

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
18 June 2009 (18.06.2009)

PCT

(10) International Publication Number
WO 2009/074540 A1

(51) International Patent Classification:
A24D 3/02 (2006.01)

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(21) International Application Number:
PCT/EP2008/067032

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(22) International Filing Date:
8 December 2008 (08.12.2008)

(81) Designated States (unless otherwise indicated, for every
kind of national protection available): AE, AG, AL, AM,
AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA,
CH, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE,
EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID,
IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK,
LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW,
MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT,
RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TJ,
TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM,
ZW.

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
P.383995 10 December 2007 (10.12.2007) PL

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(84) Designated States (unless otherwise indicated, for every
kind of regional protection available): ARIPO (BW, GH,
GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM,
ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM),
European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI,
FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MT, NL,

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[Continued on next page]

(54) Title: METHOD OF COMPILING GROUPS OF SEGMENTS IN A PROCESS OF PRODUCING MULTISEGMENT FIL-
TERS AND APPARATUS FOR PREPARING AND COMPILING SEGMENTS IN GROUPS IN A PROCESS OF PRODUCING
MULTISEGMENT FILTERS

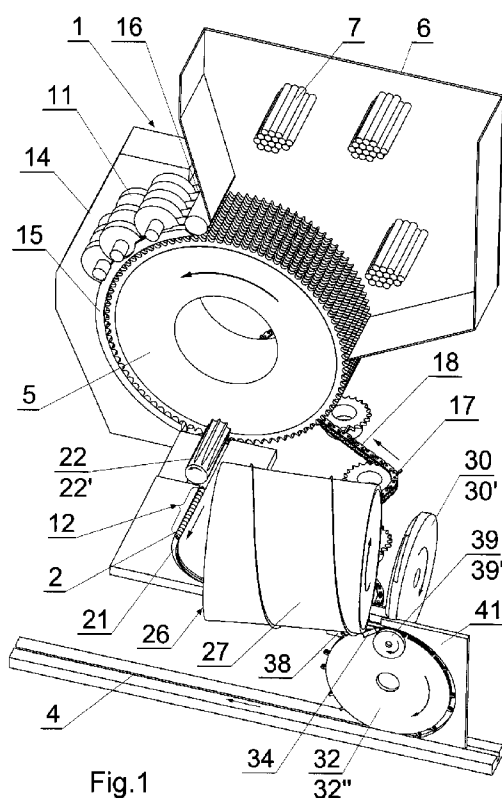


Fig.1

(57) Abstract: Method consists in passing equal segments (2) of one
type at uniform rate to a transferring element (32), which places each
segment (2) separately on an exit path (4), whereas setting of the seg-
ments (2) in group (3) of segments (2) repeated on the exit path (4) is
defined by delay in collecting segments (2) by a transferring element (32)
in each module (1) of the apparatus. The apparatus is provided with a
guiding element (22) positioned by a cutting drum (5) and constitutes
a wall closing a channel (21) for a set (12) of segments (2) drawn out
of a flute (9) on the drum (5), and the set (12) is led through the chan-
nel (21) with the aid of a dog (17) of chain (18) and is taken possession
of by a worm surface (27) of a pushing together drum (26). A separa-
tor (30) positioned at the end of the channel (21) which separates single
segments (2) has a form of a disc cam pushing out the segment (2) onto
the transferring element (32) between two neighbouring drivers (33) into
a chamber (40) created by a supporting element (39).



NO, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Declaration under Rule 4.17:

- *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))*

Published:

- *with international search report*

**METHOD OF COMPILING GROUPS OF SEGMENTS IN A PROCESS OF
PRODUCING MULTISEGMENT FILTERS AND APPARATUS FOR PREPARING AND
COMPILING SEGMENTS IN GROUPS IN A PROCESS OF PRODUCING
MULTISEGMENT FILTERS**

The subject of the invention is a method of compiling groups of segments according to a continuous endwise manner in a process of producing multi segment filters used in tobacco industry for cigarettes and apparatus for preparing and compiling segments in groups for producing said filters.

There is a demand in tobacco industry for multi segment filters used in producing cigarettes, the filters consisting of at least two types of segments made of different filtrating materials, whereas they may be soft filters filled with e.g. fibrous material, paper, monoacetate or hard segments filled with granulate, sinter elements or hollow cylinders. Compiled set of segments is then properly divided into filters used for producing cigarettes. One of methods of compiling multi segment filters is a crosswise method, the principle of which has been presented many times in patent descriptions belonging to a German company HAUNI AG. One of them is a published USA patent application No. US 2004/237972 A1 dealing with an apparatus for compiling groups of filter segments for producing multi segment filters according to a continuous manner, operating in a crosswise method. The apparatus is divided into a certain number of individual functional units-modules set together, whereas at least two segments of different type fall to each produced multi segment filter. The filter segments are transported and

forwarded by properly set drums, on which cutting segments and compiling groups of segments is effected. The groups of segments compiled transversely to the axis of a group of segments are farther transported with the aid of drums or belt conveyor equipped with flutes for filter segments the flutes being arranged transversely to the direction of transport, till they are delivered to a commonly known device for producing endless filter rod. The crosswise method of compiling multi segment filters is very expensive for necessity of applying many intermediate drums and cooperating cutting units in the apparatus. Another method of compiling multi segment filters is an endwise method, the principle of which has been presented many times in patent description belonging to an English company MOLINS Ltd. For example a British patent description No. GB 971491 discloses a machine for producing multi segment filters consisting of two different segments, producing of the filters is effected by cutting filter rods being displaced on periphery of two separate drums with circular knives. Mostly short segment instalments must be guided over the drums with arch guides coaxial with drums, whereas the width of the guides is at least twice narrower than the length of the segments being cut, which causes that the segments may position incorrectly in uncontrolled manner and as a result they may be damaged. A set of cut segments is drawn out of each flute of the drum with the aid of a chain assembly having dogs, the chain assembly always operates in a vertical plane deflected through a slight angle from axis of the cutting drum, whereas the process of drawing the set of segments out is effected in

an uncontrolled manner and it occurs that single segments fall out of the set being transported. Moreover in case of short segments hitting the back side of the first segment of the set with a dog causes that a segment on the opposite end of the set springs back from the rest of segments and moves separately for a short instant, which makes leading the short segments out more difficult. Segments are then displaced from the chain assembly to an intermediate disc with the aid of drivers arranged on periphery of a disc mounted coaxially with a chain sprocket of the chain assembly and are farther displaced in an endwise manner along a horizontal path to a worm drum which controls the flow of segments, whereas prior to entering the worm drum the segments of the other type prepared by cutting filter rods on the other drum are inserted in a similar way into empty spaces between the segments of the first type, the spaces being obtained during separating the segments in a hitting manner. In the said apparatus movement of the segments both on consecutive straight and arch-like parts of segment trajectory, where direction is changed, is effected with different means that must be synchronised with each another. In another version of the said machine presented in a British patent description No. GB 1578738 technical means are applied in order to position and group segments cut on drums prior to advancing them for farther technological operations, whereas filter rods are cut to unequal segments.

According to the invention method of compiling groups of segments according to a continuous endwise manner in a process of producing multi segment filters used in tobacco

industry for cigarettes, where segments in each consecutive module, in which segments of one type are prepared, are passed to a transferring element which displaces the segments onto an exit path constitutes in that in each module equal segments of one type are passed at a uniform rate to a transferring element which displaces each segment separately onto the exit path with the aid of drivers radially spaced on periphery of the transferring element, whereas setting of segments of each type in groups of segments positioned repeatedly on the exit path is defined by delay in collecting the segments by the transferring element in each module. Uniform setting of equal segments of one type on the exit path is effected with the aid of the transferring element provided with the drivers spaced uniformly on the periphery of the transferring element and non-uniform setting of equal segments of one type on the exit path is effected with the aid of the transferring element provided with the drivers spaced non-uniformly on the periphery of the transferring element, whereas the setting of the segment on the exit path depends on a distance between the segment passed at the uniform rate to the transferring element and the driver. The presented method enables setting a stream of groups of segments, each group consisting of many segments presenting all types of segments in the demanded filter where the sequence of setting the segments in groups is maintained and repeated.

The subject of the invention is construction of apparatus comprising at least two similar modules, and each module is provided with a cutting drum of a horizontal axis with flutes

spaced on the circumference surface, of axes parallel to the axis of the drum, at the inlet the drum being connected to a container of filter rods of length which is n-multiplicity of a segment length, and circular knives cooperating with the drum, whereas filter rods cut into sets of segments are drawn out of the flutes into a guiding channel with the aid of dogs mounted on a loop-closed chain, the trajectory of which, in the area of the sets of the segments being drawn out of flutes is in principle parallel to the axis of the flute, and moreover each module is provided with a separator which separates single segments out of a stream of the sets of the segments, and is also provided with a transferring element, which collects the separated segments and places them onto an exit path. According to the invention the apparatus is provided with a movable guiding element cooperating in synchronism with the cutting drum, situated by the cutting drum and forming a wall closing the channel for the sets of the segments drawn out of the flutes of the cutting drum, whereas the set of the segments led through the channel by the dog of the chain is taken possession of by a worm surface of a pushing together drum positioned over the channel, the drum passing the segments for separating, the pitch of the worm surface becoming diminished in direction of movement of the segments down to the value corresponding to the length of the set of the segments, and the separator of the segment situated at the end of the channel constitutes a disc cam of a rotation axis in principle parallel to the axis of the segment passed for separating, the disc cam pushing the segment out in a direction perpendicular to the axis of the

segment passed for separating onto the rotary assembled transferring element between two neighbouring drivers spaced radially on periphery of the transferring element. It is advantageous that the movable guiding element constitutes a multi flute rotary assembled shaft, whereas the axes of the flutes of the multi flute shaft in the area of guiding the set of the segments being drawn out of the drum may be parallel to the axis of the cutting drum so that the axis of the set of the segments is in principle parallel to the axis of the cutting drum and the height of the guiding channel is constant or the said axes may be askew to the axis of the cutting drum so that the guiding surface of the shaft is inclined with reference to the axis of the set of the segments and the height of the guiding channel for the front face of the first segment of the set of the segments is constant whereas the axis of the set of the segments is in principle parallel to the axis of the cutting drum. As an alternative the movable guiding element constitutes an endless belt with flutes in principle parallel to the axis of the cutting drum in the area of the sets of the segments being drawn out of the drum. The cutting drum is provided with a cover over the active part of the drum circumference surface mounted on the housing of the drum and in the cover slots are made for the circular knives which are situated on axes in a support mounted also on the housing of the drum. The said loop-closed chain is guided in a horizontal plane with the aid of sprockets so that the dogs mounted on the chain at equal distances are displaced all the time in a plane parallel to the axis of the cutting drum whereas the

sprocket before the cutting drum is displaceable. It is advantageous that the axis of the pushing together drum is askew to the axis of the set of the segments in the channel. At the outlet of the channel between the pushing together drum the separator a guide shoe is situated which holds up a consecutive segment in the direction of separating while separating the preceding segment out of the stream of the segments by the separator. Nearby the guide shoe a nozzle supplying compressed air is placed, the nozzle being directed towards the area between the guide shoe and the separator so that the stream of the air helps separating of the segment and stabilizes the segment being separated. The said separator constitutes a disc cam, the periphery of the disc cam constitutes a surface which pushes the segment out, whereas on the periphery there may be more than one pushing out surface and the pushing out surfaces, are spaced uniformly on the periphery of the separator. As an alternative the separator of the segment may have a form of a disc cam, the periphery of which constitutes a surface which pushes the segment out and moreover the cam has an abutting surface which determines axial speed of the segment being separated which is synchronised with speed imparted to the set of the segments by the worm surface of the pushing together drum. Such a separator may be provided with more than one abutting surface and more than one pushing out surface, whereas the abutting surface and the pushing out surface are spaced uniformly and the abutting surface of the separator is parallel to the front face of the segment being separated. It is advantageous that the width of the pushing

out surface in the last phase of separating is bigger than the length of the segment. The said transferring element in the periphery area constitutes a unit of two discs spaced at a distance and provided with drivers, whereas between the discs a height adjustable support is situated. The drivers may be mounted on the transferring element in a shifting manner, whereas the drivers may be spaced uniformly or non-uniformly on the periphery of the transferring element. Moreover in the area of pushing out the segment being separated a movable supporting element is situated, speed of which is synchronised with rotational speed of the transferring element, the supporting element being situated so that in the area of pushing the segments out a chamber is formed which is used for instantaneous storing the segment till it is collected by the driver, the chamber being formed at the bottom by the top surface of the adjustable support, at one side by the movable supporting element, at the other side by the pushing out surface of the cam and at the top by the cover of the transferring element. It is advantageous that the movable supporting element constitutes a disc rotary assembled on the axis perpendicular to the transferring element. As an alternative the movable supporting element constitutes an endless belt with the supporting surface parallel to the transferring element. The individual modules are set according to an endwise manner in any sequence. Due to such construction the apparatus is reliable at high speed of compiling groups of segments on the exit path. The application of the guiding element, which presses gently the set of segments especially the first segment after exiting a

flute of the cutting drum, ensures controlled guiding of the set of segments in the channel with the axis of the set being parallel to the axis of the flute while drawing out of the flute, and moreover eliminates the first segment inertial springing back after hitting the last segment in the flute by a dog. Placing the chain in a horizontal plane enables easy adjustment of the trajectory of the chain according to the required width of the cutting drum, whereas the dog always hits the centre of the last segment of the set and the position of the dog over the face of the last segment is maintained while the dog leading the segments along the entire length of the guiding channel. The cover over the active part of the cutting drum ensures stabilization of transported filter rods and also transported segments after cutting rods into the sets of segments. Applying the drum that pushes the segments together, provided with a worm surface of a variable pitch, enables eliminating a gap between sets of segments which appears after removing a dog in the end part of the channel before separating individual segments, whereas the construction of the separator enables full control of the position of the segments being separated, enables avoiding making the axis of the segment askew and ensures high capacity of the apparatus. The arrangement of the transferring element provided with drivers, the separator, the supporting element, the support and the cover enables creating the chamber, in which a segment separated from a set of segments awaits for collecting by a driver, whereas time of awaiting depends on equal or unequal spacing of drivers on the periphery of the transferring element and

defines suitable setting of the segment on the exit path in order to compile a required group of segments.

The subject of the invention is presented in examples of embodiment in the drawing, where fig. 1 shows in a perspective view a module of apparatus with the guiding element in form of a multi flute shaft and the supporting element in form of a disc, the separator has a pushing out surface and an abutting surface, whereas one set of the segments of the stream is shown, fig. 2 - module of fig. 1 in a simplified side view i.e. a nozzle and fragment of the disc of the supporting element are removed, fig. 3 - the cutting drum with the guide element in form of a multi flute shaft and the set of the segments in a perspective view, fig. 4 - fragmentary view of fig. 3 showing the guide element in enlargement in cross section, fig. 5 - the drum of fig. 3 with an alternative guiding element in form of a belt with flutes applied, fig. 6 - kinematics scheme of the chain for application of a narrow cutting drum, fig. 7 - kinematics scheme of the chain for application of a wide cutting drum, fig. 8 - enlarged fragment of the module of the apparatus of fig. 1 in the area of the segment separating, fig. 9 - fragment of fig. 8 with application of an alternative supporting element in form of an endless belt, fig. 10 - segment separator of fig. 1, fig. 11 - alternative form of the separator provided with a pushing out surface only, fig. 12 - the transferring element of fig. 1 with equally spaced drivers, fig. 13 - the transferring element of fig. 1 with non-equally spaced drivers, fig. 14 - the apparatus consisting of four similar modules of fig. 1, fig. 15 -

scheme of setting of groups of segments obtained from the apparatus on the exit path of fig. 14, fig. 16 - stream of sets of segments on the exit path.

The apparatus presented in an exemplary embodiment consists of four similar modules 1, which does not confine the application of any number of modules 1, the number of which is defined by the contents of segments 2 in a cigarette filter. The apparatus enables preparing and compiling groups 3 of segments 2 according to a continuous endwise manner on an exit path 4 of the apparatus in a process of producing multi segment filters. Each module 1 is provided with a cutting drum 5 placed under a container 6 of filter rods 7 of length constituting n-multiplicity of length of the segment 2. The cutting drum 5 of a horizontal axis 8 is provided on its periphery with flutes 9 of axes 10 parallel to the axis 8 of the drum 5. With the drum 5 cooperate circular knives 11 arranged so that they cut the filter rod 7 placed in the flute 9 into the segments 2 of equal length thus creating a set 12 of the segments 2 in the flute 9. The circular knives 11 are arranged on axes 13 positioned on the housing 14 of the cutting drum 5 with a cover 15 over active part of the cutting drum 5 so that knives 11 operate in slots 16 made in the cover 15. Each set 12 of the segments 2 is drawn out of the consecutive flute 9 of the drum 5 with the aid of a dog 17 mounted on a loop-closed chain 18, whereas distances between consecutive dogs 17 correspond to the length w of the set 12 of the segments 2. The chain 18 is guided in a horizontal plane with the aid of sprockets 19 so that the dogs 17 move all the time over a plane parallel to the axis 8

of the cutting drum 5. The sprocket 20 before the cutting drum 5 is displaceably arranged which enables required arrangement of the chain 18 dependent on the width of the cutting drum 5 so that the approximate central position of the dog 17 over the front face of the last segment 2 in the set 12 is maintained. Each set 12 is positioned in stream of the sets 12 in the guiding channel 21 and is displaced all the time with one dog 17 only. By the cutting drum 5 over the guiding channel 21 is placed a movable guiding element 22 which operates in synchronism with the cutting drum 5 and constitutes a wall which closes the channel 21. It is advantageous that the guiding element 22 constitutes a rotary multi flute shaft 22', whereas axes 23' of flutes 24' of shaft 22' within the area of guiding the withdrawn set 12 of segments 2 may be parallel to the axis 8 of the cutting drum 5 so that axis 25 of the set 12 is in principle parallel to the axis 5 while drawing the set out of the flute 9 of the cutting drum 5 and the height of the guiding channel 21 is constant. As an alternative the axes 23' of the flutes 24' of the shaft 22' within the area of guiding the drawn set 12 of segments 2 may be askew with reference to the axis 8 of the cutting drum 5 so that the guiding surface of the flute 24' of the shaft 22' is askew with reference to the axis 25 of the set 12 and the height of the guiding channel 21 for the front face of the first segment 2 in the drawn set 12 is constant, whereas the axis 25 of the set 12 while drawing is in principle parallel to the axis 8 of the cutting drum 5. In another solution presented in fig. 5 the movable guiding element 22 has a form of an endless belt 22'' with flutes 24''

of axes 23" arranged in general parallel to the axis 8 of the cutting drum 5 in the area of drawing of the set 12 of segments 2. At the end of the guiding channel 21 a drum 26 which pushes the segments together is positioned over the channel 21, the drum being provided with a worm surface 27, the pitch s of the surface diminishes gradually in the direction of movement of segments 2 from the value which enables interception the set of segments by the worm surface 27 of the set 12 of the segments 2 by the dog 17 of the chain 18, down to the value corresponding to the length of the set 12. It is advantageous that the axis 28 of the pushing together drum 26 is askew with reference to the axis 25 of the set 12 of the segments 2 displaced along the channel 21 under the pushing together drum 26. The worm surface 27 of the pushing together drum 26 intercepts the set 12 of the segments 2 from the dog 17 and pushes the segments 2 in a stream, which is passed over to a guide shoe 29 positioned by the outlet of the guiding channel 21. The task for the guide shoe 29 it is to hold up the consecutive segment 2 in the stream of the sets 12 of the segments 2 in the direction of pushing out while separating the preceding segment 2 out of the stream by a separator 30. The separator 30 has a form of a disc cam of an axis 31 in principle parallel to the axis of the segment 2 passed for separating which pushes out the segment 2 perpendicular to its axis over a rotary assembled transferring element 32 between two neighbouring drivers 33 spaced radially on the periphery of the transferring element 32. Nearby the guide shoe 29 is positioned a nozzle 34 supplying compressed air directed towards the area between

the guide shoe 29 and the separator 30 so that the stream of the air helps separating of the segment 2 and stabilizes the separated segment 2. The separator 30 may have a form of a disc cam the periphery of which constitutes a pushing out surface 35 of the segment 2, whereas on the periphery there may be more than one pushing out surface 35, and the said surfaces 35 may be spaced uniformly. In an advantageous embodiment of the apparatus the separator 30' has a form of a disc cam, the periphery of which constitutes a pushing out surface 35', and moreover it has an abutting surface 36 which determines the axial speed of the segment 2 being separated which is synchronised with the speed imparted on the set 12 of the segments 2 by the worm surface 27 of the pushing together drum 26. The said separator 30' may have more than one abutting surface 36 and more than one pushing out surface 35', whereas the said surfaces 36 and 35' may be spaced uniformly and the abutting surface 36 is parallel to the front face of the segment 2 being separated, and the width of the pushing out surface 35' in the last phase of separating the segment 2 is bigger than the length of the segment 2. The said transferring element 32 in the periphery area constitutes a unit of two discs 37 slightly spaced at a distance, whereas on each disc 37 there are drivers 33 mounted uniformly and between the discs 37 a height adjustable support 38 is situated. The drivers 33 may be mounted on the transferring element 32 in a shifting manner and moreover they may be spaced uniformly or non-uniformly on the periphery of the transferring element 32. In the area of pushing out the separated segment 2 is situated a movable

supporting element 39, the speed of which is synchronised with rotations of the transferring element 32, supporting element positioned so that in the area of separating is created a chamber 40 intended to temporarily store the segment 2 till the moment of collecting it by the driver 33, the chamber being defined at the bottom by the top edge of the support 38, on one side by the side of the movable supporting element 39, on the other side by the pushing out surface 35 or 35' of the separator 30 or 30' and at the top by a cover 41 of the transferring element 32. It is advantageous that the movable supporting element 39 constitutes a disc 39' rotary assembled on the axis perpendicular to the transferring element 32. As an alternative the movable supporting element 39 constitutes an endless belt 39'' of the supporting surface parallel to the transferring element 32. In fig. 14 of the drawing an example of the apparatus is presented, the apparatus is provided with four modules 1^I, 1^{II}, 1^{III} and 1^{IV}, whereas the outer modules 1^I and 1^{IV} are provided with the transferring element 32' with drivers 33 spaced uniformly and two inner modules 1^{II} and 1^{III} are provided with the transferring element 32'' with drivers 33 spaced non-uniformly. In the said example it is advantageous that in the outer modules 1^I and 1^{IV} the separator 30 with the pushing out surface 35 is applied and in the inner modules 1^{II} and 1^{III} the separator 30' with the pushing out surface 35' and the abutting surface 36 is applied. The method of compiling groups 3 of segments 2 on the exit path 4 in the apparatus of fig. 14 is presented in fig. 15 of the drawing. The segment 2 passed at a uniform rate by the separator 30 or 30' into the chamber 40 of the

transferring element 32 is collected by the driver 33 with the delay dependent on the distance between the driver 33 and the front face of the segment 2 and the delay determines the setting of the segment 2 passed by the transferring element 32 on the exit path 4, whereas uniform setting of equal segments 2 of one type is effected with the aid of the outer transferring elements 32' with the drivers 33 spaced uniformly and non-uniform setting of equal segments 2 of one type is effected with the aid of the inner transferring elements 32'' with the drivers 33 spaced non-uniformly. In the exemplary arrangement (fig. 15) segments 2D of double length are transferred uniformly onto the exit path 4 with the aid of the transferring element 32' of the uniformly spaced drivers 33, whereas the distance between the consecutive segments 2D constitutes value z . Into the area before and after the segment 2D of double length is placed a segment 2C of single length with the aid of the transferring element 32'' of the non-uniformly spaced drivers 33, and then similarly a segment 2B of single length is placed with the aid of the transferring element 32'' of the non-uniformly spaced drivers 33 into the area before and after the segment 2C. Finally into the empty space between the segments 2B is placed a segment 2A of double length with the aid of the transferring element 32' of the uniformly spaced drivers 33, whereas the distance between the consecutive segments 2A also constitutes the value z . As a result at the outlet of the exit path 4 is created the stream of the groups 3 of the segments 2 marked one after the other ...DCBABCDCBABCDCBA... (fig. 16) which enables obtaining identical four segment filters after

transversal cutting of the segments 2A and 2D of double length in farther operations of multi segment filters production. As a result identical filters are obtained consisting of a half of the segment 2A, the segment 2B, the segment 2C and a half of the segment 2D.

CLAIMS

1. Method of compiling groups of segments according to a continuous endwise manner in a process of producing multi segment filters used in tobacco industry for cigarettes, where segments in each consecutive module, in which segments of one type are prepared, are passed to a transferring element which displaces the segments onto an exit path, characterized in that in each module equal segments of one type are passed at a uniform rate to a transferring element which displaces each segment separately onto the exit path with the aid of drivers radially spaced on periphery of the transferring element, whereas setting of segments of each type in groups of segments positioned repeatedly on the exit path is defined by delay in collecting the segments by the transferring element in each module.
2. Method according to claim 1, characterized in that uniform setting of equal segments of one type on the exit path is effected with the aid of the transferring element provided with the drivers spaced uniformly on the periphery of the transferring element.
3. Method according to claim 1, characterized in that non-uniform setting of equal segments of one type on the exit path is effected with the aid of the transferring element provided with the drivers spaced non-uniformly on the periphery of the transferring element.
4. Method according to claim 2 or 3, characterized in that the setting of the segment on the exit path depends on a distance

between the segment passed at the uniform rate to the transferring element and the driver.

5. Apparatus for preparing and compiling segments in groups according to a continuous endwise manner in a process of producing multi segment filters used in tobacco industry for cigarettes comprising at least two similar modules, and each module is provided with a cutting drum of a horizontal axis with flutes spaced on the circumference surface, of axes parallel to the axis of the drum, at the inlet the drum being connected to a container of filter rods of length which is n-multiplicity of a segment length, and circular knives cooperating with the drum, whereas filter rods cut into sets of segments are drawn out of the flutes into a guiding channel with the aid of dogs mounted on a loop-closed chain, the trajectory of which in the area of the sets of the segments being drawn out of flutes is in principle parallel to the axis of a flute, and moreover each module is provided with a separator which separates single segments out of a stream of the set of the segments, and is also provided with a transferring element, which collects the separated segments and places them onto an exit path, characterized in that the apparatus is provided with a movable guiding element (22) cooperating in synchronism with the cutting drum (5), situated by the cutting drum (5) and forming a wall closing the channel (21) for sets (12) of segments (2) drawn out of the flutes (9) of the cutting drum (5), whereas the set (12) of the segments (2) led through the channel (21) by the dog (17) of chain (18) is taken possession of by a worm surface (27) of a pushing together drum (26) positioned over the

channel (21) , the drum passing the segments (2) for separating, the pitch (s) of the worm surface (27) becoming diminished in direction of movement of the segments (2) down to the value corresponding to the length (w) of the set (12) of the segments (2), and the separator (30) of the segment (2) situated at the end of the channel (21) constitutes a disc cam of a rotation axis (31) in principle parallel to the axis of the segment (2) passed for separating, the disc cam pushing the segment (2) out in a direction perpendicular to the axis of the segment (2) passed for separating onto the rotary assembled transferring element (32) between two neighbouring drivers (33) spaced radially on periphery of the transferring element (32).

6. Apparatus according to claim 5, characterized in that the movable guiding element (22) constitutes a multi flute rotary assembled shaft (22').
7. Apparatus according to claim 6, characterized in that the axes (23') of the flutes (24') of the multi flute shaft (22') in the area of guiding the set (12) of the segments (2) being drawn out of the drum (5) are parallel to the axis (8) of the cutting drum (5) so that the axis (25) of the set (12) of the segments (2) is in principle parallel to the axis (8) of the cutting drum (5) and the height of the guiding channel (21) is constant.
8. Apparatus according to claim 6, characterized in that the axes (23') of the flutes (24') of the multi flute shaft (22') in the area of guiding the set (12) of the segments (2) being drawn out of the drum (5) are askew to the axis (8) of the cutting drum (5) so that the guiding surface of the flute

(24') of the shaft (22') is inclined with reference to the axis (25) of the set (12) of the segments (2) and the height of the guiding channel (21) for the front face of the first segment (2) of the set (12) of the segments (2) is constant whereas the axis (25) of the set (12) of the segments (2) is in principle parallel to the axis (8) of the cutting drum (5).

9. Apparatus according to claim 5, characterized in that the movable guiding element (22) constitutes an endless belt (22'') with flutes (24'') of axes (23'') in principle parallel to the axis (8) of the cutting drum (5) in the area of the sets (12) of the segments (2) being drawn out of the drum (5).
10. Apparatus according to claim 5, characterized in that the cutting drum (5) is provided with a cover (15) over the active part of the drum (5) circumference surface mounted on the housing (14) of the drum (5) and in the cover (15) slots (16) are made for the circular knives (11) which are situated on axes (13) in a support mounted also on the housing (14) of the drum (5).
11. Apparatus according to claim 5, characterized in that the loop-closed chain (18) is guided in a horizontal plane with the aid of sprockets (19) so that the dogs (17) mounted on the chain (18) at equal distances are displaced all the time in a plane parallel to the axis (8) of the cutting drum (5) whereas the sprocket (20) before the cutting drum (5) is displaceable.
12. Apparatus according to claim 5, characterized in that the axis (28) of the pushing together drum (26) is askew to the

axis (25) of the set (12) of the segments (2) in the channel (21).

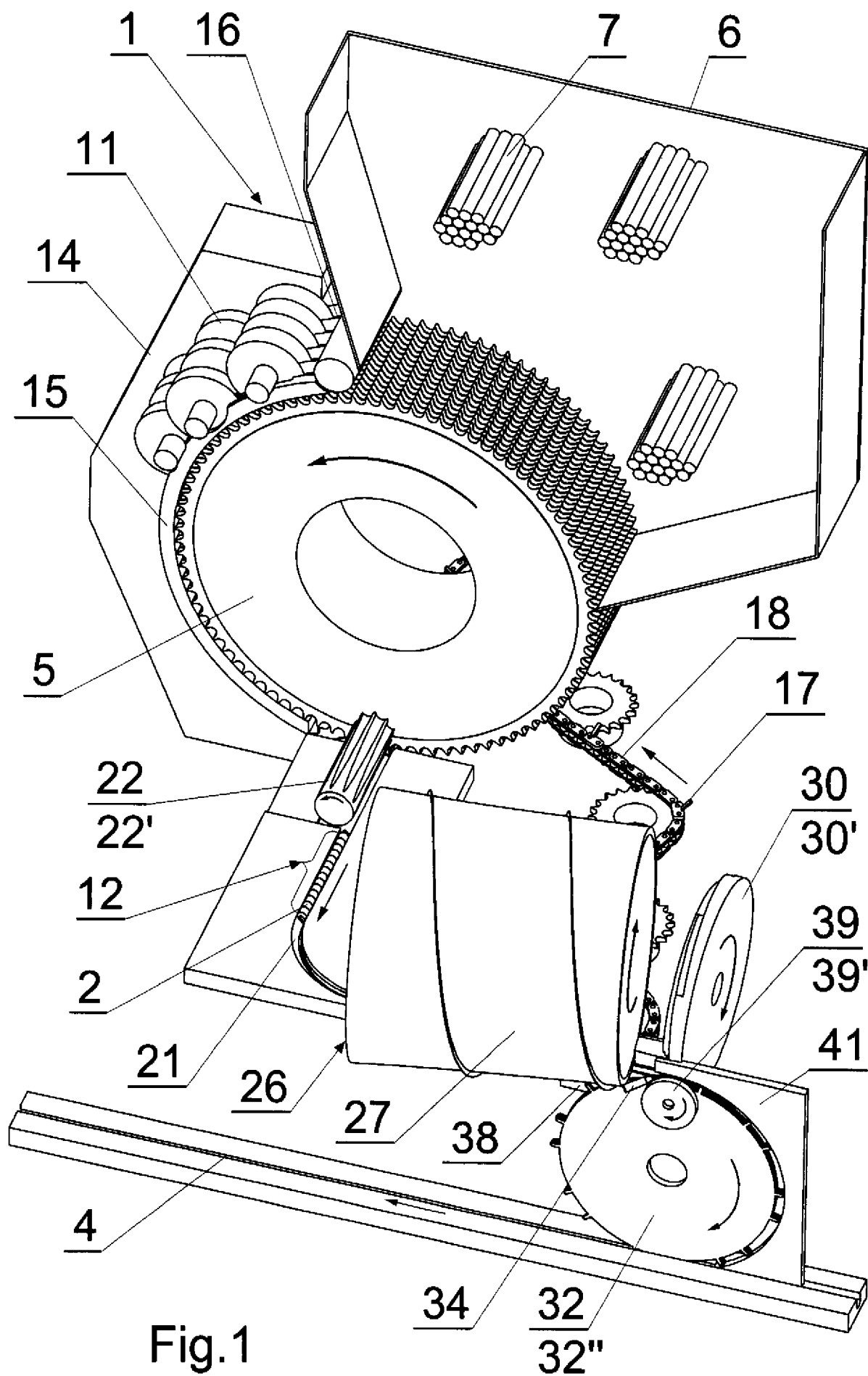
13. Apparatus according to claim 5, characterized in that at the outlet of the channel (21) between the pushing together drum (26) and the separator (30) a guide shoe (29) is situated which holds up a consecutive segment (2) of the stream of the sets (12) of the segments (2) in the direction of separating while separating the preceding segment (2) by the separator (30).
14. Apparatus according to claim 5 or 13, characterized in that it has a nozzle (34) supplying compressed air, the nozzle (34) being placed nearby the guide shoe (29) and being directed towards the area between the guide shoe (29) and the separator (30) so that the stream of the air helps separating of the segment (2) and stabilizes the segment (2) being separated.
15. Apparatus according to claim 5, characterized in that the separator (30) of the segments (2) constitutes a disc cam, the periphery of the disc cam constitutes a surface (35) which pushes the segment (2) out.
16. Apparatus according to claim 15, characterized in that on the periphery of the separator (30) there is more than one pushing out surface (35).
17. Apparatus according to claim 16, characterized in that the pushing out surfaces (35) are spaced uniformly on the periphery of the separator (30).
18. Apparatus according to claim 5, characterized in that the separator (30') of the segments (2) constitutes a disc cam, the periphery of the disc cam constitutes a surface (35')

which pushes the segment (2) out and moreover the cam has an abutting surface (36).

19. Apparatus according to claim 18, characterized in that the abutting surface (36) of the separator (30') determines axial speed of the segment (2) being separated which is synchronised with speed imparted to the set (12) of segments (2) by the worm surface (27) of the pushing together drum (26).
20. Apparatus according to claim 18, characterized in that the separator (30') is provided with more than one abutting surface (36) and more than one pushing out surface (35').
21. Apparatus according to claim 19, characterized in that the abutting surface (36) and the pushing out surface (35') of the separator (30') are spaced uniformly.
22. Apparatus according to claim 18 or 21, characterized in that the abutting surface (36) of the separator (30') is parallel to the front face of the segment (2) being separated.
23. Apparatus according to claim 18 or 21, characterized in that the width of the pushing out surface (35') in the last phase of separating of segment (2) is bigger than the length of the segment (2).
24. Apparatus according to claim 5, characterized in that the transferring element (32) in the periphery area constitutes a unit of two discs (37) spaced at a distance and provided with drivers (33), whereas between the discs (37) a height adjustable support (38) is situated.
25. Apparatus according to claim 5, characterized in that the drivers (33) are mounted on the transferring element (32) in a shifting manner.

26. Apparatus according to claim 5 or 24 to 25, characterized in that the drivers (33) are spaced uniformly on the periphery of the transferring element (32).
27. Apparatus according to claim 5 or 24 to 25, characterized in that the drivers (33) are spaced non-uniformly on the periphery of the transferring element (32).
28. Apparatus according to claim 5 or 24 to 25, characterized in that in the area of pushing out the segment (2) being separated a movable supporting element (39) is situated, speed of the supporting element (39) is synchronised with rotational speed of the transferring element (32), the supporting element (39) being situated so that in the area of pushing the segments (2) out a chamber (40) is formed which is used for instantaneous storing the segment (2) till it is collected by the driver (33), the chamber being formed at the bottom by the top surface of the adjustable support (38), at one side by the movable supporting element (39), at the other side by the pushing out surface (35), (35') of the separator (30), (30') and at the top by the cover (41) of the transferring element (32).
29. Apparatus according to claim 28, characterized in that the movable supporting element (39) constitutes a disc (39') rotary assembled on the axis perpendicular to the transferring element (32).
30. Apparatus according to claim 28, characterized in that the movable supporting element (39) constitutes an endless belt (39'') with the supporting surface parallel to the transferring element (32).

- 31.** Apparatus according to claim 5, characterized in that individual modules (1) are set according to an endwise manner in any sequence.



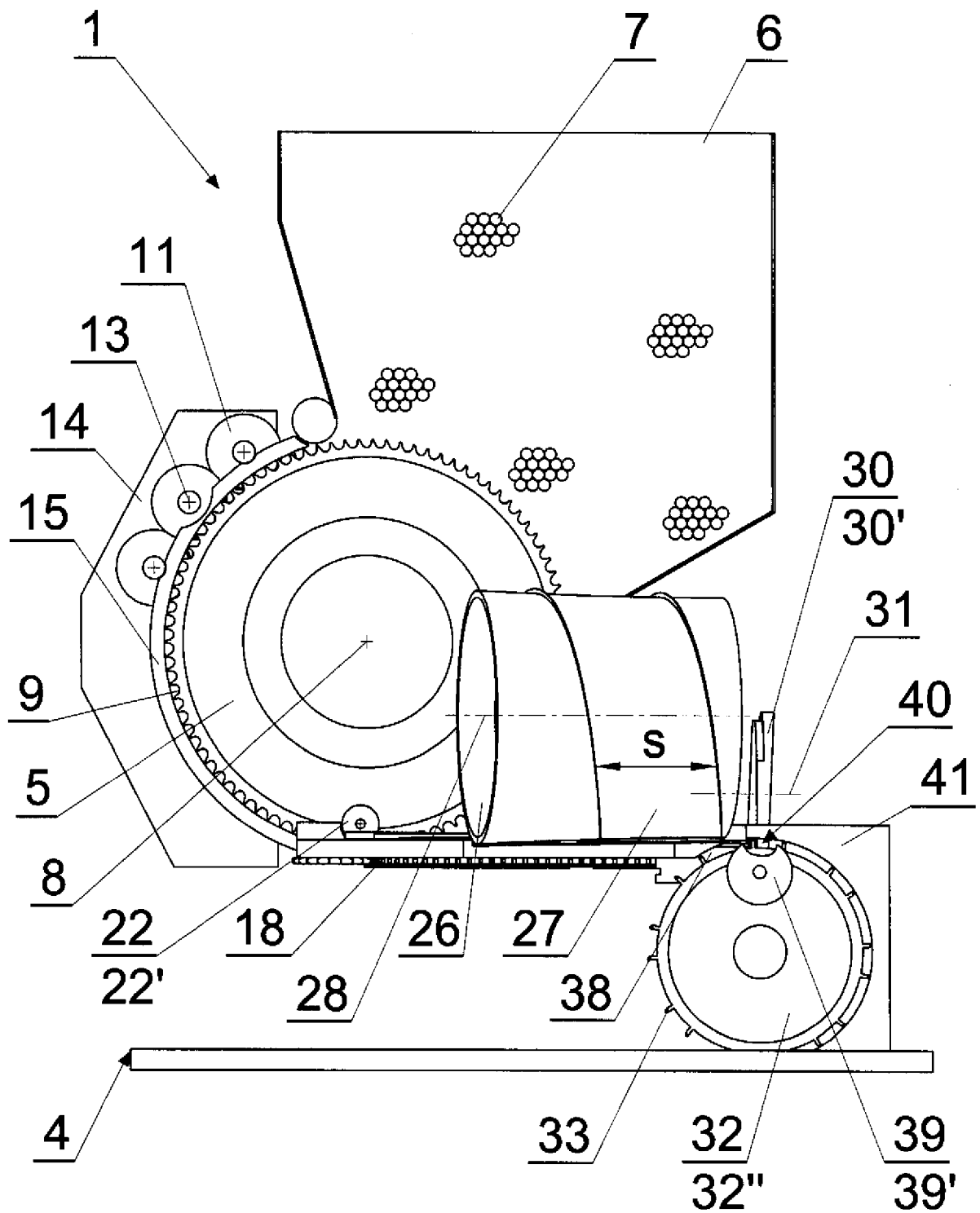
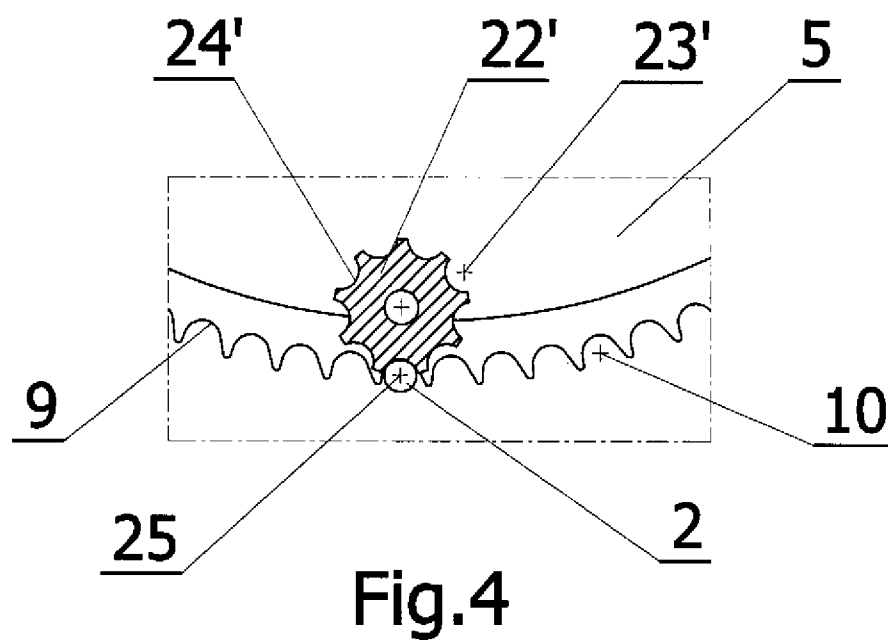
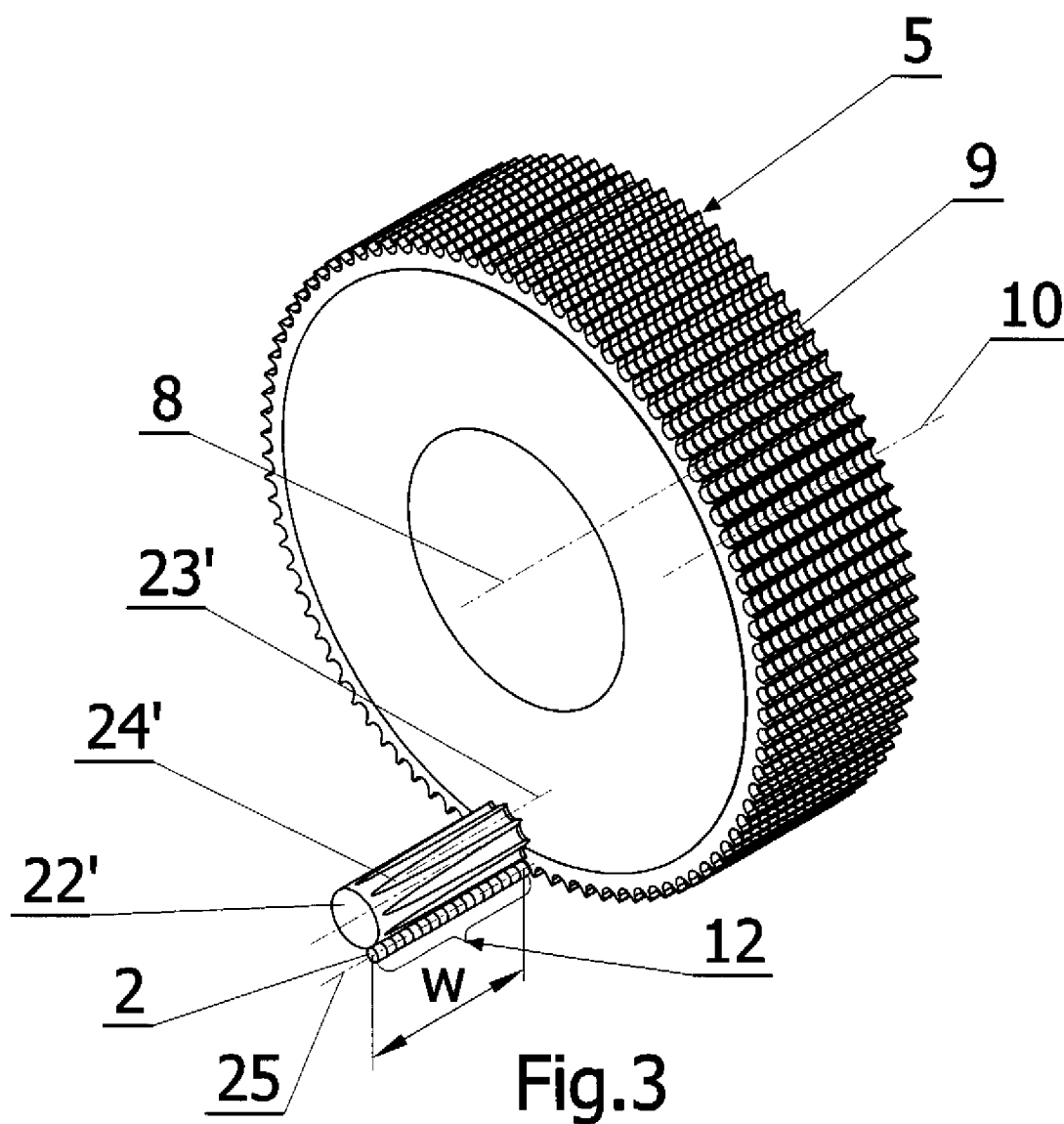


Fig.2



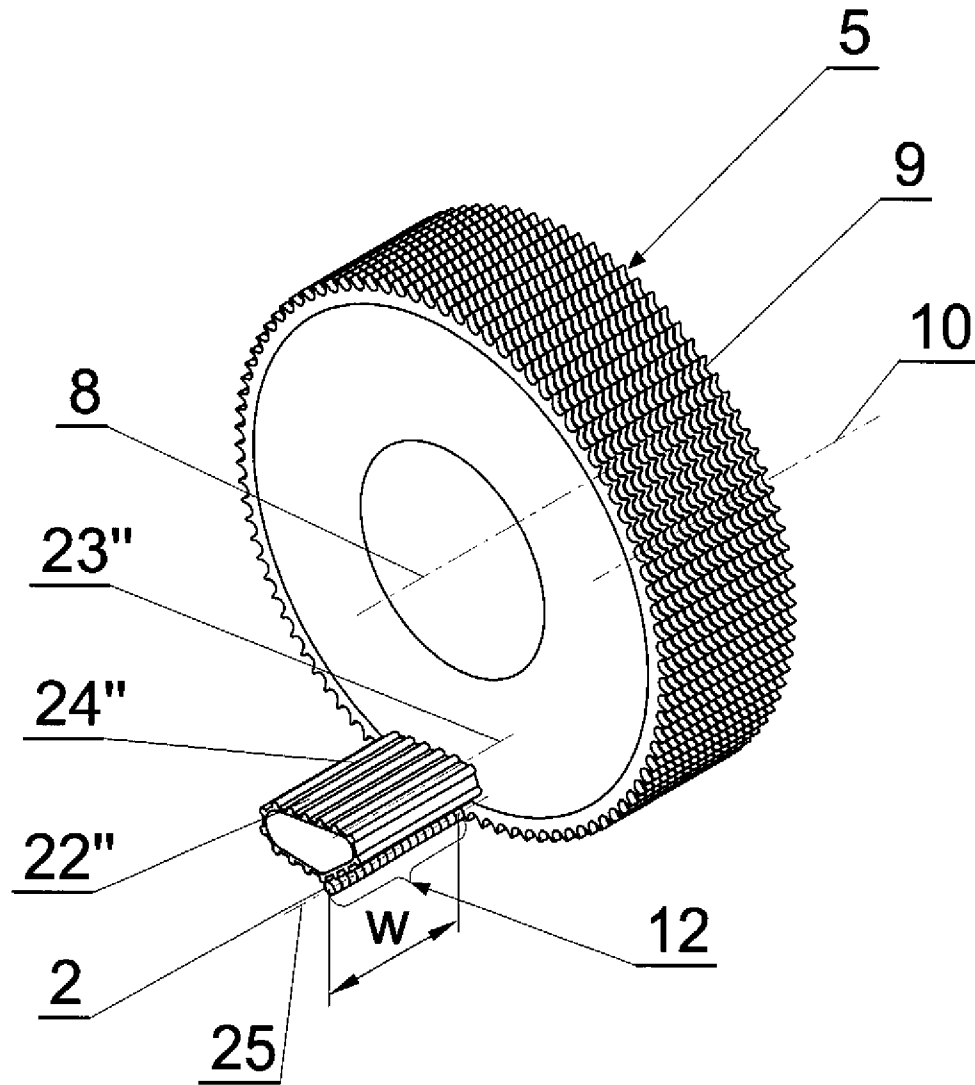


Fig.5

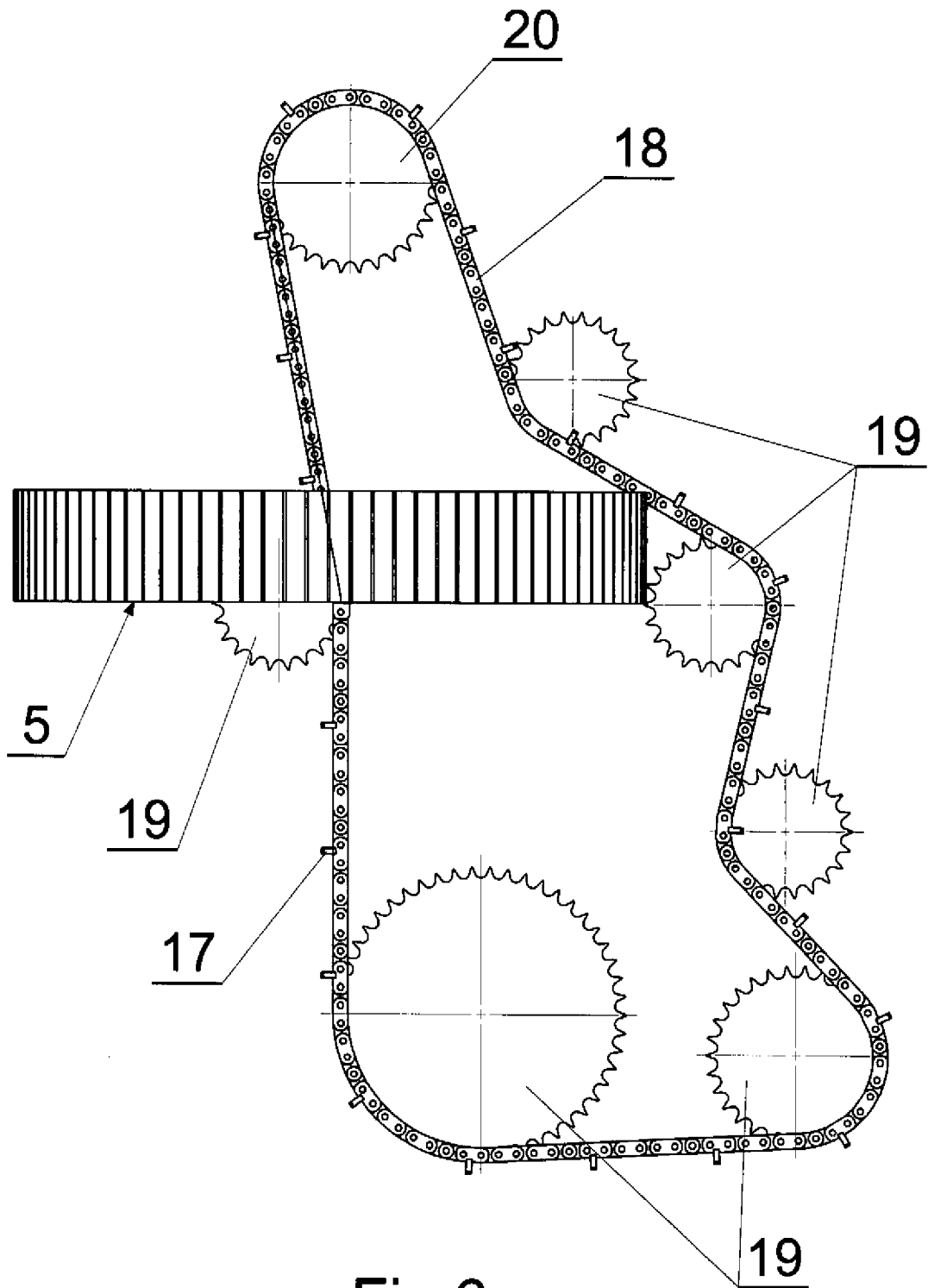


Fig.6

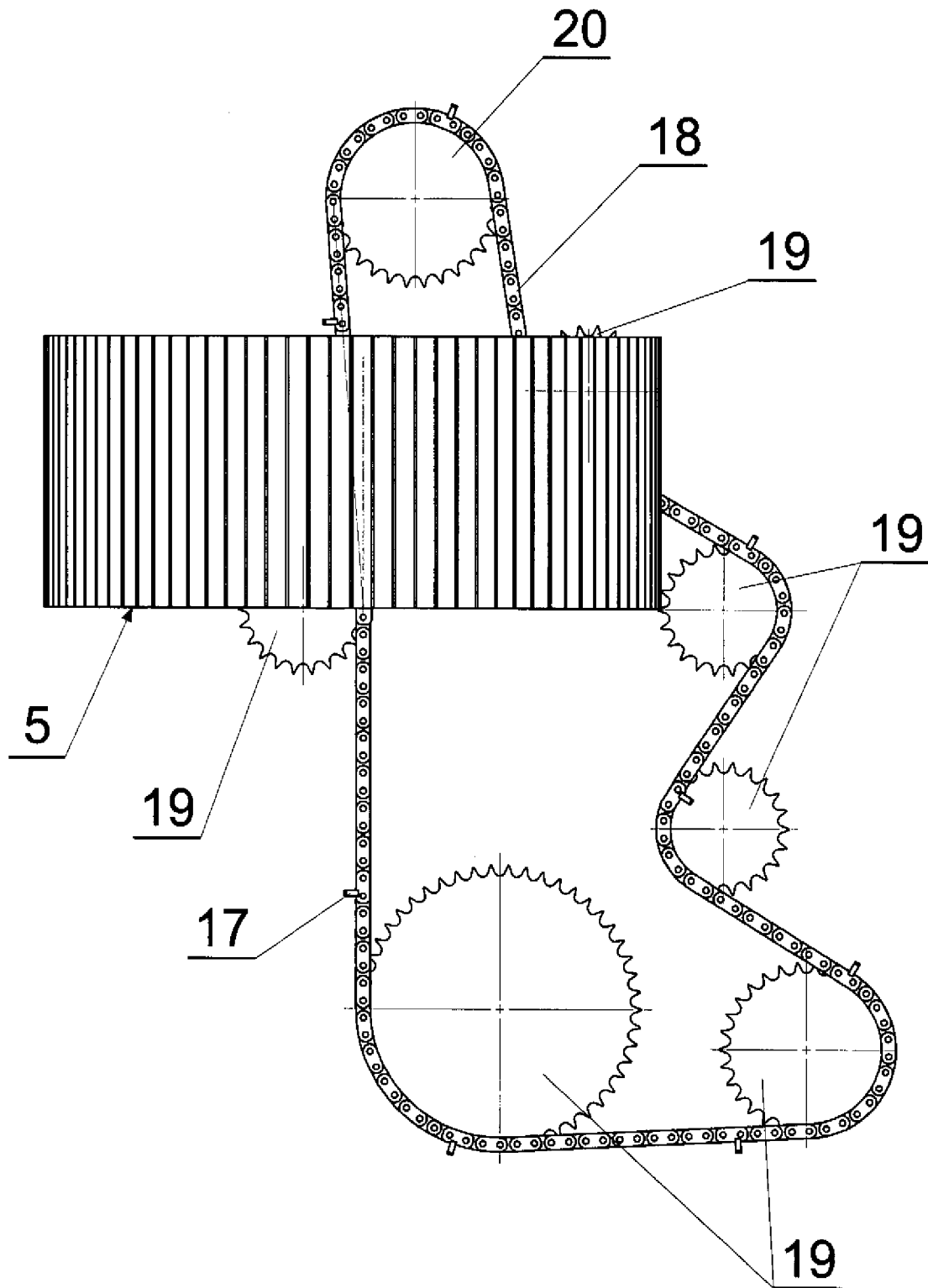


Fig.7

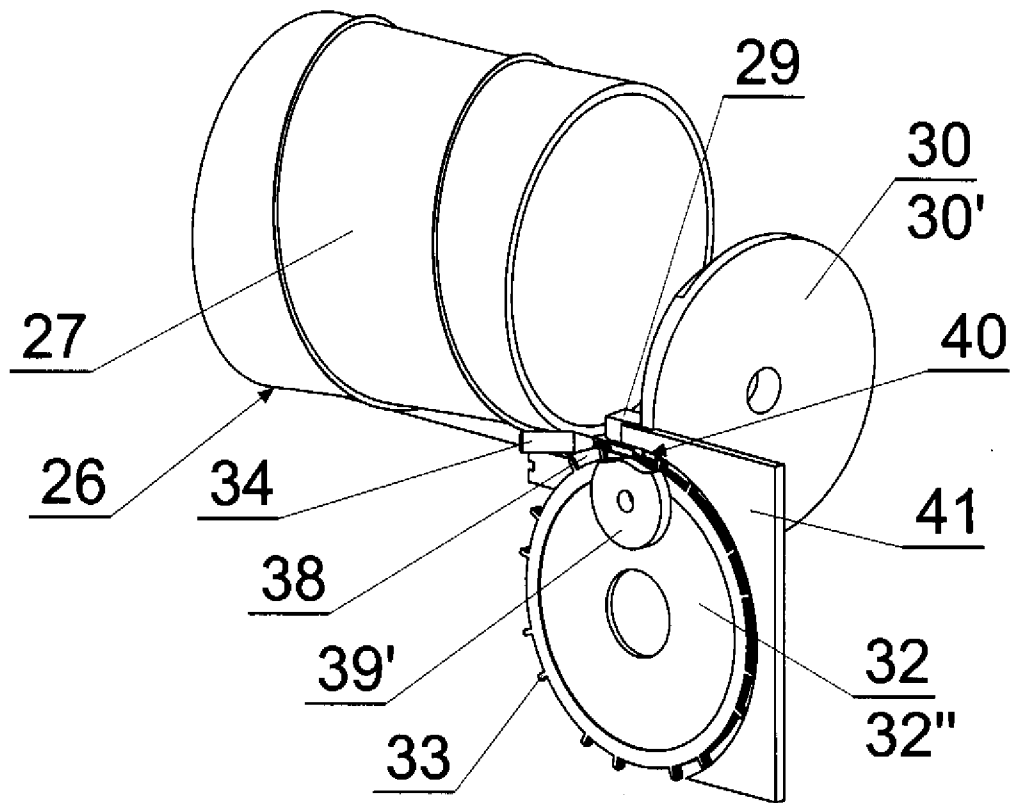


Fig.8

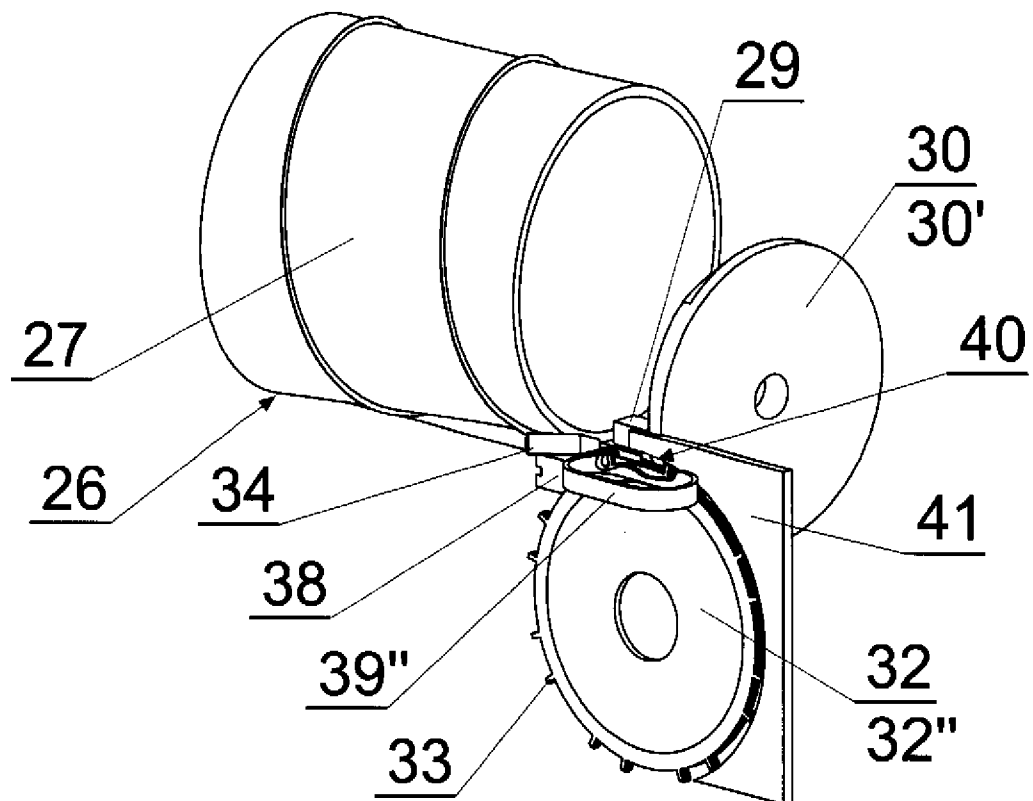


Fig.9

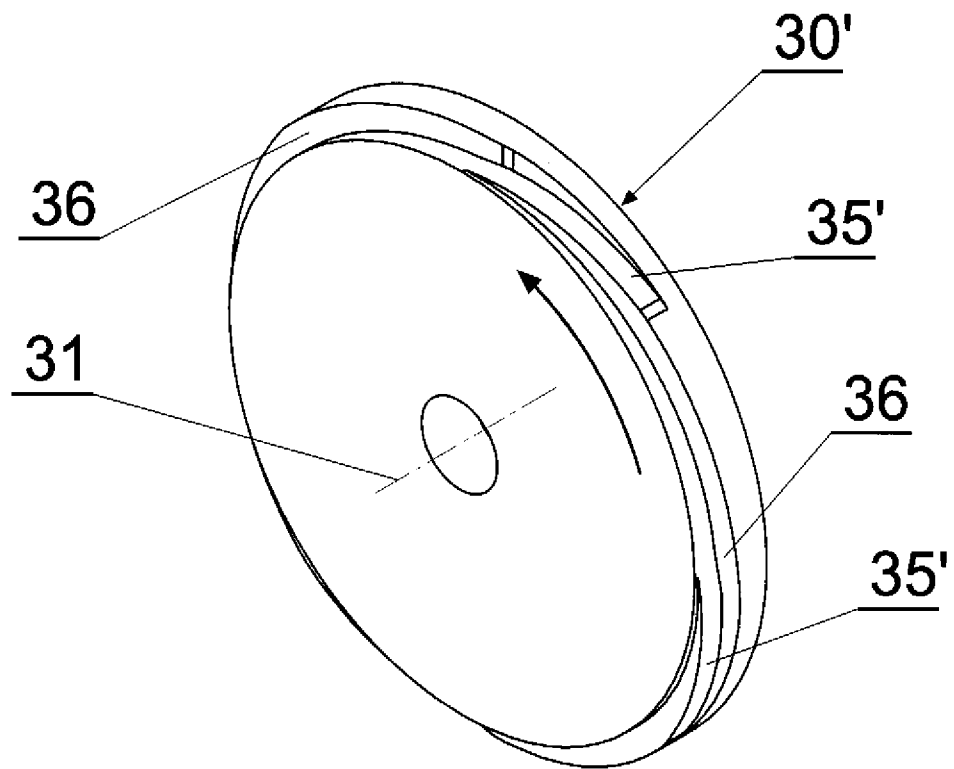


Fig.10

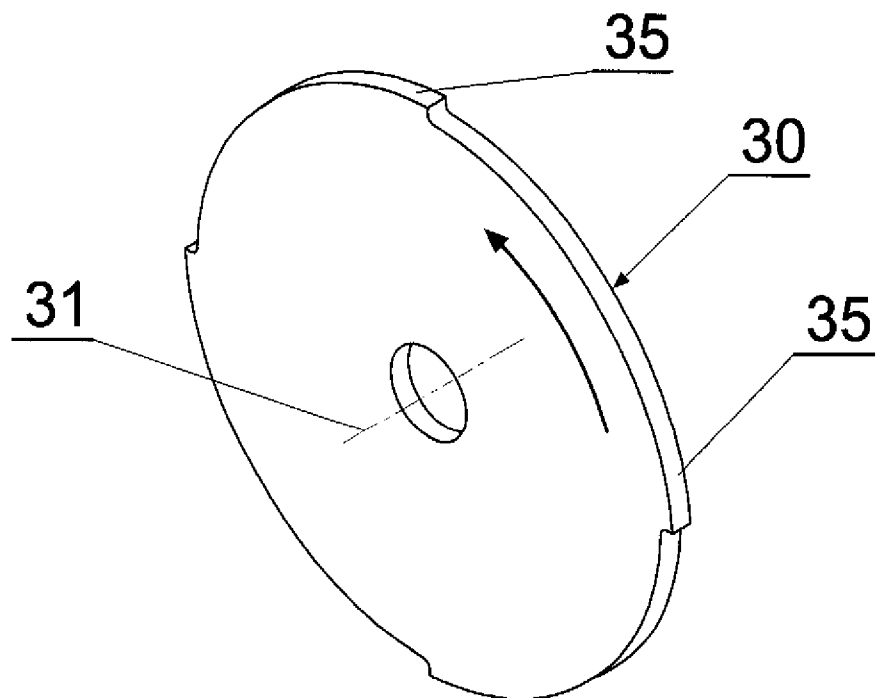


Fig.11

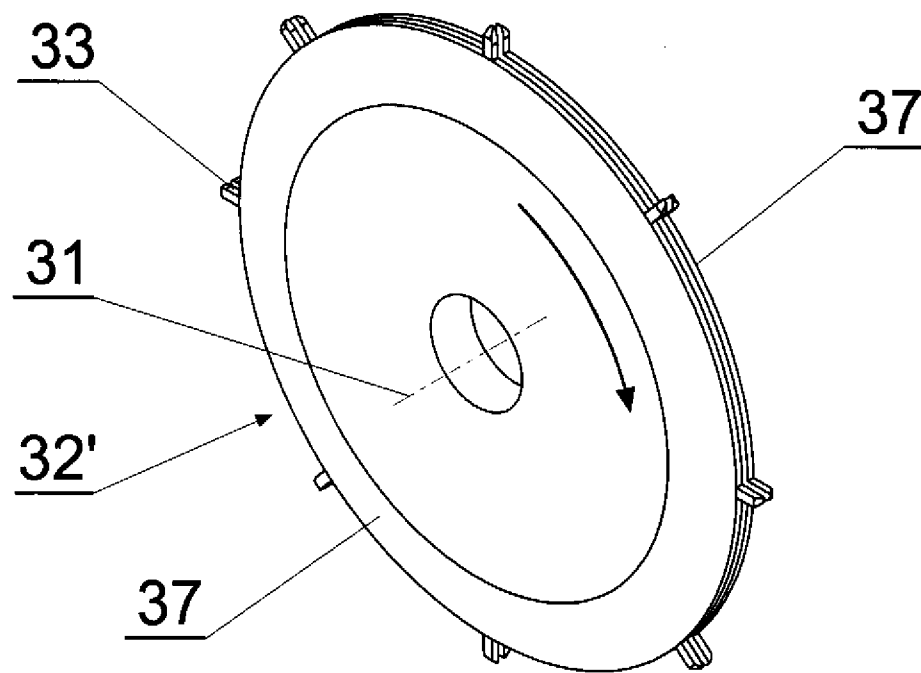


Fig.12

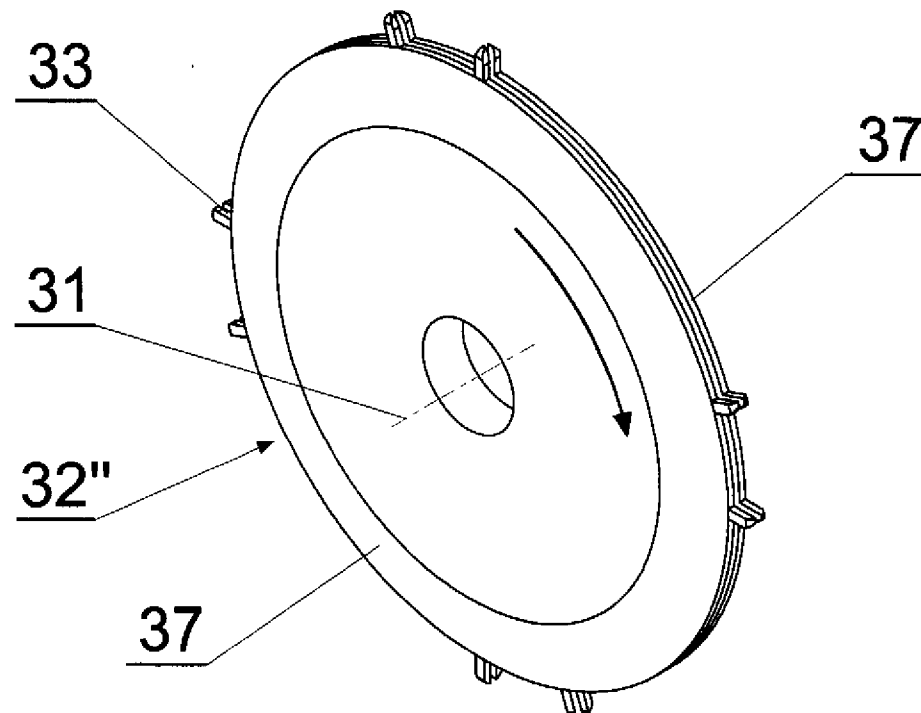


Fig.13

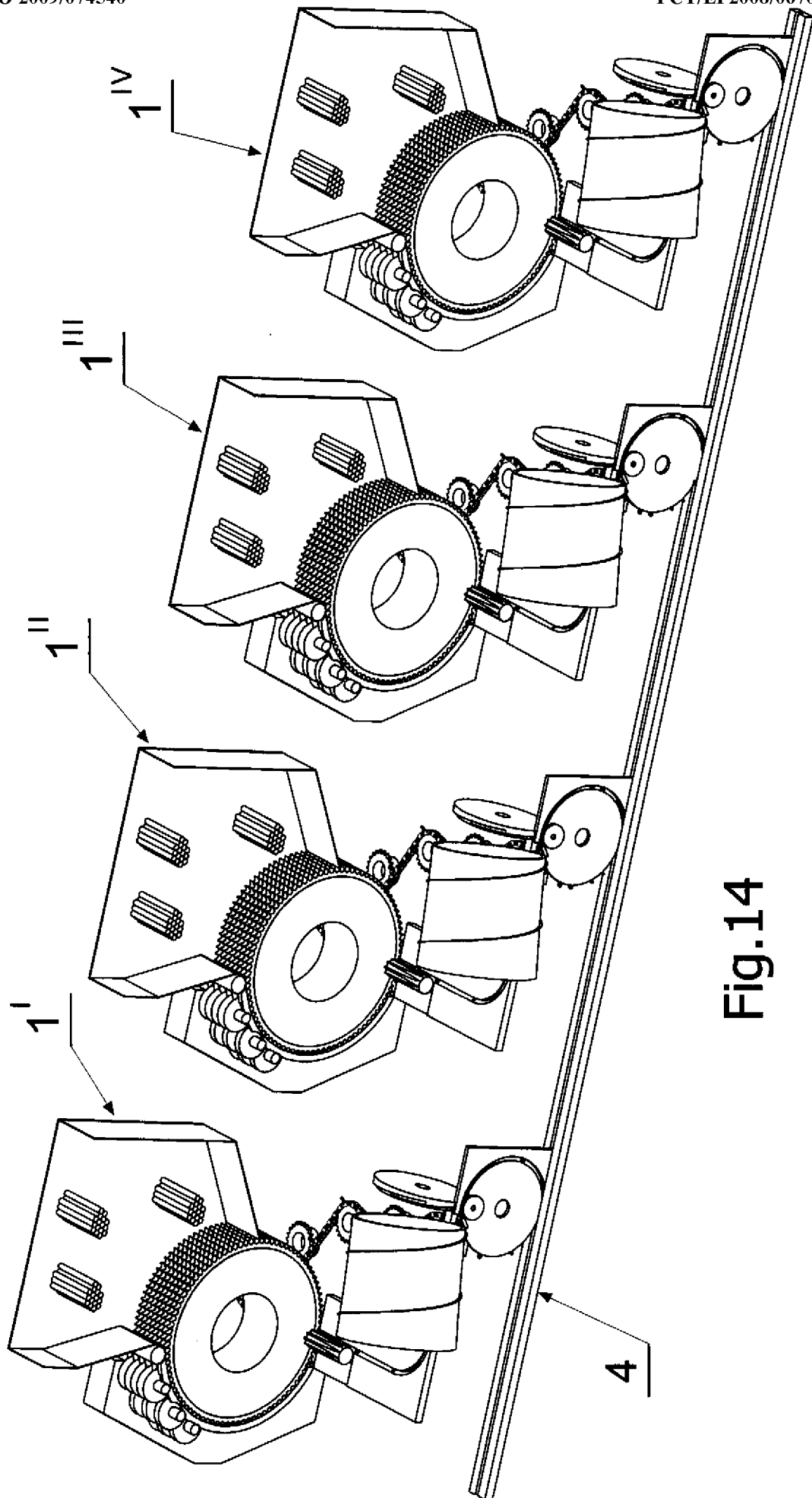


Fig. 14

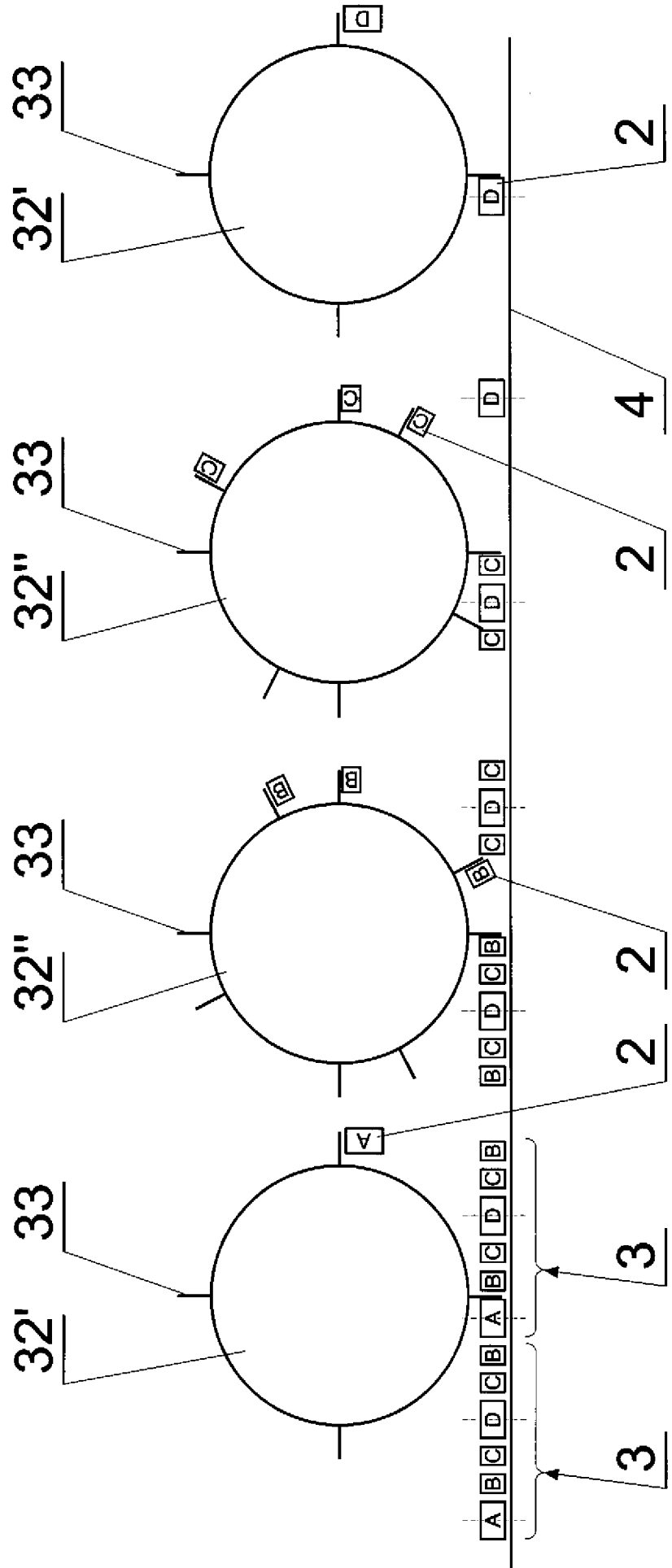


Fig.15

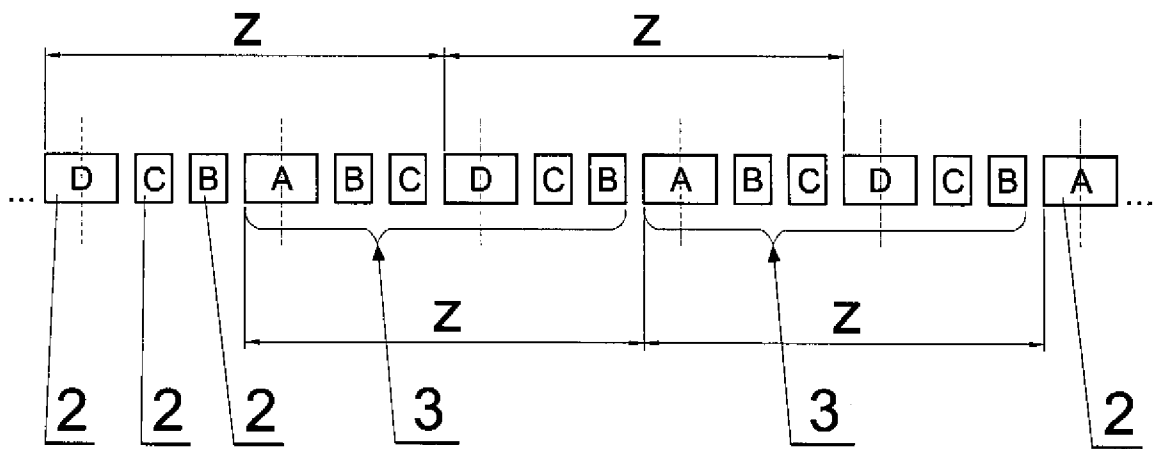


Fig.16

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2008/067032

A. CLASSIFICATION OF SUBJECT MATTER
INV. A24D3/02

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
A24D A24C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EP0-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 3 550 750 A (JACKSON NORMAN WALTER) 29 December 1970 (1970-12-29)	1-4
A	column 3, line 55 - column 8, line 15; figures	5
X	FR 2 358 845 A (MOLINS LTD [GB]) 17 February 1978 (1978-02-17)	1-4
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X	WO 03/024898 A (HAUNI MASCHINENBAU AG [DE]; SCHERBARTH THORSTEN [DE]; GEORGITSIS NIKOL) 27 March 2003 (2003-03-27) page 10, line 3 - page 13, line 27; figures	1,2
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☒ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

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- *O* document referring to an oral disclosure, use, exhibition or other means
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Date of the actual completion of the international search

3 March 2009

Date of mailing of the international search report

17/03/2009

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Marzano Monterosso

INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2008/067032

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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A	paragraph [0050] paragraphs [0056] - [0068] -----	5
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International application No

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