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(54) **METHOD AND DEVICE FOR CUTTING OF PACKAGES**

(57) A tube flattening arrangement is provided, which comprises at least one tube flattening unit (12) having at least one pair of rollers (14a-b), and which is configured to flatten a tube for subsequent cutting of the flattened

tube into sections. A method for cutting a tube into sections is also provided, which comprises the steps of flattening the tube by means of the tube flattening arrangement and cutting the tube.

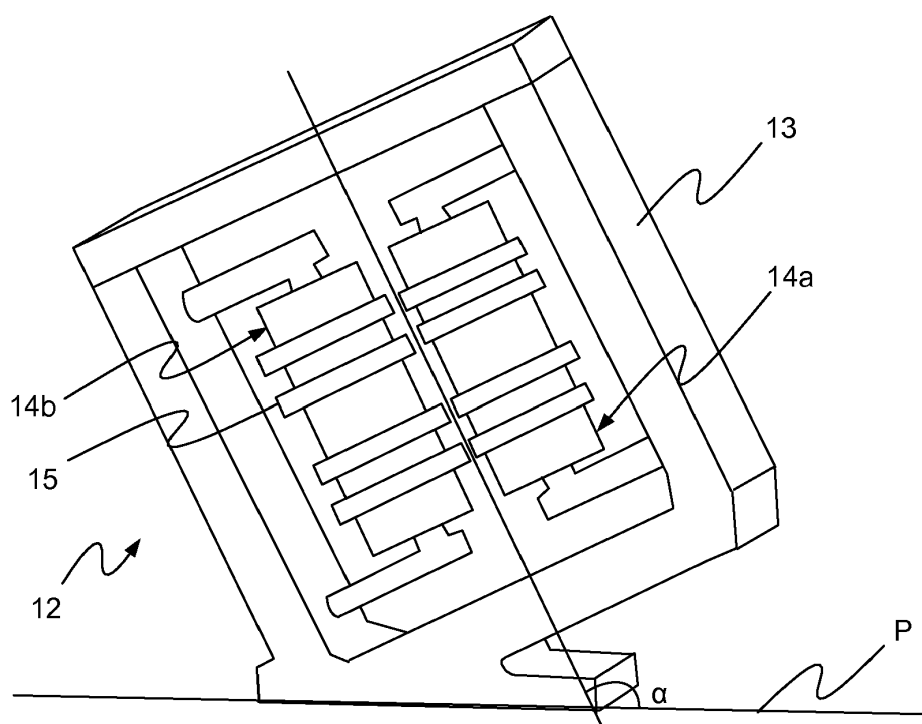


Fig. 5

Description

TECHNICAL FIELD

[0001] The present solution relates to an arrangement for flattening of tubes for cutting into sections and a method for carrying out the flattening.

BACKGROUND

[0002] It is known to produce liquid packages from paper coated on both sides with synthetic plastics material, the bottom being formed by folding over the walls of the tube, while the top is molded onto one end of the tube and consists of thermoplastics material. One way of producing such package is to start with a web of paper material which is formed into a tube. The tube is then cut into smaller segments, which are pulled over conical mandrels. These conical mandrels carrying the sleeves are then positioned over a mold into which a thermoplastic material is injected and from which by various means a thermoplastic top is formed forming a unit together with the sleeve of paper material. Since such packages are closed at one end by means of the top of thermoplastic material the packages are filled through the open end whereafter they open end is folded and sealed. A problem with this method is that the cutting of the tube into sleeve sections may result in irregular, slanted or crooked sleeves, which may result in a skewed package.

[0003] Since some packages have molded plastic tops, it is advantageous that the tube sleeve or section gets straight cutting lines, which facilitates the molding of the top. It is therefore understood that there is room for improvements.

[0004] The Australian patent number AU62369 discloses a method of making containers of different geometrical shapes out of a roll of scored plastic material. The containers are to be folded along the score lines produced in the material into the desired shape.

SUMMARY

[0005] An object of the present invention is to provide a new type of arrangement for cutting a tube which is improved over prior art and which eliminates or at least mitigates the drawbacks discussed above. This object is achieved by the technique set forth in the appended independent claims with preferred embodiments defined in the dependent claims related thereto.

[0006] In a first aspect of the invention, a tube flattening arrangement comprising at least one tube flattening unit having at least one pair of rollers is provided. It is configured to flatten a tube for subsequent cutting of the flattened tube into sections. It is beneficial to flatten the tube before it is being cut since it will improve the cut quality. The cut will be straighter and cleaner compared to a cut made at a tube having a circular cross section.

[0007] In one embodiment, the tube comprises a pack-

age material, preferably a paper material. This is a beneficial material since it is easy to handle and produce, easy to cut and can be made environmentally friendly.

[0008] In another embodiment, the tube is provided with at least two crease lines and the at least one tube flattening unit is configured to flatten the tube along the crease lines. One advantage of flattening along these crease lines is easy control over where the flattening occurs.

[0009] The tube flattening arrangement may further comprise a pre-folding unit configured to fold the tube along four crease lines simultaneously. This is advantageous in that the sides of the tube are pre-shaped before the flattening, and the flattening is easier to control.

[0010] The pre-folding unit may comprise four rollers for folding the tube along the four crease lines simultaneously. This is advantageous since the risk of folding across a side of the tube not intended for folding is reduced.

[0011] Preferably, the arrangement comprises a first and a second tube flattening unit, and the rollers of the first tube flattening unit are tilted an angle α relative a horizontal plane, and the rollers of the second tube flattening unit are tilted an angle $180^\circ - \alpha$ against the horizontal plane. Thereby, the tube is first flattened in one direction and thereafter in the opposite direction. This provides for greater stability during the cut.

[0012] In a second aspect, a method for cutting a tube into sections is provided. The method comprises the steps of flattening the tube by means of the tube flattening arrangement and cutting the tube. It is beneficial to flatten the tube before it is being cut since it will improve the cut quality. The cut will be straighter and cleaner compared to a cut made at a tube having a circular cross section.

In one embodiment, the flattening step comprises flattening of the tube along two oppositely arranged crease lines. The presence of crease lines simplifies the flattening since the crease always ends up in the pre-defined location.

[0013] Preferably, the flattening step comprises a first flattening of the tube along a first pair of oppositely arranged crease lines and a second flattening along a second pair of oppositely arranged crease lines. This provides for greater stability during the cut.

[0014] The method may comprise a pre-folding step of the tube along four crease lines simultaneously. This is beneficial since it prepares the tube for the flattening step and the process is carried out in a more controlled manner.

[0015] In one embodiment, the pre-folding step is performed before the flattening of the tube by means of the at least one tube flattening unit.

[0016] In a third aspect of the invention, a package comprising a tube section produced by the above method is provided. The final processing of transforming the tube into the package becomes easier and the stability of the packages is improved, compared with traditionally produced packages.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017] Embodiments of the invention will be described in the following; references being made to the appended diagrammatical drawings which illustrate non-limiting examples of how the inventive concept can be reduced into practice.

Fig. 1 is an isometric view of a prior art filling machine;
 Fig. 2 is an isometric view of a part of a filling machine;
 Fig. 3 is an isometric view of a tube flattening arrangement;
 Figs. 4a-c are sectional views of a tube;
 Fig. 5 is an isometric view of a flattening unit;
 Fig. 6 is an isometric view of a pre-folder;
 Fig. 7 is an isometric view of a tube flattening arrangement;
 Figs. 8a-c are sectional views of a tube; and
 Figs. 9a-b are sectional views of a tube.

DETAILED DESCRIPTION OF EMBODIMENTS

[0018] Hereinafter, certain embodiments will be described more fully with reference to the accompanying drawings. The invention may, however, be embodied in many different forms and should not be construed as limited to the embodiments set forth herein; rather, these embodiments are provided by way of example so that this disclosure will be thorough and complete, and will fully convey the scope of the present solution to those skilled in the art, such as it is defined in the appended claims.

[0019] In Fig. 1, a prior art filling machine is disclosed. In general, the progressive reforming and processing of a packaging material web during the manufacture of parallel epipedic packages or cartons of known type by the prior art filling machine is conducted as follows. A reel 1 of flexible, web-shaped packaging material is provided, from which the packaging material web 2 is unwound and fed through the filling machine with the aid of guide rollers 3 of known type. The packaging material web 2 passes over a bending roller 4 and is thereafter guided substantially vertically downwards through the filling machine with the aid of various types of forming devices 5, including a tube forming apparatus 6. By means of the tube forming apparatus 6, the packaging material web 2 is folded such that its two longitudinal edges overlap one another. The overlap may then be sealed with the aid of a longitudinal sealing device 7 which, in the simplest case when the packaging material web 2 is coated with thermoplastic material, may consist of a hot air nozzle. When the packaging material web 2 reaches the tube forming apparatus 6, it passes through a substantially circular material aperture and is hereby given a substantially circular cross-sectional configuration with partially overlapping longitudinal edges that are sealed to one another by means of the sealing device 7. In this prior art machine,

the tube is folded, filled, sealed and then cut into packages. In other known filling machines, the tube is cut into sleeve segments or sections prior to filling and, as explained in the prior art section, this cutting may lead to skewed packages.

[0020] Fig. 2 discloses a part of a filling machine apparatus (not shown). It comprises a tube forming section 6, a tube flattening arrangement 9, which is to be further explained below, and a tube cutting station 10. The web 2 passing through the filling machine is formed into a tube 8, generally as described in connection with Fig. 1, by the tube forming section 6. The tube 8 may in some embodiments of the tube forming section 6, be already provided with one or more crease lines for facilitating folding into a package. Thereafter, the tube 8 passes the tube flattening arrangement 9, where it is folded or flattened, and thereafter the folded or flattened tube 8 reaches the cutting station 10 where the flattened tube 8 is cut into sleeve sections (not shown).

[0021] In one embodiment, disclosed in Fig. 3, the tube flattening arrangement 9 comprises a first flattening unit 12a and a second flattening unit 12b. The flattening unit 12 is disclosed in Fig. 5. It comprises a frame 13 within which two rollers 14 are mounted. The longitudinal extension of the rollers 14a, 14b is such that it is parallel to one of the sides of the frame 13. In a mounted state in the package machine the rollers 14a, 14b are tilted an angle α with respect to a horizontal plane P. The frame 13 is arranged such that the frame opening is parallel with the longitudinal extension of tube 8.

[0022] The rollers 14a, 14b are provided with four protrusions 15 each, extending circumferentially around each roller 14a, 14b. In other embodiments, the rollers 14a, 14b may be provided with another number of protrusions or they may have a smooth circumferential surface. The rollers 14a, 14b are mounted in the frame 13 at a distance from each other approximately corresponding to, or being slightly larger than, the diameter of the roller 14a, 14b, including the protrusion 15, such that the circumferential surface of the protrusions of one of the rollers 14a is in contact with the corresponding surface of the other roller 14b.

[0023] The tube flattening units 12a, 12b of the tube flattening arrangement 9 of the embodiment disclosed in Fig. 3 are arranged such that the rollers 14a, 14b of the first flattening unit 12a are tilted by the angle α in one direction relative the horizontal plane P and the rollers 14a, 14b of the other flattening unit 12b are tilted by the angle α in the opposite direction, i.e. $180^\circ - \alpha$ - seen from the same direction. In the Figure, this corresponds to a tilting of the first flattening unit 12a rollers 14a, 14b towards the left, and a tilting of the second flattening unit 12b rollers 14a, 14b towards the right. The rollers 14a, 14b of both flattening units 12a, 12b are symmetrically tilted, but in other embodiments, the tilting may be asymmetrical.

[0024] A tube 8, shown in Fig. 4a, approaching the tube flattening arrangement 9 of the embodiment disclosed in

Fig. 3, has a tubular cross section and is provided with four longitudinal creases 11a-11d, provided along the extension of the tube 8. The creases 11a-11d may be provided in the tube forming section 6. When the tube 8 passes the first tube flattening unit 12a, one pair of creases 11b, 11c are folded, as shown in Fig. 4b. Thereafter, the flattened tube 8 passes the second tube flattening unit 12b where opposite pair of creases 11a-11d are folded. The tube 8 is now flattened into a flat state, such that it can be effectively cut into sleeves in the tube cutting station 10. By cutting the tube 8 in a folded state the cut becomes cleaner and the risk of a slanted or irregular cut is reduced. In this way, the future processing of the sleeve into a finished package is simplified and the symmetrical look of the finished package is improved.

[0025] In another embodiment (not shown), the tube flattening arrangement 9 comprises only one tube flattening unit 12. For some applications, it may be enough to flatten the tube 8 only once before cutting into sleeves, whereas for other applications it may be beneficial to flatten the tube 8 twice before cutting.

[0026] In Fig. 6, a pre-folding unit 16, according to an embodiment disclosed in Fig. 7, is shown. The pre-folding unit 16 comprises a rectangular frame 113 and four rollers 114a-114d. Each roller 114a-114d is arranged in parallel to one of the sides of the frame 113. Two of the rollers 114a, 114b have a longer longitudinal extension compared to the two other rollers 114c, 114d. In this embodiment, the longer rollers 114a, 114b are arranged in parallel to the longer sides of the rectangular frame 113, and the shorter rollers 114c, 114d are arranged along and in parallel with the shorter sides of the frame 113. As an alternative, the rollers 114a-114d are of other lengths, e.g. of equal length and/or the frame 113 may be square. The length of the rollers 114a-d corresponds to the distance between the crease lines of the tube 8. This simplifies the pre-folding of the tube 8 when it passes the pre-folding unit 16.

[0027] Fig. 7 discloses a tube flattening arrangement 19 according to one embodiment, comprising a pre-folding unit 16 as described in connection with Fig. 6, and flattening unit 12 as described in connection with Fig. 3. The pre-folding unit 16 is arranged such that one of the short sides of the frame 113 is parallel to the horizontal plane (P).

[0028] A tube 8, shown in Fig. 8a, approaching the tube flattening arrangement 19 of the embodiment disclosed in Fig. 7, has a tubular cross section and is provided with four longitudinal creases 11a-11d, provided along the extension of the tube 8. The creases 11a-11d may be provided in the tube forming section 6. When the tube 8 passes the pre-folding unit 16 the tube 8 is folded along all four creases 11a-11d, as shown in Fig. 5b. Thereafter, the tube 8 passes the flattening unit 12 which folds the tube 8 into a flat shape, shown in Fig. 8c. In the flat state, the tube 8 is then cut into sleeve sections in the tube cutting station 10.

[0029] In Figs. 9a-b, a tube 8 with only two creases

11a, 11b is shown. In order to cut this type of tube 8, the tube folding station comprises one tube flattening unit which folds the tube 8 along the creases 11a, 11b such that it can be cut in the tube cutting station.

Claims

1. A tube flattening arrangement comprising at least one tube flattening unit (12) having at least one pair of rollers (14a-b; 114a-d), and being configured to flatten a tube (8) for subsequent cutting of the flattened tube (8) into sections, wherein the tube (8) is provided with at least two crease lines (11a-d) and wherein the at least one tube flattening unit (12) is configured to flatten the tube (8) along the crease lines (11a-d) and , wherein the tube flattening arrangement (9; 19) further comprises a pre-folding unit (16) configured to fold the tube (8) along the at least two crease lines (11a-d) simultaneously.
2. The arrangement according to claim 1, wherein the tube (8) comprises a packaging material, preferably a paper material.
3. The arrangement according to claim 2, wherein the pre-folding unit (16) comprises four rollers (114a-d) for folding the tube (8) along four crease lines (11a-d) simultaneously.
4. The arrangement according to any one of the claims 1-3, comprising a first (12a) and a second (12b) tube flattening unit, wherein the rollers (14a, 14b) of the first tube flattening unit (12a) are tilted an angle α relative a horizontal plane (P), and the rollers of the second tube flattening unit (12b) are tilted an angle $180^\circ - \alpha$ against the horizontal plane (P).
5. A method for cutting a tube into sections comprising the steps of:
 - flattening the tube (8) by means of the tube flattening arrangement (9; 19) according to any one of claims 1-6;
 - cutting the tube (8), wherein the flattening step comprises flattening of the tube (8) along a first pair of oppositely arranged crease lines (11a, 11d; 11b, 11c), the flattening step comprising a pre-folding step of the tube (8) along at least the first pair of crease lines (11a, 11d)..
6. The method according to claim 5, wherein the flattening step comprises a first flattening of the tube (8) along the first pair of oppositely arranged crease lines (11a, 11d) and a second flattening along a second pair of oppositely arranged crease lines (11b, 11c).

7. The method according to any one of the claims 5 or 6, wherein the flattening step comprises a pre-folding step of the tube (8) along a first pair of crease lines (11a, 11d) and along a second pair of crease lines (11b, 11c) simultaneously. 5
8. The method according to claim 7, wherein the pre-folding step is performed before the flattening of the tube (8) by means of the at least one tube flattening unit (12a, 12b). 10
9. A package comprising a tube section produced by the method according to any one of the claims 5-8. 15

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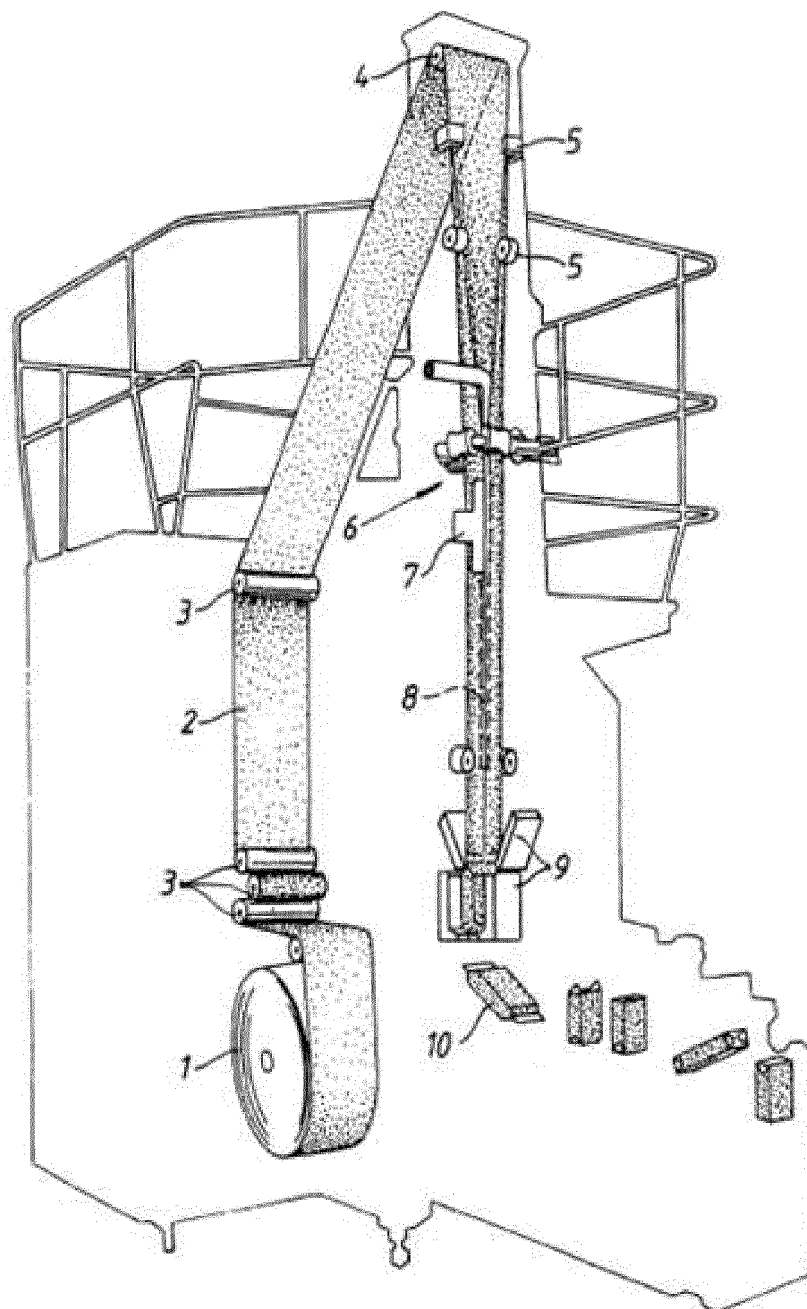


Fig. 1
Prior art

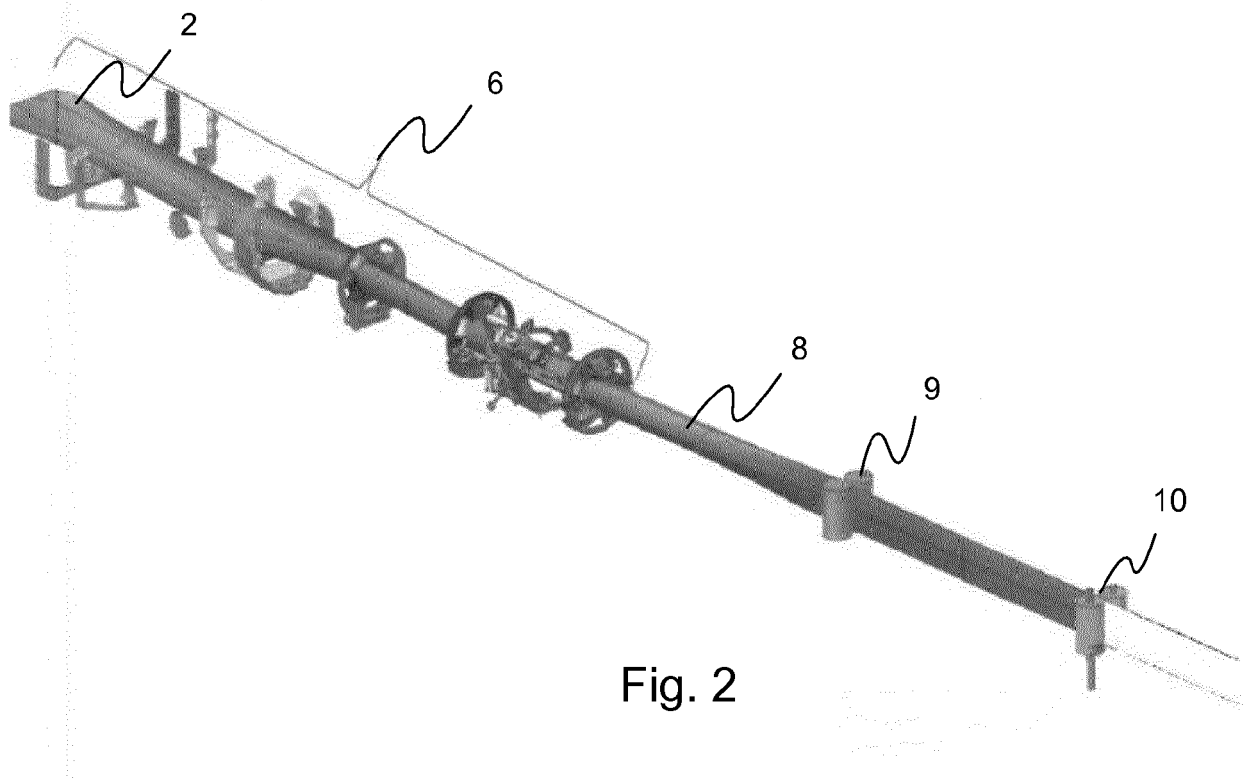


Fig. 2

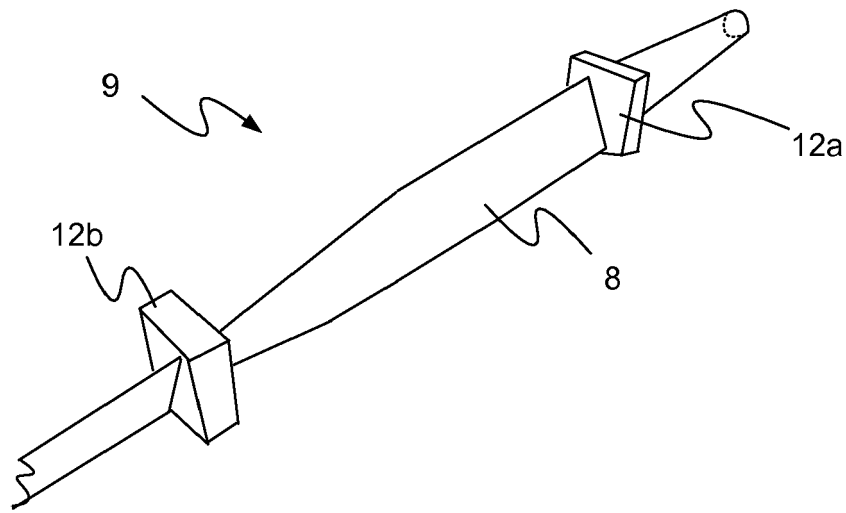


Fig. 3

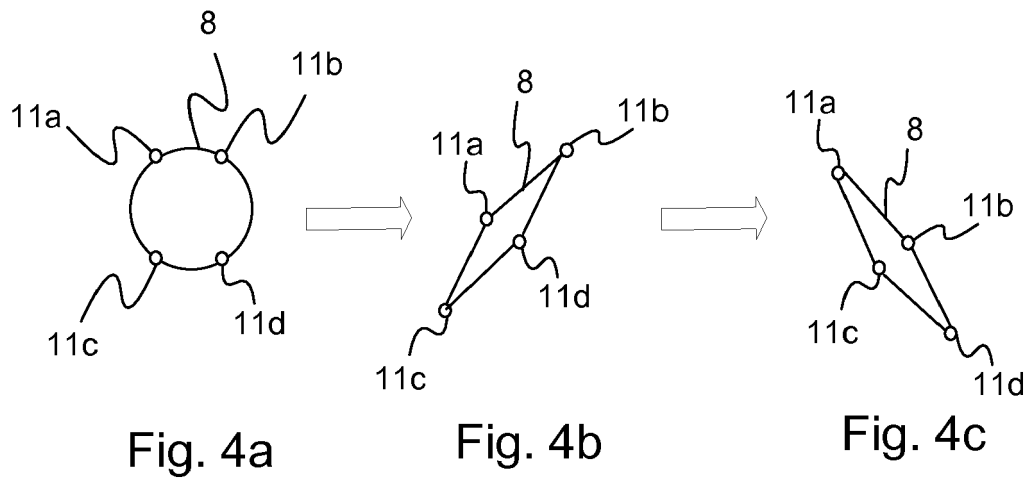


Fig. 4a

Fig. 4b

Fig. 4c

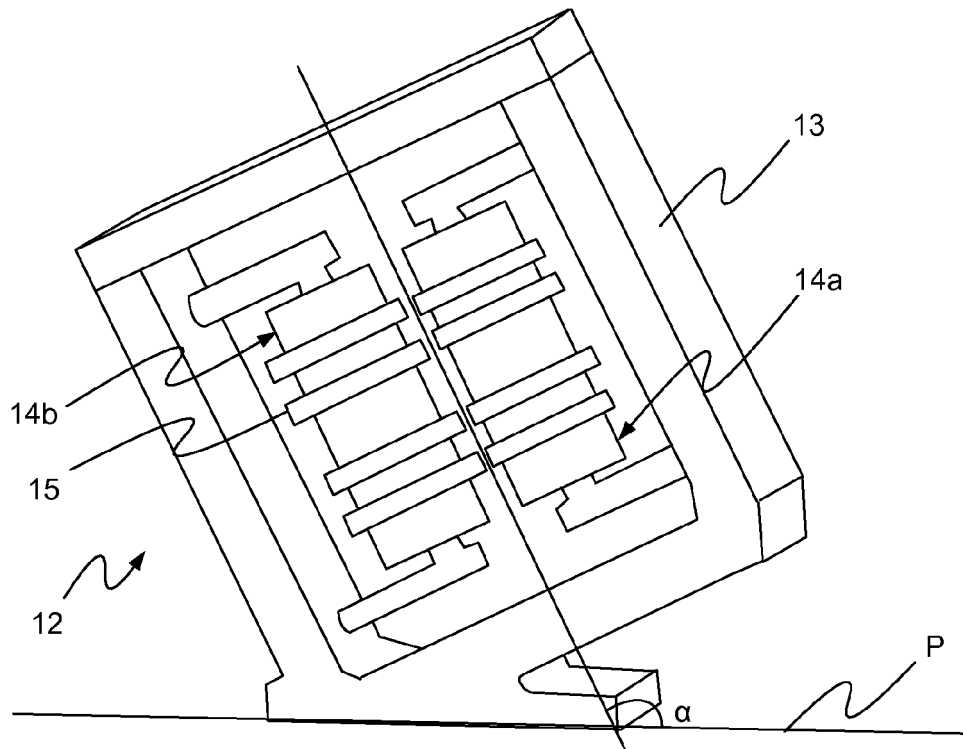


Fig. 5

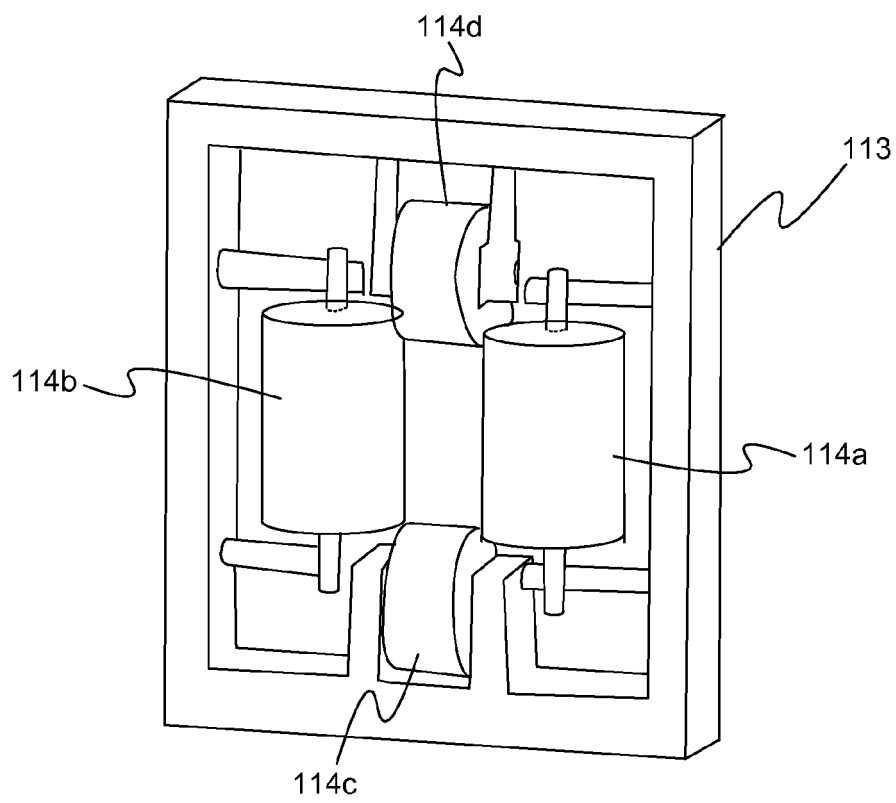


Fig. 6

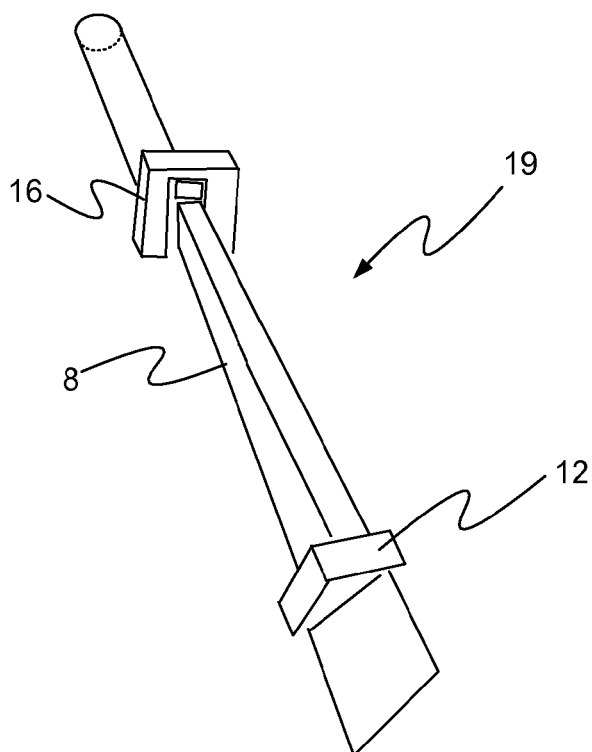


Fig. 7

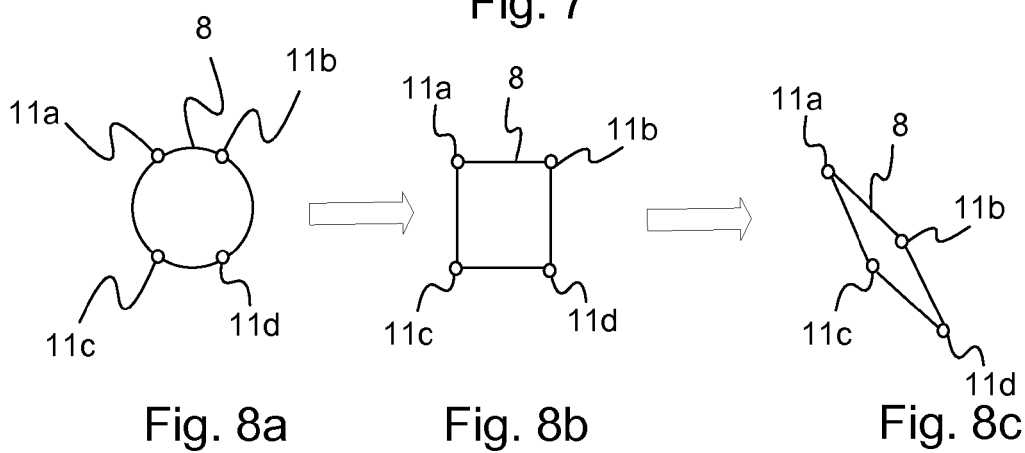


Fig. 8a

Fig. 8b

Fig. 8c

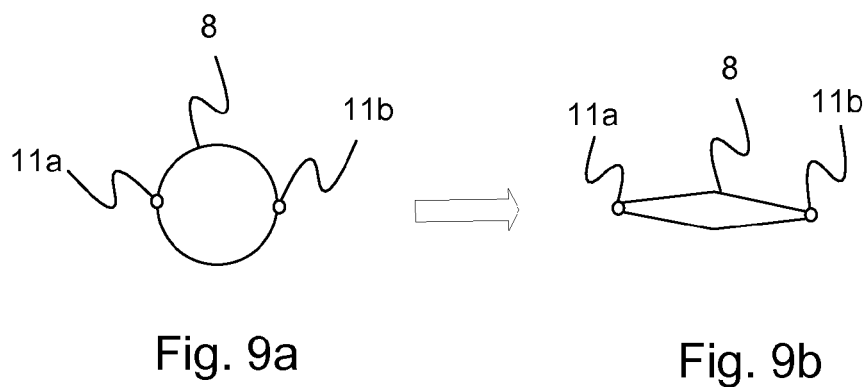


Fig. 9a

Fig. 9b



EUROPEAN SEARCH REPORT

 Application Number
 EP 18 18 1274

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EPO FORM 1503 03.82 (P04C01)

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			TECHNICAL FIELDS SEARCHED (IPC)
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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 6 November 2018	Examiner Lawder, M
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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