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

(11) **EP 4 424 179 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
04.09.2024 Bulletin 2024/36

(21) Application number: **23219739.2**

(22) Date of filing: **22.12.2023**

(51) International Patent Classification (IPC):
A24C 5/32 *(2006.01)* ***A24C 5/354*** *(2006.01)*
B65G 27/16 *(2006.01)* ***B65G 65/44*** *(2006.01)*
B65B 19/04 *(2006.01)*

(52) Cooperative Patent Classification (CPC):
A24C 5/32; A24C 5/322; A24C 5/325; A24C 5/354; B65B 19/04

(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 ME MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA
Designated Validation States:
KH MA MD TN

(30) Priority: **01.03.2023 IT 202300003636**

(71) Applicant: **G.D S.p.A.**
40133 Bologna (IT)

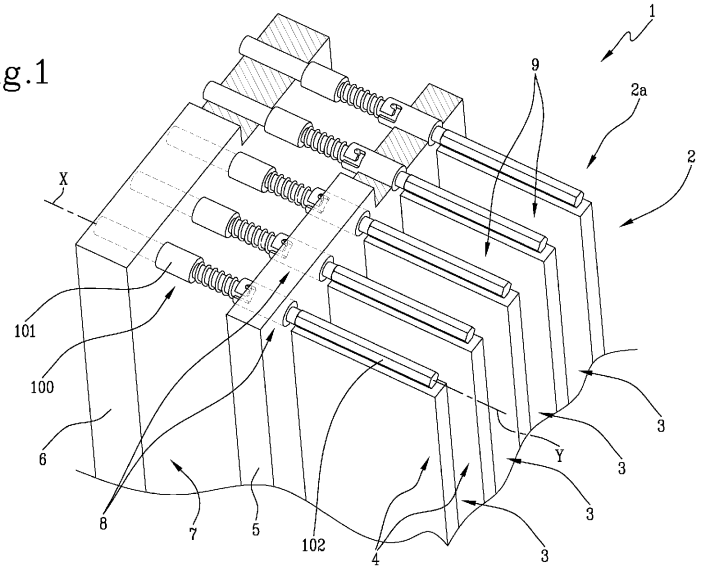
(72) Inventors:
- **MECCAGNI, Mattia**
  40133 Bologna (IT)
- **SCAGLIARINI, Simone**
  40133 Bologna (IT)

(74) Representative: **Bianciardi, Ezio**
Bugnion S.p.A.
Via di Corticella, 87
40128 Bologna (IT)

(54) **VIBRATOR USABLE BY IMMERSION IN A FLOW OR MASS OF ROD-SHAPED ARTICLES**

(57) A vibrator (100) usable by immersion in a flow or mass of rod-shaped articles to influence the positioning of the articles in the flow or mass. The vibrator (100) comprises a first rod-shaped portion (101) and a second portion (102) connected to the first portion (101) so that the two portions (101, 102) are parallel and preferably coaxial. The first portion (101) and the second portion (102) have respective connecting ends (103, 104) provided with releasable mutual coupling means (105, 106). One of the portions (101, 102) is configured to be stably connected to a motor (6) and the other portion (102, 101) is configured to be placed inside a flow or mass of rod-shaped articles.

Fig.1



EP 4 424 179 A1

Description

[0001] The present invention belongs to the manufacture field and relates to a vibrator usable by immersion in a flow or mass of rod-shaped articles. The present invention finds particular application in the tobacco industry, in a device for forming groups of rod-shaped articles.

[0002] In the relevant field of the present invention, there are known devices comprising a loading hopper having an upper portion defining a containment space for containing a plurality of rod-shaped articles and a lower portion, in communication with the upper portion, defining a series of vertical wells delimited by respective vertical walls. The rod-shaped articles contained in the space of the upper portion of the hopper are conveyed to the wells by the action of the force of gravity, forming stacks of rod-shaped articles in the wells for subsequent treatment in successive operating steps.

[0003] In order to prevent the rod-shaped articles from being distributed or conveyed to the wells in a non-uniform manner, rod-shaped vibrators are used, operatively placed close to the mouth of the wells, the function of which is to move the articles by means of a vibrating or rotating action.

[0004] In particular, the vibrators are made in one piece and have a first operating end inserted into the hopper through respective holes so that it is immersed in the plurality of rod-shaped articles, and a second end, opposite to the first end, which is mounted on a motor in a cantilever fashion, which is located behind the hopper and configured to move the vibrators. In particular, the motor has a front side facing the hopper and a rear side, opposite to the front side.

[0005] As known, the motor has through coupling seats (from the front side to the rear side) in which the vibrators are inserted. At a functional level, each vibrator is inserted into the respective through seat from the front side of the motor and fastened to the motor from the rear side with suitable fastening means.

[0006] The Applicant has observed that, even in their most modern implementations, such systems have functional and structural disadvantages, which make them improvable.

[0007] In fact, it has been noted that two technicians working at the same time are needed to replace a single vibrator: a first operator at the front side of the motor, grasping the vibrator, and a second technician at the rear side of the motor, removing the fastening means, so that the first technician can extract the vibrator once the fastening means have been removed. Moreover, such a system is disadvantageous in terms of time, and requires the use of special equipment for tightening/loosening the fastening means. Again, the continuous tightening/untightening of the fastening means can compromise the integrity of the vibrators, as well as the integrity of the device on which the vibrators are mounted.

[0008] Thus, in such a context, it is the technical task underlying the present invention to provide a vibrator free from the drawbacks complained in the prior art.

[0009] Therefore, it is the object of the present invention to provide a vibrator which can easily be replaced by a single operator.

[0010] It is a further object of the present invention to provide a vibrator which is at least partially replaceable without the use of external tools.

[0011] It is a further object of the present invention to provide a vibrator which allows not compromising the integrity of the device on which it is mounted, as well as the integrity of the vibrator itself.

[0012] The objects are substantially achieved by a vibrator and a device comprising one or more vibrators according to the features set-out in the appended claims 1 and 10, respectively, and/or in one or more of the dependent claims.

[0013] Further features and advantages of the present invention will become more apparent from the indicative and thus non-limiting description of a preferred, but non-exclusive, embodiment of a vibrator and a device on which the aforesaid vibrator can be mounted, as shown in the accompanying drawings, in which:

- figure 1 is a diagrammatic view of a detail of a device for forming groups of rod-shaped articles according to the present invention and comprising a vibrator according to the invention;
- figures 2-5 show respective coupling/uncoupling steps of a preferred embodiment of a vibrator mountable on the device in figure 1, according to the present invention.

[0014] The present invention belongs to the manufacture field and relates to a vibrator usable by immersion in a flow or mass of rod-shaped articles. The present invention finds particular, but not limiting application, in a device for forming groups of rod-shaped articles. Therefore, in the continuation of the present invention reference will be made to a vibrator usable by immersion in a flow or a mass of rod-shaped articles in a device for forming groups of rod-shaped articles, belonging to the tobacco manufacturing industry.

[0015] However, note that the same vibrator is usable on devices and machines configured to work on general articles or semi-finished products, not necessarily in the tobacco industry and/or not necessarily rod-shaped, according to the general nature of the invention.

[0016] With reference to figure 1, reference numeral "1" indicates a device 1 for the formation of rod-shaped articles.

[0017] The device 100 comprises a hopper 2 defining a space for containing a plurality of rod-shaped articles.

[0018] Preferably, the hopper 2 has an upper portion, not shown, defining the aforesaid space for containing the plurality of rod-shaped articles and a lower portion 2a, in communication with the upper portion, defining a series of vertical wells 3 delimited by respective vertical

side walls 4. The hopper 2 further comprises a rear wall 5 delimiting a containment space in the upper portion and the wells 3 in the lower portion.

[0019] The device 1 comprises a motor 6 configured to drive a plurality of vibrators 100, operatively located behind the hopper 2 and to which the vibrators 100 are connected in a cantilever fashion.

[0020] In use, the vibrators 100 extend from the motor 6 and are inserted into the hopper 2, located at the front of the motor 6. Thus, in particular, the vibrators 100 emerge from a front face 7 of the motor and are partially inserted into the hopper 2, by means of through holes 8 made in the rear wall 5 of the hopper 2, so that they are at least partially immersed in the plurality of articles. The vibrators 100 are preferably snugly inserted into the respective holes 8. The vibrators 100 are preferably operatively located close to a mouth 9 of the wells 3.

[0021] At a functional level, the vibrators 100 are configured to move the articles by means of a rotating and/or vibrating action so as to determine a uniform distribution of the articles in the wells 3. In other words, each vibrator 100 is usable by immersion in a flow or mass of rod-shaped articles to influence the positioning of the articles in the aforesaid flow or mass reaching the wells by gravity.

[0022] Structurally, according to an aspect of the present invention, each vibrator 100 comprises a first rod-shaped portion 101, having a respective longitudinal axis of extension "X", and a second rod-shaped portion 102, having a respective longitudinal axis of extension "Y". The second portion 102 is connectable to the first portion 101 so that the first and second portions 101, 102 are parallel and preferably coaxial. In other words, when connected, the first portion 101 and the second portion 102 have respective aligned axes of extension "X", "Y".

[0023] To this end, the first portion 101 and the second portion 102 have respective connecting ends 103, 104 provided with releasable mutual coupling means 105, 106. The coupling means 105, 106 are preferably located behind the hopper 2, in particular positioned at least partially outside the rear wall 5 of the hopper 2. In other words, the connection means 105, 106 are at least partially inserted into a space or gap between the motor 6 and the hopper 2.

[0024] Each vibrator 100 can take a coupled configuration, in which the first portion 101 and the second portion 102 are connected by the aforesaid coupling means 105, 106, and a non-operating configuration, in which the first portion 101 and the second portion 102 are disconnected. Figure 1 and figure 2 show the coupled configuration of a preferred embodiment of the vibrators 100 while figure 5 shows the non-operating configuration of the same embodiment of the vibrators 100.

[0025] In use, one of the portions 101, 102 is configured to be stably connected to the motor 6 while the other portion 102, 101 is configured to be placed inside the flow or mass of rod-shaped articles contained in the hopper 2. In other words, in use, one of the portions 101, 102 is at least partially inserted into the motor 6 while the other portion 102, 101 is at least partially inserted into the hopper 2.

[0026] The connection to motor 6 is of the known type. In particular, the connection to motor 6 is stable and can be achieved by suitable fastening means or by shape coupling between the motor 6 and the respective portion 101,102 of the vibrator 100.

[0027] According to a first example, the first portion 101 is configured to be stably connected to the motor 6 while the second portion 102 is configured to be placed in the flow or mass of the rod-shaped articles.

[0028] According to a second example, the first portion 101 is configured to be placed in the flow or mass of the rod-shaped articles, while the second portion 102 is configured to be stably connected to the motor 6.

[0029] For purposes of disclosure simplicity, with reference to the accompanying figures, the embodiment will be exclusively described in the continuation of the present description, where the first portion 101 is configured to be stably connected to the motor 6, while the second portion 102 is configured to be placed in the flow or mass of rod-shaped articles. According to an aspect of the present invention, the portion connectable to the motor can have a grooved shape and/or a non-circular cross-section. Alternatively, the portion connectable to the motor has a substantially circular cross-section. In the embodiment shown in the accompanying figures, the first portion 101, connectable to the motor 6, has a substantially circular cross-section.

[0030] According to an aspect of the present invention, the portion inserted into the hopper 2 can have a grooved shape and/or a non-circular cross-section. Alternatively, the portion inserted into the hopper 2 can have a substantially circular cross-section.

[0031] In the embodiment shown in the accompanying figures, the second portion 102, inserted into the hopper 2, has a grooved shape and/or a non-circular cross-section.

[0032] Structurally, according to an aspect of the present invention, the coupling means 105, 106 are of the quick-coupling type. In particular, the coupling means 105, 106 are of a quick-coupling type operable by manually manipulating the second portion 102 without the need for external tools. In other words, the second portion 102 can be simply connected to and disconnected from the first portion 101 by manual manipulation by a single operator, as will become more apparent in the continuation of the present description.

[0033] According to an aspect of the present invention, the coupling means 105, 106 are of the bayonet-coupling type: preferably, the quick-coupling means 105, 106 are configured to connect and disconnect the first portion 101 and the second portion 102 to and from each other by a movement of the "press-turn-release" type, where the pressing action is carried out by pushing the second portion towards the first portion against the opposing action of an opposing spring 107.

[0034] With reference to the embodiment shown in the accompanying figures, the connecting end 104 of the second portion 102 has a cup-shaped receiving portion 108 defining a cylindrical concavity adapted to axially receive the connecting end 103 of the first portion 101, which is shaped to match the shape of the cylindrical cavity. In other words, in use, the connecting end 103 of the first portion 10 is at least partially received in the connecting end 104 of the second portion 102 so that the first portion 101 at least partially penetrates the second portion 102.

[0035] According to an aspect of the present invention, the cup-shaped receiving portion 108 is inserted, snugly, in particular with minimum play, into the corresponding through hole 8 made in the rear wall 5 of the hopper 2.

[0036] In the preferred embodiment, the coupling means 105, 106 comprise at least one protuberant element or pin 109 made on the connecting end 103 of the first portion 101, extending transversely away from the respective connecting end 101, and at least one contoured slot 110 made on the receiving portion 108 of the second portion 102 and adapted to receive the protuberant element or pin 109 of the connecting end 103 of the first portion 101, to make a predefined coupling movement by roto-translation, in particular defining a bayonet connection.

[0037] The coupling means 105, 106 preferably comprise a pair of protuberant elements or pins 109 and a pair of contoured slots 110, mutually and radially distributed on the respective connecting ends 103, 104.

[0038] The contoured slot 110 is preferably shaped like a "serifed L". Alternatively, the contoured slot 110 is "L"-shaped.

[0039] The term "serifed L" is understood to mean that the contoured slot 110 has a first section 110a, a second section 110b, and a third section 110c, where the second section 110b is placed orthogonally to the first section 110a and the third section 110c.

[0040] The first section 110a is oriented parallel to the axis of extension "Y" of the second portion 102 and starts from the edge of the receiving portion 108 extending away from the connecting end 104. The second section 110b is oriented transversely to the axis of extension "Y" of the second portion 102, orthogonally to the first section 110a of the contoured slot 110. In particular, the second section 110b starts from the first section 110a extending transversely on the receiving portion 108. In other words, the second section 110b is connected and seamlessly made with the first section 110a and the third section 110c. The third section 110c is oriented parallel to the axis of extension "Y" of the second portion 110, orthogonally to the second section 110b. In particular, the third section 110c starts from the second section 110b in the opposite direction to the first section 110a. The third section 110c has a smaller extension than the first section 110a so as not to reach the edge of the receiving portion 108.

[0041] Preferably, irrespective of the specific "serifed L" or "L" shape, the contoured slot 110 extends radially over an angle of between 45° and 135°. In other words, the second section 110b of the contoured slot 110 has a radial extension, preferably of between 45° and 135°. Even more preferably, the contoured slot 110 extends radially through an included angle of 90°.

[0042] The first portion 101 is further provided with a radial shoulder 111: the aforesaid opposing spring 107 is placed between the radial shoulder 111 and the at least one protuberant element or pin 109, and is configured, when in a coupled configuration, to apply an axial pushing action to the second portion 102 away from the first portion 101, to oppose an accidental uncoupling of the two portions 101, 102 from each other. According to an alternative embodiment, not shown, the coupling means 105, 106 can be made so that, in use, the second portion 102 penetrates the first portion 101, i.e., the cup-shaped receiving portion is made on the first portion 101, in accordance with the general information of the invention.

[0043] At a functional level, as shown by way of example in figures 2, 3, 4 and 5, the coupling of the two portions 101, 102 takes place in accordance with the following steps.

[0044] Figure 2 shows the disconnected or non-operating configuration of the vibrator 100, where the two portions 101, 102 are disconnected. In such a step and in the next ones, the first portion 101 is connected to the motor 6, which is not shown to simplify figure 2 as well as figures 3, 4, and 5.

[0045] Figure 3 shows the step of "pressing" the second portion 102 with respect to the first portion 101. In such a step, the connecting ends 103, 104 of the two portions 101, 102 are first placed in abutment so that the coupling means 105, 106 are aligned. The second portion 102 is then pressed against the first portion 101 so that the second portion 102 is moved by translation towards the first portion 101 according to the arrow "F1": the protuberant elements or pins 109 are received in the respective contoured slots 110, and in particular in the first section 110a of the contoured slot 110, and they slide inside the respective contoured slot 110 until they abut against the second section 110b of the contoured slot 110, resulting in an end stop of the translation movement of the second portion 102 with respect to the first portion 101.

[0046] Figure 4 shows the step of "rotating" the second portion 102 with respect to the first portion 101 according to the arrow "F2": the protuberant elements or pins 109 slide in the respective contoured slots 110, and in particular in the second section 110b of the contoured slots 110, until they abut against the third section 110c of the contoured slot 110, resulting in an end stop of the rotation movement of the second portion 102 with respect to the first portion 101.

[0047] Figure 5 shows the step of "releasing" the second portion 102. In such a step, the second portion 102 is released by the operator and completes a translation movement away from the first portion 101 by means of the action applied by the opposing spring 107, according

to the arrow "F3": the protuberant elements or pins 109 slide in the respective contoured slots 110, and in particular in the third section 110c of the contoured slots 110, until they abut against the end edge of the third section 110c of the contoured slot 110, resulting in an end stop of the translation movement of the second portion 102 with respect to the first portion 101.

[0048] Instead, as for the disconnection of the second portion 102 from the first portion 101, it occurs by completing the aforesaid "press-turn-release" steps in a reverse order, performing the corresponding movements in the opposite direction to the arrows "F1 ", "F2", "F3".

[0049] According to an aspect of the present invention, the portion 101, 102 insertable into the hopper 2 can be disassembled and replaced with a corresponding replacement portion after damage or breakage of the second portion 101, 102. Likewise, such a portion 101, 102 can be disassembled and replaced with a corresponding replacement portion with a different format.

[0050] To this end, the present invention also relates to a kit for changing format in the hopper 2 for rod-shaped articles, preferably of the tobacco industry. The kit comprises a plurality of vibrators 100 where the portions 102, 101 intended to be inserted into the space of the hopper 2 are provided with different formats, in particular, different diameters and/or lengths, but with the same coupling means 105, 106 so as to be replaceable by fitting and removing them to and from corresponding non-replaceable portions 101, 102 connected to the motor 6.

[0051] The kit preferably comprises a plurality of second portions 102 provided in different formats, in particular different diameters and/or lengths, but with the same coupling means 105, 106 so as to be replaceable by fitting and removing them to and from the first non-replaceable portions 101, connected to the motor 6.

[0052] The present invention achieves the preset objects, overcoming the drawbacks highlighted by the prior art: firstly, in this respect, note that the vibrators 100 as described and/or claimed can easily be replaced by a single operator without the use of external tools. Such a result is achieved by virtue of the two-piece structure of the vibrator 100, comprising a portion 101, 102 which is stably constrained to the motor 6, and a further portion 102, 101 (intended to be inserted into the hopper 2) which is connectable to the other portion 101, 102 and by virtue of the presence of coupling means 105, 106 of the quick-coupling type. Moreover, advantageously, the kit for changing format makes the vibrators 100 highly versatile by virtue of the option of replacing the portion 101, 102 intended to be inserted into the hopper 2 with a corresponding replacement portion with a different format.

[0053] Likewise, the structure of the vibrators 100 ensures the structural integrity of the vibrator 100 and the device 1 on which the vibrator 100 is mounted. In fact, advantageously, the option of keeping a portion 101, 102 stably constrained to the motor 6 and only replacing the portion 102, 101 intended to be inserted into the hopper 2, allows not damaging the mutual connection portions of the motor 6 and the vibrator 100.

Claims

1. A vibrator (100) usable by immersion in a flow or a mass of rod-shaped articles to influence the positioning of the articles in the flow or mass, comprising a first, rod-shaped portion (101) having a respective longitudinal axis of extension (X), and a second, rod-shaped portion (102) having a respective longitudinal axis of extension (Y) and connected to the first portion (101) in such a way that the first and second portions (101, 102) are parallel and preferably coaxial, wherein one of the portions (101, 102) is configured to be stably connected to a motor (6) and the other portion (102, 101) is configured to be placed inside a flow or mass of rod-shaped articles, and wherein the first portion (101) and the second portion (102) have respective connecting ends (103, 104) provided with releasable mutual coupling means (105, 106).

2. The vibrator (100) according to claim 1, wherein the coupling means (105, 106) are of the quick coupling type, in particular a quick coupling operable by manually manipulating the second portion (102) without the need for external tools, preferably a bayonet coupling.

3. The vibrator (100) according to claim 1 or 2, wherein the coupling means (105, 106) are configured to connect and disconnect the first and the second portion (101, 102) to and from each other by a "press-turn-release" movement where the pressing action is accomplished by pushing the second portion (102) towards the first portion (101) against the opposing action of an opposing spring (107).

4. The vibrator (100) according to any one of the preceding claims, wherein the connecting end (104) of the second portion (102) has a cup-shaped receiving portion (108) defining a cylindrical concavity adapted to axially receive the connecting end (103) of the first portion (101), which is shaped to match the shape of the cylindrical cavity.

5. The vibrator (100) according to claim 4, wherein the coupling means (105, 106) comprise:

   at least one protuberant element or pin (109) made on the connecting end (103) of the first portion (101) and extending transversely away from the connecting end (103);
   at least one contoured slot (110) made on the receiving portion (108) and adapted to receive the protuberant element or pin (109) of the connecting end (103) of the first portion (101) to

make a predefined coupling movement by roto-translation, in particular defining a bayonet connection.

6. The vibrator (100) according to claim 5, wherein the contoured slot (110) is shaped like an L and/or a serifed L.

7. The vibrator (100) according to claim 6, wherein the contoured slot (110) extends radially through an angle of between 45° and 135°, the contoured slot (110) preferably extending radially through an included angle of 90°.

8. The vibrator (100) according to any one of the preceding claims 5 to 7, wherein the first portion (101) is provided with a radial shoulder (111) and wherein the radial shoulder (111) and the at least one protuberant element or pin (109) have, interposed between them, an opposing spring (107) configured, when in a coupled configuration, to apply an axial pushing action on the second portion (102) away from the first portion (101) to oppose an accidental uncoupling of the two portions (101, 102) from each other.

9. The vibrator (100) according to any one of the preceding claims, wherein the portion (101, 102) connectable to the motor has a grooved shape and/or a non-circular cross section.

10. A device (1) for forming groups of rod-shaped articles, comprising:

a hopper (2) defining a space for containing a plurality of rod-shaped articles;
a plurality of vibrators (100) made according to any one of the preceding claims, the vibrators (100) having one of the two portions (101, 102) inserted at least partly in the hopper (2) so that, in use, it is at least partly immersed in the plurality of articles; the vibrators (100) being configured to move the articles by a rotating and/or vibrating action;
a motor (6) for driving the vibrators (100), located behind the hopper (2) and to which the vibrators (100) are connected in a cantilever fashion.

11. The device (1) according to claim 10, wherein the coupling means (105, 106) are located behind the hopper (2), in particular positioned at least partly outside a rear wall (5) of the hopper (2).

12. The device (1) according to claim 10 or 11 when dependent on claim 4, wherein the cup-shaped receiving portion (108) is inserted snugly, in particular with minimal play, in a corresponding through hole (8) made in a rear wall (5) of the hopper (2).

13. The device (1) according to any one of the preceding claims 10 to 12, wherein the vibrators (100) are mounted on the motor (6) in a cantilever fashion.

14. A kit for changeover in a hopper (2) for rod-shaped articles of the tobacco industry, comprising a plurality of vibrators (100) made in accordance with any one of the preceding claims 1 to 9, wherein the portions (101, 102) intended to be inserted in the space in the hopper (2) are provided with different formats, in particular, different diameters and/or lengths, but with the same coupling means (105, 106), so as to be replaceable by fitting and removing them to and from corresponding non-replaceable portions (102, 101) connected to a motor (6).

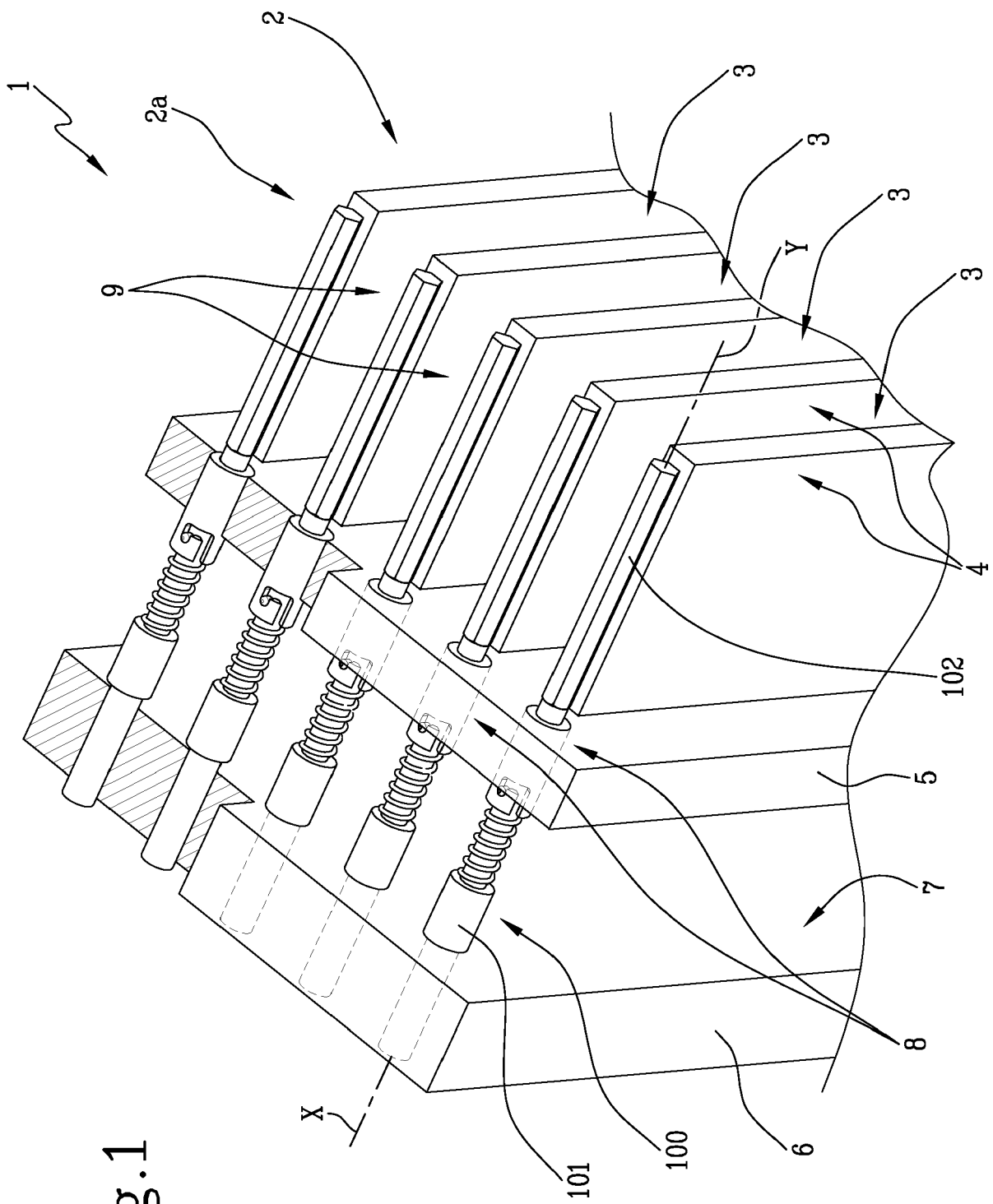


Fig.1

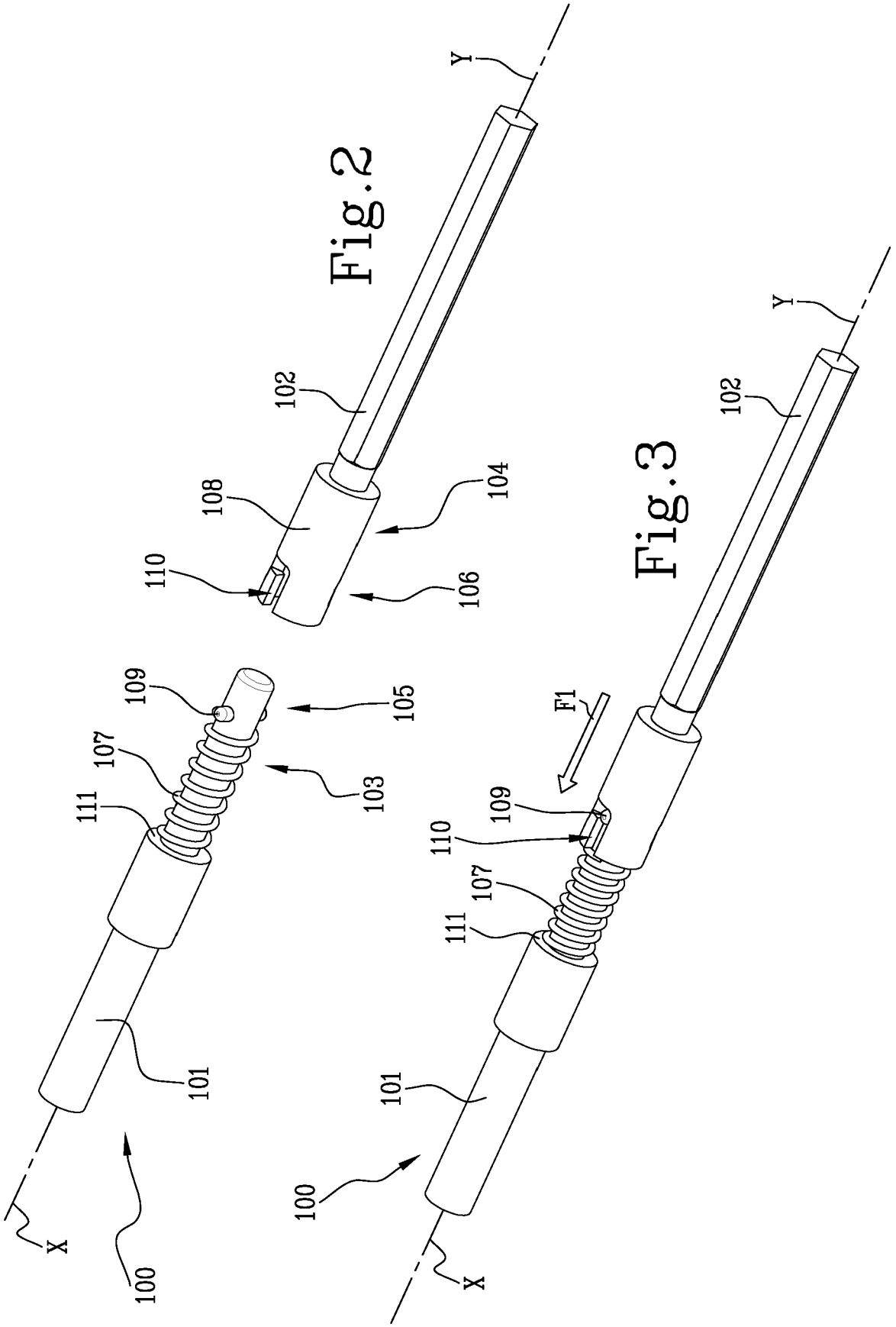

Y
102
108
104
110
106
109
105
107
103
111
101
100
X

Fig.2

Y
102
F1
109
110
107
111
101
100
X

Fig.3

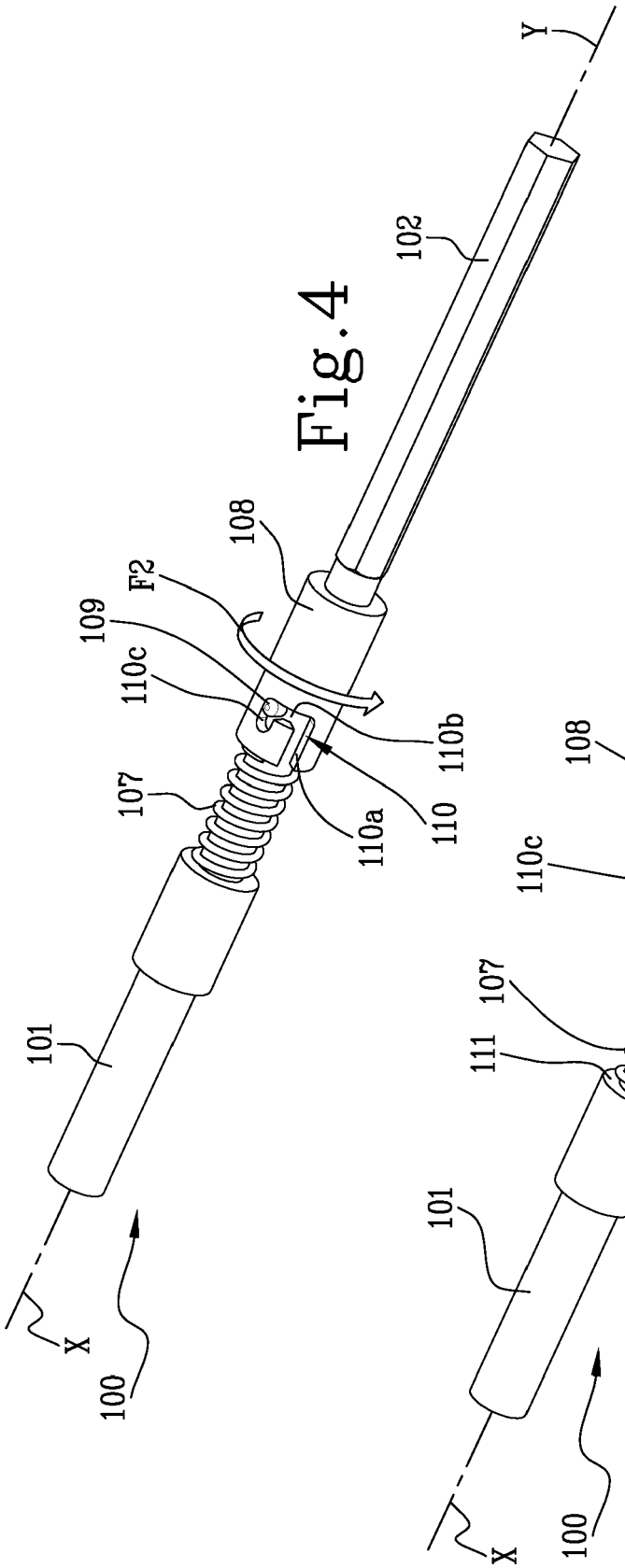

Y
102
108
F2
109
110c
110b
107
110a
110
101
X
100

Fig.4

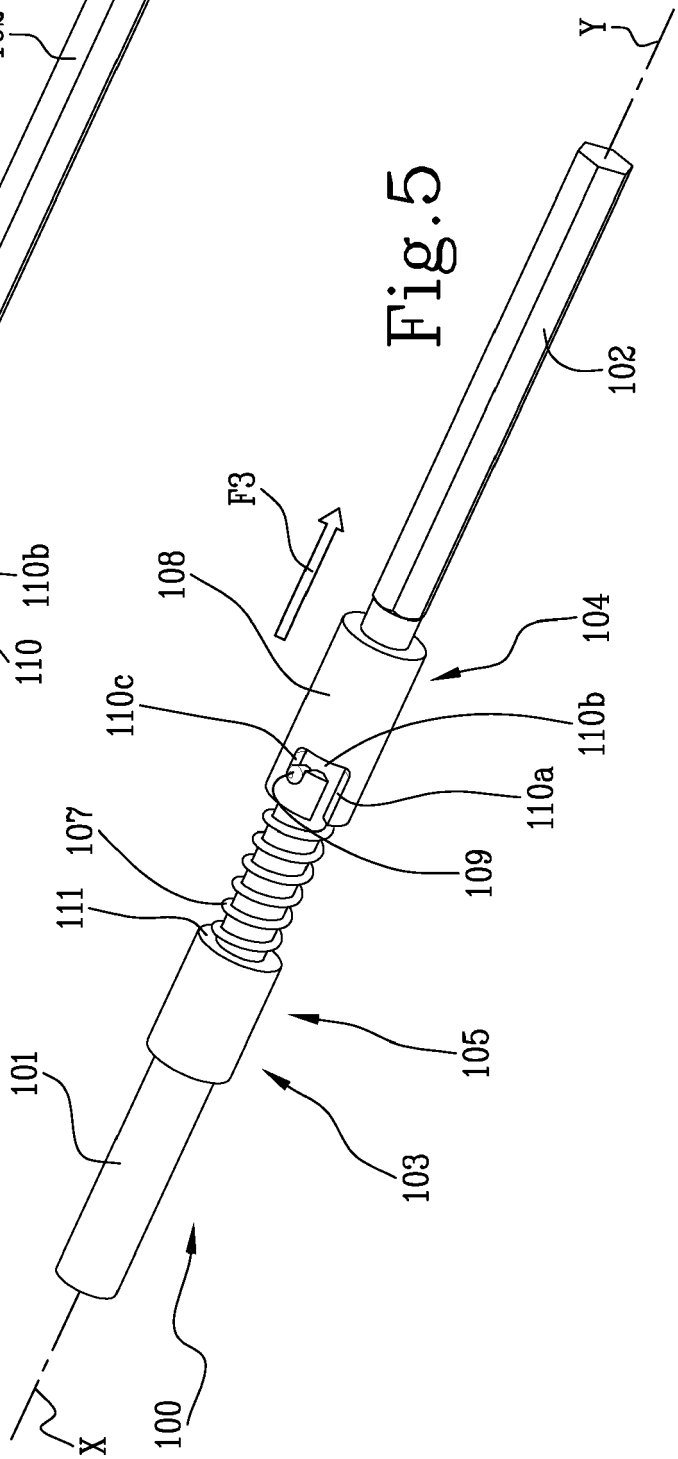

Y
102
F3
108
104
110c
110b
110a
107
109
111
101
105
103
X
100

Fig.5

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 23 21 9739

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	EP 0 539 324 B1 (TABAC FAB REUNIES SA [CH]) 2 November 1995 (1995-11-02)	1,4, 9-11,13, 14	INV. A24C5/32 A24C5/354
Y	* column 3, line 35 - column 4, line 31 *	2,3,5-8	B65G27/16
A	* column 5, line 44 - column 6, line 8 * * figures 1-4 *	12	B65G65/44 B65B19/04
Y	Anonymous: "Bayonet mount - Wikipedia", Wikipedia, 29 May 2019 (2019-05-29), XP055684465, Retrieved from the Internet: URL:https://en.wikipedia.org/w/index.php?title=Bayonet_mount&oldid=899225808 [retrieved on 2020-04-08] * the whole document *	2,3,5-8	
A	EP 0 141 322 B1 (FOCKE & CO [DE]) 2 September 1987 (1987-09-02) * the whole document *	1-14	
A	US 4 487 001 A (TOLASCH GERHARD [DE] ET AL) 11 December 1984 (1984-12-11) * column 8, line 64 - column 9, line 16 * * figures 1-7 *	1-14	TECHNICAL FIELDS SEARCHED (IPC) A24C B65G B65B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	15 May 2024	Cabrele, Silvio

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 23 21 9739

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.

15-05-2024

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0539324 B1	02-11-1995	DE 69205797 T2	30-05-1996
		EP 0539324 A1	28-04-1993
EP 0141322 B1	02-09-1987	BR 8405606 A	10-09-1985
		CA 1242419 A	27-09-1988
		DE 3339703 A1	23-05-1985
		EP 0141322 A1	15-05-1985
		JP H0314692 B2	27-02-1991
		JP S60110615 A	17-06-1985
		US 4646938 A	03-03-1987
US 4487001 A	11-12-1984	DE 2709700 A1	25-01-1979
		FR 2382202 A1	29-09-1978
		GB 1599336 A	30-09-1981
		IT 1158660 B	25-02-1987
		JP S6255833 B2	21-11-1987
		JP S53124700 A	31-10-1978
		US 4207720 A	17-06-1980
		US 4487001 A	11-12-1984

EPO FORM P0459

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