



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
13.11.2013 Bulletin 2013/46

(51) Int Cl.:
B65B 11/38 (2006.01) **B65B 57/00** (2006.01)
B65B 65/00 (2006.01)

(21) Application number: **13167136.4**

(22) Date of filing: **08.05.2013**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME

- **Gherardi, Giampaolo**
40055 Castenaso (IT)
- **Salmi, Stefano**
40054 Budrio (IT)
- **Uccellari Sauro**
40133 Bologna (IT)
- **Zanotti, Maurizio**
40030 Grizzana (IT)
- **Squarzoni, Michele**
44100 Ferrara (IT)

(30) Priority: **08.05.2012 IT BO20120251**
04.01.2013 IT BO20130005

(71) Applicant: **G.D SOCIETA' PER AZIONI**
Bologna (IT)

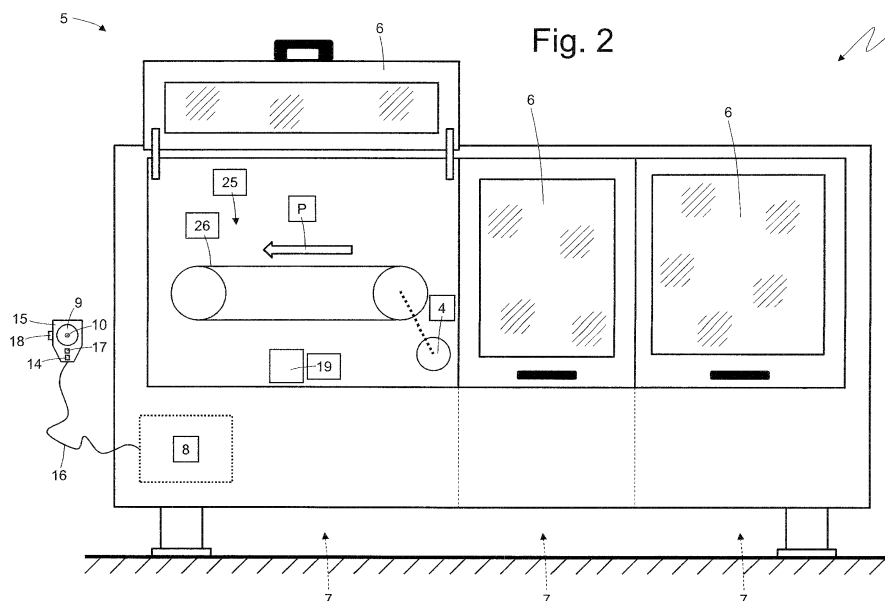
(74) Representative: **Boggio, Luigi et al**
Studio Torta S.p.A.
Via Viotti, 9
10121 Torino (IT)

(72) Inventors:
• **Fiorentini, Marco**
40043 Marzabotto (IT)

(54) **Automatic product packing machine with manual electric drive control**

(57) An automatic product packing machine (1) having: a conveying device (25) which feeds a product (21) for packing along a packing path (P), which originates at a first feed station (20) and extends through a second feed station (22) and at least one work station (24); an electric machine motor (4) which drives at least part of

the conveying device (25) to move the conveying device (25); a manual control (9) operated manually by an operator; and a control unit (8) which controls operation of the electric machine motor (4) according to the position of the manual control (9); and a portable device (15), which can be gripped and moved about freely by an operator, and supports the manual control (9).



Description

TECHNICAL FIELD

[0001] The present invention relates to an automatic product packing machine with manual electric drive control.

[0002] The present invention may be used to advantage in an automatic cigarette packing machine, to which the following description refers purely by way of example.

BACKGROUND ART

[0003] An automatic cigarette packing machine normally comprises a number of conveyors, which feed the cigarettes along a packing path and are driven by at least one main electric motor. The whole of the packing path, which is equipped with numerous continuously-moving parts (effectors), is protected by safety housings to prevent operators from accidentally coming into contact with the moving parts. For obvious safety reasons, the main electric motor is only powered to drive the packing machine when the safety housings are closed, i.e. when the packing path is inaccessible from the outside.

[0004] To allow technicians to effectively adjust or service the automatic machine (e.g. to improve packing efficiency or clear blockages), a handwheel is provided, which, only when the main electric motor is off, can be connected mechanically to the mechanical transmission of the main electric motor with a suitable transmission ratio to allow technicians to operate the effectors along packing path manually at low speed.

[0005] On more modern cigarette packing machines, the handwheel connected mechanically to the mechanical transmission of the main electric motor is replaced by (or combined with) a 'virtual' handwheel, which is fully independent of the mechanical transmission of the main electric motor. In this solution, the 'virtual' handwheel only rotates an angular position sensor (typically an encoder), which reads the angular position of the 'virtual' handwheel, and the main electric motor is rotated to track the angular position of the 'virtual' handwheel.

[0006] The handwheel is normally located in a central 'centre of gravity' position on the automatic machine.

[0007] When dealing with large automatic machines, however, one central handwheel may not be enough, by being located too far away from the lateral portions of the machine, i.e. using one central handwheel, the operator is too far away from the lateral portions of the machine to accurately monitor the moving parts in the lateral portions.

[0008] To solve the problem, it has been proposed to equip the automatic machine with a number of (typically two or three) identical handwheels equally spaced along the machine, so the operator can use the handwheel closest to the moving parts of the machine to be monitored. Providing multiple handwheels, however, poses various machine design problems, in that the necessary space

in which to house the handwheels is not always readily available. Moreover, each handwheel limits access to the machine parts behind it, so increasing the number of handwheels reduces overall access to the machine.

[0009] To solve the above problem, Patent Application DE102007048053A1 describes an automatic machine equipped with one electronic handwheel for controlling the effectors along the packing path. The handwheel is fitted to a control box, which can be fixed to various given points on the machine, and, once fixed, is connected to a control unit on the machine by a connecting cable with an end jack that fits into a receptacle close to the selected point. The electronic handwheel can thus be used where required, by the operator first fixing the control box to the most suitable point on the machine.

DESCRIPTION OF THE INVENTION

[0010] It is an object of the present invention to provide an automatic product packing machine with manual electric drive control, which automatic machine is designed to eliminate the above drawbacks and, in particular, is cheap and easy to implement.

[0011] According to the present invention, there is provided an automatic product packing machine with manual electric drive control, as claimed in the accompanying Claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] A number of non-limiting embodiments of the present invention will be described by way of example with reference to the attached drawings, in which:

Figure 1 shows a schematic view in perspective, with parts removed for clarity, of an automatic machine for wrapping packets of cigarettes in transparent plastic overwraps, and implementing the control method according to the present invention;

Figure 2 shows a schematic front view, with parts removed for clarity, of the Figure 1 automatic machine equipped with safety housings;

Figure 3 shows a schematic side view, with parts removed for clarity, of the Figure 1 automatic machine equipped with safety housings;

Figure 4 shows a schematic view in perspective, with parts removed for clarity, of an automatic machine for producing rigid packets of cigarettes, and implementing the control method according to the present invention;

Figure 5 shows a schematic front view, with parts removed for clarity, of a variation of the Figure 1 automatic machine equipped with safety housings.

PREFERRED EMBODIMENTS OF THE INVENTION

[0013] Number 1 in Figure 1 indicates as a whole an automatic machine for wrapping packets of cigarettes in

transparent plastic overwraps.

[0014] Automatic machine 1 has a packing path P, which originates at a feed station 20 supplying a product 21 for packing (i.e. packets of cigarettes to be wrapped in transparent plastic overwraps). Packing path P extends through a feed station 22 supplying a sheet 23 of packing material (more specifically, a sheet of transparent, heat-seal plastic packing material), which is applied to product 21. Packing path P extends through a number of work stations 24, where product 21 is packed in sheet 23 of packing material, i.e. where sheet 23 of packing material is folded about product 21 and then heat sealed in place. Finally, automatic machine 1 comprises a conveying device 25 for feeding product 21 for packing along packing path P, which originates at feed station 20 and extends through feed station 22 and work stations 24. Conveying device 25 comprises a number of successive conveyors 26 of different types (typically conveyor belts and rotary wheels). A number of effectors are located along conveying device 25, i.e. a number of operating parts comprising moving parts, and which operate on product 21 and/or sheet 23 of packing material. The effectors may be connected mechanically to conveyors 26 of conveying device 25 (i.e. may be driven directly by conveyors 26 of conveying device 25) or may be driven independently of conveyors 26 of conveying device 25.

[0015] As shown in Figures 2 and 3, conveyors 26 of conveying device 25 are driven by at least one electric machine motor 4. One electric machine motor 4 may drive all of conveyors 26, or a number of electric machine motors 4 may be provided, each for only driving some of conveyors 26. Electric machine motor 4 (or, in the event of a number of electric machine motors 4, a main electric machine motor 4) acts as a 'master', which defines a reference position which is tracked by all the other electric actuators, which operate as 'slaves'. The other electric actuators operating as 'slaves' comprise, if any, the electric machine motors 4 other than the main electric machine motor 4 acting as the 'master', and all the other electric actuators driving corresponding effectors of automatic machine 1.

[0016] The whole of packing path P, which is equipped with numerous continuously-moving parts, is protected by a safety housing 5 to prevent operators from accidentally coming into contact with the moving parts. For obvious safety reasons, electric machine motor 4 is only powered to drive the packing machine when safety housing 5 is closed, i.e. when packing path P is inaccessible from the outside. Safety housing 5 comprises three hatches 6 hinged to move between a closed position 'sealing' packing path P, and an open position allowing free access to packing path P.

[0017] In one embodiment, automatic machine 1 is modular, and comprises three independent modules 7 connected to one another and each comprising at least one electric machine motor 4 (it may even comprise two or more electric machine motors 4).

[0018] Automatic machine 1 comprises an electric

drive control unit 8 which, among other things, controls electric machine motor 4; and at least one manual control 9 which may be operated manually by an operator when automatic machine 1 is stopped (i.e. for maintenance or repair). In a preferred embodiment shown in the attached drawings, manual control 9 is rotary; in a different embodiment not shown, manual control 9 is linear.

[0019] In the embodiment shown, manual control 9 is mounted to rotate idly, i.e. is in no way connected mechanically to electric machine motor 4. As shown in Figure 2, manual control 9 is associated with an angular position sensor 10 (typically an encoder), which detects the angular position of manual control 9.

[0020] When automatic machine 1 is stopped for maintenance or repair, i.e. when automatic machine 1 is stopped and one or more of hatches 6 are open to allow the operator to carry out maintenance or repair work, manual control 9 may be operated so that control unit 8 controls operation of electric machine motor 4 (or at least one electric machine motor 4) on the basis of the position of manual control 9. In other words, the operator controls operation of electric machine motor 4 using manual control 9; and control unit 8 controls electric machine motor 4 to track the position of manual control 9.

[0021] In a preferred embodiment, control unit 8 has various software safeties (i.e. safety logic circuits) designed firstly to ensure the physical safety of the operators, and secondly to ensure the integrity of automatic machine 1, when electric machine motor 4 is controlled by manual control 9. For example, one software safety may prevent electric machine motor 4 from pushing excessively against 'obstacles'. One software safety may prevent electric machine motor 4 from operating too fast and possibly asymmetrically (i.e. at different speeds in different directions); this speed limitation is designed to prevent rapid movements, and so safeguard the operator against fast-moving parts, or spin-off of packing material or loosely fitted parts of automatic machine 1. One software safety may permit certain movements in one direction only, and/or only up to a given point (possibly software-adjustable by the operator). One software safety may even prevent electric machine motor 4 from moving parts along 'hazardous' trajectories (i.e. resulting in destructive mechanical interference).

[0022] In one embodiment, automatic machine 1 is equipped with an optical barrier generated by a system of optical emitters/receivers and extending parallel to the front of automatic machine 1 to 'protect' all the moving parts. Only when the optical barrier is uninterrupted, i.e. there are no foreign bodies in the optical barrier area, can electric machine motor 4 actually be operated by control unit 8. In other words, invasion of the moving-part area by the operator's hand prevents electric machine motor 4 from being started using manual control 9. Obviously, an optical barrier is only one of several possible safety devices, and may be replaced by or used in conjunction with a weight-sensitive platform located on the floor in front of automatic machine 1 to detect the pres-

ence of an operator close enough to come into contact with the moving parts.

[0023] In one embodiment, electric machine motor 4 is connectable mechanically to a crank, which is inserted and turned manually by an operator to move electric machine motor 4 (and therefore all the other moving parts connected mechanically to electric machine motor 4) when electric power to automatic machine 1 is cut off (normally only when automatic machine 1 is being assembled and so lacks many of its component parts).

[0024] As shown in Figures 2 and 3, provision is made for a portable device 15, which can be gripped and carried easily by the operator, i.e. is small and light enough to be gripped and carried easily by the operator in one hand. Portable device 15 is fitted with manual control 9 (which is preferably in the form of a rotary knob) so the operator can grip and carry portable device 15 in one hand (e.g. the left) and operate manual control 9 with the other (e.g. the right). Portable device 15 is preferably connected to control unit 8 by a shielded connecting cable 16, which is typically coiled to stretch when needed. In an alternative embodiment not forming part of the present invention, portable device 15 may be radiofrequency, i.e. 'wireless', connected to control unit 8. For operator safety reasons, however, portable device 15 is preferably connected 'physically' to control unit 8, i.e. by shielded connecting cable 16, which ensures uninterrupted connection, safeguards against electromagnetic interference, and above all restricts the range of the operator using portable device 15 to a given maximum distance (equal to the maximum length of connecting cable 16) from automatic machine 1. It is essential that the operator using portable device 15 remain close enough to automatic machine 1 to maintain a clear view of the machine before starting electric machine motor 4. In other words, to ensure, firstly, the safety of the operators and, secondly, the mechanical integrity of automatic machine 1, the operator using portable device 15 must always be stationed in the best position to ensure safe control of electric machine motor 4.

[0025] In short, portable device 15 supports manual control 9, is physically independent of and separate from automatic machine 1, can be gripped comfortably by the operator in one hand, to enable the operator to grip it in one hand while simultaneously operating manual control 9 with the other, and in use can be gripped and moved about freely by the operator; while connecting cable 16 connects portable device 15 to control unit 8, and is of a given length designed to allow the operator using portable device 15 to move in the vicinity of, but no further than a given maximum distance from, automatic machine 1.

[0026] In one embodiment, portable device 15 comprises a scale adjuster 14 (typically defined by a rotary switch) connected to manual control 9. Scale adjuster 14 allows the operator to adjust (continuously or discretely or in steps) the transmission ratio between a variation in the position of manual control 9 and a corresponding variation in the position of electric machine motor 4. In other

words, using scale adjuster 14, the operator may set each one-degree variation in the angular position of manual control 9 to correspond, for example, to a one-degree, ten-degree, or tenth-of-a-degree variation in the angular position of electric machine motor 4 or the corresponding conveyor.

[0027] In one embodiment, portable device 15 comprises a direction control 17 (typically a two-position switch) allowing the operator to select the direction (i.e. 'forward' or 'reverse') of electric machine motor 4.

[0028] Portable device 15 may comprise indicator lights (LEDs or LCD screens) for displaying information about the status of automatic machine 1 (typically, whether it is activatable/blocked) and/or the status of portable device 15 (typically, whether it is on/off).

[0029] Portable device 15 comprises a safety button 18, which must be kept pressed at all times to permit operation of electric machine motor 4 by manual control 9. In other words, only if safety button 18 is pressed uninterruptedly can electric machine motor 4 be controlled by manual control 9; and, as soon as safety button 18 is released, control unit 8 immediately stops electric machine motor 4. Safety button 18 is preferably located on the left side of portable device 15, so the operator gripping portable device 15 with the left hand can press safety button 18 with the thumb of the left hand while operating manual control 9 with the right hand. Safety button 18 ensures the operator keeps both hands on portable device 15 when controlling electric machine motor 4 using manual control 9, and prevents accidental contact with manual control 9 from resulting in unintentional (i.e. potentially dangerous) operation of electric machine motor 4.

[0030] Finally, automatic machine 1 comprises a receptacle 19 for housing and supporting portable device 15 when not in use. Receptacle 19 may be located inside safety housing 5 (in which case, a hatch 6 of safety housing 5 must be opened for access to portable device 15) or outside safety housing 5.

[0031] In one embodiment, portable device 15 may comprise an electric feedback motor connected mechanically to manual control 9 and controlled by control unit 8 to provide force feedback to the operator using manual control 9.

[0032] In the Figure 1-3 embodiment, automatic machine 1 provides for wrapping packets of cigarettes in transparent plastic overwraps.

[0033] In a different embodiment shown in Figure 4, automatic machine 1 provides for producing rigid packets of cigarettes. In this embodiment, automatic machine 1 has a packing path P originating at a feed station 20 supplying a product 21 for packing (i.e. cigarettes to be divided into groups for packing). Packing path P extends through a feed station 22a supplying a sheet 23a of packing material (in particular, a sheet of foil wrap) which is applied to product 21; and through a work station 24a, where sheet 23a of packing material is folded about product 21. Packing path P extends through a feed station

22b supplying a sheet 23b of packing material (in particular, an inner blank) which is applied to product 21; and through a work station 24b, where sheet 23b of packing material is folded about product 21 (over the previously folded sheet 23a of packing material). Finally, packing path P extends through a feed station 22c supplying a sheet 23c of packing material (in particular, an outer blank) which is applied to product 21; and through a work station 24c, where sheet 23c of packing material is folded about product 21 (over the previously folded sheet 23b of packing material).

[0034] As shown clearly in Figure 4, automatic machine 1 for producing rigid packets of cigarettes has a particularly long, irregular (i.e. zig-zag) layout, and so is best served by a number of manual controls 9 (and therefore a number of portable devices 15 fitted with manual controls 9) arranged along the whole length of automatic machine 1 to enable the operator to closely monitor each part of automatic machine 1 when manually controlling conveyors 26 using manual control 9.

[0035] In the Figure 5 embodiment, automatic machine 1 comprises the portable device 15 described above, connected physically to control unit 8 by connecting cable 16; and also an easy-carry computer tablet 28 (e.g. with a 9-10-inch screen and weighing less than 500-600 grams) connected wirelessly to control unit 8 by a radio-frequency connection. Computer tablet 28 has a rechargeable battery; and a touch screen 29 by which the operator interacts with computer tablet 28. Computer tablet 28 enables the operator to interact with control unit 8 to display information about the status of automatic machine 1 (or also other adjacent automatic machines interacting with automatic machine 1), and to alter settings or configurations of automatic machine 1. In other words, computer tablet 28 is a portable replica of the user interface of control unit 8; its only limitation, for the safety issues referred to above, being that of not being able to operate electric machine motor 4.

[0036] In other words, using computer tablet 28, the operator can interact almost completely with control unit 8 from any position, close to or relatively far from automatic machine 1, to do almost anything except operate electric machine motor 4; whereas, using portable device 15, the operator in close proximity to automatic machine 1 (i.e. within the length of connecting cable 16) can also operate electric machine motor 4. This difference in performance of computer tablet 28 and portable device 15 is necessary to ensure, first and foremost, the safety of the operators, and, secondly, the mechanical integrity of automatic machine 1, in that, to operate electric machine motor 4, it is essential that the operator have a clear view of (and so be stationed in close proximity to) automatic machine 1.

[0037] A preferred embodiment comprises docking stations 30, to each of which a computer tablet 28 is connectable to provide an easily locatable, safe (i.e. suitably damage-proof) receptacle for computer tablet 28, and to recharge the battery of computer tablet 28. Each docking

station 30 is preferably mounted on a column 31 fixed to the floor in front of automatic machine 1. Alternatively, docking stations 30 may be fitted directly to the frame of automatic machine 1.

[0038] The Figure 5 embodiment shows two different computer tablets 28 and three docking stations 30. That is, docking stations 30 outnumber computer tablets 28 to allow greater freedom in 'parking' computer tablets 28 at docking stations 30. The number of computer tablets 28 and docking stations 30 at each automatic machine 1 may obviously differ from those shown in Figure 5, depending, normally, on the size of automatic machine 1 and the number of operators working on it simultaneously.

[0039] In a further embodiment not shown, automatic machine 1 only comprises (at least) one computer tablet 28 and no portable device 15. In other words, despite the obvious improvement in operator efficiency afforded by combining portable device 15 with computer tablet 28, only computer tablet 28 or only portable device 15 may be provided.

[0040] Automatic machine 1 described has numerous advantages.

[0041] Firstly, on automatic machine 1 described, an operator equipped with portable device 15 can move along the machine to manually control electric machine motor 4 using manual control 9, while keeping a close watch at all times on the pertinent parts of automatic machine 1.

[0042] Secondly, being small and portable, portable device 15 allows full access to, and poses no restraints on the design of, automatic machine 1.

[0043] Finally, portable device 15 is cheap and easy to produce, and on the whole is comparable in cost, if not cheaper than, a conventional handwheel.

Claims

1. An automatic product packing machine (1) comprising:

at least a first feed station (20) for supplying at least one product (21) for packing;

at least a second feed station (22) for supplying at least one sheet (23) of packing material, which is applied to the product (21);

at least one work station (24) where the product (21) is packed in the sheet (23) of packing material;

a conveying device (25) which feeds the product (21) for packing along a packing path (P), which originates at the first feed station (20) and extends through the second feed station (22) and the work station (24);

at least one electric machine motor (4) which drives at least part of the conveying device (25) to move the conveying device (25);

at least one manual control (9) operated manually by an operator; and
 a control unit (8) which controls operation of the electric machine motor (4) according to the position of the manual control (9);
 the automatic machine (1) being **characterized by** comprising:

a portable device (15), which supports the manual control (9), is physically independent of and separate from the automatic machine (1), is designed for easy, one-handed grip by an operator to allow the operator to grip the portable device (15) in one hand and simultaneously operate the manual control (9) with the other hand, and in use can be gripped and moved about freely by the operator; and
 a connecting cable (16), which connects the portable device (15) to the control unit (8), and is of a given length designed to allow the operator using the portable device (15) to move in the vicinity of, but no further than a given maximum distance from, the automatic machine (1).

2. An automatic machine (1) as claimed in Claim 1, wherein the manual control (9) is in the form of a rotary knob.

3. An automatic machine (1) as claimed in Claim 1 or 2, wherein the portable device (15) has a safety button (18), which must be kept pressed at all times to permit operation of the electric machine motor (4) by the manual control (9).

4. An automatic machine (1) as claimed in Claim 3, wherein the safety button (18) is located on one side of the portable device (15), so the operator gripping the portable device (15) with one hand can press the safety button (18) with the thumb of the same hand while operating the manual control (9) with the other hand.

5. An automatic machine (1) as claimed in one of Claims 1 to 4, wherein the portable device (15) comprises a scale adjuster (14) for adjusting the transmission ratio between a variation in the position of the manual control (9) and a corresponding variation in the position of the electric machine motor (4).

6. An automatic machine (1) as claimed in one of Claims 1 to 5, wherein the portable device (15) comprises a direction control (17) for controlling the operating direction of the electric machine motor (4).

7. An automatic machine (1) as claimed in one of Claims 1 to 6, and comprising a receptacle (19) for

housing and supporting the portable device (15) when not in use.

8. An automatic machine (1) as claimed in one of Claims 1 to 7, and comprising a computer tablet (28) connected wirelessly to the control unit (8) by a radiofrequency connection.

9. An automatic machine (1) as claimed in Claim 8, wherein the computer tablet (28) interacts with the control unit (8) to display information relating to the status of the automatic machine (1), and to modify settings or configurations of the automatic machine (1).

10. An automatic machine (1) as claimed in Claim 8 or 9, wherein the computer tablet (28) does not provide for controlling the electric machine motor (4).

11. An automatic machine (1) as claimed in Claim 8, 9 or 10, and comprising at least one docking station (30) where the computer tablet (28) is connectable.

12. An automatic machine (1) as claimed in Claim 11, wherein the docking station (30) is fitted to a column (31) fixed to the floor in front of the automatic machine (1).

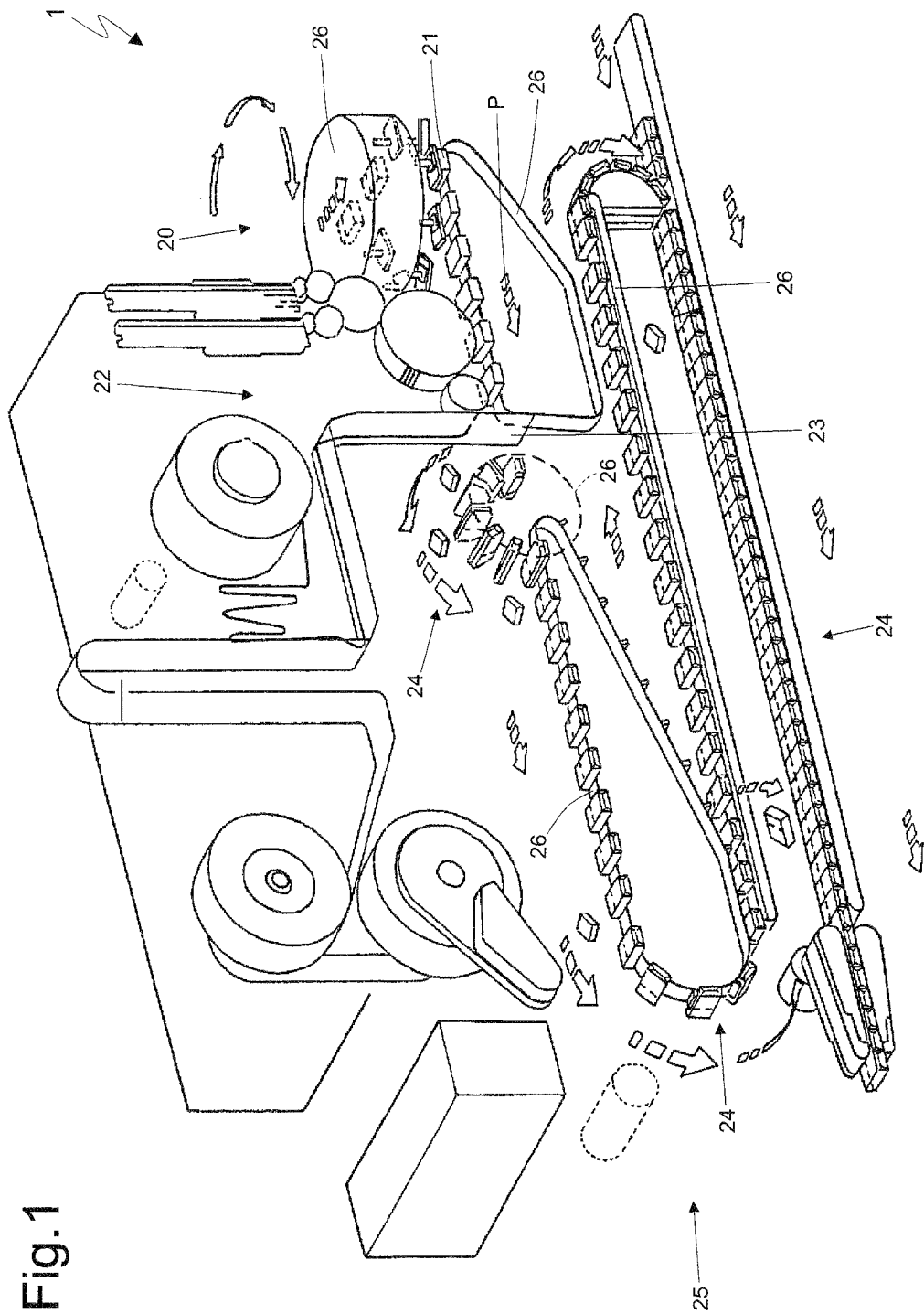
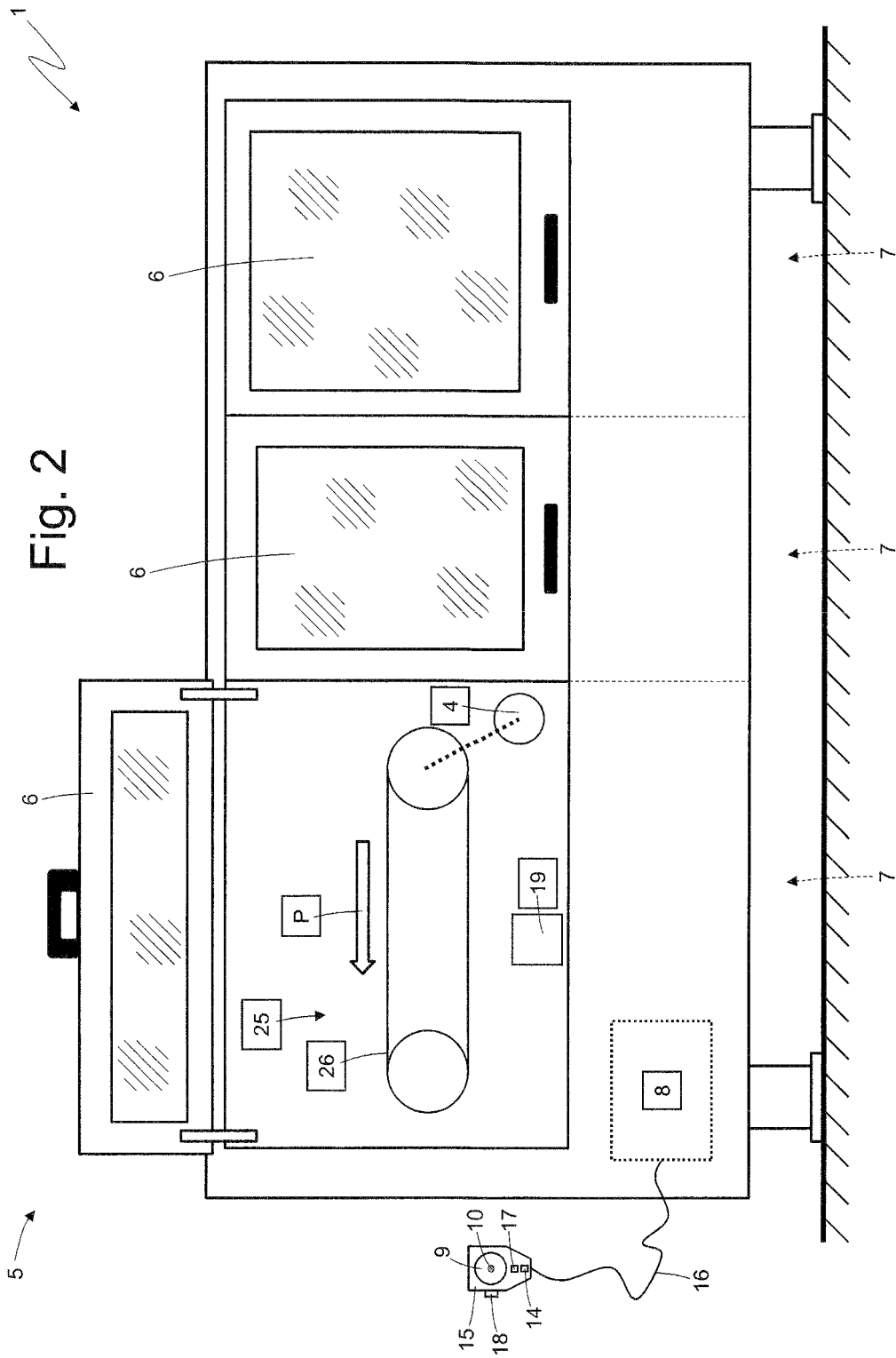


Fig.1



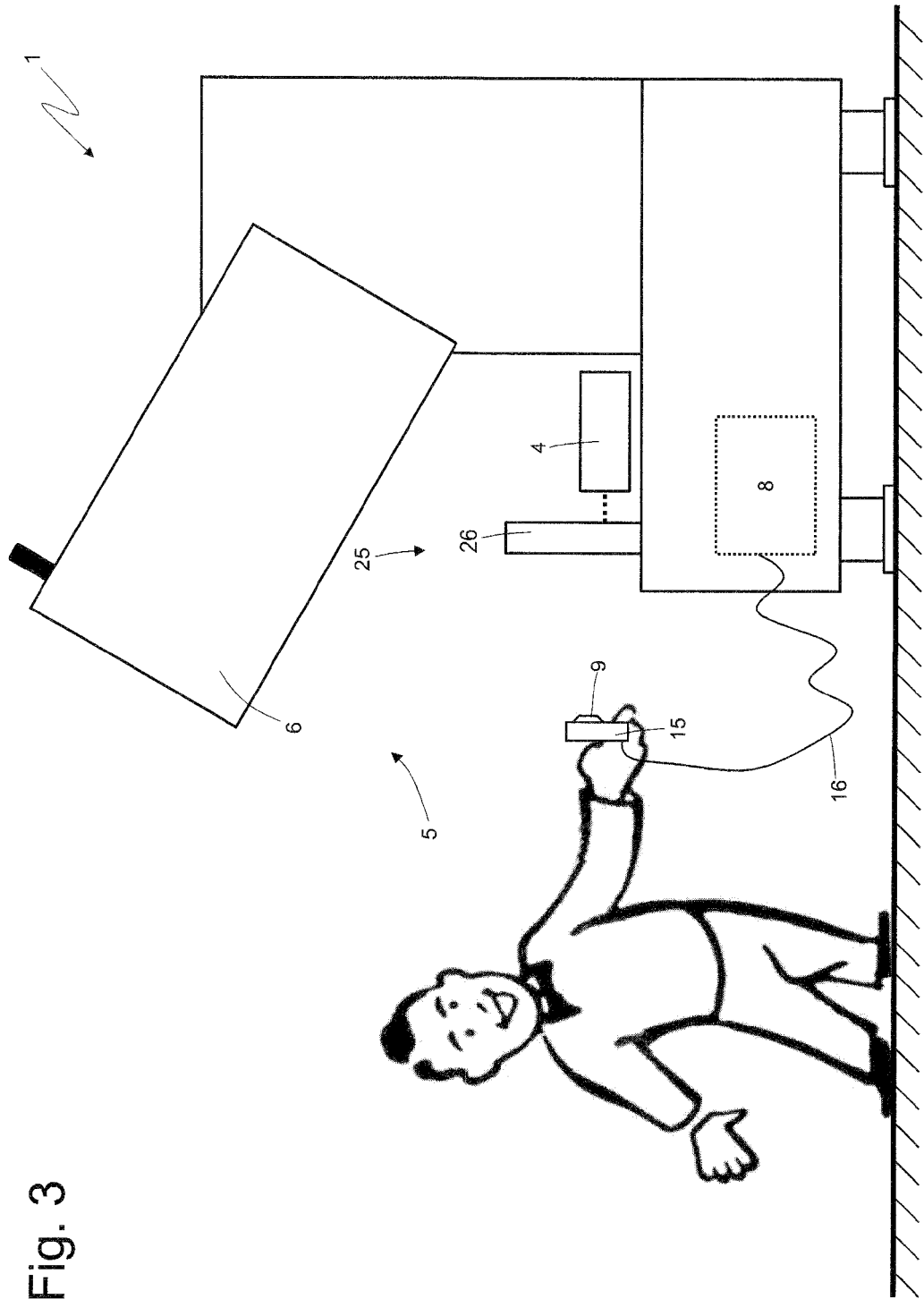


Fig. 3

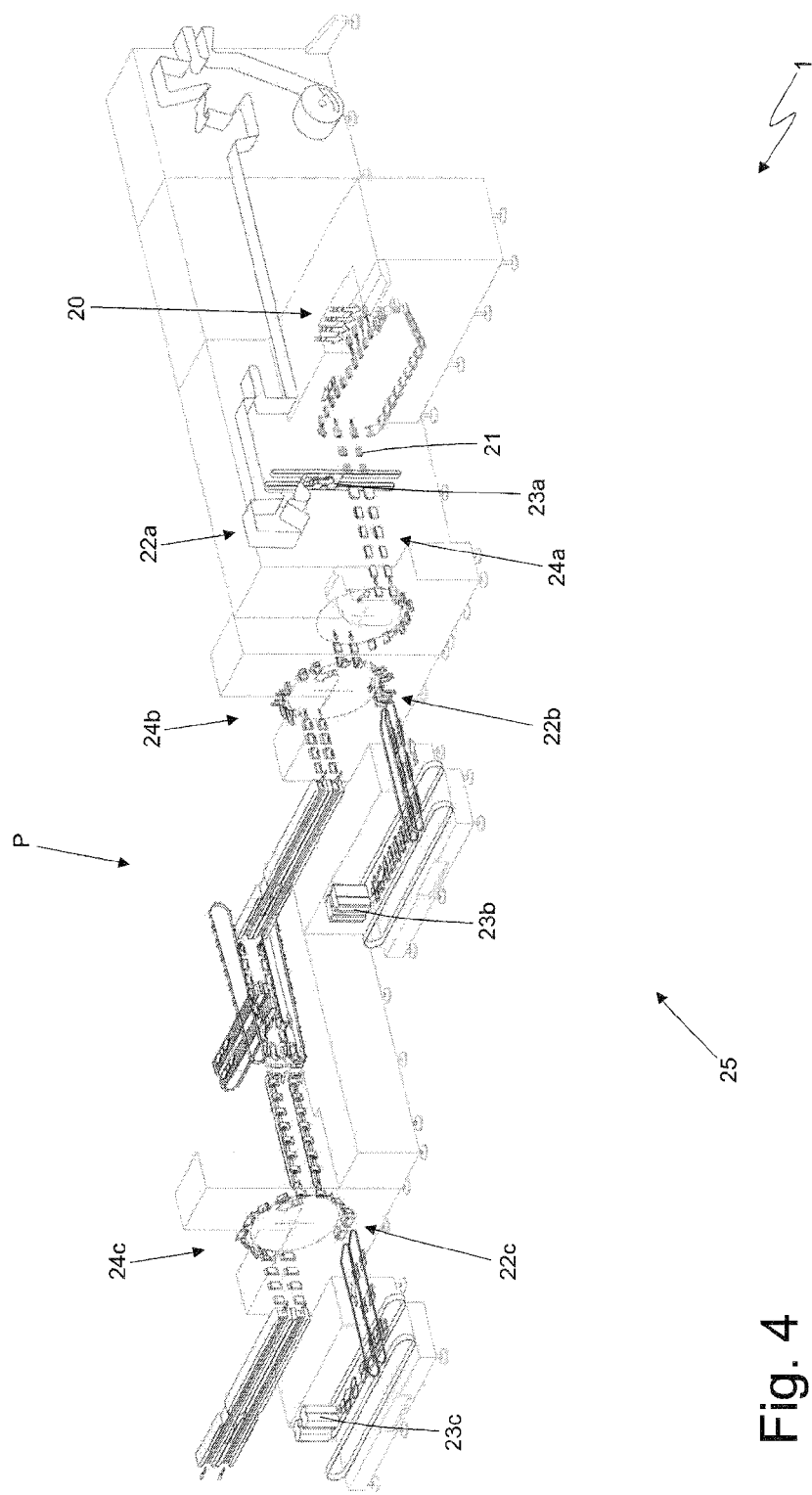
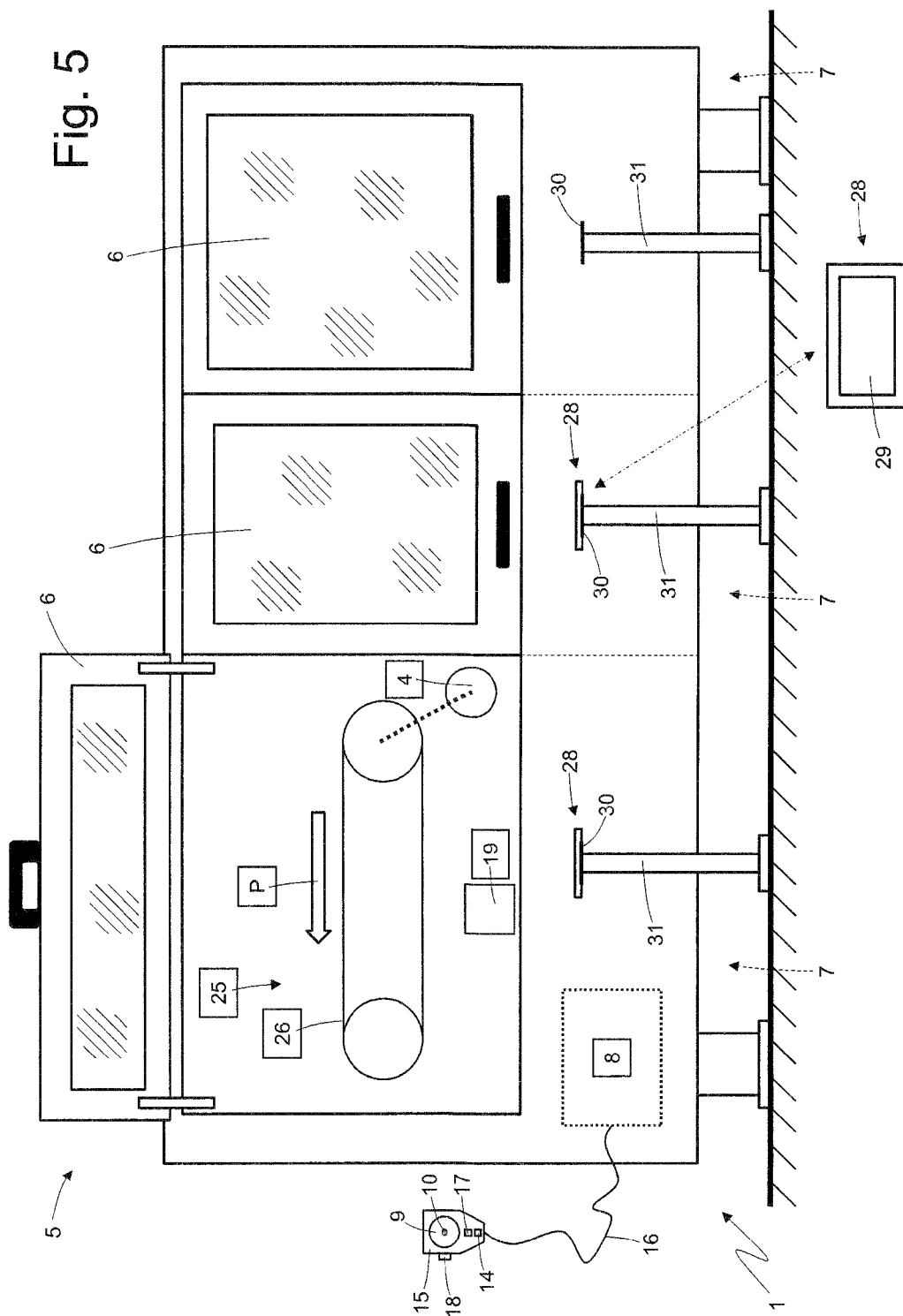


Fig. 4





EUROPEAN SEARCH REPORT

Application Number
EP 13 16 7136

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
Y,D	DE 10 2007 048053 A1 (FOCKE & CO [DE]) 9 April 2009 (2009-04-09)	1-4,8,9	INV.
A	* paragraphs [0024] - [0055]; figures 2,3 *	5-7, 10-12	B65B11/38 B65B57/00 B65B65/00
Y	DE 36 17 681 A1 (BORNEMEIER OTTO [DE]) 3 December 1987 (1987-12-03)	1,2,8,9	
A	* column 3, line 54 - column 5, line 18; figures 1-12 *	3-7, 10-12	
Y	WO 97/48860 A1 (AUSTRALIAN EQUIPMENT DESIGNERS [AU]; LEEDER LINDSAY JOHN [AU]; BROWN D) 24 December 1997 (1997-12-24)	1-4	
A	* page 5, line 33 - page 6, line 15; claim 1; figures 1,5,6 *	5-12	
Y	EP 1 712 470 A1 (GD SPA [IT]) 18 October 2006 (2006-10-18)	1,2	
A	* column 13; figure 1 *	3-12	
A	DE 10 2009 060134 A1 (FOCKE & CO [DE]) 16 June 2011 (2011-06-16)	1-12	TECHNICAL FIELDS SEARCHED (IPC)
	* paragraphs [0047] - [0057]; figures 5,6 *		B65B G06F
A	JP H05 229782 A (NIPPON STEEL CORP) 7 September 1993 (1993-09-07)	8-12	
	* abstract *		
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 21 August 2013	Examiner Kulhanek, Peter
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 03.02 (P04C01)

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

EP 13 16 7136

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.

21-08-2013

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 102007048053 A1	09-04-2009	DE 102007048053 A1	09-04-2009
		EP 2205106 A1	14-07-2010
		WO 2009046788 A1	16-04-2009
DE 3617681 A1	03-12-1987	NONE	
WO 9748860 A1	24-12-1997	EP 1012410 A1	28-06-2000
		WO 9748860 A1	24-12-1997
EP 1712470 A1	18-10-2006	CN 1847092 A	18-10-2006
		EP 1712470 A1	18-10-2006
		JP 4996124 B2	08-08-2012
		JP 2006290468 A	26-10-2006
		US 2006254212 A1	16-11-2006
DE 102009060134 A1	16-06-2011	CN 102892686 A	23-01-2013
		DE 102009060134 A1	16-06-2011
		EP 2509889 A1	17-10-2012
		EP 2599734 A1	05-06-2013
		JP 2013513527 A	22-04-2013
		KR 20120105022 A	24-09-2012
		US 2012241339 A1	27-09-2012
		WO 2011069575 A1	16-06-2011
JP H05229782 A	07-09-1993	NONE	

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- DE 102007048053 A1 [0009]