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(54) Feeder for feeding lids in vacuum crimping machines

(57) A feeder (1a, 1b), particularly for feeding lids in vacuum crimping machines, comprising a passage channel (2) adapted to guide lids (3) to a crimping station (4) contained in a vacuum chamber (5). The passage channel (2) has a closed profile and passes through a wall (50) of the vacuum chamber (5) so as to connect the environment inside the vacuum chamber (5) to the outside environment. The peculiarity of the invention resides

in that it comprises means (7) for pushing the lids (3) which are accommodated slidingly along the passage channel (2) so as to push the lids (3) along the passage channel (2). Advantageously, a hermetic seal is provided between the inner walls of the passage channel (2) and the pusher means (7) so as to prevent the air of the outside environment from filtering through the passage channel (2) into the vacuum chamber (5).

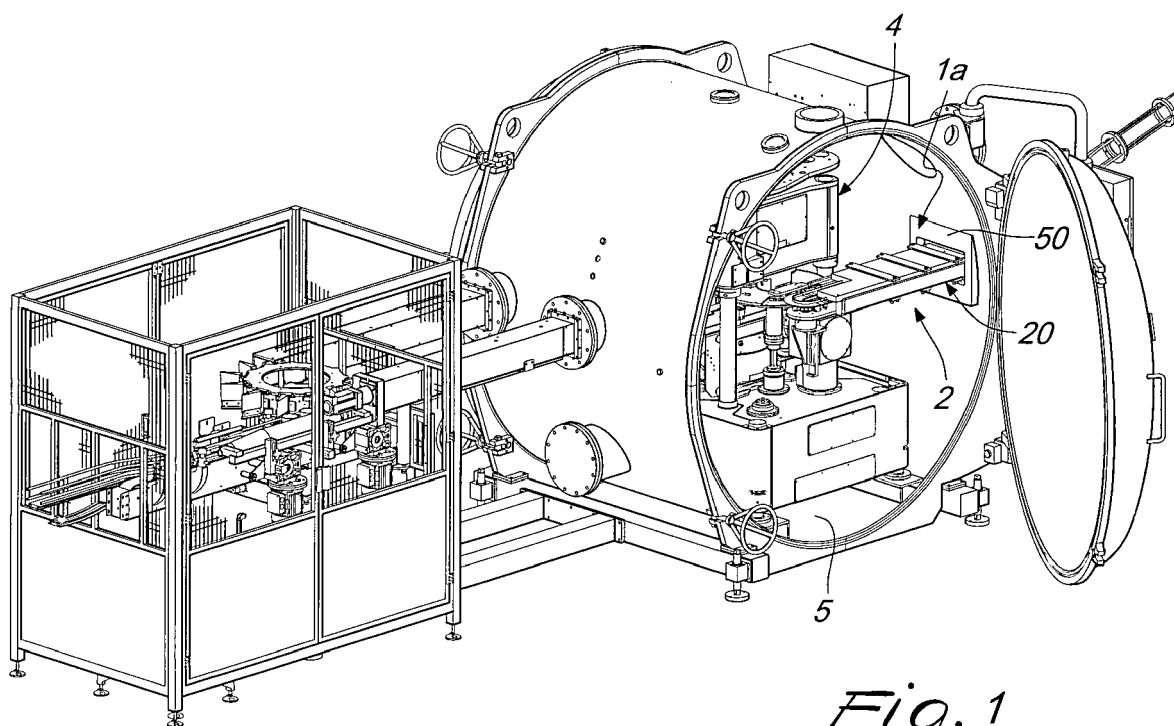


Fig. 1

EP 2 703 302 A1

Description

[0001] The present invention relates to a feeder particularly for feeding lids in vacuum crimping machines.

[0002] The present invention is within the field of crimping machines and particularly of crimping machines that can also work in vacuum for example to crimp cans for the canning industry.

[0003] In this field, the problem is particularly felt of introducing the lids of the cans in the vacuum chamber in which the crimping machine works while maintaining as much as possible the vacuum conditions inside the chamber without damaging the lids themselves due to the suction effect generated by the difference in pressure between the inside environment and the outside environment of the vacuum chamber.

[0004] The known and most widely used method of feeding the lids in crimping machines that operate in vacuum consists in introducing the lids, stacked one on top of the other, by means of a hole provided in the upper part of the vacuum chamber.

[0005] In this case, the lids are then separated by means of an adapted separator inside the vacuum chamber and are then fed to the crimping machine.

[0006] However, this method of feeding from above entails considerable drawbacks. In particular, due to the dimensions of the crimping machine and of the vacuum chamber that contains it, it is necessary to feed the lids from heights that often exceed three meters. Moreover, the difference in pressure between the outside environment, from which the lids arrive, and the internal environment of the vacuum chamber causes a strong suction of air through the upper hole obstructed by the lids. This suction tends to accelerate the lids in an uncontrollable manner.

[0007] Additional technical solutions, such as the adoption of adapted brakes, constituted for example by pneumatic pistons actuated transversely to the direction of the fall of the lids to reduce their falling speed, are therefore indispensable. The braking systems, in addition to being economically expensive and technically complicated, also increase the risk of damaging the edges of the lids.

[0008] Another drawback of the devices of the known type resides in that they do not ensure good airtightness of the vacuum chamber and therefore cannot ensure a good degree of vacuum.

[0009] The aim of the present invention is to provide a feeder, particularly for feeding lids in vacuum crimping machines, that overcomes the limitations and obviates the above mentioned drawbacks, enabling to feed lids to a vacuum crimping machine simply and efficiently.

[0010] Within this aim, an object of the present invention is to provide a feeder that makes it possible to ensure vacuum tightness in the vacuum chamber constantly during the operation of the feeder and of the crimping machine.

[0011] Another object of the invention is to provide a

feeder that protects the lids during their insertion in the vacuum chamber.

[0012] Another object of the invention is to provide a feeder that can work at high operating speeds and is capable of operating with the most disparate types of lid (both tinplate and aluminum).

[0013] Another object of the invention is to provide a feeder that is capable of giving the greatest assurances of reliability and safety in use.

[0014] Another object of the invention is to provide a feeder that is easy to provide and economically competitive if compared with the background art.

[0015] This aim and these and other objects that will become better apparent hereinafter are achieved by a feeder, particularly for feeding lids in vacuum crimping machines, comprising a passage channel adapted to guide lids to a crimping station contained in a vacuum chamber, said passage channel having a closed profile and passing through a wall of said vacuum chamber so as to connect the environment inside said vacuum chamber to the outside environment, **characterized in that** it comprises means for pushing said lids which are accommodated slidingly along said passage channel so as to push said lids along said passage channel, a hermetic seal being provided between the inner walls of said passage channel and said pusher means so as to prevent the air of said outside environment from filtering through said passage channel into said vacuum chamber.

[0016] Further characteristics and advantages will become better apparent from the description of a preferred but not exclusive embodiment of a feeder particularly for feeding lids in vacuum crimping machines, illustrated by way of non-limiting example in the accompanying drawings, wherein:

Figure 1 is a perspective view of an embodiment of a feeder according to the invention, shown in combination with a vacuum crimping machine;

Figure 2 is a different perspective view of the feeder of Figure 1;

Figure 3 is a detailed perspective view of the feeder according to the invention, showing in phantom lines the walls of the vacuum chamber;

Figure 4 is an enlarged-scale view of a detail of the feeder of Figure 3, illustrating in particular the placement of a lid between two pushers;

Figure 5 is a top plan view of the feeder of Figure 3;

Figure 6 is a sectional view of the feeder shown in Figure 5, taken along the line VI-VI;

Figure 7 is an enlarged-scale view of a detail of part of the sectional view of the feeder of Figure 6;

Figure 8 is a side elevation view of the feeder of Figure 3;

Figure 9 is an external front view of the vacuum chamber of the feeder of Figure 3;

Figure 10 is a front view, from the inside of the vacuum chamber, of the feeder of Figure 3;

Figure 11 is a detailed perspective view of a variation

of the feeder according to the invention, illustrating in phantom lines the walls of the vacuum chamber; Figure 12 is an enlarged-scale view of a detail of the feeder of Figure 11, illustrating in particular the placement of a lid between two pushers;

Figure 13 is a top plan view of the feeder of Figure 11; Figure 14 is a sectional view of the feeder shown in Figure 5, taken along the line VI-VI;

Figure 15 is a perspective view of a detail of the feeder shown in Figures 11 to 14;

Figure 16 is an external front view of the vacuum chamber of the feeder of Figure 11;

Figure 17 is an internal front view of the vacuum chamber of the feeder of Figure 11.

[0017] With reference to Figures 1 to 10, the feeder, particularly for feeding lids in vacuum crimping machines, generally designated by the reference numeral 1a, comprises a passage channel 2 that is adapted to guide the lids 3 to a crimping station 4 contained in a vacuum chamber 5.

[0018] In greater detail, the passage channel 2 has a closed profile and passes through a wall 50 of the vacuum chamber 5, connecting the environment inside the vacuum chamber 5, at a pressure that is lower than the atmospheric pressure, to the external environment, at atmospheric pressure.

[0019] According to the invention, the feeder 1a comprises means 7 for pushing the lids 3, which are accommodated so that they can slide along the passage channel 2 so as to push the lids 3 along the passage channel 2.

[0020] Advantageously, a hermetic seal is provided between the inner walls of the passage channel 2 and the pusher means 7 so as to prevent the air of the outside environment from filtering through the passage channel 2 into the vacuum chamber 5.

[0021] Conveniently, in order to provide the hermetic seal cited above, the passage channel 2 comprises, in at least one of its portions 20, at least one longitudinal channel 21 which has, in a transverse cross-section, a profile 25 that corresponds substantially to the profile 75 of the transverse cross-section of the pusher means 7.

[0022] In this manner, the pusher means 7 engage slidably in the longitudinal channel 21 so as to close substantially the longitudinal channel 21 to the passage of air.

[0023] The coupling between the pusher means 7 and the longitudinal channel 21 is in fact such as to hinder the flow of air from the outside environment to the internal environment of the vacuum chamber that is generated by the difference in pressure established across the wall 50 of the vacuum chamber 5.

[0024] A play between the pusher means 7 and the longitudinal channel 21 comprised in the range between 0.05 mm and 0.1 mm is such as to ensure a good hermetic seal and at the same time allow the sliding of the pusher means 7 within the passage channel 2, without creating an excessive heating due to the friction between the pusher means 7 and the inner edges of the hole 21.

[0025] Preferably, the passage channel 2 comprises two longitudinal channels 21, 26, so that the pusher means 7 engage slidably respectively the first channel 21 in input to the vacuum chamber 5 and the second channel 26 in output from the vacuum chamber 5.

[0026] The pusher means 7 in fact enter the vacuum chamber 5, pushing the lids 3 toward the crimping station 4 through the first channel 21, and exit from the vacuum chamber 5, once the lid 3 has been abandoned, through the second channel 26. In other words, the pusher means 7 slide along a closed loop that is defined by the passage channel 2 in its central part.

[0027] The pusher means 7 preferably comprise a plurality of pushers 71, each adapted to push a lid 3, and an actuation chain 72, which supports the pushers 71 and is adapted to move them along the passage channel 2.

[0028] Advantageously, the pushers 71 are alternated with the lids 3 so as to retain each lid 3 between two consecutive pushers 71, which are thus arranged at a mutual distance that is substantially equal to the diameter of a lid 3.

[0029] If there is also a device 6 for separating lids 3, it can be arranged outside the vacuum chamber 5, since the passage channel 2 is adapted to receive the lids 3 from the external separator 6 and only then introduce them in the vacuum chamber 5.

[0030] In output from the passage channel 2, proximate to the crimping station 4, and in particular at the point where the lids 3 are passed to the guides of the crimping machine, means 11 for containing the lids 3 are advantageously provided, which are adapted to contain the movement of the lids 3 and prevent their fall during passage from the feeder 1 to the crimping station 4.

[0031] With reference to Figures 1 to 10, the containment means 11 comprise preferably a plurality of pads 12 actuated by a chain 13, which can slide in a direction that is integral with the advancement direction of the lids 3 in the passage channel 2.

[0032] Differently, in a variation of the feeder 1a, generally designated by the reference numeral 1b and shown in Figures 11 to 12, the containment means 11 comprise a plurality of pads 112, which are actuated synchronously with the advancement of the lids 3 and are provided by a cam that acts on the individual lids 3 by means of a kinematic chain that is connected to the pusher means 7.

[0033] As regards the pusher means 7 and in particular the actuation chain 72, they are preferably actuated by a motor 73 of the brushless type, which is provided with a reduction unit 74 to actuate the ring gear that drives the actuation chain 72.

[0034] The first longitudinal channel 21 advantageously has a length that is at least equal to the distance that separates two consecutive pushers 71, so that such hole is always occupied by at least one portion of a pusher 71. Likewise, the second longitudinal channel 26 also can have a length that is at least equal to the distance that separates two consecutive pushers 71.

[0035] Operation of the feeder according to the invention is described hereinafter.

[0036] A column of stacked lids arrives at the separator 6, which is external to the vacuum chamber 5. The separator 6 separates each lid 3, placing it on adapted external guides 61, where each lid 3 is gripped by a pair of consecutive pushers 71. The pushers 71 push the lids 3 into the first longitudinal channel 21 of the passage channel 2, thus guiding them into the vacuum chamber 5.

[0037] Proximate to the crimping station 4, in output from the passage channel 2, the lids 3 are stabilized by the containment means 11, and in particular by the pads 12 or 112 that press slightly on the lid 3 to prevent it from moving from its own seat before being accommodated in the guides 41 of the crimping station 4.

[0038] The pushers 71 that have abandoned the respective lid 3 at the crimping station 4 are guided again to the passage channel 2, where, through the second longitudinal channel 26, they return to the separator 6 to grip a new lid 3 and repeat the above mentioned operations.

[0039] The longitudinal channels 21 and 26 of the passage channel 2 are advantageously always occupied by at least one portion of a pusher 71, so as to hinder the passage of air between the external environment, at atmospheric pressure, and the environment inside the vacuum chamber, at a lower pressure, during the entire operation of the device 1b.

[0040] In practice it has been found that the feeder, particularly for feeding lids in vacuum crimping machines, according to the present invention, achieves the intended aim and objects, since it makes it possible to feed the lids to a vacuum crimping machine in a simple and efficient manner.

[0041] Another advantage of the feeder according to the invention resides in that it ensures pressure losses, between the inside and the outside of the vacuum chamber in which the crimping machine operates, on the order of 2-4 mmHg, even with degrees of vacuum inside the vacuum chamber of not less than 800 mmHg. Accordingly, the operation of the vacuum pump used to maintain the desired degree of vacuum inside the vacuum chamber is reduced substantially, with a consequent increase in the efficiency of the crimping process and a reduction in consumption.

[0042] Another advantage of the feeder according to the invention resides in that it can ensure very high feed rates, even higher than 600 lids per minute.

[0043] Another advantage of the feeder according to the invention resides in that it makes it possible to place the separator outside the vacuum chamber.

[0044] Another advantage of the feeder according to the invention resides in that it prevents unwanted damage of the lids and of their edges during their feeding from the separator, which is external to the vacuum chamber, to the crimping machine, which is internal to the vacuum chamber.

[0045] The feeder thus conceived is susceptible of numerous modifications and variations, all of which are within the scope of the appended claims.

merous modifications and variations, all of which are within the scope of the appended claims.

[0046] All the details may further be replaced with other technically equivalent elements.

[0047] In practice, the materials used, so long as they are compatible with the specific use, as well as the contingent shapes and dimensions, may be any according to requirements.

Claims

1. A feeder (1a, 1b), particularly for feeding lids in vacuum crimping machines, comprising a passage channel (2) adapted to guide lids (3) to a crimping station (4) contained in a vacuum chamber (5), said passage channel (2) having a closed profile and passing through a wall (50) of said vacuum chamber (5) so as to connect the environment inside said vacuum chamber (5) to the outside environment, **characterized in that** it comprises means (7) for pushing said lids (3) which are accommodated slidingly along said passage channel (2) so as to push said lids (3) along said passage channel (2), a hermetic seal being provided between the internal walls of said passage channel (2) and said pusher means (7) so as to prevent the air of said outside environment from filtering through said passage channel (2) into said vacuum chamber (5).
2. The feeder (1a, 1b) according to claim 1, **characterized in that** said passage channel (2) comprises, in at least one portion (20), at least one longitudinal channel (21, 26) which has, in a transverse cross-section, a profile (25) that corresponds substantially to the profile (75) of the transverse cross-section of said pusher means (7).
3. The feeder (1a, 1b) according to claims 1 or 2, **characterized in that** said passage channel (2) comprises two longitudinal channels (21, 26), said pusher means (7) being accommodated slidingly respectively in a first channel (21) of said two longitudinal channels (21, 26) that enter said vacuum chamber (5) and in a second channel (26) of said two longitudinal channels (21, 26) in output from said vacuum chamber (5).
4. The feeder (1a, 1b) according to one or more of the preceding claims, **characterized in that** said pusher means (7) comprise a plurality of pushers (71), each adapted to push a respective lid (3), and an actuation chain (72), which supports said pushers (71) and is adapted to move said pushers (71) along said passage channel (2).
5. The feeder (1a, 1b) according to claim 4, **characterized in that** said pushers (71) are alternated with

said lids (3) so as to retain each one of said lids (3) between two consecutive pushers (71).

6. The feeder (1a, 1b) according to one or more of the preceding claims, **characterized in that** said passage channel (2) is adapted to receive said lids (3) from a lid separator (6) arranged outside said vacuum chamber (5). 5
7. The feeder (1a, 1b) according to one or more of the preceding claims, **characterized in that** said at least one longitudinal channel (21, 26) has a length at least equal to the distance that separates two consecutive pushers (71). 10
8. The feeder (1a, 1b) according to one or more of the preceding claims, **characterized in that** it comprises means (11) for containing said lids (3) which are accommodated in said vacuum chamber (5) at the outlet of said passage channel (2) proximate to said crimping station (4) so as to contain the movement of said lids (3). 15 20
9. The feeder (1a) according to claim 8, **characterized in that** said containment means (11) comprise a plurality of pads (12) which are actuated by a chain (13) that can slide in a direction that matches the advancement direction of said lids (3). 25
10. The feeder (1b) according to claim 8, **characterized in that** said containment means (11) comprise a plurality of pads (112) which are actuated synchronously with the advancement of said lids (3). 30

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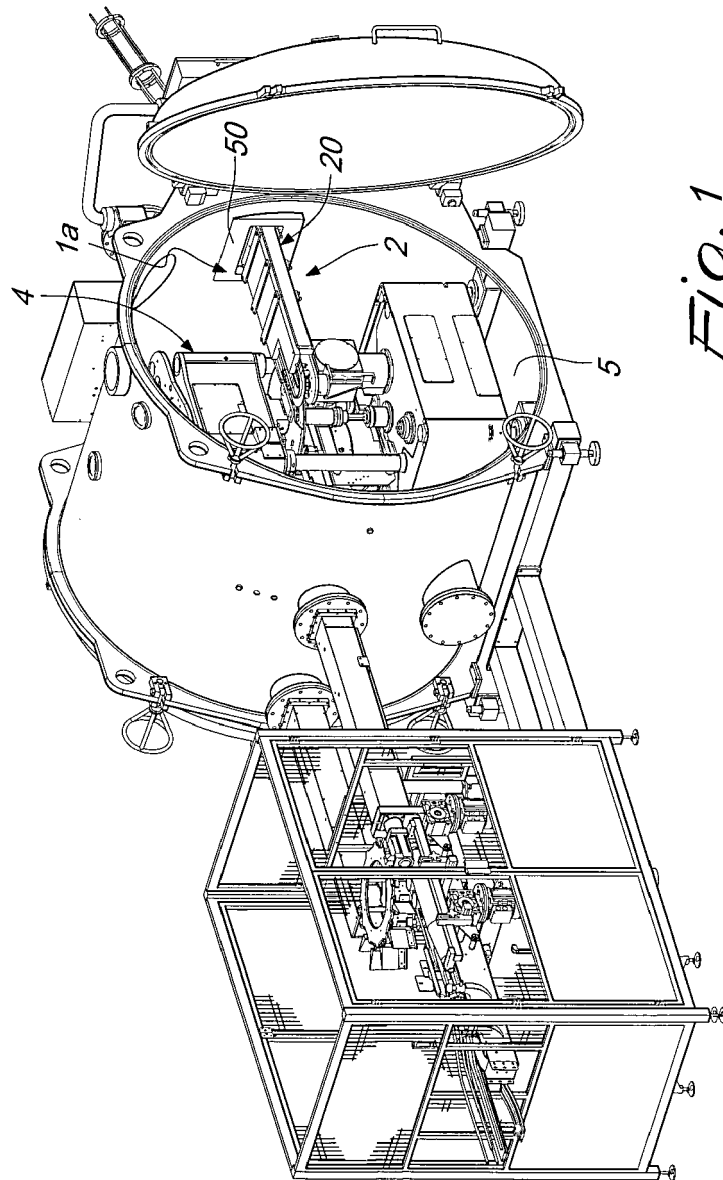
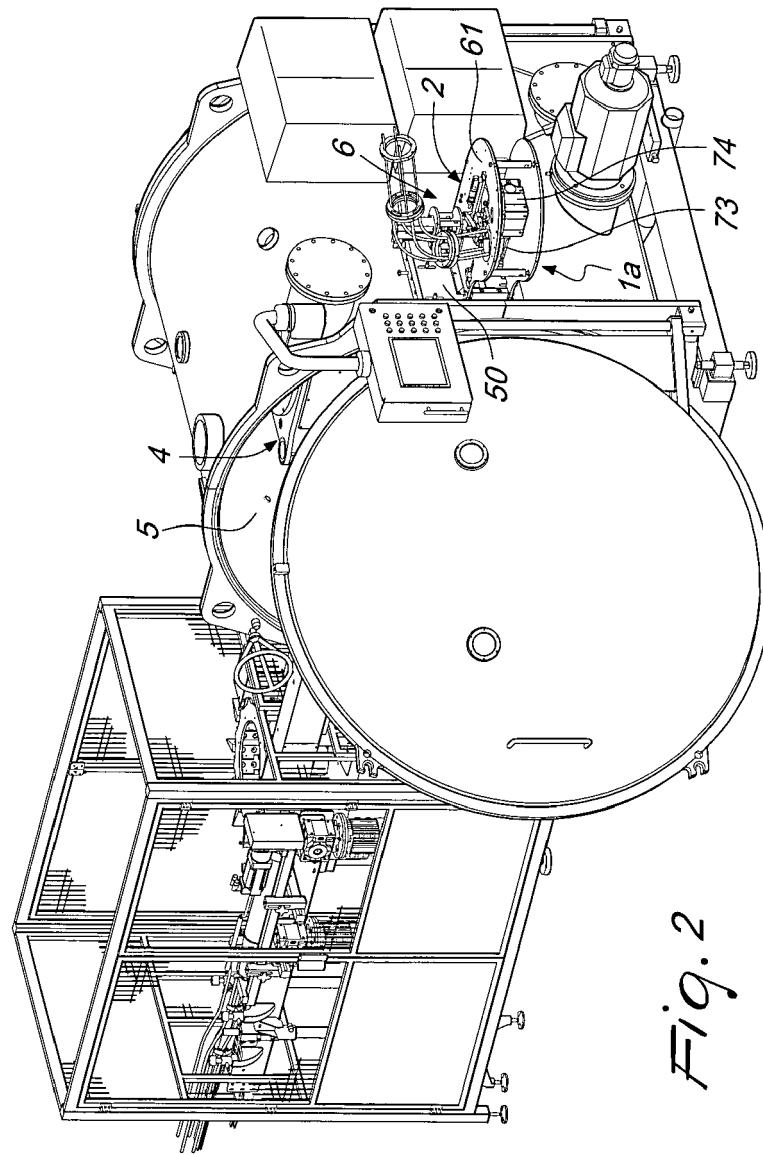


Fig. 1



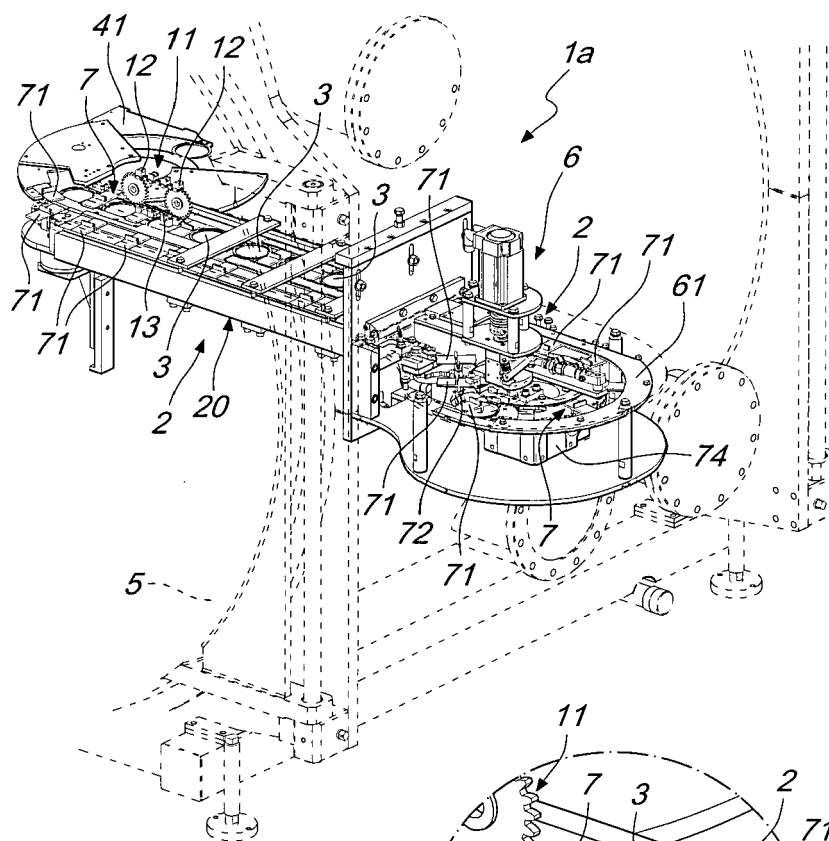


Fig. 3

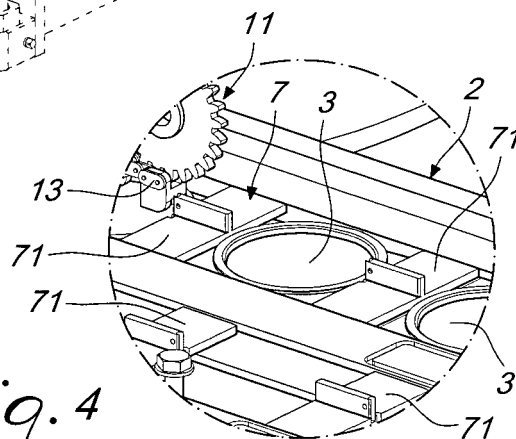
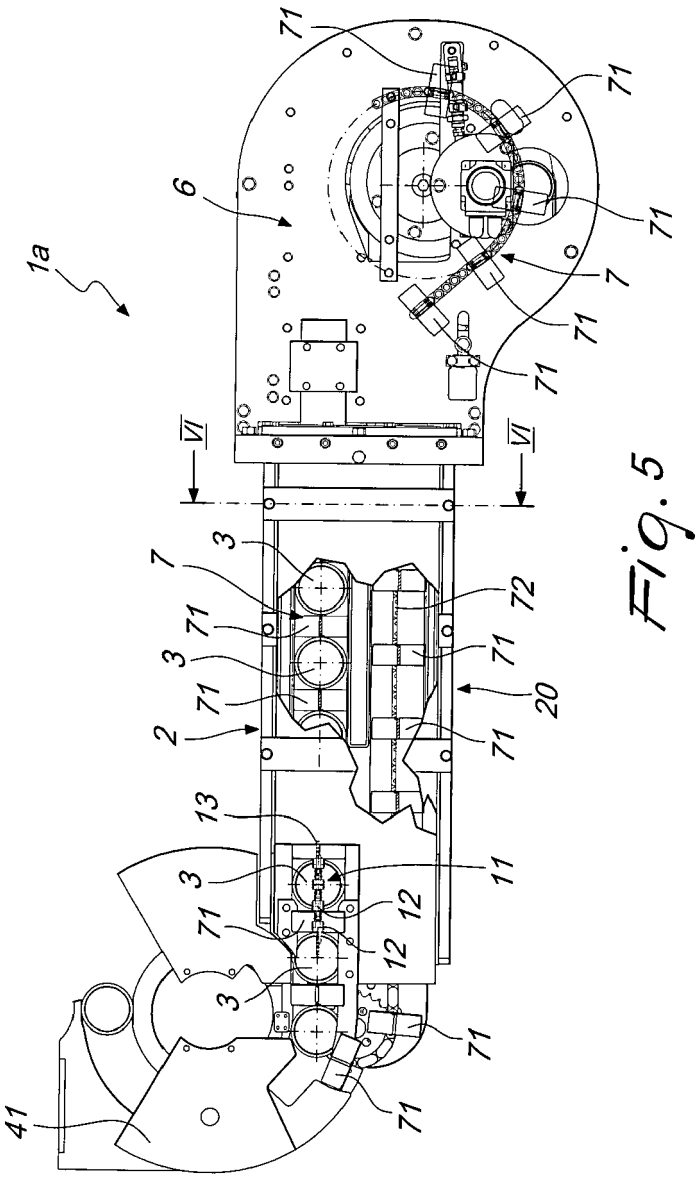


Fig. 4



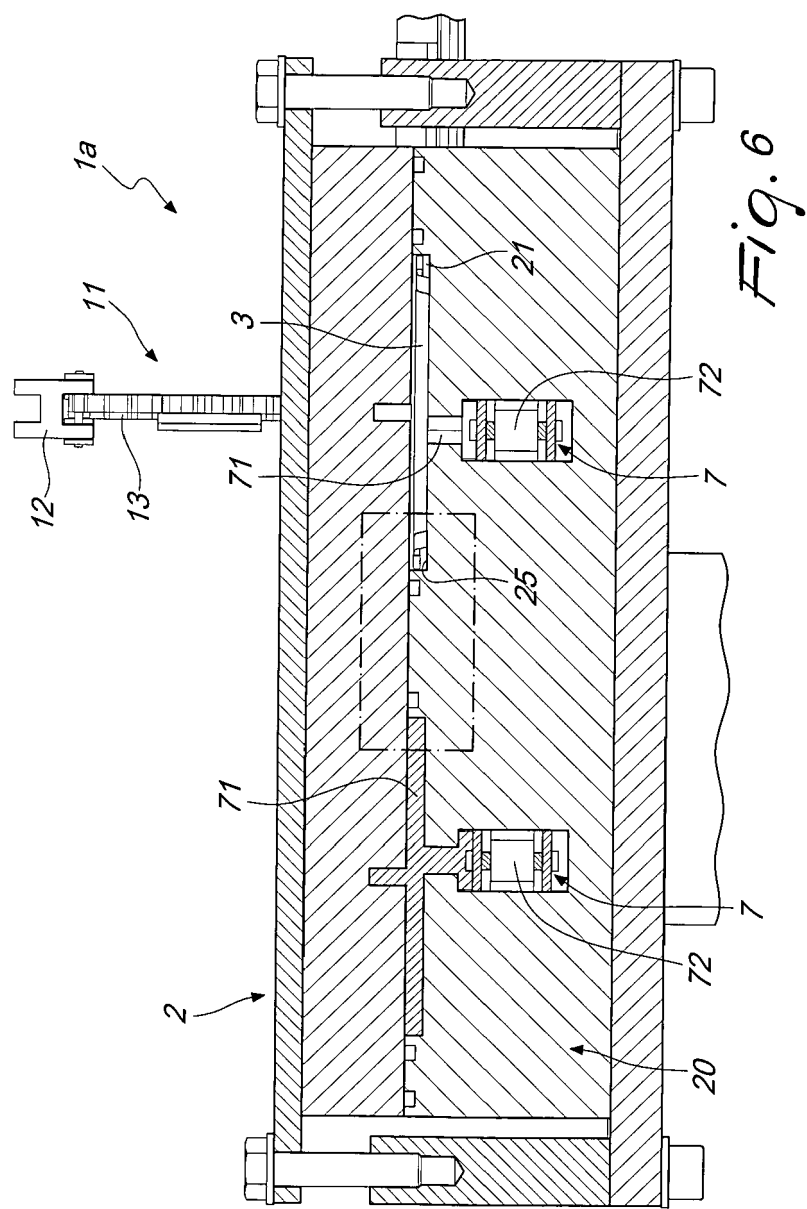


Fig. 6

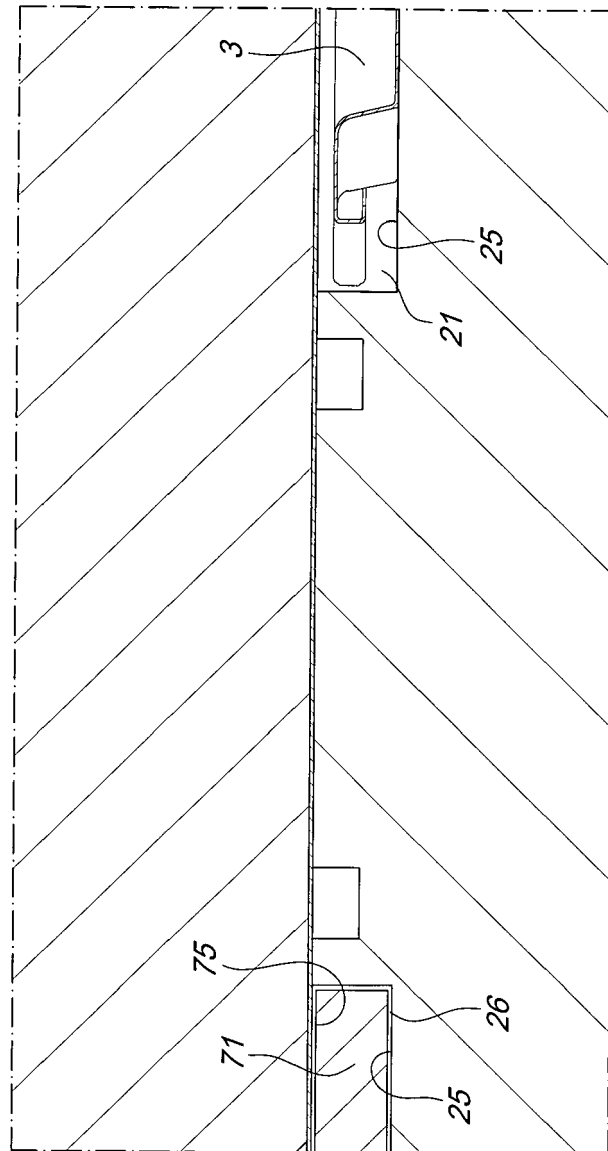
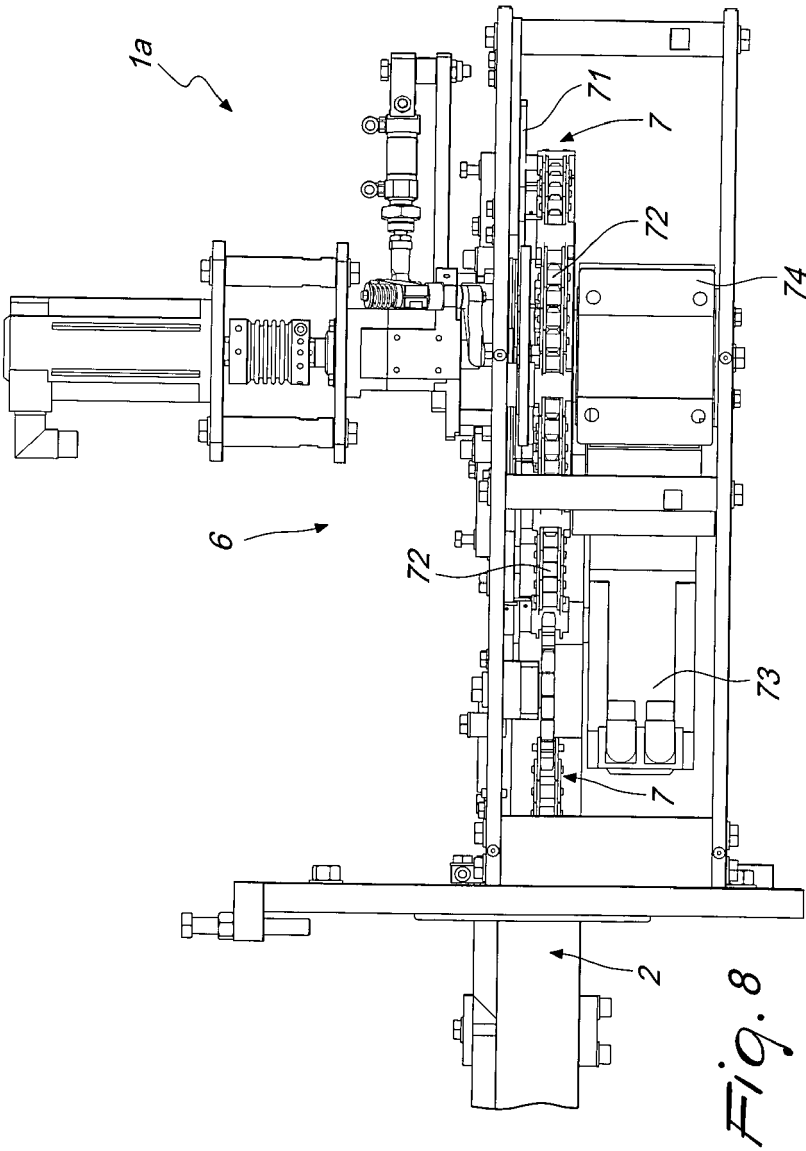


Fig. 7



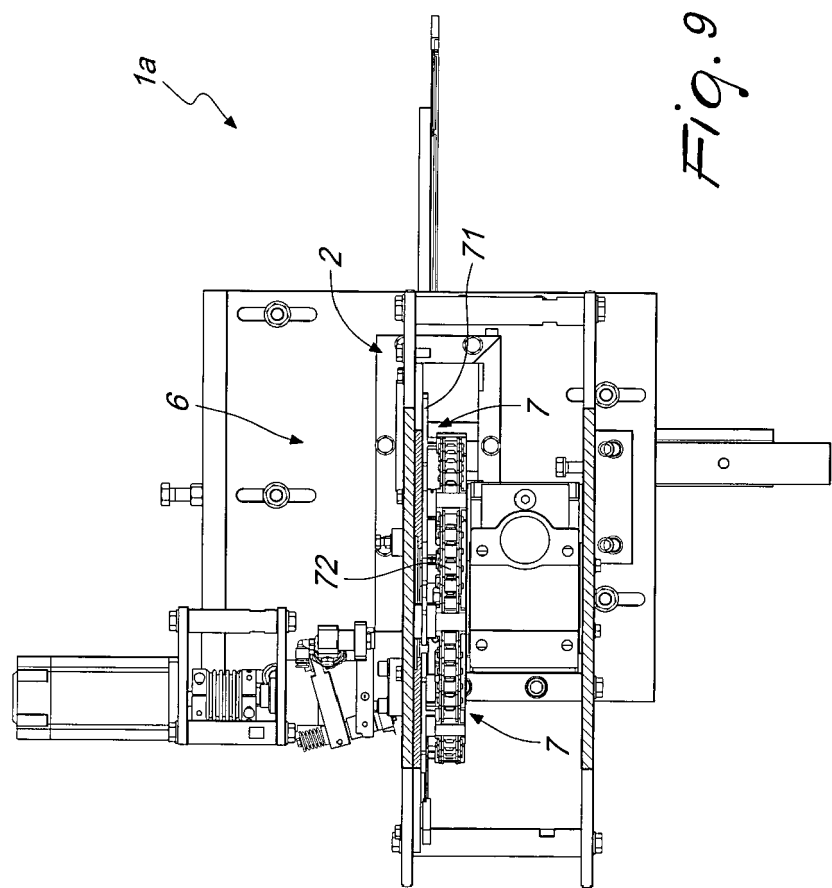


Fig. 9

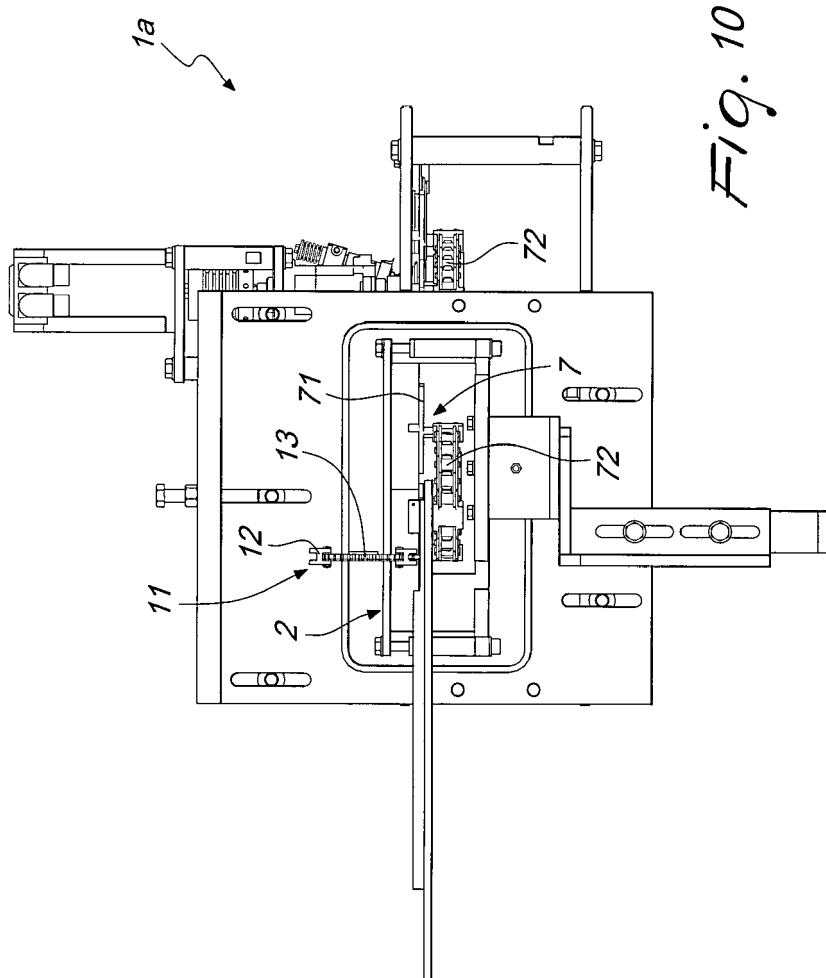


Fig. 10

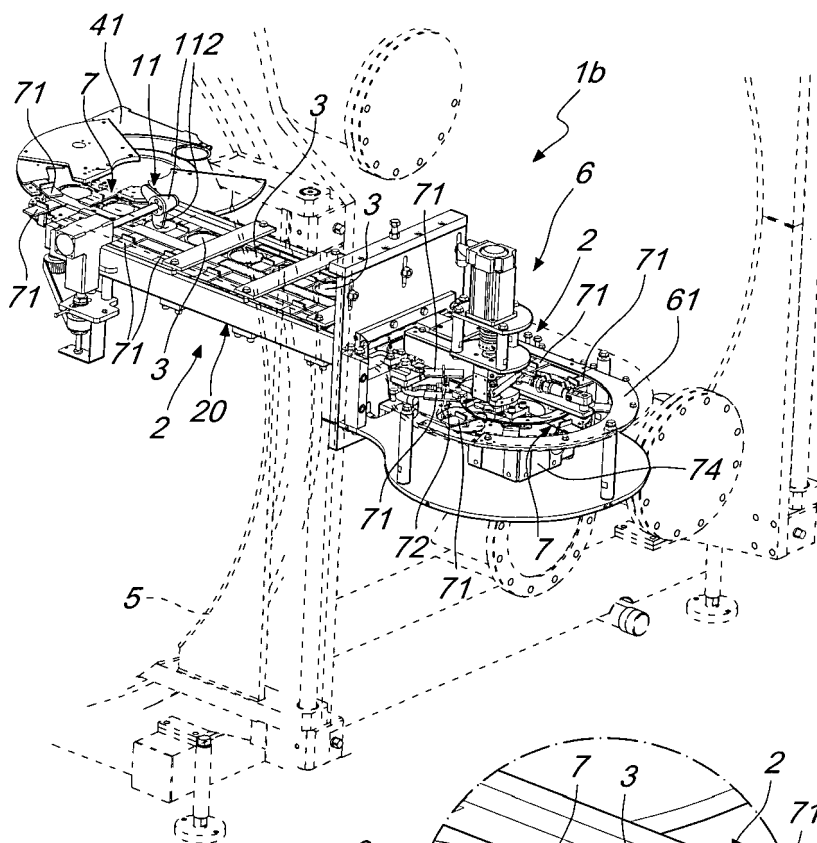


Fig. 11

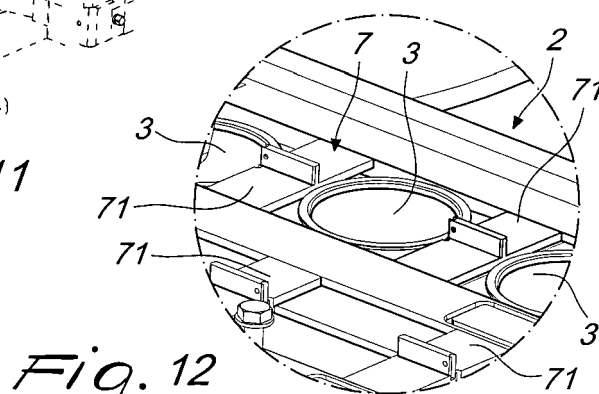


Fig. 12

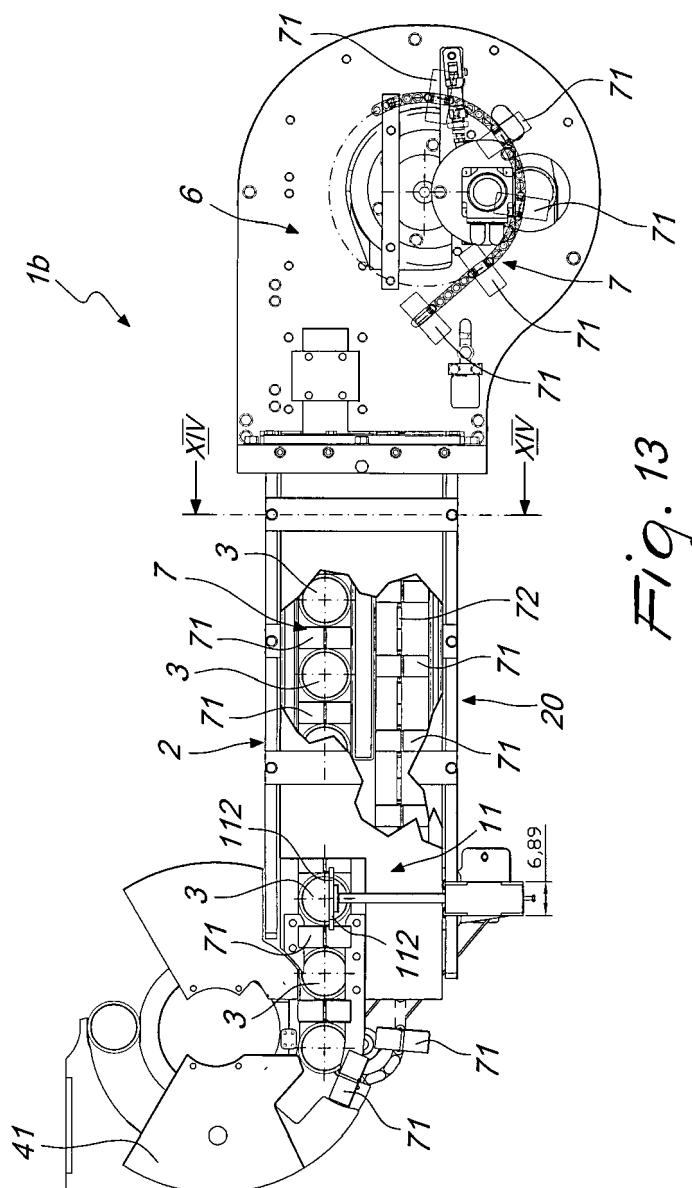
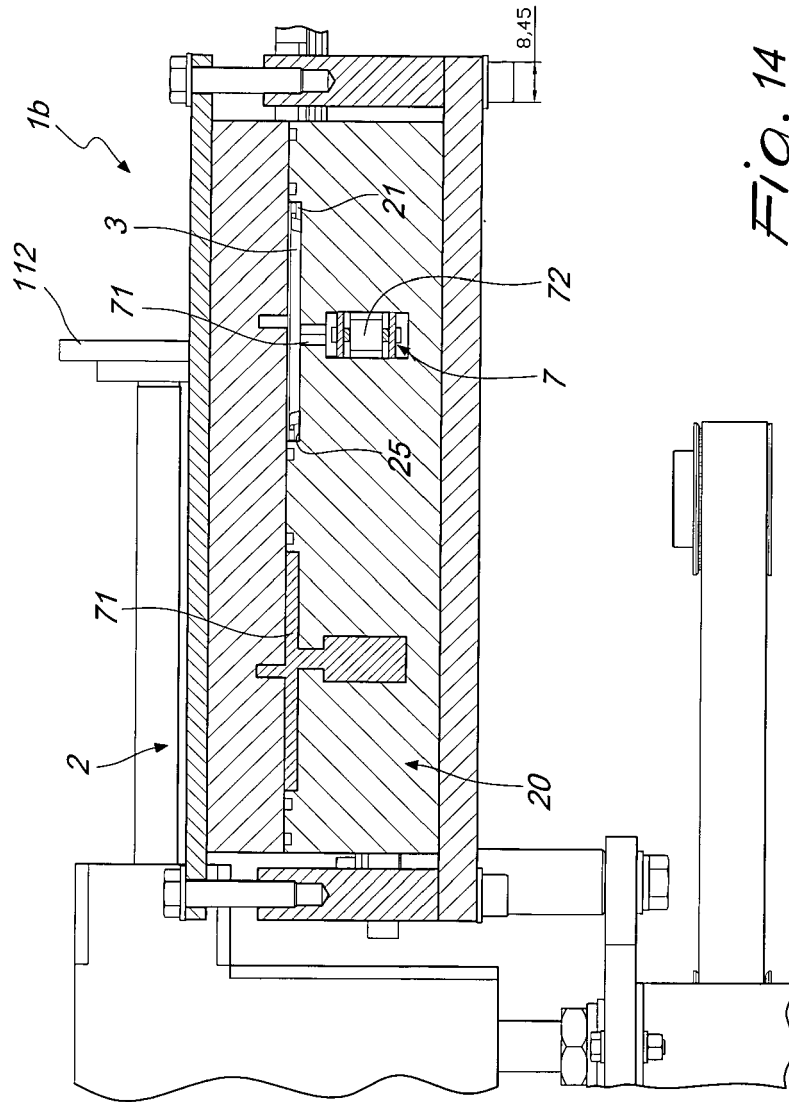


Fig. 13



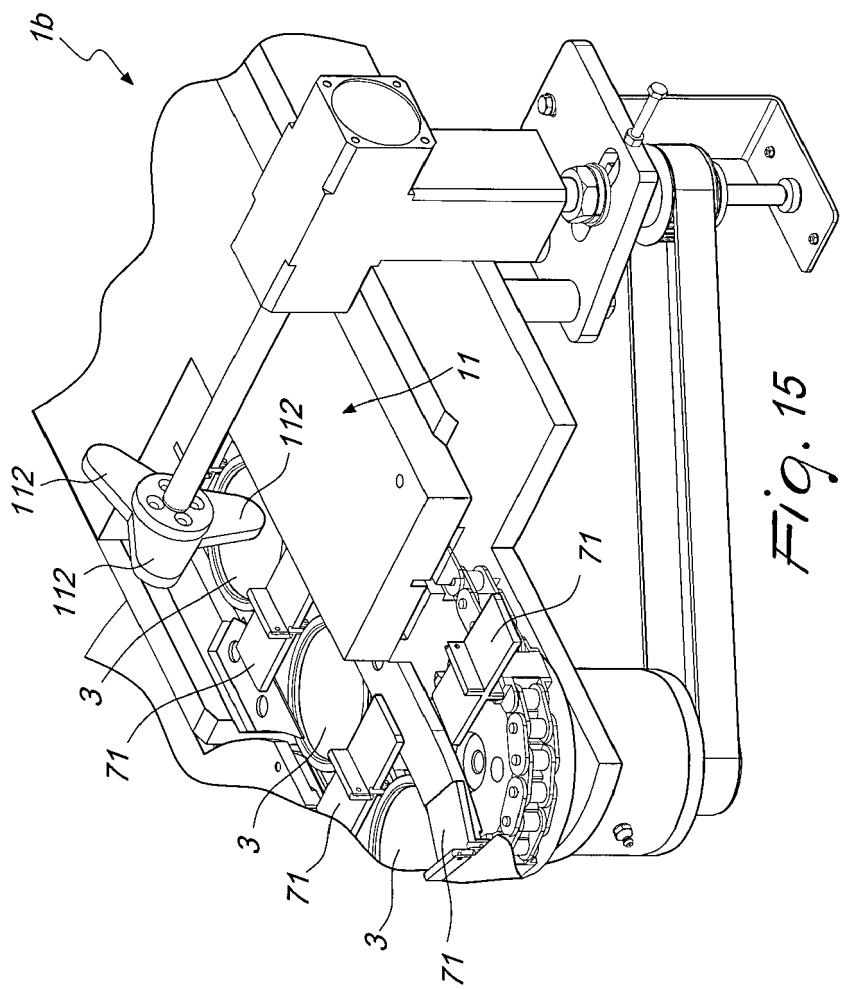
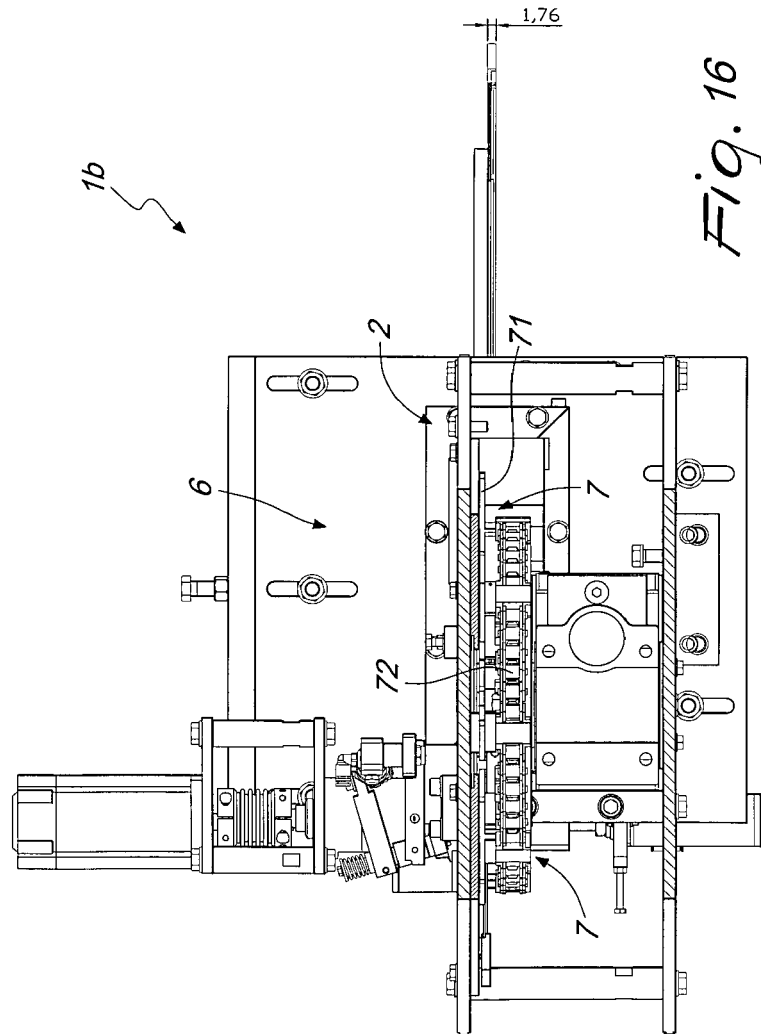
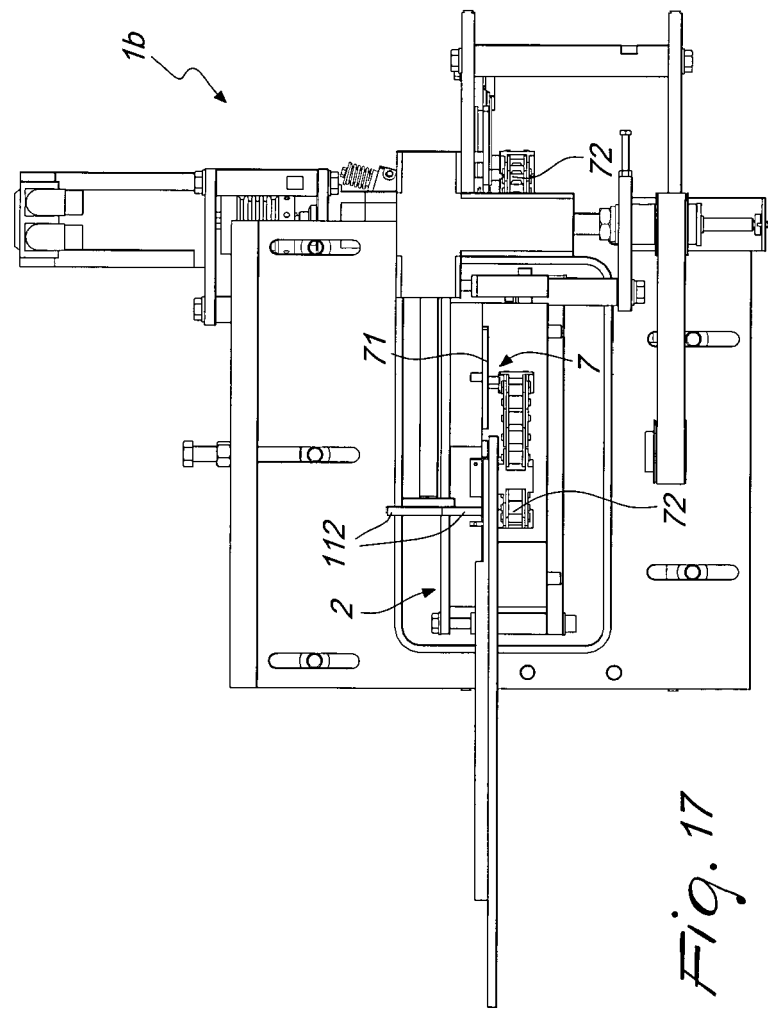


Fig. 15







EUROPEAN SEARCH REPORT

Application Number
EP 12 42 5143

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 29 00 724 A1 (SIEMENS AG) 24 July 1980 (1980-07-24) * page 5, line 23 - page 7, line 11; figure 1 *	1-7	INV. B65B31/02 B65B7/28
X	GB 2 143 910 A (BALZERS HOCHVAKUUM) 20 February 1985 (1985-02-20) * page 1, line 109 - page 2, line 45; figures 1-2 *	1,2,6	
X	US 2011/033267 A1 (ALBRECHT THOMAS [DE]) 10 February 2011 (2011-02-10) * paragraph [0027] - paragraph [0040]; figures 1-3 *	1-7	
Y	WO 2010/046636 A2 (P2I LTD [GB]; KING CHARLES EDMUND [GB]) 29 April 2010 (2010-04-29) * page 8, line 21 - page 14, line 19; figures 1-3 *	1-6	
Y	US 3 674 160 A (GUTOWSKI CHESTER L) 4 July 1972 (1972-07-04) * the whole document *	8-10	TECHNICAL FIELDS SEARCHED (IPC)
Y	US 3 812 641 A (BEMISS R) 28 May 1974 (1974-05-28) * column 9, line 35 - column 9, line 51 *	8-10	B65B
Y	GB 1 383 507 A (BRISTOL PACKAGING MACHINES LTD) 12 February 1974 (1974-02-12) * the whole document *	8,10	
Y	US 3 872 651 A (LEONARD GEORGE E) 25 March 1975 (1975-03-25) * the whole document *	8,10	
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 15 January 2013	Examiner Paetzke, Uwe
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			

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

EP 12 42 5143

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15-01-2013

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 2900724 A1	24-07-1980	NONE	
GB 2143910 A	20-02-1985	FR 2549452 A1	25-01-1985
		GB 2143910 A	20-02-1985
		JP 60026662 A	09-02-1985
US 2011033267 A1	10-02-2011	CN 101939464 A	05-01-2011
		DE 102008007629 A1	06-08-2009
		EP 2238276 A1	13-10-2010
		JP 2011511156 A	07-04-2011
		US 2011033267 A1	10-02-2011
		WO 2009097888 A1	13-08-2009
WO 2010046636 A2	29-04-2010	AU 2009306194 A1	29-04-2010
		CA 2740450 A1	29-04-2010
		CN 102203315 A	28-09-2011
		EP 2361321 A2	31-08-2011
		EP 2441857 A2	18-04-2012
		JP 2012506490 A	15-03-2012
		KR 20110074615 A	30-06-2011
		TW 201024449 A	01-07-2010
		US 2011259455 A1	27-10-2011
		WO 2010046636 A2	29-04-2010
US 3674160 A	04-07-1972	AU 3903172 A	23-08-1973
		CA 949084 A1	11-06-1974
		GB 1381815 A	29-01-1975
		US 3674160 A	04-07-1972
US 3812641 A	28-05-1974	NONE	
GB 1383507 A	12-02-1974	NONE	
US 3872651 A	25-03-1975	NONE	