

(19)



(11)

EP 2 742 811 B1

(12)

EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention
of the grant of the patent:
12.08.2015 Bulletin 2015/33

(51) Int Cl.:
A24C 5/32 (2006.01)

(21) Application number: **13195936.3**

(22) Date of filing: **05.12.2013**

(54) Device for transferring pieces of filter or cigarette rod

Vorrichtung zum Übertragen von Filter- oder Zigarettenstrangteilen

Dispositif de transfert de pièces de tige de filtre ou de cigarette

(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**

(30) Priority: **11.12.2012 IT BO20120664**

(43) Date of publication of application:
18.06.2014 Bulletin 2014/25

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EP 2 742 811 B1

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Description

[0001] This invention relates to a device for transferring pieces of filter or cigarette rod.

[0002] Prior art transfer devices of this kind (see e.g. EP 2 505 086 A1) are used in cigarette making machines to transfer pieces of filter rod from a pickup station to a release station where the pieces of filter rod are combined with respective pieces of cigarette rod to make finished cigarettes.

[0003] These devices basically comprise a supporting drum which revolves about a main axis of rotation and a plurality of carrier elements or satellite elements, each mounted rotatably on the supporting drum in such a way as to rotate relative thereto about a respective axis of rotation which is parallel to the main axis.

[0004] Each satellite element supports a gripper head which rotates about an axis of rotation also parallel to the main axis and which is movable, as the drum revolves, between a configuration for picking up the filters at the pickup station and a configuration for releasing the filters at the release station.

[0005] Usually, each gripper head has a pair of seats in which respective pieces of filter or cigarette rod are held by suction during transfer between the pickup station and the release station.

[0006] Further, as the drum revolves, each seat of each gripper head remains parallel to itself for each angular position of the drum.

[0007] The rotation of the movable carrier elements and of the gripper heads about the respective axes of rotation is accomplished through a transmission system driven by the rotation of the supporting drum and housed therein.

[0008] The prior art transmission systems have several disadvantages, however.

[0009] In effect, the transmission system comprises a plurality of gears movable with reciprocating or uniform rotational motion and, in particular, at least one pair of gears for each movable carrier element, whose motion produces noise and vibrations causing imprecise positioning of the gripper heads.

[0010] Moreover, the gear teeth are subject to wear and heating which cause further slack to be taken into account when assembling and setting up the transmission system.

[0011] From the above it may be inferred that the prior art system are extremely complex, difficult to assemble - because they require painstakingly meticulous adjustments - and relatively high in cost.

[0012] In this context, the main technical purpose of this invention is to propose a device for transferring pieces of filter or cigarette rod which is free of the above-mentioned disadvantages.

[0013] More specifically, this invention has for an aim to propose a device for transferring pieces of filter or cigarette rod which is structurally simpler, and thus easier to assemble and less expensive, than devices used for

the same purpose known in the prior art.

[0014] The technical purpose and aims specified are substantially achieved by a device for transferring pieces of filter or cigarette rod as set out in the independent claim 1.

[0015] Further features of the invention and its advantages are more apparent in the non-limiting description below, with reference to a preferred but non-exclusive embodiment of a transfer system, as illustrated in the accompanying drawings, in which:

- Figure 1 is a schematic front view of a device for transferring pieces of filter or cigarette rod according to this invention;
- Figure 2 illustrates the device of Figure 1 in a sectional view, with some parts cut away in order to better illustrate others.

[0016] With reference to Figure 1, the numeral 1 denotes a device for transferring pieces of filter rod 2 or of cigarette rod.

[0017] The device 1 is preferably mounted on a cigarette making machine capable of operating simultaneously on two continuous filter rods advancing in parallel with each other.

[0018] The device 1 transfers a pair of pieces 2 from a pickup station 7 to a release station 8.

[0019] More specifically, at the pickup station 7, the pieces 2 of filter, obtained by cutting continuous filter rods, are picked up and at the release station 8, the pieces 2 of filter rod are combined with respective pieces of cigarette rod.

[0020] The transfer device 1 comprises a supporting drum 3 mounted rotatably about an axis of rotation A1.

[0021] The drum 3 comprises at least one satellite element 4 having a respective gripper head 5 for picking up at least one piece 2 of filter rod.

[0022] Preferably, each gripper head 5 is equipped with a pair of seats 6 for simultaneously holding and transferring a pair of pieces 2.

[0023] In the embodiment illustrated, the drum 3 comprises a plurality of satellite elements 4 which are equispaced from each other along the periphery of the drum 3 itself.

[0024] The satellite element 4 is driven in rotation by the drum 3, thus rotating about the first axis of rotation A1.

[0025] The satellite element 4 also rotates about its own axis of rotation, referred to as second axis of rotation A2, parallel to the first axis of rotation A1.

[0026] The transfer device 1 comprises movement means 9 for driving the satellite elements 4 and able to impart rotation to the satellite element 9 itself about the axis of rotation thereof, that is, about the second axis of rotation A2, as the drum 3 revolves about the first axis of rotation A1.

[0027] Thus, each satellite element 2 is rotated about the first axis of rotation A1 by the action of the drum 3 and is also driven in rotation about its own axis of rotation,

that is the second axis of rotation A2, by the action of the respective movement means 9.

[0028] According to the invention, the movement means 9 comprise a transmission unit 19 and an actuator member 21 associated with the transmission unit 19.

[0029] The transmission unit 19 comprises a sleeve 10 connected to the satellite element 4 and a shaft 11 movable along a direction parallel to its own main axis B, housed at least partly in the sleeve 10 and screwably engaged therewith by a helical profile 20. More specifically, the actuator member 21 is engaged with the shaft 11 of the transmission unit 19.

[0030] The sleeve 10 has an internal chamber 13 which receives the shaft 11 in such a way as to surround at least the part of it which is screwably engaged therewith.

[0031] More specifically, the shaft 11 has on its outside surface a splined guide 14 defining the helical profile 20 of predetermined pitch P.

[0032] The internal chamber 13 of the sleeve 10 also has a helical profile, which matches the helical profile of the splined guide 14 of the shaft 11.

[0033] A plurality of spherical elements 15 are inserted in the splined guide 14 in such a way as to be interposed between the shaft 11 and the sleeve 10.

[0034] Advantageously, the spherical elements 15, by rolling, allow the sleeve 10 and the shaft 11 to move relative to each other.

[0035] The coupling between the shaft 11 and the sleeve 10 through the agency of the helical profile 20 allows the translational or linear motion of the shaft 11 to be converted into the rotational motion of the sleeve 10.

[0036] In effect, the helical profile imparts helical motion composed of translational motion and rotational motion, so that translation is accomplished by the shaft 11 and rotation by the sleeve 10. Preferably, the satellite element 4 and the sleeve 10 are coaxial parts, so that a rotation of the sleeve 10 corresponds to a rotation of the respective satellite element 4.

[0037] Advantageously, the satellite element 4 is connected directly to the sleeve 10, without any transmission element being interposed between them.

[0038] In order to constrain the sleeve 10 to be only rotated, the transmission unit 19 comprises a bush 16 which is rotatably coupled to the sleeve 10.

[0039] The bush 16 defines a first locking element by which the sleeve 10 is locked to the supporting drum 3.

[0040] That way, while the shaft 11 is translated, the bush 16 prevents the sleeve 10 from being translated relative to the selfsame shaft 11 along a direction parallel to the main axis B.

[0041] In order to constrain the shaft 11 to be only translated, the transmission unit 19 comprises a tube 17 which is slidably coupled to the shaft 11.

[0042] The tube 17 defines a second locking element by which the shaft 11 is locked to the supporting drum 3.

[0043] That way, while the shaft 11 is translated, the tube 17 prevents it from rotating about the main axis B of the selfsame shaft 11.

[0044] From what is described above, it follows that the shaft 11 moves only by translational or linear motion along a direction parallel to the main axis B and that the sleeve 10 moves only by rotational motion about the main axis B.

[0045] In practice, the cylindrical shaft 11 and the sleeve 10 respectively define a threaded shaft and a lead nut of a recirculating ball screw assembly 18.

[0046] The translational drive is imparted to the shaft 11 through the actuator member 21.

[0047] The actuator member 21 comprises a cam 12, which rotates about the first axis of rotation A1 of the drum 3.

[0048] The cam 12 has a profile for engaging with the shaft 11 with at least a first shaped stretch able to impart a translational movement to the selfsame shaft 11 in such a way that the gripper head 5 of the satellite element 4 is kept parallel to itself, according to an operating configuration, for each angular position of the drum 3 between the pickup station 7 and the release station 8.

[0049] More precisely, with reference in particular to Figure 1, in the operating configuration of the gripper heads 7, the respective seats 6 maintain their positions in respective horizontal planes. Advantageously, only between the pickup station 7 and the release station 8 does the transmission unit 19 allow gripper heads 5 of the satellite elements 4 to remain parallel to themselves, that is to say, do the respective seats 6 maintain their positions in respective horizontal planes, for each angular position of the drum 3, unlike the prior art, where the gripper heads 5 remained parallel to themselves in all the angular positions of the drum 3 during its rotation.

[0050] In the circular sector following the release station 8, that is to say, while the gripper heads 5 travel from the release station 8 back to the pickup station 7, each of the gripper heads 5 is rotated about its respective second axis of rotation A2 to return to its operating configuration.

[0051] The cam 12 has a profile by which it engages the shaft 11 and which has at least a second stretch which is shaped to impart a translational movement such that from the release station 8 to the pickup station 7, the gripper head 5 of the satellite element 4 is returned to its operating configuration at the pickup station 7 by rotation about its respective second axis of rotation A2.

[0052] In order to impart the translational movements, the engagement profiles of the cam 12 are shaped stretches, each having a certain inclination to the vertical of the cam 12.

[0053] The engagement profiles of the cam 12 are shaped in such a way as to cause the shaft 11 to advance in parallel to the main axis B in a first direction, indicated by the arrow F1, and in a second direction, indicated by the arrow F2, opposite to the first direction.

[0054] The rotation of the satellite element 4, connected to the respective sleeve 10, is a function of the pitch P of the helical guide 14 formed on the cylindrical shaft 11.

[0055] The rotation of the sleeve 10 is in turn converted

to translation to be imparted to the shaft 11 through the agency of the engagement profile of the cam 12.

[0056] Consequently, the translation of the shaft 11 along its main axis B and the shaped profile of the cam 12 also depend on the pitch P of the helical guide 14.

[0057] Preferably, a quarter of the helicoid pitch corresponds to a rotation through approximately 90 sexagesimal degrees of the sleeve 10, and thus of the satellite element 4.

[0058] Preferably, the pitch of the helical guide is as large as possible in order to minimize positioning errors.

[0059] The invention as described above brings important advantages.

[0060] A first advantage is the constructional simplicity of the transfer device 1 because the transmission unit 19 of each satellite element 4 is no longer housed inside the drum 3, as in the prior art, but is mounted peripherally of the drum 3, in alignment with the respective satellite element 4. This does away with the need for angle transmission devices and thus allows significantly higher precision.

[0061] Furthermore, certain parts of the transmission unit 19, such as the shaft 11 and the sleeve 10, are used in place, for example, of gears and appreciably reduce vibrations and noise.

[0062] Another advantage is given by the ease of assembly and setting up of the transmission unit 19 and actuator member 21, since the shaft 11 and the sleeve 10 are pre-assembled and coupled to each other before being installed in the device 1. This, combined with the fact that these parts can advantageously be preloaded makes it possible to minimize slack during operation.

Claims

1. A device for transferring pieces of filter or cigarette rod, comprising a drum (3) revolving about a first axis of rotation (A1), at least one satellite element (4) comprising a respective gripper head (5) for picking up at least one piece of filter or cigarette rod (2) and which is movable between a pickup station (7) where the piece (2) is picked up and a release station (8) where the selfsame piece (2) is released; the satellite element (4) rotating about a second axis of rotation (A2) parallel to the first axis of rotation (A1); the transfer device (1) comprising movement means (9) for driving the satellite element (4) and being **characterized in that** the movement means (9) comprise a transmission unit (19) comprising a sleeve (10) connected to the satellite element (4) and a shaft (11) movable along a direction parallel to its own main axis (B), housed at least partly in the sleeve (10) and screwably engaged therewith by a helical profile (20), the movement means comprising an actuator member (21) associated with the transmission unit (19) and engaged with the shaft (11); the actuator member (21) causing translation of the shaft (11)

along a direction parallel to the main axis (B); the translation, through the agency of the helical profile (20), in turn causing the sleeve (10) and the respective satellite element (4) to rotate about the second axis of rotation (A2).

2. The transfer device according to claim 1, **characterized in that** the transmission unit (19) comprises a first locking element (16) by which the sleeve (10) is connected to the supporting drum (3); the first locking element (16) being rotatably coupled to the sleeve (10).
3. The transfer device according to claim 1 or 2, **characterized in that** the transmission unit (19) comprises a second locking element (17) by which the shaft (11) is connected to the supporting drum (3); the shaft (11) being slidably coupled to the second locking element (17).
4. The transfer device according to claim 3, **characterized in that** the actuator member (21) comprises a cam (12), rotatable about the first axis of rotation (A1) and having a profile for engaging with the shaft (11) with at least a first stretch shaped to impart a translational movement to the selfsame shaft (11) in such a way that the gripper head (5) of the satellite element (4) is kept parallel to itself, according to an operating configuration, for each angular position of the drum (3) between the pickup station (7) and the release station (8).
5. The transfer device according to claim 4, **characterized in that** the cam (12) has a profile for engaging with the shaft (11) with at least a second stretch for imparting a translational movement to the selfsame shaft (11) in such a way that from the release station (8) to the pickup station (7), the gripper head (5) of the satellite element (4) is returned to its operating configuration at the pickup station (7).
6. The transfer device according to claim 5, **characterized in that** from the release station (8) to the pickup station (7), the gripper head (5) of the respective satellite element (4) rotates about the second axis of rotation (A2).
7. The transfer device according to any of the claims from 1 to 6, **characterized in that** the shaft (11) has on its outside surface a splined guide (14) defining the helical profile (20) of predetermined pitch (P); the rotation of the satellite element (4) being a function of the pitch (P) of the helical, splined guide (14).
8. The transfer device according to claim 7, **characterized in that** the translation of the shaft (11) along its main axis (B) and the shaped profile of the cam (12) depend on the pitch (P) of the helical, splined guide

(14).

9. The transfer device according to any of the claims from 1 to 8, **characterized in that** the shaft (11) and the sleeve (10) respectively define a threaded shaft and a lead nut of a recirculating ball screw assembly (18).

Patentansprüche

1. Vorrichtung zum Übertragen von Filter- oder Zigarettenstrangteilen, umfassend eine Trommel (3), die sich um eine erste Rotationsachse (A1) dreht, mindestens ein Satellitenelement (4), umfassend einen jeweiligen Greiferkopf (5), um mindestens ein Filter- oder Zigarettenstrangteil (2) aufzunehmen, das zwischen einer Aufnahmestation (7), in der das Teil (2) aufgenommen wird, und einer Freigabestation (8), in der das Teil (2) freigegeben wird, beweglich ist, wobei sich das Satellitenelement um eine zweite Rotationsachse (A2) dreht, die parallel zur ersten Rotationsachse (A1) verläuft, und die Übertragungsvorrichtung (1) Bewegungsmittel (9) für den Antrieb des Satellitenelements (4) umfasst, **dadurch gekennzeichnet, dass** die Bewegungselemente (9) eine Antriebseinheit (19) umfassen, umfassend eine Hülse (10), verbunden mit dem Satellitenelement (4), und eine Welle (11), bewegbar entlang einer Richtung, die parallel zu ihrer eigenen Hauptachse (B) verläuft, untergebracht mindestens teilweise in der Hülse (10) und verschraubbar im Eingriff damit mittels eines Schraubenprofils (20), wobei die Bewegungsmittel ein Betätigungsorgan (21) umfassen, assoziiert mit der Antriebseinheit (19) und im Eingriff mit der Welle (11), wobei das Betätigungsorgan (21) die Verschiebung der Welle (11) entlang einer Richtung, die parallel zur Hauptachse (B) verläuft, verursacht, wobei die Verschiebung mittels der Mitwirkung des Schraubenprofils (20) wiederum die Hülse (10) und das jeweilige Satellitenelement (4) veranlassen, sich um die zweite Rotationsachse (A2) zu drehen.
2. Übertragungsvorrichtung nach Anspruch 1, **dadurch gekennzeichnet, dass** die Antriebseinheit (19) ein erstes Verriegelungselement (16) umfasst, mittels dessen die Hülse (10) mit der Haltetrommel (3) verbunden ist, wobei das Verriegelungselement (16) drehbar mit der Hülse (10) gekuppelt ist.
3. Übertragungsvorrichtung nach Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** die Antriebseinheit (19) ein zweites Verriegelungselement (17) umfasst, mittels dessen die Welle (11) mit der Haltetrommel (3) verbunden ist, wobei die Welle (11) verschiebbar mit dem zweiten Verriegelungselement (17) gekuppelt ist.

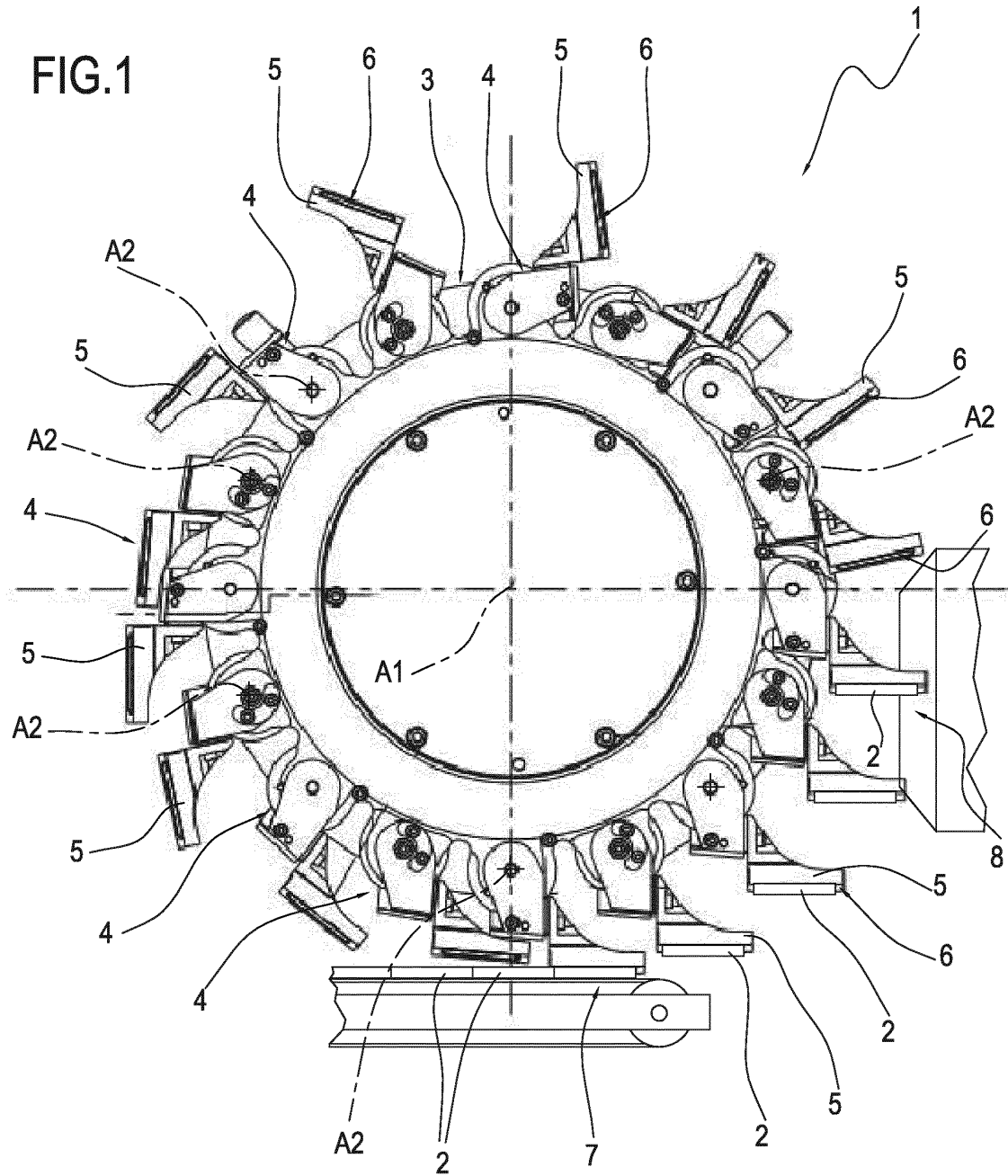
4. Übertragungsvorrichtung nach Anspruch 3, **dadurch gekennzeichnet, dass** das Betätigungsorgan (21) einen Nocken (12) umfasst, drehbar um die erste Rotationsachse (A1) und aufweisend ein Profil, um mit der Welle (11) mit mindestens einem ersten Teilstück in Eingriff zu gelangen, geformt, um der Welle (11) eine Verschiebungsbewegung zu verleihen, sodass der Greiferkopf (5) des Satellitenelements (4) gemäß einer Betriebskonfiguration für jede Winkelposition der Trommel (3) zwischen der Aufnahmestation (7) und der Freigabestation (8) parallel dazu gehalten wird.
5. Übertragungsvorrichtung nach Anspruch 4, **dadurch gekennzeichnet, dass** der Nocken (12) ein Profil aufweist, um mit der Welle (11) mit mindestens einem zweiten Teilstück in Eingriff zu gelangen, um der Welle (11) eine Verschiebungsbewegung zu verleihen, sodass der Greiferkopf (5) des Satellitenelements (4) von der Freigabestation (8) zur Aufnahmestation (7) wieder in die Betriebskonfiguration (7) an der Aufnahmeposition gefahren wird.
6. Übertragungsvorrichtung nach Anspruch 5, **dadurch gekennzeichnet, dass** sich der Greiferkopf (5) des jeweiligen Satellitenelements (4) von der Freigabestation (8) zur Aufnahmestation (7) um die zweite Rotationsachse (A2) dreht.
7. Übertragungsvorrichtung nach einem der Ansprüche 1 bis 6, **dadurch gekennzeichnet, dass** die Welle (11) an der äußeren Oberfläche eine Keilführung (14) aufweist, definierend das Schraubenprofil (20) mit einer vorgegebenen Steigung (P), wobei die Drehung des Satellitenelements (4) eine Funktion der Steigung (P) der schraubenförmigen Keilführung (14) ist.
8. Übertragungsvorrichtung nach Anspruch 7, **dadurch gekennzeichnet, dass** die Verschiebung der Welle (11) entlang ihrer Hauptachse (B) und das geformte Profil des Nockens (12) von der Steigung (P) der schraubenförmigen Keilführung (14) abhängen.
9. Übertragungsvorrichtung nach einem der Ansprüche 1 bis 8, **dadurch gekennzeichnet, dass** die Welle (11) und die Hülse (10) jeweils eine Gewindelwelle und ein Muttergewinde einer Kugelumlaufspindelgruppe (18) definieren.

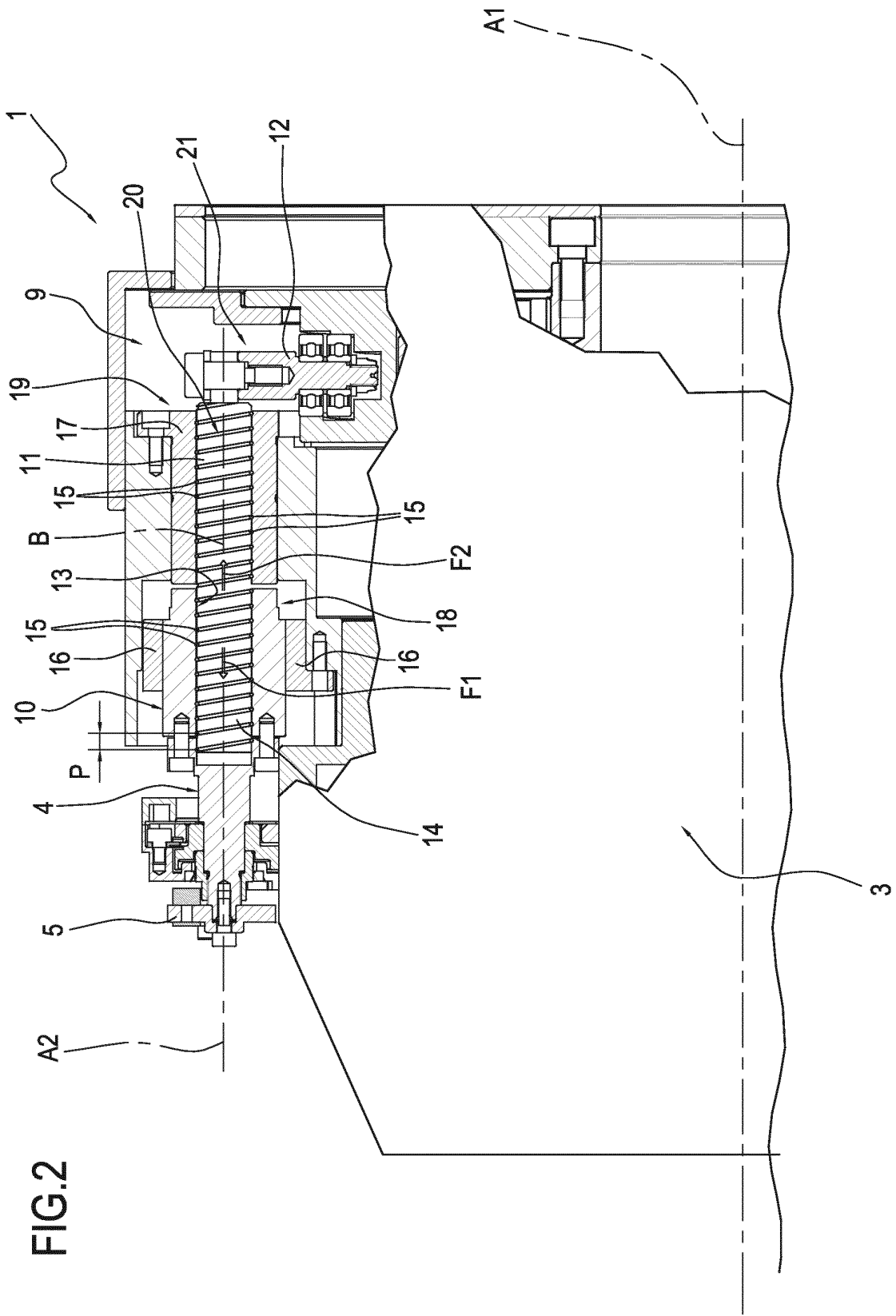
Revendications

1. Dispositif de transfert de bouts filtres ou de cigarette, comprenant un tambour (3) tournant autour d'un premier axe de rotation (A1), au moins un élément satellite (4) comprenant une tête de préhension respective (5) pour prélever au moins un bout filtre ou

- de cigarette (2) et qui est mobile entre un poste de prélèvement (7), où le bout (2) est prélevé, et un poste de libération (8), où le même bout (2) est libéré ; l'élément satellite (4) tournant autour d'un second axe de rotation (A2) parallèle au premier axe de rotation (A1) ; le dispositif de transfert (1) comprenant des moyens de déplacement (9) servant à entraîner l'élément satellite (4) et étant **caractérisé en ce que** les moyens de déplacement (9) comprennent une unité de transmission (19) comprenant un manchon (10) relié à l'élément satellite (4) et un arbre (11) mobile le long d'une direction parallèle à son propre axe (B), logé au moins en partie dans le manchon (10) et se mettant en prise par vissage par un profil hélicoïdal (20), les moyens de déplacement comprenant un organe d'actionnement (21) associé à l'unité de transmission (19) et se mettant en prise avec l'arbre (11) ; l'organe d'actionnement (21) provoquant la translation de l'arbre (11) le long d'une direction parallèle à l'axe principal (B) ; la translation, au moyen du profil hélicoïdal (20), provoquant à son tour la rotation autour du second axe de rotation (A2) du manchon (10) et de l'élément satellite respectif (4).
2. Dispositif de transfert selon la revendication 1, **caractérisé en ce que** l'unité de transmission (19) comprend un premier élément de blocage (16) par lequel le manchon (10) est relié au tambour de support (3) ; le premier élément de blocage (16) étant accouplé de façon rotative au manchon (10).
 3. Dispositif de transfert selon les revendications 1 ou 2, **caractérisé en ce que** l'unité de transmission (19) comprend un second élément de blocage (17) par lequel l'arbre (11) est relié au tambour de support (3) ; l'arbre (11) étant accouplé de façon coulissante au second élément de blocage (17).
 4. Dispositif de transfert selon la revendication 3, **caractérisé en ce que** l'organe d'actionnement (21) comprend une came (12), pouvant pivoter autour du premier axe de rotation (A1) et ayant un profil pouvant se mettre en prise avec l'arbre (11) ayant au moins une première portion ayant une forme adaptée pour imprimer un mouvement de translation au même arbre (11) de sorte que la tête de préhension (5) de l'élément satellite (4) soit maintenue parallèle à elle-même, selon une configuration de fonctionnement, pour chaque position angulaire du tambour (3) entre le poste de prélèvement (7) et le poste de libération (8).
 5. Dispositif de transfert selon la revendication 4, **caractérisé en ce que** la came (12) possède un profil se pouvant se mettre en prise avec l'arbre (11) ayant au moins une seconde portion destinée à imprimer un mouvement de translation au même arbre (11) de sorte que du poste de libération (8) au poste de prélèvement (7), la tête de préhension (5) de l'élément satellite (4) revienne à sa configuration de fonctionnement au niveau du poste de prélèvement (7).
 6. Dispositif de transfert selon la revendication 5, **caractérisé en ce que** du poste de libération (8) au poste de prélèvement (7), la tête de préhension (5) de l'élément satellite (4) respectif tourne autour du second axe de rotation (A2).
 7. Dispositif de transfert selon l'une quelconque des revendications de 1 à 6, **caractérisé en ce que** l'arbre (11) possède sur sa surface externe un guide cannelé (14) définissant le profil hélicoïdal (20) de pas prédéfini (P) ; la rotation de l'élément satellite (4) étant fonction du pas (P) du guide (14) cannelé hélicoïdal.
 8. Dispositif de transfert selon la revendication 7, **caractérisé en ce que** la translation de l'arbre (11) le long de son axe principal (B) et le profil façonné de la came (12) dépendent du pas (P) du guide (14) cannelé hélicoïdal.
 9. Dispositif de transfert selon l'une quelconque des revendications de 1 à 8, **caractérisé en ce que** l'arbre (11) et le manchon (10) définissent respectivement un arbre fileté et un écrou fileté d'un assemblage par vis à recirculation de billes (18).

FIG.1





REFERENCES CITED IN THE DESCRIPTION

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