) A stopswitch sensor detects the lowering and allows the activation of the grasping elements 325 that tighten the plates 328 against the frame. Two elements 325 positioned on two adjacent frame sides are activated first, then the other two. This makes it possible to obtain orthogonality.

n) Once the last stopswitch of the four cylinders 325 has been activated, the four grasping elements 326 are activated.

o) The activation of all the stopswitches of the grasping means 326 allows the grasping spider to ascend.

p) The ascent stopswitch allows the activation of the movement system of the trolleys 311, 316 that are activated so as to bring the gripping and manoeuvring unit 30 closer to the beader machine 60.

q) The advancing of the trolleys is decelerated when suitable photoelectric sensors detect that the trolley has come into the vicinity of the beader machine 60.

r) Positioning is complete when the frame rests against the ledges 61 and 62 of the beader machine.

The previous step f) on the other hand envisages, for its performance, the succession of the following phases:

s) Two proximity sensors positioned on these ledges allow the machine to start the corner caulking cycle

t) Once the caulking cycle is finished, the beader machine gives consent to the grasping spider to retreat to a safe area for the 90° rotation.

u) Once the 90° rotation is finished, a sensor makes it possible to take the corner back to the beader machine caulking position

v) The caulking cycle is repeated for the other three corners

w) At the end of the last corner, the electronic system gives consent to return to the start position to the grasping spider

Lastly, step g) envisages the sequence of steps listed below:

x) The stopswitch sensors detect the presence in the start position of the grasping spider and give consent to the unloading system to position the forks 51 and 52 under the spider

y) Once the forks are positioned under the spider, it releases the frame

z) The release stopswitch of the grasping elements 325 give consent to unload the frame by the mobile forks

Claims

1. Device for automatic beader machine feeding **characterised in that** it comprises at least one gripping and manoeuvring unit (30)

2. Device for automatic beader machine feeding according to claim 1, **characterised in that** it further comprises at least one loading unit (10), at least one centring unit (20) and at least one unloading unit (50)
- 5 3. Device for automatic beader machine feeding according to claims 1-2, **characterised in that** said at least one loading unit (30) comprises four fixed support means (31, 32, 33, 34) connected to a central unit (39) associated to a first trolley (311) and to suitable manoeuvring means (310, 3232) suited to transmitting to said central unit (39) a rotary motion and a translatory motion of raising and lowering.
- 10 4. Device for automatic beader machine feeding according to claim 3, **characterised in that** said first trolley (311) is associated to suitable sliding runners (312, 313) connected to a second trolley (316)
5. Device for automatic beader machine feeding according to claim 4, **characterised in that** said second trolley (316) is associated to suitable sliding runners (314, 315)
- 15 6. Device for automatic beader machine feeding according to claims 4 - 5, **characterised in that** said trolleys (311, 316) are associated to suitable manoeuvring means (317, 318).
- 20 7. Device for automatic beader machine feeding according to claim 6, **characterised in that** said suitable manoeuvring means (317, 318) are constituted by electric motors associated to screws engaging on nut screws.
8. Device for automatic beader machine feeding according to claim 6, **characterised in that** said suitable manoeuvring means (317, 318) are constituted by electric motors associated to rack and pinion pairs.
- 25 9. Device for automatic beader machine feeding according to claim 6, **characterised in that** said suitable manoeuvring means (317, 318) are constituted by electric motors associated to belt type kinematic mechanisms.
- 30 10. Device for automatic beader machine feeding according to claim 6, **characterised in that** said suitable manoeuvring means (317, 318) are constituted by pneumatic or hydraulic cylinders.
- 35 11. Device for automatic beader machine feeding according to claims 1 - 10, **characterised in that** said at least one gripping and manoeuvring unit further comprises four mobile elements (35, 36, 37, 38) allowing the spider to assume two positions, one of minimum and one of maximum extension.
12. Device for automatic beader machine feeding according to claim 11, **characterised in that** said four mobile elements (35, 36, 37, 38) are associated to said fixed supports (31, 32, 33 and 34) and can slide with respect thereto by means of suitable runners and by means of suitable manoeuvring means.
- 40 13. Device for automatic beader machine feeding according to claim 12, **characterised in that** said suitable manoeuvring means are constituted by the activation devices (319, 320, 321 and 322).
- 45 14. Device for automatic beader machine feeding according to claims 11 - 13, **characterised in that** said mobile elements (35, 36, 37, 38) are associated to suitable sliders (324) comprising suitable means for grasping (325, 326) the frame to be caulked.
- 50 15. Device for automatic beader machine feeding according to claim 14, **characterised in that** said grasping means (325, 326) comprise stroke plates (328).
16. Device for automatic beader machine feeding according to claim 15, **characterised in that** said stroke plates (328) are clad in non-slip material.
- 55 17. Device for automatic beader machine feeding according to claims 14 - 16, **characterised in that** said grasping element (326) is constituted by a pneumatic cylinder activating an element connected to a rubber pad (329).
18. Device for automatic beader machine feeding according to claims 14 - 17, **characterised in that** said sliders (324) are associated to suitable manoeuvring means.
19. Device for automatic beader machine feeding according to claim 18, **characterised in that** said suitable manoeuvring means are constituted by electric motors (327, 330) associated to a pair of screws, one right hand and the other

left hand.

20. Device for automatic beader machine feeding according to claims 2 - 19, **characterised in that** said loading unit (10) comprises a cross member (13) provided with suitable resting means (11, 12) and a transport unit (16).

21. Device for automatic beader machine feeding according to claim 20, **characterised in that** said transport unit (16) comprises two belts (14, 15) connected to said cross member (13) and having the same height and said resting means (11, 12) are adjustable widthwise and are provided with two edges at right angles.

22. Device for automatic beader machine feeding according to claims 2 - 21, **characterised in that** said centring unit (20) comprises two ledges (21, 22) associated to a bar (23) by means of two sliders (24, 25) and free to move on it, said bar (23) in turn comprising at least two sliders (26, 27) bound to two corresponding runners (28, 29)

23. Device for automatic beader machine feeding according to claim 22, **characterised in that** said bar (23) and said sliders (24, 25) are associated to suitable manoeuvring means.

24. Device for automatic beader machine feeding according to claim 23, **characterised in that** said suitable manoeuvring means associated to said bar (23) are constituted by an electric motor (210) and by a manoeuvre screw (211) associated thereto and said suitable manoeuvring means associated to said sliders (24, 25) are constituted by a pair of left hand (214) and right hand (213) screws and by an electric motor (212) associated thereto.

25. Device for automatic beader feeding according to claims 2 - 24, **characterised in that** said unloading unit (50) comprises two forks (51, 52) associated to a trolley (53) in turn bound to suitable sliding runners (54, 55) and associated to suitable manoeuvring means.

26. Device for automatic beader machine feeding according to claim 25, **characterised in that** said suitable manoeuvring means associated to said trolley (53) are constituted by an electric motor (56) associated to a belt-driven transmission system.

27. Method for automatic beader machine feeding, **characterised in that** it comprises the following steps:

- a) Placing of the automatic feeding device.
- b) Introduction of the frame into the loading station.
- c) Starting of the automatic positioning system.
- d) Transport of the frame from the loading to the grasping area.
- e) Frame grasping and positioning of the four corners of the frame on the joining machine.
- f) Caulking and junction of the frame corner.
- g) Unloading of the finished frame.

28. Method for automatic beader machine feeding according to claim 27, **characterised in that** said previous step a) is performed according to the following steps:

- h) positioning of supports (11, 12) depending on the width of the frame to be machined
- i) positioning of the pawls (21, 22) depending on the width and length of the frame to be machined
- j) positioning of the mobile elements (35, 36, 37, 38) and the sliders (324) depending on the length and width dimensions of the frame to be machined;

29. Method for automatic beader machine feeding according to claim 27, **characterised in that** said previous step d) is performed according to the following steps:

- k) The bar (13) moves forward pushing the frame against the pawls (21, 22)
- l) A stopswitch sensor positioned on the line connecting the pawls (21, 22) blocks the bar (13) and gives consent to the grasping system (30) to descend

30. Method for automatic beader machine feeding according to claim 27, **characterised in that** said previous step e) is performed according to the following steps:

- m) A stopswitch sensor detects the end of grasping unit (30) lowering and allows the activation of the grasping

elements (325) that tighten the plates (328) against the frame.

n) The four grasping elements (326) are activated after the last stopswitch of the cylinders (325) is reached.

o) The grasping unit (30) rises after all the grasping means stopswitches (326) have been reached

p) The grasping unit (30) ascent stopswitch allows the activation of the manoeuvring system of the trolleys (311, 316)

q) The advance of said trolleys (311, 316) is decelerated when, by means of suitable photoelectric sensors, it is detected that the frame has come into the vicinity of the beader machine (60).

r) The frame is rested against the ledges (61, 62) of said beader machine (60)

31. Method for automatic beader feeding according to claim 27, **characterised in that** said previous step f) is performed according to the following steps:

s) The frame corner caulking cycle starts after two proximity sensors have detected the reaching, by the frame, of said ledges (61, 62)

t) Once the caulking cycle has been terminated, the beader machine gives the grasping unit (30) consent to retreat to a safe area for 90° rotation.

u) Once the 90° rotation is terminated, the subsequent corner is relocated in the beader machine caulking position (60)

v) The caulking cycle is repeated for the other three corners

w) Once the machining of the last corner is terminated, said grasping unit (30) is taken back to the start position

32. Method for automatic beader feeding according to claim 27, **characterised in that** said previous step g) is performed according to the following steps:

x) Suitable stopswitch sensors detect the presence in the start position of the grasping unit (30) and give consent to the unloading system (40) to position the forks (51, 52) under the grasping unit (30)

y) Said gripping unit (30) releases the frame

z) The release stopswitch of the grasping elements (325) give consent to unload the frame by the mobile forks

33. Method for automatic beader machine feeding according to claims 27 - 32, **characterised in that** it uses a device for automatic beader machine feeding according to claims 1 - 26.

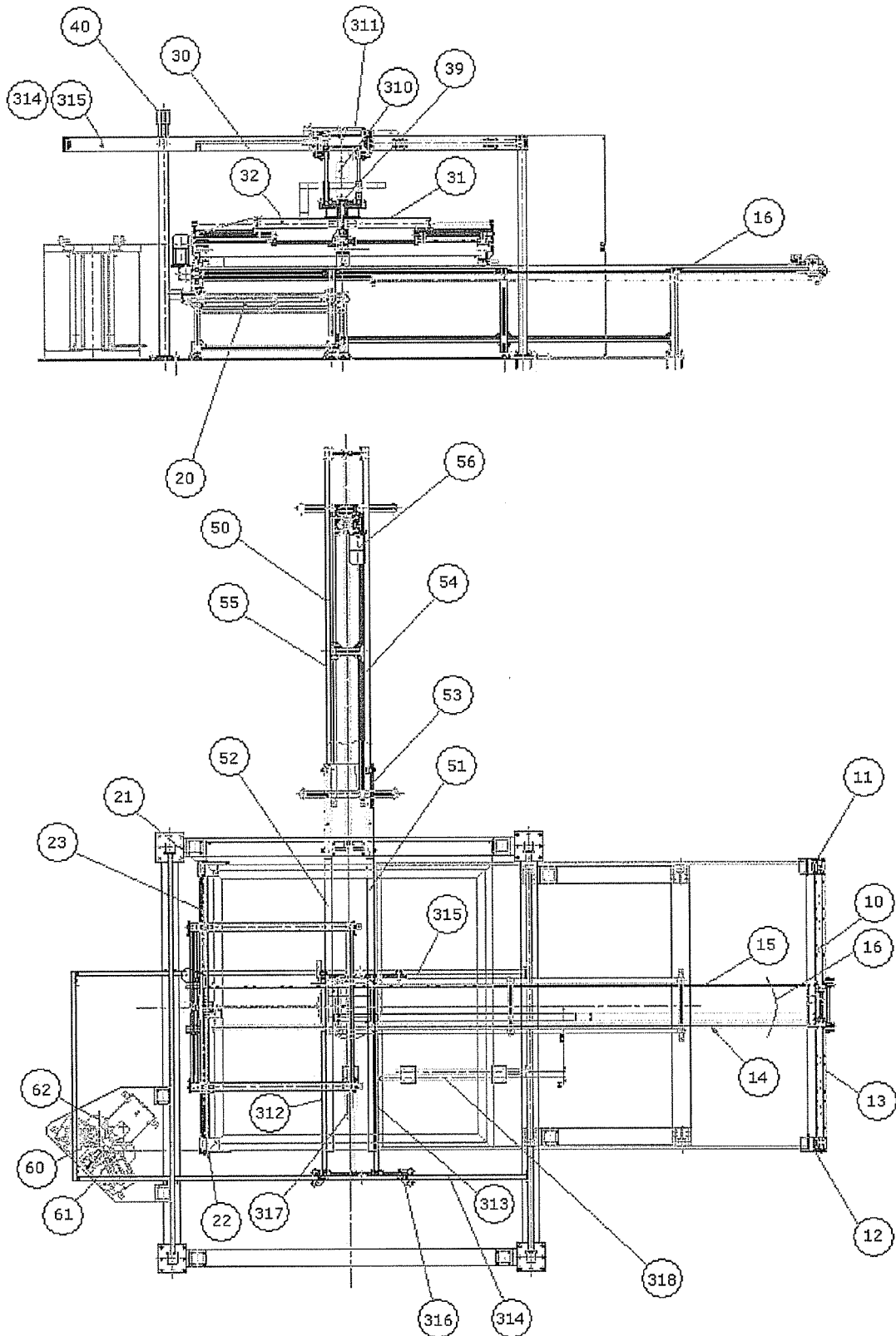


Fig. 1

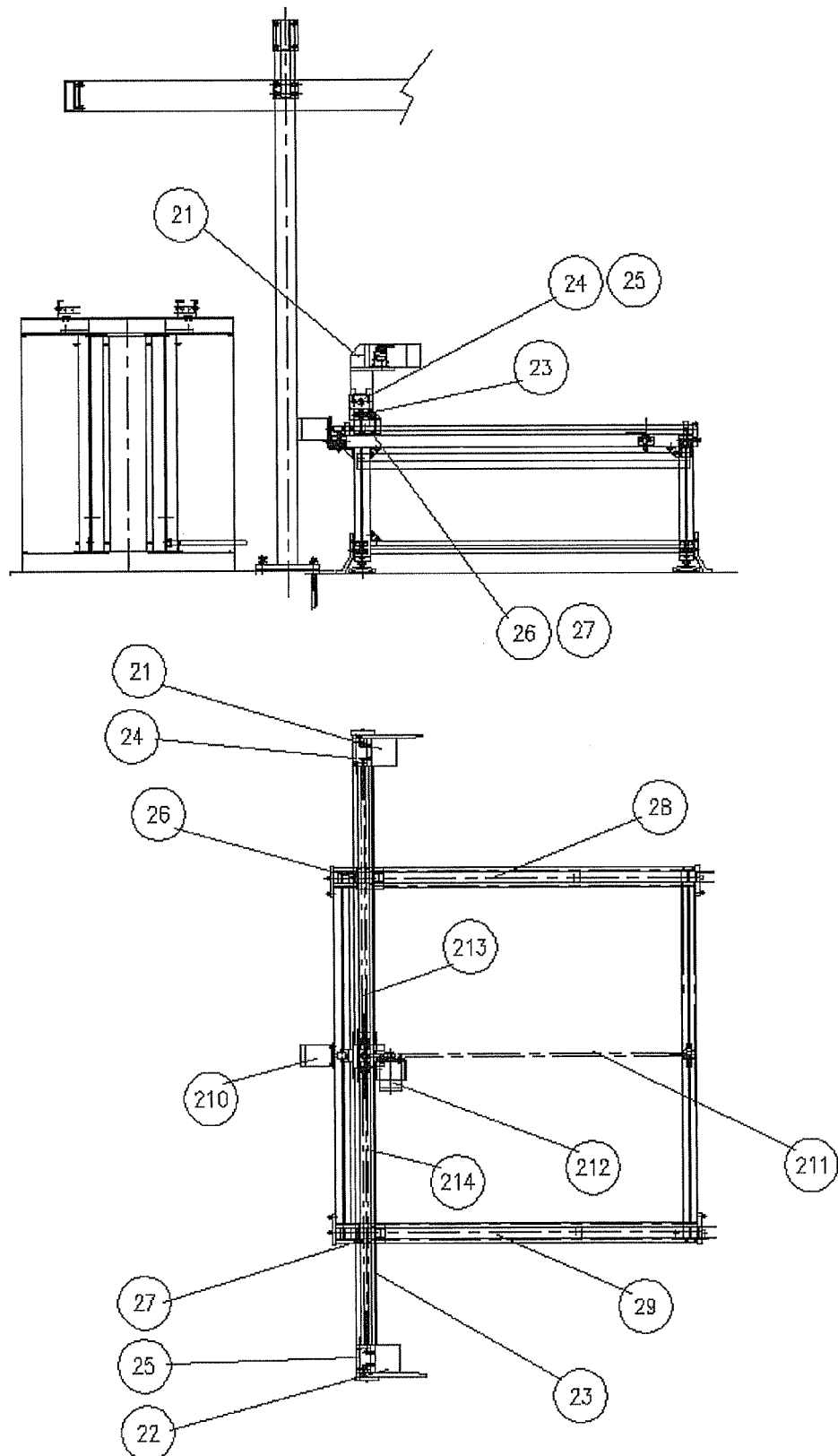


Fig. 2

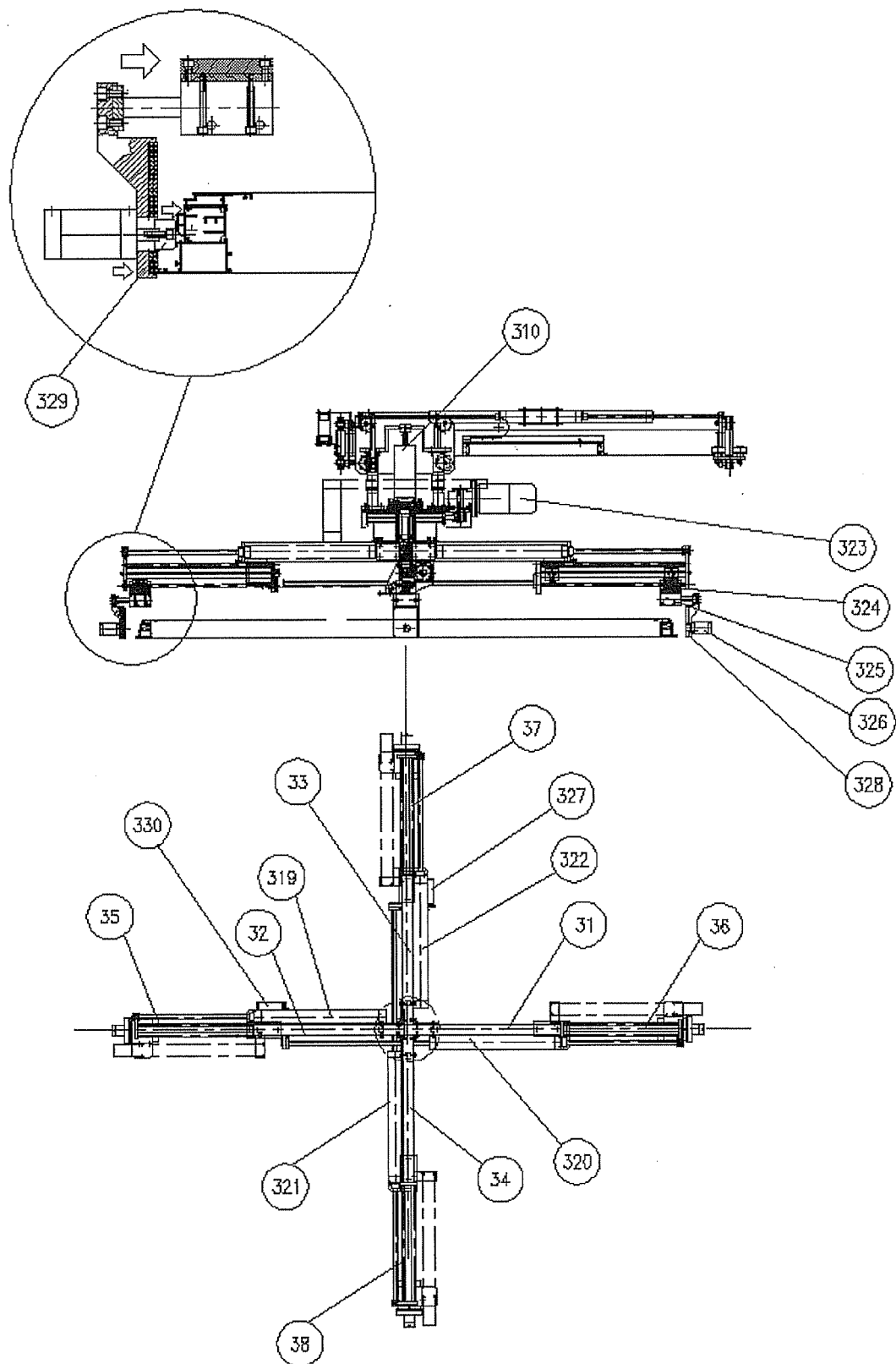


Fig. 3



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 06 11 0943

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	DE 23 45 881 A1 (HANS ROTTNER KG) 27 March 1975 (1975-03-27) * page 2, paragraphs 1,2; figures 1,2 * * pages 3-5; claim 7 * -----	1-3,27	INV. B21D53/74
X	DE 23 54 233 A1 (HANS ROTTNER KG) 15 May 1975 (1975-05-15) * the whole document * -----	1,27	
X	DE 30 08 326 A1 (LOTH,HERMANN) 17 September 1981 (1981-09-17) * the whole document * -----	1,27	
A	EP 1 153 701 A (RAFFONI, GIUSEPPE) 14 November 2001 (2001-11-14) * the whole document * -----		
A	EP 1 075 893 A (RAFFONI, GIUSEPPE) 14 February 2001 (2001-02-14) * the whole document * -----		
A	EP 1 055 482 A (RAFFONI, GIUSEPPE) 29 November 2000 (2000-11-29) * the whole document * -----		TECHNICAL FIELDS SEARCHED (IPC)
			B21D B23P E06B
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 17 July 2006	Examiner Knecht, F
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

2
EPO FORM 1503 03.82 (P04C01)

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

EP 06 11 0943

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

17-07-2006

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 2345881	A1	27-03-1975	NONE
DE 2354233	A1	15-05-1975	NONE
DE 3008326	A1	17-09-1981	NONE
EP 1153701	A	14-11-2001	IT F020000011 A1 12-11-2001 US 2001039721 A1 15-11-2001
EP 1075893	A	14-02-2001	AT 289892 T 15-03-2005 DE 60018333 D1 07-04-2005 IT B0990458 A1 12-02-2001
EP 1055482	A	29-11-2000	AT 271953 T 15-08-2004 DE 60012421 D1 02-09-2004 ES 2224948 T3 16-03-2005 IT B0990289 A1 27-11-2000 US 6164512 A 26-12-2000