(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 471 009 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
27.10.2004 Bulletin 2004/44

(51) Int Cl.[7]: **B65B 61/18**

(21) Application number: **03009449.4**

(22) Date of filing: **25.04.2003**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IT LI LU MC NL PT RO SE SI SK TR
Designated Extension States:
AL LT LV MK

(71) Applicant: **Tetra Laval Holdings & Finance SA**
1009 Pully (CH)

(72) Inventors:
- **Cavilli, Gianfranco**
  41057 San Vito (IT)
- **Succi, Omar**
  41100 Modena (IT)
- **Baldini, Claudio**
  41015 Le Casette (IT)
- **Zuccotti, Alessandro**
  15069 Serravalle Scrivia (IT)
- **Sereni, Andrea**
  41100 Modena (IT)

(74) Representative: **Franzolin, Luigi et al**
STUDIO TORTA S.r.l.,
Via Viotti, 9
10121 Torino (IT)

(54) Gripper for opening devices to be applied to packages of pourable food products

(57) A gripper (25) for opening devices (2) to be applied to packages of pourable food products, having a casing (27); two jaws (28, 29) fitted to the casing (27), movable with respect to each other, and having respective gripping heads (44, 45) between which to grip a portion (7) of an opening device (2); and a spring (53) for forcing the jaws (28, 29) into a maximum approach position of the gripping heads (44, 45); the gripping heads (44, 45) define between them a seat (62) which engages the portion (7) of the opening device (2) interferentially when the gripper (25) is moved in a pickup direction (Z).

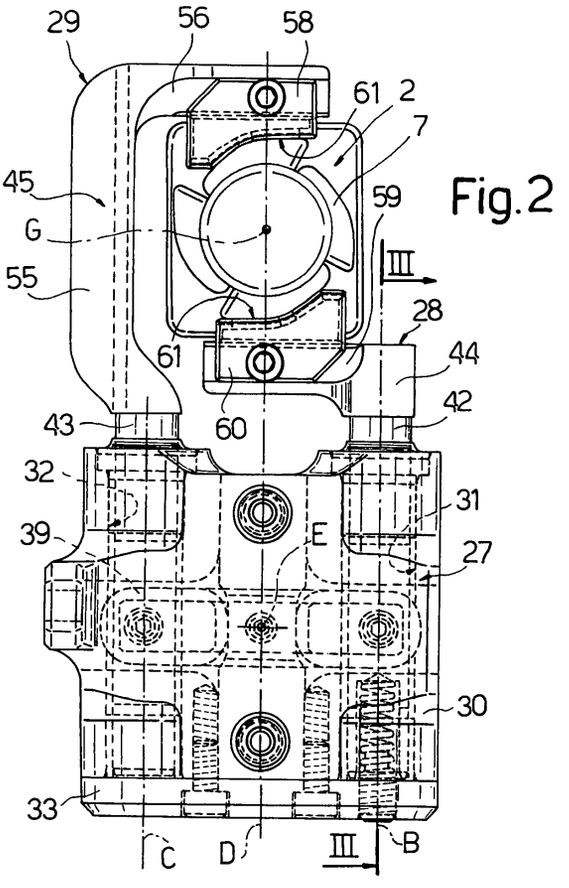


Fig.2

EP 1 471 009 A1

Description

[0001] The present invention relates to a gripper for opening devices to be applied to packages of pourable food products.

[0002] As is known, many pourable food products, such as fruit juice, UHT (ultra-high-temperature-treated) milk, wine, tomato sauce, etc., are sold in packages made of sterilized packaging material.

[0003] A typical example of this type of package is the parallelepiped-shaped package for liquid or pourable food products known as Tetra Brik Aseptic (registered trademark), which is made by folding and sealing a web of laminated packaging material. The packaging material has a multilayer structure comprising a layer of fibrous material, e.g. paper, covered on both sides with layers of heat-seal plastic material, e.g. polyethylene, and, in the case of aseptic packages for long-storage products, such as UHT milk, also comprises a layer of oxygen-barrier material, defined, for example, by aluminium foil, which is superimposed on a layer of heat-seal plastic material, and is in turn covered with another layer of heat-seal plastic material eventually defining the inner face of the package contacting the food product.

[0004] As is known, such packages are produced on fully automatic packaging machines, on which a continuous tube is formed from the web-fed packaging material; the web of packaging material is sterilized on the packaging machine itself, e.g. by applying a chemical sterilizing agent, such as a hydrogen peroxide solution, which, once sterilization is completed, is removed, e.g. vapourized by heating, from the surfaces of the packaging material; and the web of packaging material so sterilized is kept in a closed, sterile environment, and is folded and sealed longitudinally to form a vertical tube.

[0005] The tube is filled with the sterilized or sterile-processed food product, and is sealed and cut along equally spaced cross sections to form pillow packs, which are then folded mechanically to form the finished, e.g. substantially parallelepiped-shaped, packages.

[0006] Alternatively, the packaging material may be cut into blanks, which are folded on forming spindles into packages, which are then filled with the food product and sealed. One example of the this type of package is the so-called "gable-top" package known by the trade name Tetra Rex (registered trademark).

[0007] Once formed, packages of the above type may undergo further operations, such as application of a closable opening device.

[0008] The most commonly marketed opening devices comprise a frame defining an opening and fitted about a pierceable or removable portion of the top wall of the package; and a cap hinged or screwed to the frame, and which is removable to open the package. Alternatively, other, e.g. slidable, opening devices are also known to be used.

[0009] The pierceable portion of the package may be defined, for example, by a so-called "prelaminated" hole, i.e. a hole formed in the fibrous layer of the packaging material before it is covered with the barrier layer, which thus remains whole and closes the hole to ensure airtight, aseptic sealing, while at the same time being easily pierceable.

[0010] In the case of aseptic packaging machines, the opening devices described are normally applied continuously, straight onto the formed packages, by on-line applicator units downstream from the packaging machine.

[0011] Applying the opening devices, which is done by heat sealing or gluing, calls for precise positioning of the packages with respect to the application means. More specifically, in the case of packages with a prelaminated hole, application of the opening device in the wrong position may result in poor adhesion to the package and malfunctioning of the opening device, which, in use, may result in difficulty in opening the package, product leakage, and gulping when the product is poured out.

[0012] EP-A-0 842 041 describes a unit for applying opening devices to packages, which comprises a first conveyor for the packages; and a second belt conveyor fitted with a number of equally spaced grippers, which pick up the opening devices from a feeder and apply them to the packages.

[0013] The grippers comprise a substantially elongated outer casing housing a sliding rod; and two jaws symmetrical with respect to the rod axis, connected to each other by a tension spring, and cooperating with one end of the sliding rod. During the gripping operation, the rod moves forward, and its end tends to part the two jaws, which open when the force applied to the rod exceeds the tension of the spring.

[0014] Vertical movement of the grippers and operation of the rods are controlled by cam follower rollers, which call for fixed cams along the path of the belt conveyor.

[0015] Since the position of the grippers is therefore determined solely by the path of the belt conveyor, this solution is unsuitable for applications requiring precise, individual adjustment of the position of each gripper with respect to the package.

[0016] Moreover, since the jaws are opened and closed regardless of the presence or correct position of the opening device in the feeder, the gripper may fail to grip the opening device, or may grip it improperly, thus impairing application and possibly also the finished package.

[0017] Finally, each gripper requires an opening mechanism, thus increasing overall cost, which may be considerable in the case of applicator units with a larger number of grippers.

[0018] It is an object of the present invention to provide a gripper for opening devices to be applied to packages of pourable food products, designed to eliminate the aforementioned drawbacks.

[0019] According to the present invention, there is

provided a gripper as claimed in Claim 1.

[0020] A preferred, non-limiting embodiment of the present invention will be described by way of example with reference to the accompanying drawings, in which:

Figure 1 shows a schematic plan view of a unit for applying opening devices to packages of food products, and featuring grippers in accordance with the present invention;

Figure 2 shows a plan view of a gripper in accordance with the invention;

Figure 3 shows a section along line III-III in Figure 2;

Figure 4 shows a section along line IV-IV in Figure 3;

Figure 5 shows a view in perspective of the gripper, with parts removed for clarity.

[0021] Number 1 in Figure 1 indicates as a whole a unit for applying opening devices 2 to aseptic packages 3 of pourable food products.

[0022] Packages 3 are produced in a packaging unit (not shown) from a web of sheet packaging material comprising a layer of fibrous material covered on both sides with layers of heat-seal plastic material, e.g. polyethylene; and a layer of barrier material, e.g. aluminium, located inwards of the layer of paper material and in turn covered internally with another layer of plastic material.

[0023] Packages 3, which are substantially parallelepiped-shaped in the example shown, comprise, on a top wall 4, a pierceable portion 5 conveniently defined by a so-called "prelaminated" hole, i.e. a hole formed in the fibrous layer of the packaging material before the fibrous layer is covered with the barrier layer, which closes the hole to ensure aseptic, airtight sealing, while at the same time being easily pierceable.

[0024] Opening devices 2 are made of thermoplastic material, and each comprise in known manner a frame 6, which is heat sealed about pierceable portion 5 on wall 4 of a respective package 3, and defines a pour opening (not shown); and a cap 7 or cover, which is screwed or hinged to the frame to close the pour opening. The opening devices conveniently comprise known means (not shown) for piercing or removing pierceable portion 5 of package 3 to unseal the package.

[0025] Unit 1 comprises a first linear step conveyor 8 for conveying a succession of packages 3 along a preferably straight path P1; a second linear step conveyor 9 for conveying a succession of opening devices 2 along a straight path P2 - in the example shown, parallel to and in the opposite direction to path P1; and a step-operated carousel conveyor 10 for feeding opening devices 2 from a pickup station 11, coincident with one of the stop stations of second conveyor 9, to an application station 12 where opening devices 2 are applied to respective packages 3, and which is coincident with one of the stop stations of first conveyor 8.

[0026] More specifically, carousel conveyor 10 feeds opening devices 2 along a circular path P3 through a number of intermediate work stations 13, 14, 15, where opening devices 2 are stopped and heated by respective heaters 16 to partly melt the material.

[0027] First conveyor 8 comprises a movable bottom surface 17 defined by a continuous belt or by a number of adjacent elements, and defining a supporting surface for the packages; and lateral belt feed devices 18 cooperating with respective opposite sides of packages 3. More specifically, the two feed devices 18 are symmetrical with respect to a vertical plane M containing path P1, and are fitted with a number of vertical feed bars 19 equally spaced by a distance d defining the spacing of packages 3 on first conveyor 8. The position of each package 3 on first conveyor 8 is therefore unequivocally determined transversely by contact with movable surface 17 and with the branches of feed devices 18, and longitudinally by contact with two bars 19 forming part of respective feed devices 18.

[0028] Carousel conveyor 10 comprises a turntable 24 rotating about a vertical axis A; and a number of grippers 25 - equal to the number of stations of carousel conveyor 10 - for gripping opening devices 2, and which are equally spaced about turntable 24, are connected to the turntable by respective actuating assemblies 26 for actuating grippers 25 and not described in detail by not forming part of the present invention, and are permitted a limited amount of movement in the direction of three coordinate axes X, Y, Z of a local reference system, the first two (X, Y) being horizontal and perpendicular, and the third (Z) vertical.

[0029] More specifically, each gripper 25 (Figures 2-5) comprises a substantially flat, parallelepiped-shaped casing 27 extending predominantly in the XY plane in the example shown; and a first and second jaw 28, 29 projecting from casing 27 and cooperating with opening device 2.

[0030] Casing 27 comprises a body 30 having a first and second straight, substantially circular-section, through seat 31 and 32, the respective axes B and C of which are parallel to each other and located on opposite sides of a central plane D - radial with respect to carousel conveyor 10 - of body 30.

[0031] Casing 27 also comprises a first cover 33 fixed to body 30 to axially close respective first ends of seats 31, 32.

[0032] Said first end of each seat 31, 32 houses a first bush 36; and the opposite end of each seat 31, 32 is fitted in fixed manner with a second bush 37 and a lip seal 38.

[0033] Body 30 also defines a housing 39, which is perpendicular to plane D, intersects both seats 31 and 32, forms with them a substantially H-shaped inner cavity of body 30, and is open at a flat bottom face of body 30.

[0034] Casing 27 also comprises a second cover 40 closing housing 39.

[0035] Jaws 28 and 29 comprise respective rods 42

and 43, which slide axially along seats 31 and 32, and are guided by respective pairs of bushes 36, 37; and respective gripping heads 44 and 45 fixed to respective free ends of rods 42, 43 projecting from seats 31, 32, and for gripping opening device 2.

[0036] The two rods 42, 43 are connected to each other, to travel axially by the same amount and in opposite directions, by a rigid rocker arm 46 housed in housing 39. Rocker arm 46 is hinged at a mid-point to casing 27 by a pin 47 of axis E parallel to axis Z, and has ends 48, 49 substantially hinged to respective rods 42, 43.

[0037] More specifically, rocker arm 46 has a central cylindrical through seat 50 engaged by pin 47, which is supported at the ends by body 30 and second cover 40.

[0038] Each end 48, 49 of rocker arm 46 is fork-shaped, and partly encloses corresponding rod 42, 43, to which it is hinged by a pin 51 fitted through the rod and having an axis F parallel to axis Z. Axes E and F are coplanar.

[0039] Rod 42 comprises an axial housing 52 facing first cover 33 and housing a spring 53, which is compressed between rod 42 and a through screw 54 screwed inside first cover 33 and defining, for spring 53, an adjustable axial stop by which to adjust the preload of spring 53 from the outside.

[0040] Gripping head 45 is substantially L-shaped, and comprises a first portion 55 parallel to plane D and adjacent to rod 43; and a second portion 56 extending perpendicularly towards plane D, at a given distance from casing 27, and fitted rigidly but removably with an insert 58 for adapting to the shape of opening device 2 and forming part of gripping head 45. Gripping head 44 comprises a portion 59 extending perpendicularly from rod 42 towards plane D and facing second portion 56 of gripping head 45; and a second insert 60 for adapting to the shape of opening device 2, and which is connected rigidly but removably to portion 59 and forms part of gripping head 44.

[0041] Inserts 58, 60 have respective contact surfaces 61 facing each other and symmetrical with respect to an axis G parallel to axis Z. In a plane parallel to the XY plane, surfaces 61 have profiles complementary to respective diametrically-opposite lateral portions of cap 7 of opening device 2, and define between them a seat 62 for interferentially engaging cap 7. Inserts 58, 60 also have respective bottom inner bevels 63 defining a flared inlet 64 of seat 62.

[0042] At rest, i.e. when the gripper is "empty", jaws 28, 29 are set by spring 53 to a maximum approach position of inserts 58, 60 defined, for example, by rod 43 contacting first cover 33, and in which the dimensions of seat 62 in a plane parallel to the XY plane are approximately equal to but no greater than the corresponding dimensions of cap 7, and the maximum dimension of flared inlet 64 is approximately equal to but no less than the dimensions of cap 7.

[0043] Operation of gripper 25 will now be described as of the condition in which opening device 2 is located on conveyor 9 at pickup station 11, and carousel conveyor 10 is positioned angularly with a gripper 25 at pick-up station 11, and with relative seat 62 a given height over opening device 2.

[0044] In the course of each step, carousel conveyor 10 performs an operation on an opening device 2 at each station 11, 12, 13, 14, 15, and then feeds each opening device 2 on to the next station.

[0045] At pickup station 11, actuating assembly 26 moves in direction Z towards opening device 2, and then back up to the start height. More specifically, when gripper 25 moves down, bevels 63 of inserts 58 and 60 strike a top peripheral edge of cap 7 of opening device 2, and are subjected to respective reaction forces which part jaws 28 and 29, in opposition to spring 53, so that cap 7 engages seat 62 and is retained by friction by contact surfaces 61.

[0046] By virtue of rocker arm 46, rearward movement of rod 42 corresponds to a symmetrical forward movement of rod 43. For small displacements, translation of pins 51 integral with respective rods 42, 43 is equivalent to rigid rotation of ends 48, 49 of rocker arm 46 about axis E, and the inevitable slack involved is sufficient to ensure correct mechanical operation.

[0047] On reaching the bottom limit position, actuating assembly 26 is inverted and moves back up to the starting height; and gripper 25 is raised, taking with it the opening device 2 retained by the friction generated by spring 53 in response to interference between seat 62 and cap 7.

[0048] Over the next three steps, gripper 25 is arrested at work stations 13, 14 and 15, where heating operations are performed by heaters 16.

[0049] At the last step in the work cycle, gripper 25 is located at application station 12 where, with a similar down-up vertical movement, it applies opening device 2 to a respective package 3, and a pressure device - not shown or described, by not forming part of the invention - holds opening device 2 down on the package and detaches it from gripper 25 as the gripper moves back up.

[0050] The advantages of gripper 25 for opening devices 2 according to the present invention are as follows.

[0051] In particular, grippers 25 operate simply by interference with opening devices 2.

[0052] Consequently, no control devices, either fixed on the structure of applicator unit 1 or on grippers 25 or carousel conveyor 10, are required to open jaws 28, 29.

[0053] Grippers 25 are therefore structurally extremely straightforward and cheap to produce, while at the same time being extremely accurate, compact, and lightweight.

[0054] Not being subject to external control, grippers 25 are suitable for applications requiring precise, individual adjustment of the position of each gripper 25 with respect to package 3.

[0055] Moreover, grippers 25 ensure correct pickup of opening devices 2, by the opening and closing of jaws 28, 29 being controlled by the presence and correct po-

sition of opening device 2 in the feeder.

[0056] By virtue of rocker arm 46, jaws 28, 29 move symmetrically with respect to axis G, the position of which with respect to actuating assembly 26 is known in any operating condition. As such, the position of opening device 2 on gripper 25 is also known, which is important in the event actuating assembly 26 provides for adjusting the position of the axis of cap 7 in the XY plane in relation to the actual position of pierceable portion 5, which may be detected at a station along conveyor 8, upstream from application station 12.

[0057] Clearly, changes may be made to gripper 25 as described and illustrated herein without, however, departing from the scope of the present invention as defined in the accompanying Claims.

[0058] Firstly, gripper 25 may be fitted to any type of device for transferring opening devices 2 from a feeder to application station 12, e.g. a mechanical arm with sufficient freedom of movement to also perform the function of actuating assembly 26.

[0059] Secondly, inserts 58 and 60 may be hinged to respective jaws 29 and 28 about respective axes of rotation parallel to axis Z. Apart from in no way impairing mechanical operation of gripper 25, hinging the inserts assists gripping in the event opening devices 2 are not positioned particularly accurately on conveyor 9.

Claims

1. A gripper (25) for opening devices (2) to be applied to packages (3) of pourable food products, comprising a casing (27); two jaws (28, 29) fitted to said casing (27), movable with respect to each other, and having respective gripping heads (44, 45) between which to grip a portion (7) of a said opening device (2); and elastic means (53) for forcing said jaws (28, 29) into a maximum approach position of said gripping heads (44, 45); **characterized in that** said gripping heads (44, 45) define between them a seat (62) which engages said portion (7) of said opening device (2) interferentially when the gripper (25) is moved in a pickup direction (Z); the transverse dimensions of said seat (62), crosswise to said pickup direction (Z) and in said maximum approach position, being approximately equal to but no greater than the corresponding transverse dimensions of said portion (7).

2. A gripper (25) as claimed in Claim 1, **characterized in that** said gripping heads (44, 45) comprise respective lead-in inner portions (63), which are the first to contact said portion (7) of said opening device (2), and which define a flared inlet (64) of the seat (62), the maximum dimensions of which are approximately equal to but no smaller than the corresponding dimensions of said portion (7) of said opening device (2).

3. A gripper (25) as claimed in Claim 1 or 2, **characterized in that** said jaws (28, 29) comprise respective rods (42, 43) having respective parallel axes (B, C) and sliding axially inside respective seats (31, 32) of said casing (27); said gripping heads (44, 45) being carried by the respective said rods (42, 43).

4. A gripper (25) as claimed in Claim 3, **characterized by** comprising a rigid rocker arm (46) hinged about an axis of rotation (E) parallel to said pickup direction (Z), and having ends (48, 49) connected, with the possibility of relative rotation about respective axes (F) coplanar with each other and with said axis of rotation (E) of said rocker arm (46), to respective members (51) fitted to and translating integrally with said rods (42, 43).

5. A gripper (25) as claimed in any one of the foregoing Claims, **characterized by** comprising an adjusting device (54) for adjusting said elastic means (53).

6. A gripper (25) as claimed in any one of the foregoing Claims, **characterized in that** said elastic means (53) are housed in at least one of said two jaws (28, 29).

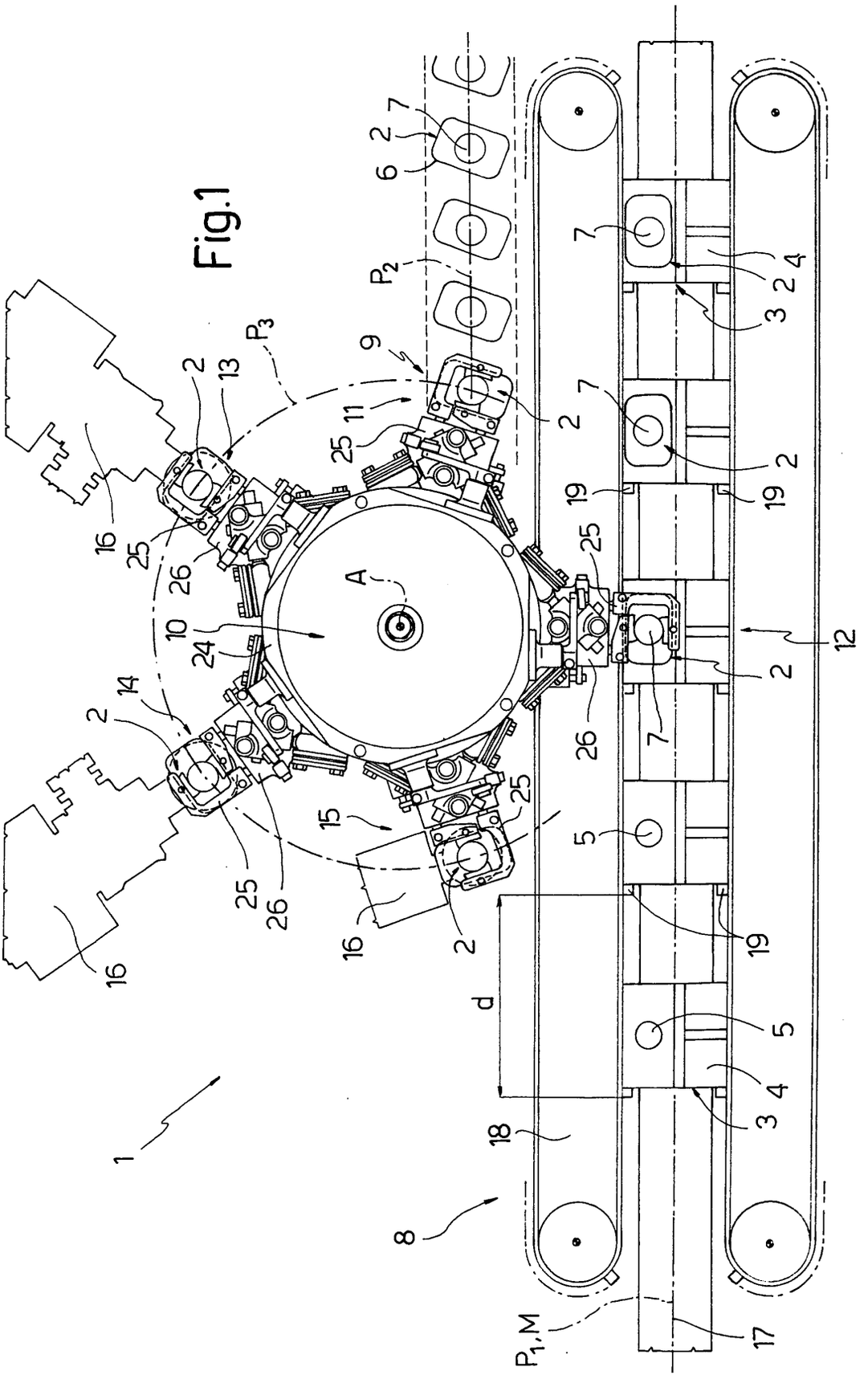
7. A gripper (25) as claimed in Claims 5 and 6, **characterized in that** said elastic means comprise a spring (53) housed in one of said rods (42) and compressed between said rod (42) and a screw (54) accessible from outside said casing (27) and defining said adjusting device.

8. A gripper (25) as claimed in one of the foregoing Claims, **characterized in that** said gripping heads (44, 45) comprise at least one removable insert (58, 60) for adapting to the shape of said opening device (2); said insert (58, 60) bounding said seat (62).

9. A gripper (25) as claimed in Claim 8, **characterized in that** said insert (58, 60) is connected rigidly to the respective jaw (29, 28).

10. A gripper (25) as claimed in Claim 8, **characterized in that** said insert (58, 60) is hinged to the respective jaw (29, 28).

Fig.1



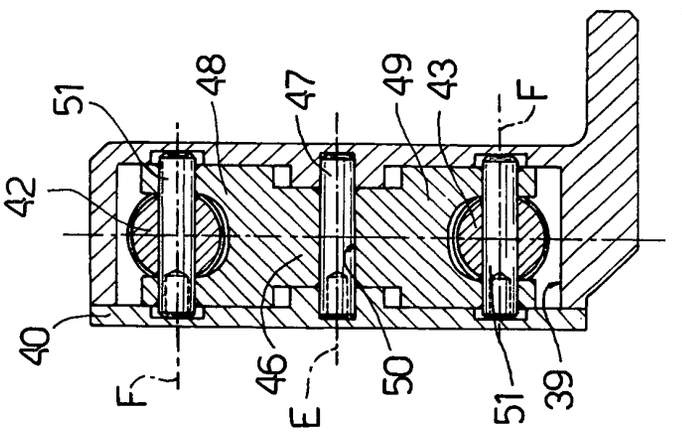


Fig.4

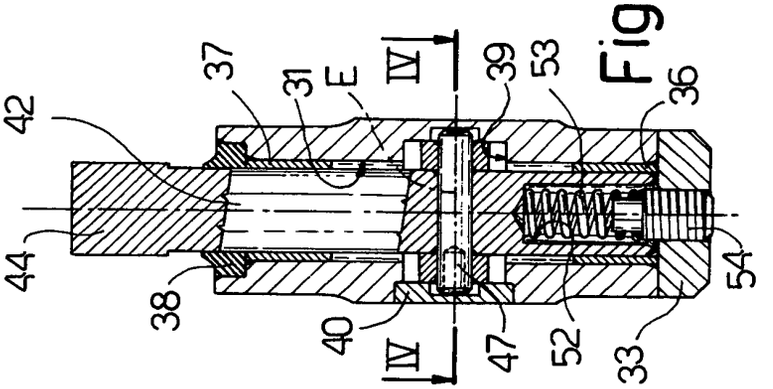


Fig.3

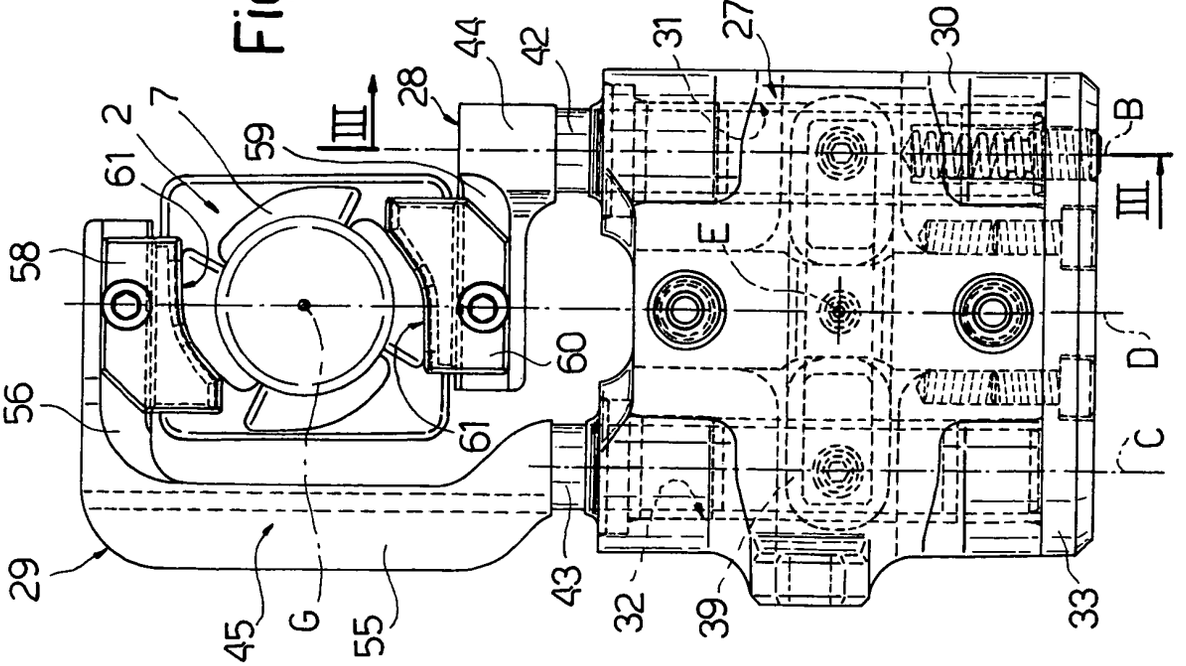


Fig.2

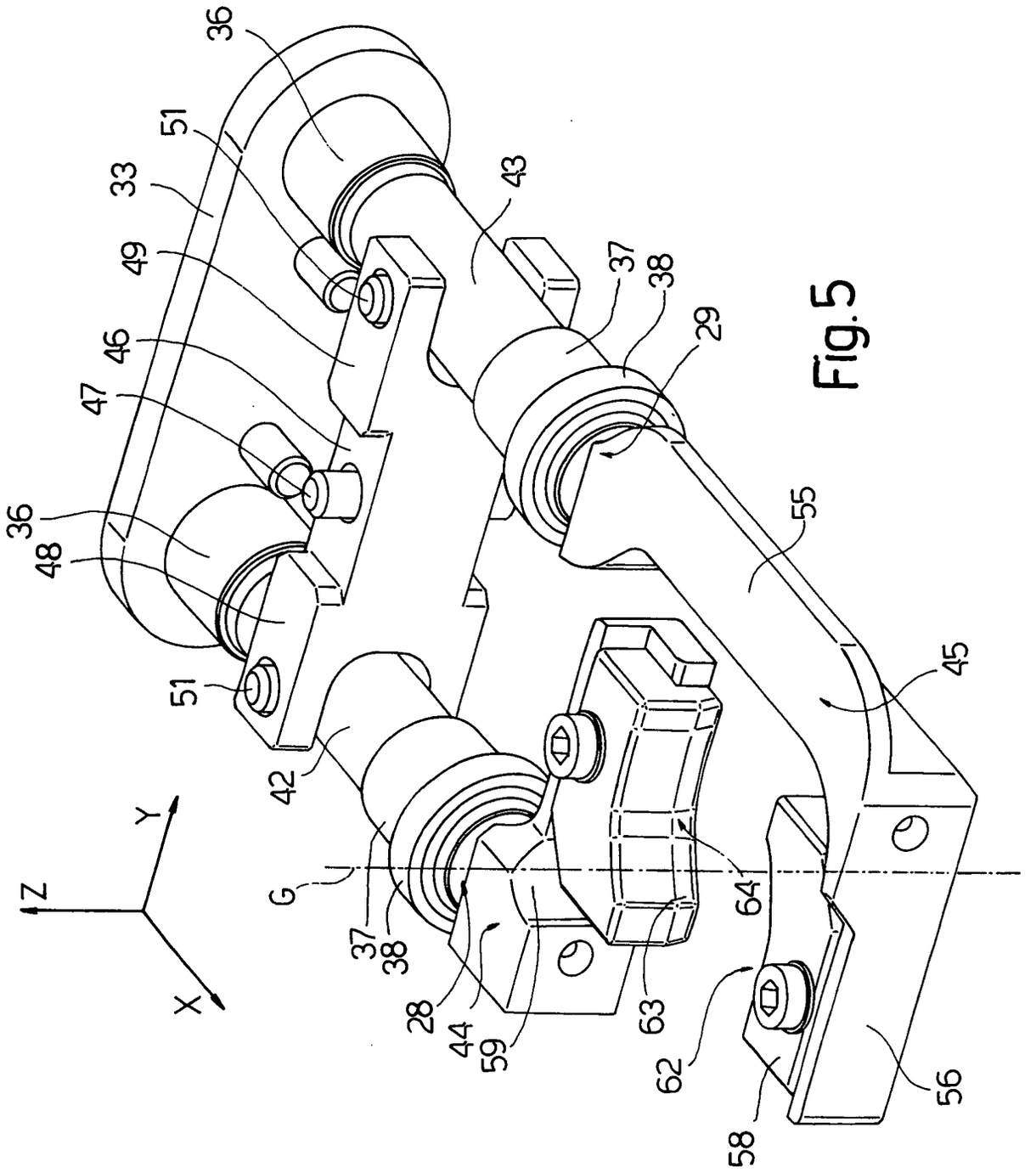

36
51
33
49
46
47
36
48
51
42
43
37
38
29
55
45
Y
Z
X
G
37
38
28
44
59
63
64
62
58
56

Fig.5

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 03 00 9449

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
Y,D	EP 0 842 041 A (PKL VERPACKUNGSSYSTEME GMBH) 20 May 1998 (1998-05-20) * paragraph '0024!; figure 6 *	1,2,5,6	B65B61/18
Y	EP 1 072 518 A (ELOPAK SYSTEMS) 31 January 2001 (2001-01-31) * the whole document *	1,2,5,6	

TECHNICAL FIELDS SEARCHED (Int.Cl.7)

B65B
B31B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	9 December 2003	Grentzius, W

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

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 03 00 9449

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.

09-12-2003

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0842041 A	20-05-1998	AT 184837 T	15-10-1999
		CZ 9800298 A3	15-07-1998
		DE 59603176 D1	28-10-1999
		WO 9704953 A1	13-02-1997
		EP 0842041 A1	20-05-1998
		ES 2137721 T3	16-12-1999
		HU 9900513 A2	28-06-1999
		PL 324799 A1	22-06-1998
		US 6092351 A	25-07-2000
EP 1072518 A	31-01-2001	US 6269935 B1	07-08-2001
		EP 1072518 A1	31-01-2001
		JP 2001187426 A	10-07-2001

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82