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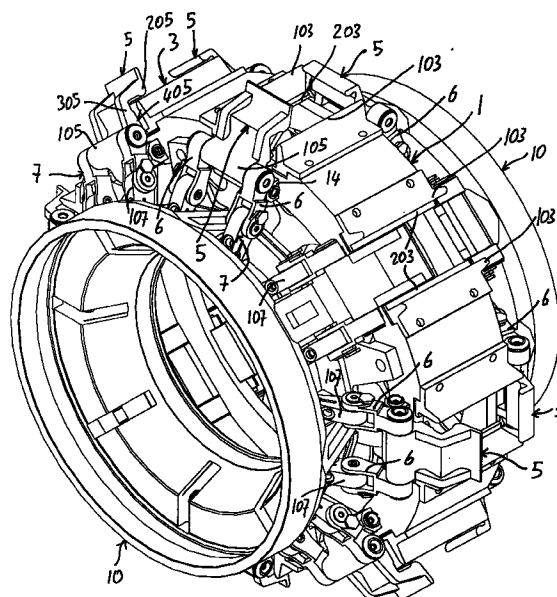
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(54) **Group for forming packets of rigid packaging, in particular of cigarette packets, in the cigarette packing machines**

(57) Group for forming packets of rigid packaging, in particular of cigarette packets, in cigarette packing machines, comprising at least one conveyor housing (3), preferably a sequence of conveyor housings (3) each for an orderly group of cigarettes (G) together with a respective blank (F) to form an outer envelope of the packet by means of the folding means (5, 21, 222) distributed along a preset path of the conveyor housings (3) between an entry station (I) and one of discharge (IV) and the said folders (5, 21, 222) determining the progressive folding of the blank (F) around the corresponding orderly group of cigarettes (G). According to the invention, for each conveyor housing (3) folding means (5) are provided at least for the most significant and constant foldings of parts of the blank (F1, F2, F5, F6) which constitute the visible faces of the finished packet, which move together with the conveyor housings (3) and farther on to the different stations according to the folds of the blank to be carried out and whose contact zones with the part of the blank (F1, F2, F5, F6) to be folded are at rest, this means do not move along the corresponding part of the blank for substantially the entire folding proceeding..



*Fig. 1*

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## Description

[0001] The invention relates to a group for forming packets of rigid packaging, in particular of cigarette packets, in the cigarette packing machines, comprising the features according to the preamble of claim 1.

[0002] The known cigarette packet forming groups, generally have stationary folders for any type of path, that is consisting of surfaces suitably shaped and engaging with the parts of the blank to be folded around preset folding lines. The advancement of the orderly groups of cigarettes together with the associated blank along the folding path takes place at high speed and generally in steps of advancement with considerable accelerations and decelerations. Furthermore, in general the wings or the flaps of the blank not yet folded are and must be free and therefore, as they have relatively large projections, are subjected to the influence of the accelerations and decelerations. Furthermore, the stationary folding surfaces must obviously be curved as they must deviate said wings or said flaps of the blank from the direction of the unfolded position to the one of the folded position. The coincidence of the above mentioned conditions entails considerable risks that during the folding of the front edges or corners of the wings and the flaps of the blank not folded, with reference to the direction of advancement, stop against the surfaces of the stationary folders generally of a concave shape, becoming either delayed because of the surging greater friction or completely deformed when the stop is drastic. In the best of the assumption this entails a certain deformation of the finished packet. The deformation becomes critical also due to the fact that with regards to the group of orderly cigarettes and with the present blanks for instance for the rigid packets with hinged lids, frequently wings or flaps of the blank project at the top end of the orderly group of cigarettes which are not symmetric between each other. Therefore the above mentioned conditions have a greater effect on the flap with greater projection than the opposite flap with lesser projection.

[0003] Furthermore, the stationary folding surfaces have the inconvenience that these must remain adherent against the associated parts of the blank in the different folding positions. Consequently one has a grazing of the blank and more precisely of the face which constitutes the one visible of the packet against the said surfaces and with the speeds of advancement presently required such grazing can cause damage to the blank from the aesthetic point of view, both with regards to damage by scraping or cancellation of aesthetic elements foreseen on the blank as well as for the appearance, for example, of lines or other marks caused by the reciprocal rubbing between the blank and the folding surfaces.

[0004] The conditions described above assume a considerable importance, when the folding path winds along a curved line in particular tangential or secant to

the blank not folded, as in this case also centrifugal forces take effect which push the flaps of the blank cooperating with the folding surfaces necessarily already curved on their own but are in this case curved still further according to the radius of the curved folding path, against the said folding surfaces of the same amplifying the inconveniences described.

[0005] The invention has therefore the aim to create a cigarette packet forming group of the type described at the beginning that thanks to simple and low cost devices is able to prevent the inconveniences described above without thus operationally limiting the group relative to the present ones, but on the contrary allowing for a better and more efficient and reliable operation.

[0006] The invention attains the above aims with a packet forming group of the type described at the beginning and showing the combination of features of the characterizing part of claim 1

[0007] According to a preferred embodiment of the invention, the conveyor housings are constituted by housing pockets distributed along the peripheral rim of a wheel revolving around an horizontal axes, while folding means with the relative support and driving means are provided in correspondence with each housing pocket and on the two sides axially opposite of each pocket.

[0008] Therefore the folding means form two crowns of coinciding means each with one of the two opposite faces of the wheel and each pair of folders in correspondence with the corresponding housing pocket, while the support means of the folders are stationary relative to the housing pockets, that is they move together with the same.

[0009] In this case it becomes advantageous to provide as a driving means of the folders a small oscillating drive arm which is operated thanks to a stationary cam, the oscillating drive arm being articulated to the folder and is therefore itself movable together with the housing pockets.

[0010] The cam is of the three dimensional desmodromic type and the oscillating arms have pairs of rollers which engage with the opposite faces of the cam track.

[0011] The housing pockets of the individual orderly groups of cigarettes together with the blank to be folded are open preferably along the ends parallel to the two faces of the wheel and along the radially external side, while in combination with the folders have stationary means to retain the orderly groups of cigarettes in the housing pockets constituted by stationary surfaces concentric with the path of the housing pockets. While the said stationary retaining surfaces become smaller and thinner little by little as the folding means approach the parts of the blank to be folded to the faces still free of the orderly group of cigarettes, so as not to interfere with the said parts of the blank and with the folding means.

[0012] In a preferred embodiment, the blank is wrapped around an orderly group of cigarettes with a progressive motion of wrapping the same that is transversal to the major axis of the blank, in that the orderly

group of cigarettes is arranged in such a way, whereby the major axis of the blank is transversal to the direction of advance, while on the two sides of the housing pocket parallel with the direction of conveyance and with the minor axis of the blank, oscillating folder arms are provided the oscillating support of which moves together with the housing pocket and the said folder arms oscillate between a dwell station where they are tilted laterally outward relative to the housing pocket and in a position of completed fold in where they are oscillated towards the median plane of the housing pockets and in which position they push the parts of the blank engaging with the face on the peripheral external face of the wheel of the group of ordered cigarettes to the corresponding part of the blank.

[0013] According to a further feature, associated with the preceding parts of the blank projecting on the two sides of the housing pockets in direction transversal to the conveyance and intended to overlap each other on the lateral and upper faces of the orderly group of cigarettes oriented parallel with the direction of conveyance, are folded in such a manner whereby first the folding of the parts destined to overlap the face parallel with the direction of conveyance and opposite to the closed side of the housing pocket is carried out and the folding takes place with regards to the part of the blank intended to overlap the lateral faces perpendicular relative to the first of the orderly group of cigarettes, while subsequently after this first folding, the contemporaneous folding of said two parts of the blank is carried out substantially together and already with the final reciprocal orientation against the associated face of overlap of the orderly group of cigarettes. For this purpose, apart from an appropriate control along the folding line between the two sections of the projecting part of the blank, each folder arm has a shape such as to engage first with the outermost part of the blank relative to the mean axis of the conveyor housings, and subsequently also with the innermost part to accompany and fold together and with the final orientation between the said two sections of the projecting part of the blank against the orderly group of cigarettes.

[0014] In particular this is obtained providing each folder arm with two areas of contact with the blank.

[0015] Arranging and shaping the arms appropriately it becomes possible to obtain that the two areas of contact between the blank and the folder arm always be very small and alternating between each other.

[0016] In particular it becomes advantageous to make the folder arms to oscillate around an axis arranged below the edges of the opposite lateral faces of the orderly groups of cigarettes beyond which extend the two projecting parts of the blank in that the folder arm is shaped in form of an inverted L, or oscillating around the longer branch and the surfaces of contact with the blank one being provided in the intermediate area of the longer branch and one in the intermediate area of the shorter branch in such a way, whereby an area of con-

tact with the blank coincides with the folding line between the two areas of the projecting part of the blank that cooperate with said arm and one area of contact is constituted by the band along the said folding line of the outermost area of the blank.

[0017] In this case, the two areas of the projecting part of the blank are folded in advance between themselves taking up an intermediate orientation, while the reciprocal correct position is reached under condition of completion of the fold against the corresponding face of the orderly group of cigarettes.

[0018] In combination with the folding means above further mobile or stationary folders can be provided for the folding of further flaps, for example of the overlapping wings for forming the sides perpendicular to the direction of conveyance or additional wings.

[0019] The advantages of the present invention become evident from the description above. The parts of the blank that constitute the visible faces generally of greater extension and aesthetic impact of the packet obtained by folding the same move together with the pocket and the blank and carry out motions with regards to the folding that are very limited. In this way one eliminates the inconveniences due to possible sticking of the same parts of the blank to the surfaces that determine the folding and one avoids, or in any case drastically reduces the danger of damaging the visible surfaces of the blank that would reduce the value or aesthetic appearance. The particular construction of the folders allows to obtain the maximum precision of motion and the delicate handling of the blank, furthermore the same is mechanically simple. The construction of the folding means also allows for the making of the housings to be such to prevent leaks of lubricants in the sections where the product is housed avoiding any danger of soiling. The construction is of safe and reliable operation.

[0020] The invention has additional features which are subject of the dependent claims.

[0021] The features of the invention and the advantages arising from the same will be better evidenced from the following description of a non limiting executive example illustrated in the attached drawings, in where:

The Fig. 1 illustrates a perspective view of a forming wheel with the folding arms.

The Fig. 2 illustrates an enlarged detail of the wheel according to Fig. 1 in the area of a folding arm.

The Fig. 3 illustrates an axial view partially in cross-section of the wheel according to the preceding figures.

The Fig. 4 illustrates an enlarged detail of Fig. 3.

The Fig. 5 illustrates an axial cross-section of the wheel according to the preceding figures.

The Fig. 6 illustrates a detail of the folding means of the inner flaps on the end sides of the orderly group of cigarettes parallel to faces of the wheel.

The Figs 7 to 12 illustrate an enlarged detail of the section according to Fig. 5 with the folding arms in

the respective different folding positions.

The Figs 13 to 17 illustrate different views of the drive cam of the oscillating drive arms.

The Fig. 18 to 21 illustrate the blank in the starting condition and in the different folding conditions relevant for the folding process.

**[0022]** With reference to the figures, a group for forming rigid packets, in particular of cigarettes, is constituted in particular, but not limit wise by a wheel 1 which is mounted revolving around an horizontal axis 2 and that carries a plurality of housing pockets 3 angularly equidistant on its circumferential peripheral face. The wheel 1 is formed by two discs 101 each of which is mounted on a half shaft 33. The two discs and the two half shafts are coaxial between each other and the two discs are distanced between each other in a dimension substantially corresponding to the dimensions of the packet in direction of the axis of rotation.

**[0023]** The driving can take place thanks to any means known in themselves for example by transmissions not illustrated which drive the two half shafts in a manner perfectly synchronized between each other. This allows to position followers/ejectors inside between the two discs indicated generically with 4 also known in themselves and which are activated by drive shafts 104 which extend themselves inside the hollow made half shafts 33. The housing pockets are constituted by a bottom wall which can be whole or formed by small bars or crossbars 103 in the two end zones of the corresponding side of the packet and by vertical ribs 203 which overlap at the two radial sides of the packet P transversal to the direction of advance.

**[0024]** In correspondence with each housing pocket 3 or the side of the same on the face of the wheel 1 an oscillating folder arm 5 is provided in form of an L and that is fulcrated in a manner oscillating around a perpendicular axis at the median radius between the two lateral vertical ribs 203 and that is foreseen radially inside with respect to the bars 203 that form the bottom side of the housing pockets 3. The radial distance corresponds substantially to the radial dimension of the packet G that is intended to be housed in the housing pocket 3. Two parallel drive arms 6 are articulated on an intermediate appendix 105 of each arm 5, the opposite end of which is articulated to the corresponding branch of the forked end 107 of an oscillating drive arm 7. This is fulcrated in an oscillating manner at its intermediate point around an axis 8 parallel to the axis of oscillation of the folding arms 5 and the opposite end has a revolving roller 15 at the ends of the two branches of a second fork 207 oriented perpendicularly to the first 107 respectively. The axis of the fulcrum 8 of the drive arms 7, as well as the axis of oscillation of the folding arms 5 is mounted on a stationary support 14, 14' fixed to the external side of the corresponding disc 101 or shaped with the same. The rollers 15 are revolving around axis contained in the median radial plane of the housing

pocket 3 and each engaging with the two opposed tracks 109 of a three dimensional cam 9. The same is foreseen on a stationary part 10 mounted coaxially to the axis of rotation 3 of the wheel and facing the corresponding disc of the wheel 1. The peripheral edge is suitably circular and the part 10 on which the cam 9 is made constitutes the axial closure element of the housing chamber 11 of the drive arms 7 and of the cam 9. This one is at least partially closed on the circumferential side of the covers 111 that are fixed to the corresponding disc 101 suitably shaped to form bearing and mounting surfaces and that support lubricant proof and in a rotary manner relative to the same thanks to oil seal rings 211 against the circular peripheral edge of the part 10 that carries the cam 9.

**[0025]** The folding arms 5 have an extension such as to cover in the circumferential direction of the extension of the housing pocket 3, while these are in the shape of an inverted L with the longer branch 205 that is the one fulcrated in an oscillating manner and with the shorter branch 305 that in the position oscillated towards the disc 101 arranges itself parallel to the plane defined by the lateral bottom ribs 203 of the housing pocket 3 at a radial distance from the same corresponding to the thickness of the packet, while the intermediate zone 405 of the longer branch 205 of the folding arm 5 is radially perfectly oriented and extends itself level with the plane defined by the open side of housing pocket 3 parallel to the face of the corresponding disc 101.

**[0026]** The cam 9 can be shaped in such a manner as to guarantee the oscillations of the folding arms 5 into the desired positions of folding of the flaps projecting axially from the blank F.

**[0027]** The motion of the folding arms is to a limited degree smooth and continuous with regards to stops due to the advancement in steps of the wheel itself, without variations in position or leaps. This guarantees together with the absence of relative circumferential motion and to the limited reciprocal rubbing between the folding arms 5 and areas of contact of the same on the blank, a delicate but also firm folding of the blank and such as to avoid hang ups between the folding means and the parts folded by the same or damage to the blank.

**[0028]** A typical blank for making a rigid cigarette packets with hinge lid is shown in Fig. 18.

**[0029]** The blank has in reality already been subjected to some forming operations or to the connection with the so called inner frame that are not subject and do not have an effect on the sequences carried out by the group according to the invention.

**[0030]** The blank F has a central band formed by several rectangles of different dimensions and indicated in order from F1 to F6 and which are respectively the front facing part of the hinged lid the top end side of the packet connected to the hinged lid the rear side of the hinged lid that is hinged at the remaining part of the rear side of the packet, the bottom side of the packet and the

remaining part of the front facing side of the packet. Lateral wings indicated with L1 to L6 and L1' to L6' are connected on both sides of the central band and are symmetrically to the same. From L1, L1' to L6, L6' the wings constitute respectively the outer overlapping wing on the sides of the packet, the two opposite internal wings at the top end of the blank which is overlapped by the zone F2, the wings that form the narrow sides in the area of the lid and which are overlapped by the wings L1, L1', the wings that form the remaining part of the sides, the wings of the bottom side which is overlapped by the area F5 and the wings overlapping the wings L4, L4' along the sides of the packet.

**[0031]** The wings L2, L2' and L5, L5' that form the internal layer of the end sides that form the bottom and the head of the packet and which are overlapped in the finished condition of the packet by the areas F2 and F5, are connected along the preset folding lines to the adjacent wings L3, L3' and L4, L4' that form the innermost layer of the sides of the packet, while they are separated by cut-outs from the areas F2, F5 adjacent to the same and from the wings L1, L1' and L6, L6'.

**[0032]** In these conditions in order to better understand the operation of the group according to the invention, it is appropriate to indicate that the blank is suitably wrapped around an ordered group of cigarettes G preferably previously wrapped in an inner envelope of foil or similar. The Fig.s 18 to 20 illustrate some main phases of the folding. In a first phase not illustrated, the orderly group of cigarettes G is pushed into a pocket 3 with a radial motion and placed between the group G and the pocket a blank F suitably centered with the zones F3 and F4 relative to the corresponding side of the orderly group of cigarettes G. The insertion into the pocket with the blank oriented with its longitudinal axis parallel to the axis of rotation of the wheel 1 determines the first folding of the lateral wings L3, L3' and L4, L4' against the sides of the narrow sides of the orderly group of cigarettes G.

**[0033]** From the two end sides parallel with the discs 101 the areas F1, F2 project in this way with the associated wings L1, L1', L2, L2' from one side and F5, F6 with the wings L5, L5' and L6, L6' from the opposite side.

**[0034]** In the following folding phase the wings L2, L2' and L5, L5' are folded which are connected by means of a preset folding line to the ends of the lateral wings L3, L3' and L4, L4' folded on insertion of the orderly group of cigarettes G into the pocket 3.

**[0035]** The wings L2, L5 are folded by external folders 21 that move tangentially to the discs 101 and that are formed for example by folding spatulas parallel with the faces of the disc and movable forward and back in position substantially overlapping the end side of the orderly group of cigarettes G. The Fig. 6 illustrates said folders 21 in the withdrawn position and in the folding position respectively which is indicated with a dotted line with the reference number 21'.

**[0036]** The spatulas advantageously constitute the

branches of a fork that is mounted on a rod 121, while the movement of the spatulas 21 takes place thanks to an articulated polygon formed by the levers and the by the arms indicated with 221, 321, 421, and 521. In the folding position the spatulas arrange themselves at a certain distance from the shoulders 222, in order to form an extension and as the said distance is smaller than the dimension of the wings L2, L5 and remain in this position to guarantee that said wings slip under said shoulders 222 during at least the initial phase of the subsequent step of advancement.

**[0037]** With these steps of advancement the wings L2' and L5' are folded, in front with reference to the direction of rotation thanks to the shoulders 222.

**[0038]** These two steps are schematically indicated in the Fig.s 7 and 8 and 9 viewed in direction of advancement of the housing pocket 3.

**[0039]** After this phase the further advancement of the wheel entails the activation of the two opposed oscillating folding arms 5 that act on the projecting areas F1, F2 and F5, F6. The first folding takes place along the lines L7 and L8 as illustrated in the Fig.s 10 and 20. The folding arms 5 start to engage with the branch 305 with the areas F1 and F6 and thanks to the opposing action of a stationary part 322, fold said areas relative to the areas F2 and F5.

**[0040]** The following folding step will lead the areas F1 and F2 and F5 and F6 to progressively overlap the corresponding side of the orderly group of cigarettes as illustrated in the Fig.s 11, 12, and 21. The only wings still to be folded after this step are those overlapping the narrow sides L1, L1' and L6, L6' that extend themselves in line in pairs and that are folded thanks to the stationary folding surfaces on ejection in station IV of the packet from the housing pocket 3.

**[0041]** Obviously what is proven in these Fig.s 18 to 20 is extremely schematized to obtain the maximum possible simplicity.

**[0042]** The orderly group of cigarettes G with the associated blank are retained in the corresponding pockets 3, until the complete folding in the final position of the areas F1, F2 and F5, F6 of the blank F has been reached thanks to a circumferential retaining surface that extends itself coaxially with the wheel 1, at a distance from the pockets corresponding to the thickness of the orderly group of cigarettes G with the blank and that lessens in thickness, keeping its position in direction of advancement of the wheel, presenting a preset angular amplitude that normally lies between 100 and 120 degrees.

**[0043]** Said surface 122 is formed by the radially internal side of a concave that terminates progressively tapering itself in the angular position corresponding to the moment where the areas F1, F2 and F5, F6, have been brought into contact with the corresponding side of the orderly group of cigarettes G and are retained in that position by the folding arms 5. Therefore the areas F1, F2, F5 and F6, are folded over the concave 22 that ter-

minates in such a position as not to interfere with the actual folders 5.

[0044] The concave 22 has in its initial area with reference to the direction of rotation also lateral shoulders 222 which substantially overlap in line the open ends of the pockets 3 parallel to the discs 101 and that have an angular amplitude such whereby the shoulders 222 do not break along the entire path from the station of introduction I to the angular position II corresponding to the moment in where the first fold has been carried out in the conditions substantially as in Figs 7 to 10 and 20. In this case, the lateral shoulders 222 have an L shaped section with an axial branch 322 the external edge of which is in line with the folding line L7, L8 between the areas F1 and F2 and the areas F5 and F6.

[0045] A further retaining surface 122 is foreseen downstream from the station indicated with III in which the folding arms complete the fold. This one is made substantially symmetric to the preceding ones and is part of a coaxial concave 22' and with a construction substantially symmetrical and analogous to the concave 22.

[0046] The concaves 22, 22' are stationary and are supported by the frame of the machine obviously in an adjustable manner with regards to the position of the same.

## Claims

1. Group for forming packets of rigid packaging, in particular of cigarette packets, in the cigarette packing machines, comprising
  - a) at least one conveyor housing (3), preferably a sequence of conveyor housings (3) each for an orderly group of cigarettes (G), preferably of a sequence of orderly groups of cigarettes, in particular prewrapped in an inner envelope of the finished pack, together with a respective blank (F);
  - b) the said at least one conveyor housing or the said conveyor housings show at least two adjacent open sides with different orientations one with respect to the other;
  - c) folders (5, 21, 222) distributed along a preset path of the conveyor housings (3) between an entry station (I) and a discharge station (IV) and which folding means (5, 21, 222) determine the progressive folding of the parts of the blank (F) corresponding to the said open sides of the conveyor housings (3) for forming the corresponding parts of the external envelope of the rigid packet.;
  - d) each conveyor housing (3) being provided with dedicated, associated folding means (5) which move together with the conveyor housings (3);
  - e) the folding means (5) being built in such a

way that they show means for carrying out at least two different folding steps which are carried out at least partially the one after the other.

2. Group according to claim 1, characterized in that the folding means are formed by separate folding members (205, 405) which are driven in a synchronized manner one with respect to the other.
3. Group according to claim 1 or 2, characterized in that the folding members (205, 405) are mounted onto two movable elements or they are integrated on a unique movable element (5).
4. Group according to one or more of the preceding claims, characterized in that the folding members have surfaces of contact with the relating parts of the blank (F1, F2, F5, F6) and are made in such a way that the contact zone of the same one with the corresponding part of the blank will remain substantially at rest during folding.
5. Group According to one or more of the preceding claims, characterized in that the zones of contact of the folding members are at least partially rounded or smoothed.
6. Group according to one or more of the preceding claims characterized in that the zones of contact are formed at least partially by movable elements, or by rotatable elements, like rollers, bands or belts, or the like.
7. Group according to one or more of the preceding claims, characterized in that the folding means (5) may be provided with means for generating air cushions between their surfaces of contact and the zones of contact with the corresponding parts of the blank (F1, F2, F5, F6).
8. Group according to one or more of the preceding claims characterized in that the conveyor housings (3) have at least two open sides which are oriented substantially in direction of transport and at which open sides the sides of the ordered group of cigarettes - eventually already wrapped in an internal envelope (G) - are placed, against which the parts (F1, F2, F5, F6) of the blank has to be folded, the folding being carried out according two lines of folding which are parallel or tangential to the direction of transport and which are coinciding with the corresponding edges of the two faces of the ordered group of cigarettes (G) at the said open sides, and the folding is carried out starting from a coplanar position of the parts (F1, F2, F5, F6) of the blank to be folded and being the folding members (205, 405) destined to carry out a first fold around a first edge, in combination with a stationary bearing (322)

cooperating with the internal surface of the part (F1, F2, F5, F6) of the blank, and a second fold around a further folding edge against a further fixed bearing (G).

9. Group according to claim 8, characterized in that the first fold is carried out between the parts (F1, F2, F5, F6) of the blank along a line of folding corresponding to the edge connecting the two faces of the group G of cigarettes at the open sides of the relating conveyor housing (3), while the second fold is carried out afterwards and around a line of folding coincident with the edge which is parallel to the first folding line and placed between one of the faces of the group of cigarettes at the open side and the adjacent face of the group of cigarette at the closed side of the corresponding conveyor housing (3), being in the case of the second fold the second stationary bearing formed by the ordered group of cigarette (G) itself.

10. Group according to one or more of the preceding claims, characterized in that the folding members (405) for carrying out the second fold come into contact with the first edge of folding between the parts of blank (F1, F2, F5, F6) which in a finished condition of the folding is coincident with the edge connecting two adjacent faces of the ordered group of cigarettes (G) which faces are placed at the two adjacent open sides of the corresponding conveyor housing (3).

11. Group according to one or more of the preceding claims, characterized in that

- a) the folding means (5) have two folding members (205, 405);
- b) the fold along the first folding line which is coincident in the finished condition with the connecting edge between the two faces of the cigarette group at the two adjacent open sides of the conveyor housing (3) is carried out only partially by the first folding member (205);
- c) the said first folding member (205) being made or driven in such a way to spread apart from the associated part of blank (F2, F6) when the second folding member (405) is activated and during the folding around the second line of folding for carrying out at least partially the second fold;
- d) the first folding member being again activated or becoming again effective in substitution of or at the same time with the second folding member (405) for terminating the first and/or the second fold, thanks to which the two parts of blank (F1, F2, F5, F6) are brought against the corresponding faces of the ordered group of cigarettes (G) in the conveyor housing

(3).

12. Group according to one or more of the preceding claims, characterized in that the folding means (5) are shape as an overturned L and are hinged at their end opposite to the angled zone pivotably around an axis which is parallel to the folding lines, while the first folding member (205) is formed by the free end of the transversal branch of the L-shaped folder and the second folding member (405) is formed by a zone of contact (405) at an intermediate point of the hinged leg of the L-shaped folder.

13. Group according to claim 12, characterized in that the axis around which the folder (5) is hinged, is placed at a certain distance from the connecting edge between the closed side and the adjacent open side of the conveyor housing (3) according to one or to both the directions parallel to the open sides of the conveyor housing (3).

14. Group according to one or more of the preceding claims, characterized by the fact that the conveyor housings (3) have supporting means (14) of the folding means (5) that are integral with the same, while the means (7, 15, 9, 10) driving the motion of the folding means (5) are formed by a mobile part (7, 15) dynamically linked to each folder (5) and movable with the same, and by a drive part (10, 9) stationary and cooperating with all the moving parts (7, 15) associated with the folding means(5).

15. Group according to one or more of the preceding claims, characterized by the fact that the drive means (7, 15, 9, 10) of the folding means (5) form together with the conveyor housings (3) or with the conveyor (1, 101) of said conveyor housings (3) a closed or closable chamber at least in part towards the outside and is provided with retaining means against leaks of lubricating fluids.

16. Group according to one or more of the preceding claims, characterized by the fact that the folding means (5) cooperate with parts (F1, F2, F5, F6) of the blank projecting transversally outwards to the direction advance of the conveyor housings (5) and are fixed to the bearing structure (101) of the conveyor housings on the side parallel to the direction of conveyance, while the folding means (5) are activated by an oscillating drive arm (7) articulated to each folding means (5) of each conveyor housing (3) which have an end supporting at least one roller (15) preferably a pair of rollers (15) revolving around an axis perpendicular to the direction of conveyance, the said roller or the said rollers cooperating with a stationary cam (9) which winds itself longitudinally in direction of conveyance.

17. Group according to one or more of the preceding claims, characterized by the fact that the conveyor housings are constituted by pockets (3) formed by ribs transversal to the direction of conveyance shaped in form of an L and with a surface perpendicular to and a surface parallel to the direction of conveyance, while said pockets (3) are open at least in correspondents to the opposite side of the plane formed by the branches of the ribs that define the plane parallel to the direction of conveyance and of the lateral ends parallel to the direction of conveyance, folding means (5) being provided in correspondents to at least one or both the said ends.

18. Group according to the claim 17, characterized by the fact that stationary means (22, 222) are provided to retain the orderly groups of cigarettes (G) in the housing pockets (3) which extend themselves above at least one of the open ends of the conveyor housings (3) at a distance corresponding to the dimension of the orderly group of cigarettes (G); that said stationary means taper progressively in a manner substantially complementary to the position of the folding means (5) and of the areas (F1, F2, F5, F6) of the blank (F) against the faces of the orderly group of cigarettes with which cooperate the same retaining means and in such a manner as not to interfere with the folding motion, leaving the said faces of the orderly group of cigarettes (G) progressively free when the areas (F1, F2, F5, F6) are progressively brought into contact with the same, and terminate directly upstream to the station in which the said areas (F1, F2, F5, F6) have been brought into direct contact with the orderly group of cigarettes (G) in the end of fold position.

19. Group according to the claim 18, characterized by the fact that said stationary means of retention overlap all the open sides of the housing pockets forming a U shaped conduit (22, 122, 222) in the initial area with two lateral shoulders (222) and a flat median surface and which progressively transforms itself into a flat concave (122) which in turn tapers in direction of the station (III) in which the fold is completed.

20. Group according to one or more of the preceding claims, characterized by the fact that the blank has folding wings (L2, L2', L5, L5') transversal and perpendicular to the direction of advancement on at least one of the two end sides parallel with the direction of advancement of the housing pockets (3) and which are intended to be folded against the said end sides, while for the folding of the rear wings (L2, L5) with reference to the direction of advancement spatulas (21) are foreseen tangentially movable at the said end sides of the housing

pockets (3) in a position overlapping the same and in the rest position in where they are moved away from the corresponding pocket.

21. Group according to the claim 20, characterized by the fact that the spatulas (21)

are provided in the loading station (I) of the blank (F) together with the associated group of orderly cigarettes (G) into the housing pocket (3), while the initial part of the stationary means of retention (22, 122, 222) is provided directly downstream of the pocket, the shoulders (222) of which also extend themselves tangentially to the end sides of the housing pocket (3) and constitute the folding means of the transversal wings perpendicular to the direction of advancement, in front with reference to the actual direction of advancement.

22. Group according to one or more of the claims 20 to 21, characterized by the fact that in the active folding position the spatulas (21) overlap the corresponding end side of the housing pocket (3) and terminate at a certain distance from the starting end of the complanar shoulders (222), the said distance is smaller than the corresponding dimension of the transversal wings (L2, L5) folded by the spatulas (21) against or parallel to the corresponding open end side of the housing pocket (3).

23. Group according to one or more of the preceding claims, characterized by the fact that the housing pockets move along a circular track (1).

24. Group according to the claim 23, characterized by the fact that the housing pockets are carried at the periphery of a wheel (1, 101) and are angularly equidistant.

25. Group according to the claims 23 or 24, characterized by the fact that the housing pockets are arranged with the three open sides one in correspondence to the outermost radial circumferential plane and the other two in correspondence to the axial end sides parallel to the two faces of the wheel, or perpendicular to the axis of rotation of the wheel (1), while one or both the faces of the wheel (1) carry a crown of folding arms (5) that are provided coinciding with each housing pocket (3) and that oscillate around perpendicular axes at the median radius of the corresponding housing pocket (3) and at the axis of rotation of the wheel (1), the said axes are rotary wise integral with the actual wheel (1).

26. Group according to one or more of the preceding claims 23 to 25, characterized by the fact that the



- folding arms (5) have a section in form of an inverted L, with the longer branch hinged at its extremity to the axis of oscillation and with the shorter branch (205) arranged at such a distance, whereby in condition of oscillation against the associated face of the wheel the shorter branches (205) overlap each other exerting a preset pressure on the face of the radially external circumferential side of the orderly group of cigarettes, while the oscillating arms themselves have a second area of contact (405) with the blank (F) at an intermediate point of the longer branch (305).
27. Group according to one or more of the preceding claims, characterized by the fact that the retaining surfaces (22, 122, 222) extend themselves coaxially to the wheel (1) over a preset angular portion of the same between the entry station (I) and a station (III) in where the folding arms (5) have finished the folding phase.
28. Group according to one or more of the preceding claims, characterized by the fact that downstream of the station (III) in where the folding arms (5) have finished the folding and the station of discharge (IV) from the wheel (1) retaining surfaces are provided symmetrically substantially analogous to the ones between the station of entry (1) and the said station (III) in which the folding phase is finished.
29. Group according to one or more of the preceding claims, characterized by the fact that one or both faces of the wheel (1) carry a second crown of oscillating drive arms (7) that are rotary wise integral with the wheel and that drive the oscillation of the folding arms (5) thanks to an associated stationary annular cam (9) which is carried by a stationary disc (10) and that cooperates with at least one roller (15), preferably a pair of rollers (15) carried at the radially innermost extremity of the drive arms (7).
30. Group according to one or more of the preceding claims, characterized by the fact that the support disc (10) of the cam (9) forms together with a disc (101) that constitutes the facing side of the wheel (1) a chamber (11, 12) substantially lubricant leak proof and in which the drive arms (7) are located, while the folding arms (5) are external to said chamber.
31. Group according to one or more of the preceding claims, characterized by the fact that the folding arms (5) are dynamically connected to the drive arms (7) by means of small arms of transmission that are articulated at the radially outermost extremity of the drive arms (7) and at an intermediate point of the folding arms (5).
32. Group according to one or more of the preceding claims, characterized by the fact that the axis of oscillation of the folding arms (5) is foreseen in a radial position more inside with regards to the radially innermost circumferential side (203) of the pockets (3) radially slightly outwardly offset relative to the corresponding end side of the housing pockets (3).
33. Group according to one or more of the preceding claims, characterized by the fact that the housing pockets (3) have a radially inner circumferential side (203) a central opening and two radial end ribs (103), while the folding arms (5) extend themselves over a substantial part of the distance between the radial ribs (103).
34. Group according to one or more of the preceding claims, characterized by the fact that the folding arms cooperate with parts of the blank (F1, F2, F5, F6) are intended to overlap each other at the end sides of the orderly groups of cigarettes (G) and at the radially outermost circumferential side, the said parts of the blank (F1, F2, F5, F6) project beyond the two opposite end sides of the housing pockets in a direction transversal to the one of conveyance and are folded by the folding arms (5) provided with two different contact areas (205, 405) with the same of which one is intermediate and one at the extremity, in such a manner whereby the folding of the parts (F1, F6) intended to overlap each other at the radially outermost circumferential face of the orderly group of cigarettes (G) are folded first relative to the parts of the blank (F2, F5) intended to overlap each other at the end sides of the orderly group of cigarettes (G), at least in the intermediate position between the initial and the final one, while subsequently, the contextual folding of the said parts of the blank (F1, F2, F5, F6) takes place substantially together and with an already reciprocal final or intermediate orientation, against the associated faces of the orderly groups of cigarettes (G), as stationary stops (322) carried by stationary means of retention (22, 122, 222) that define the folding line (L7, L8) are foreseen for the path of the housing pockets (3) relative to the said first folding phase and the folding arms (5) being suitably shaped in form of an (L).
35. Group according to one or more of the preceding claims, characterized by the fact that the intermediate striking area (305) of the folding arms (5) comes to cooperate with the area of the folding line (L7, L8) between the two parts of the blank (F1, F2, F5, F6) projecting beyond the housing pockets (3) and previously at least partly folded one relative to the other.

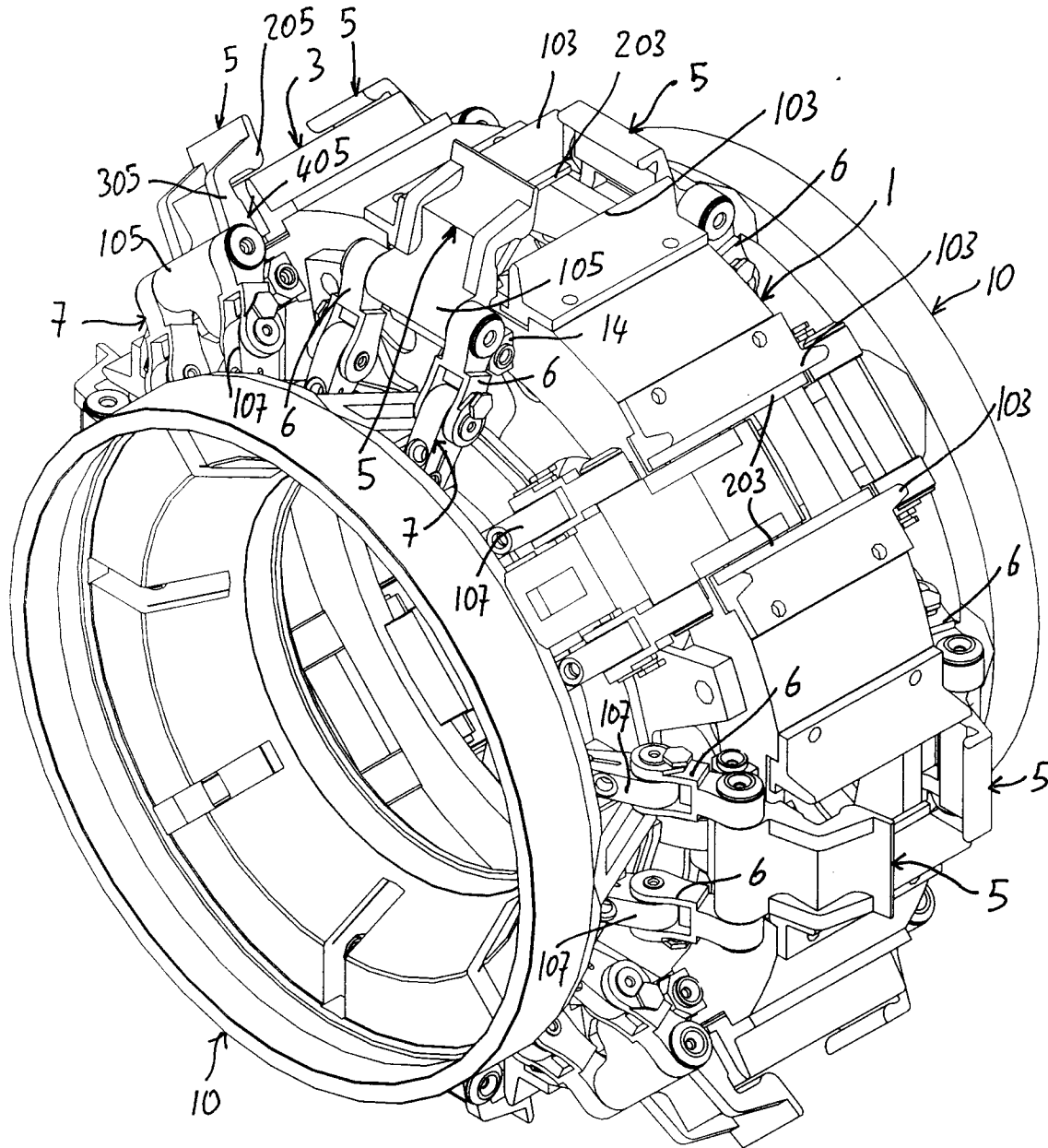


Fig. 1

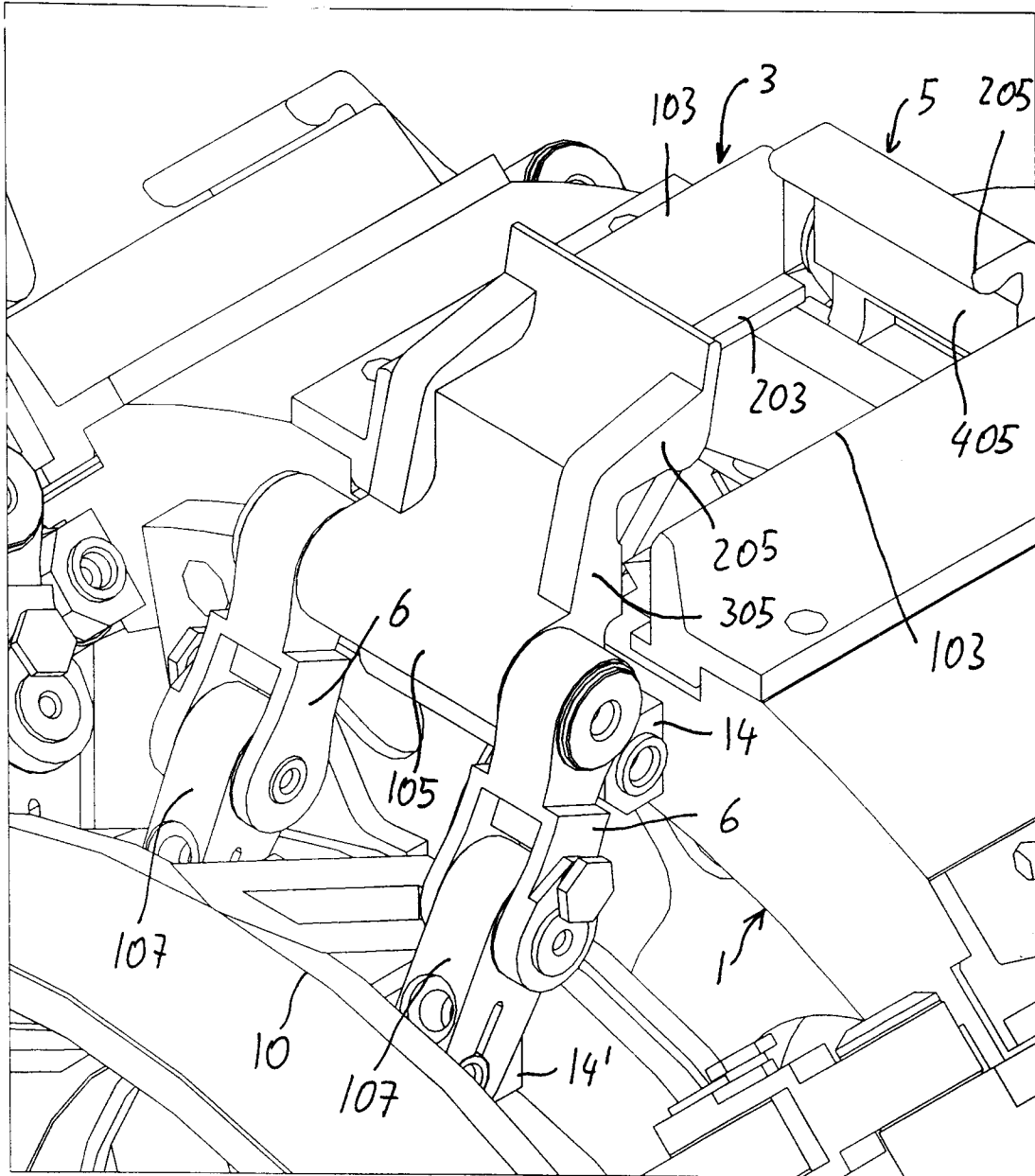


Fig. 2

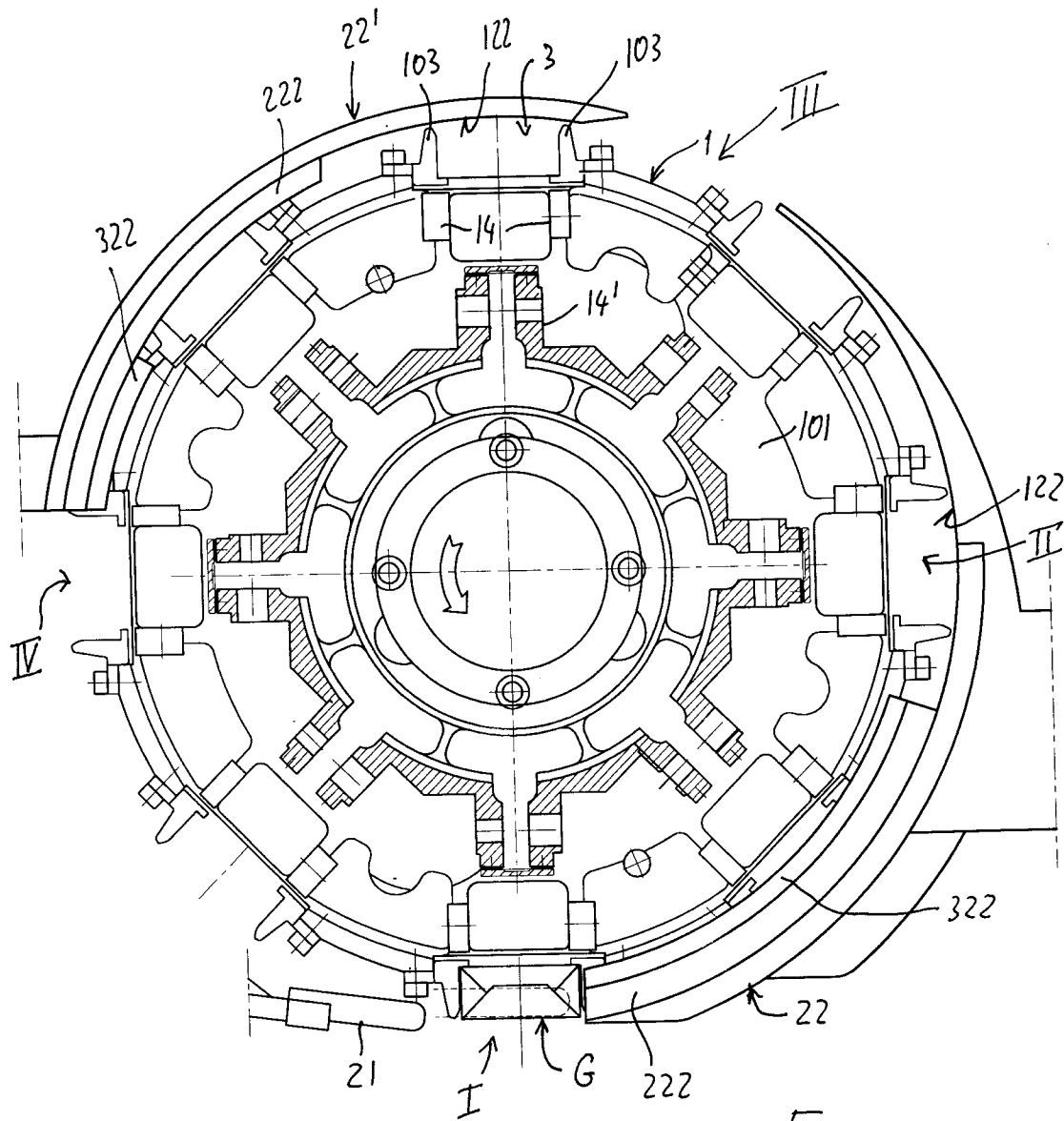


Fig. 3

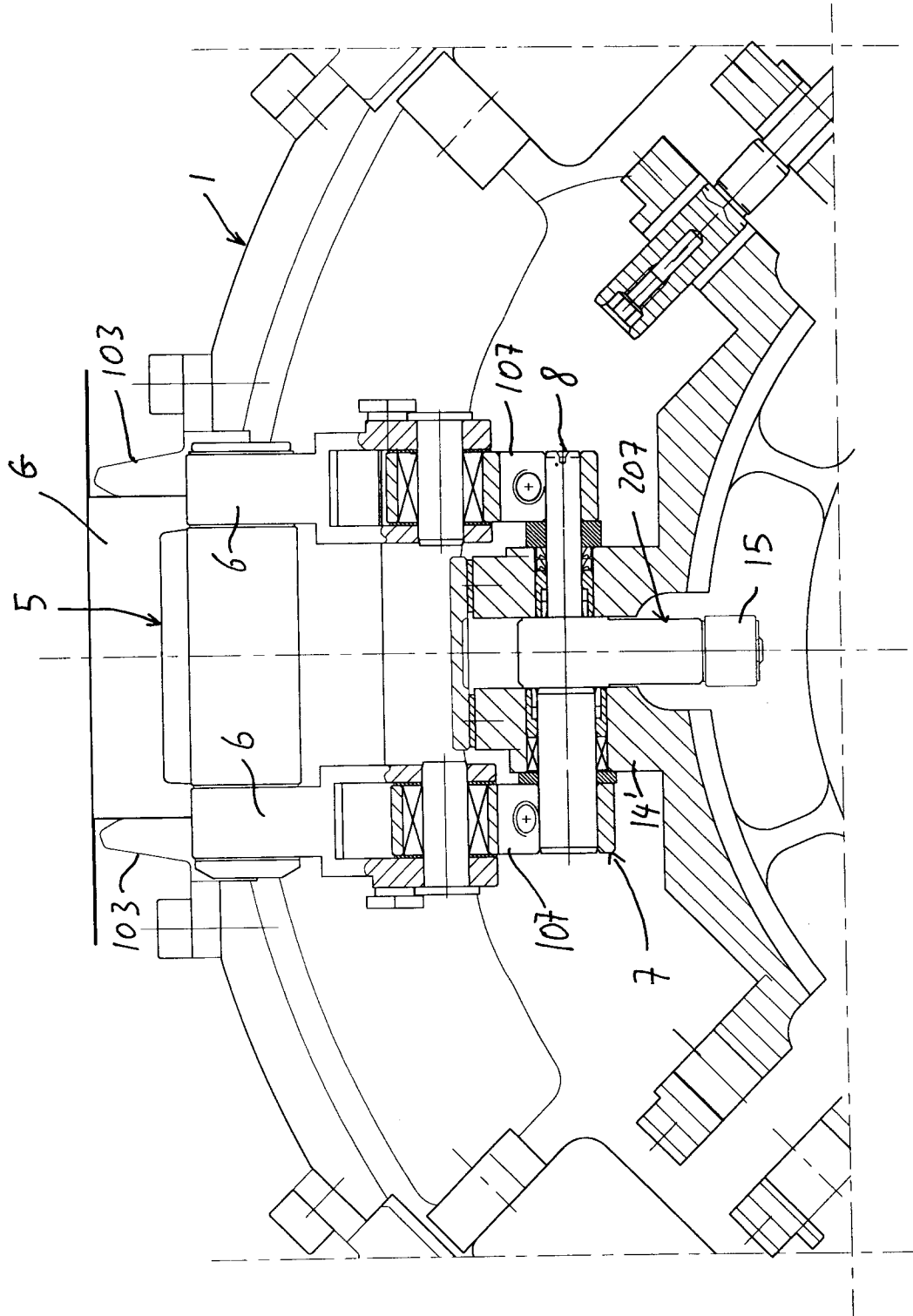
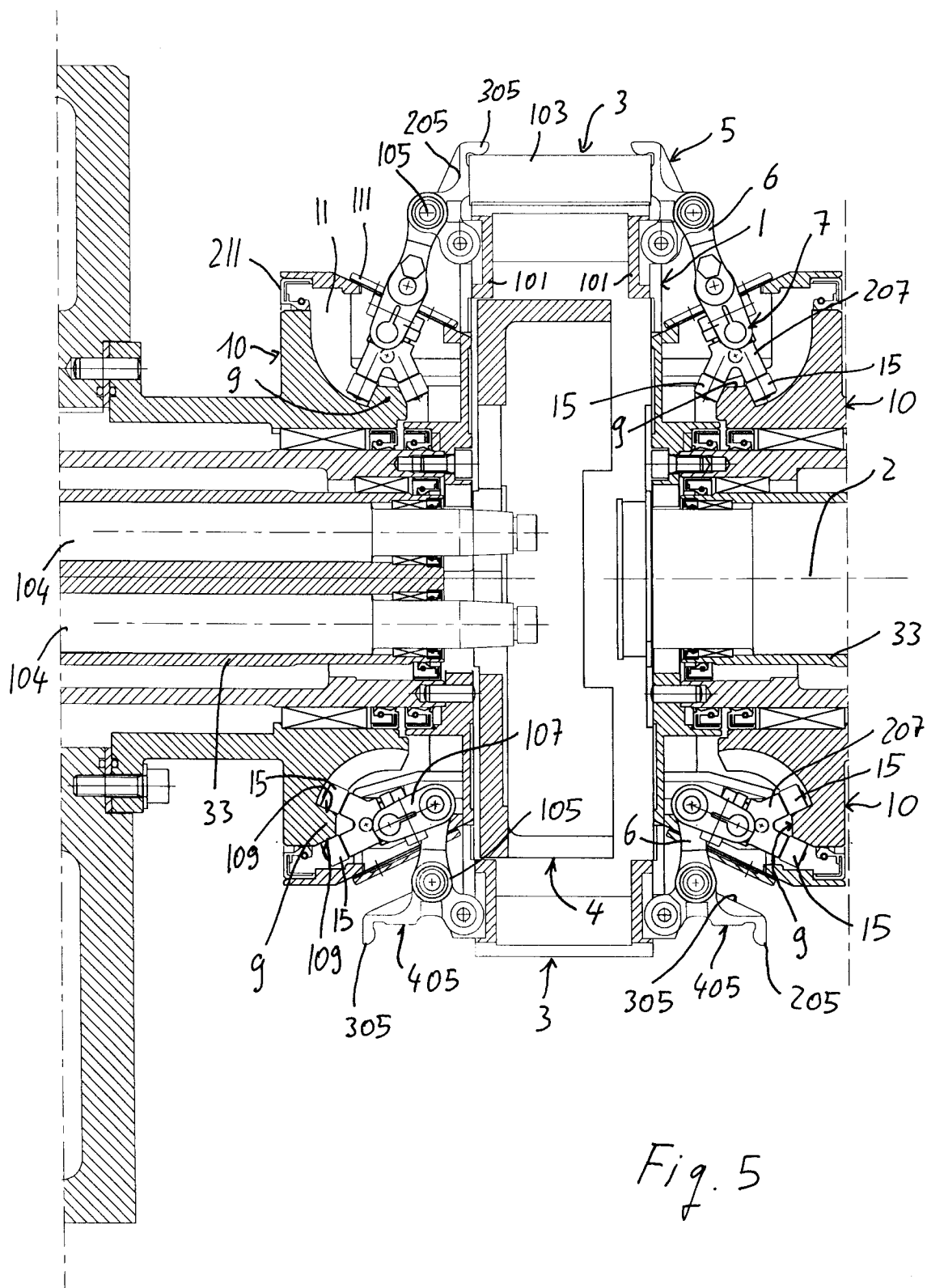


Fig. 4



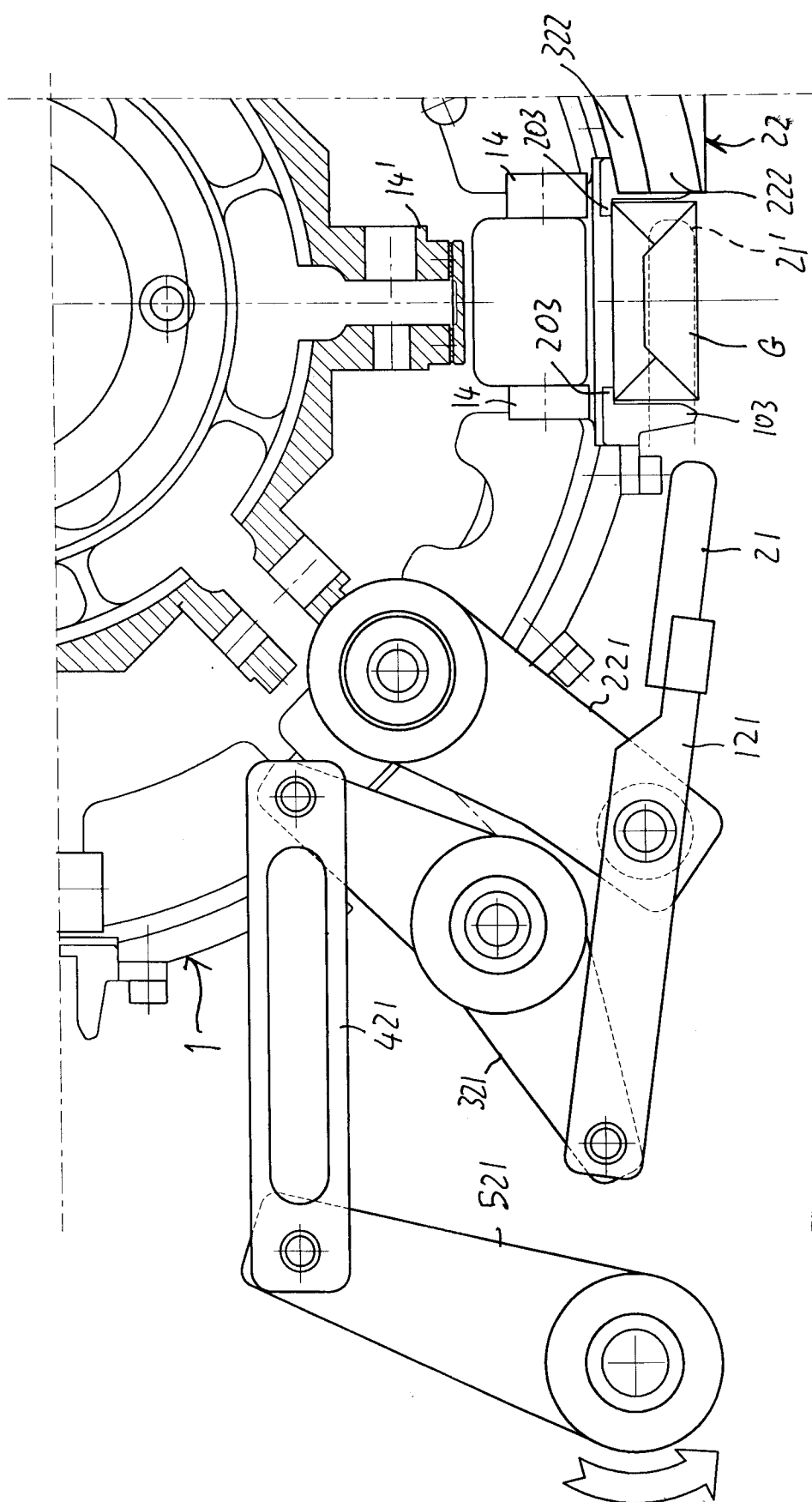
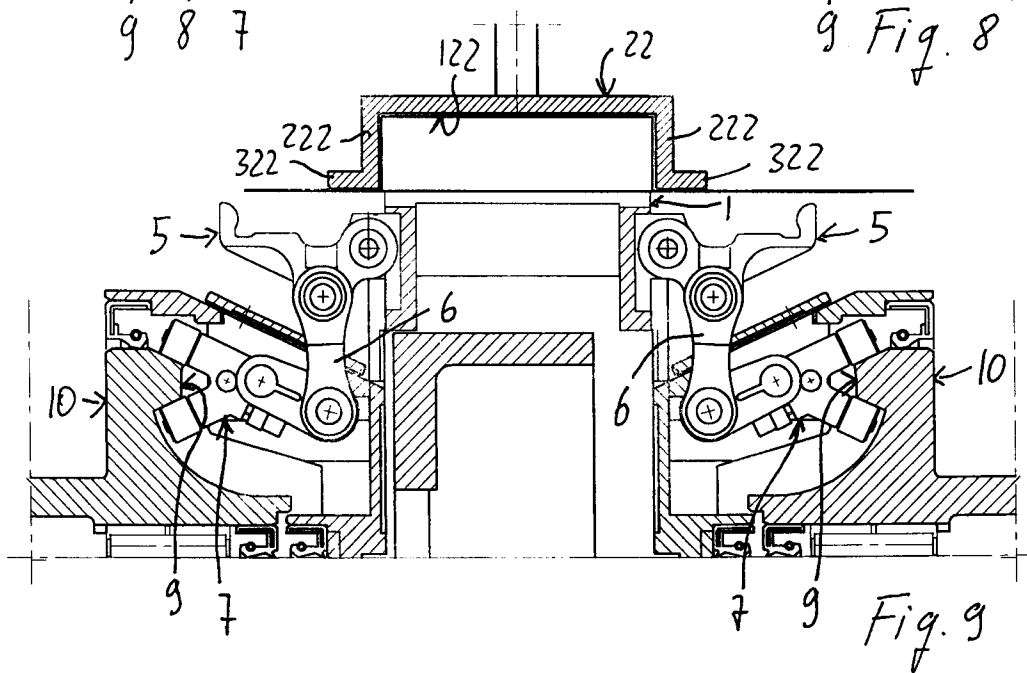
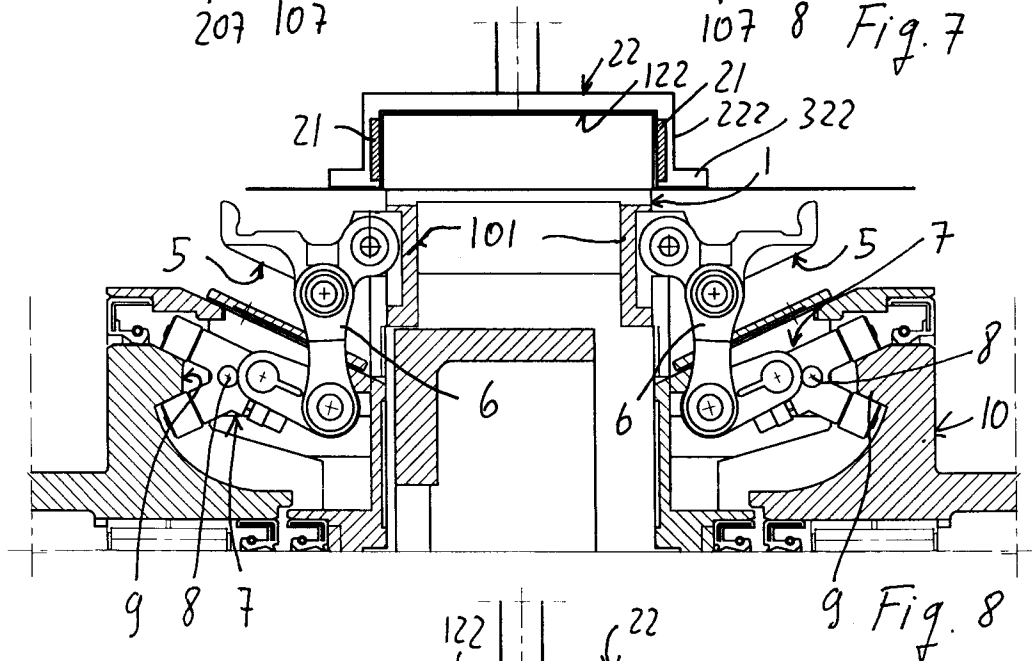
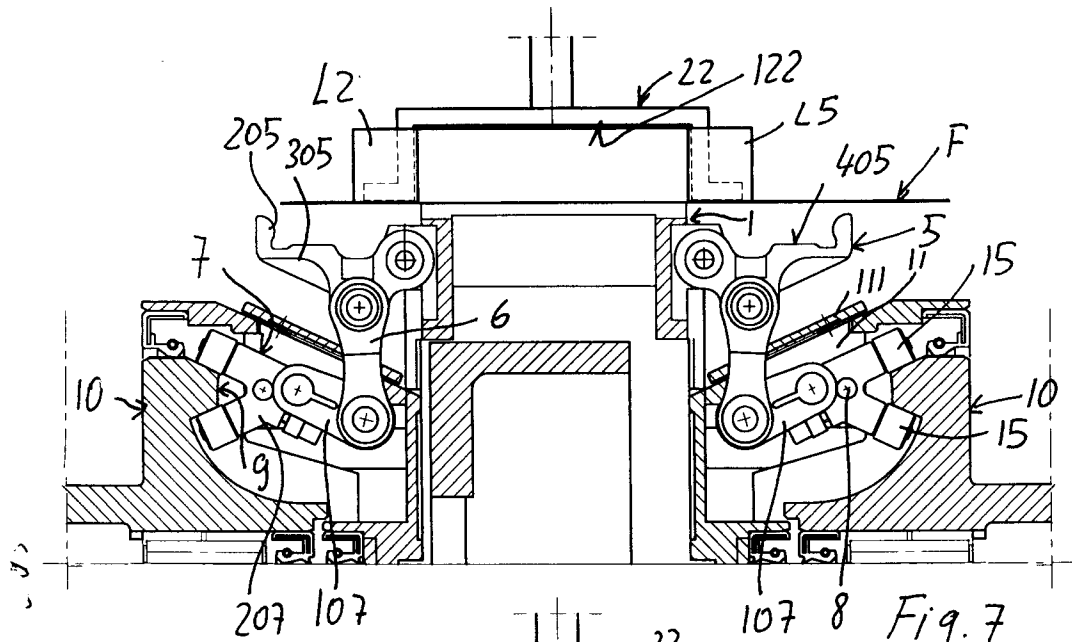


Fig. 6





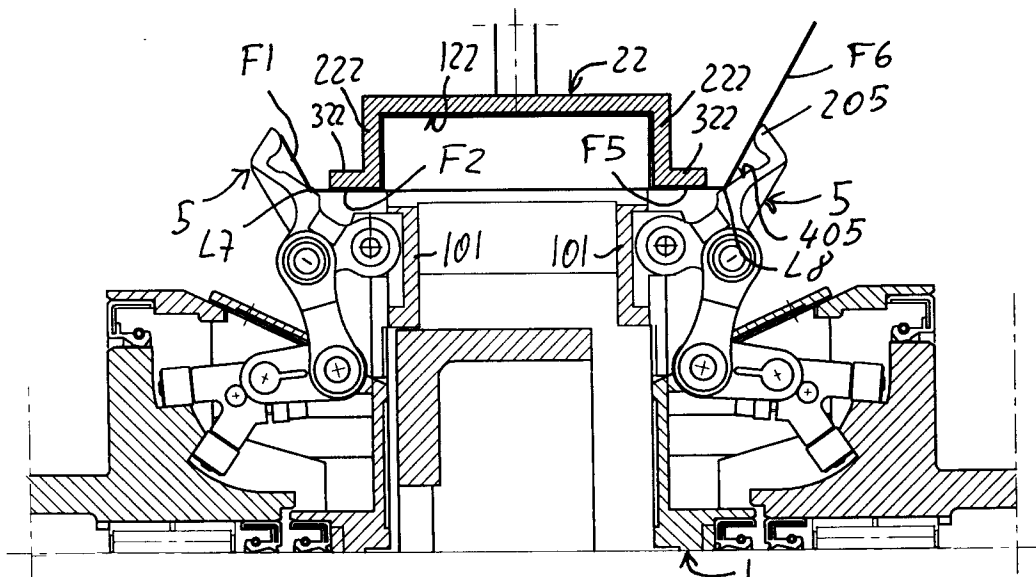


Fig. 10

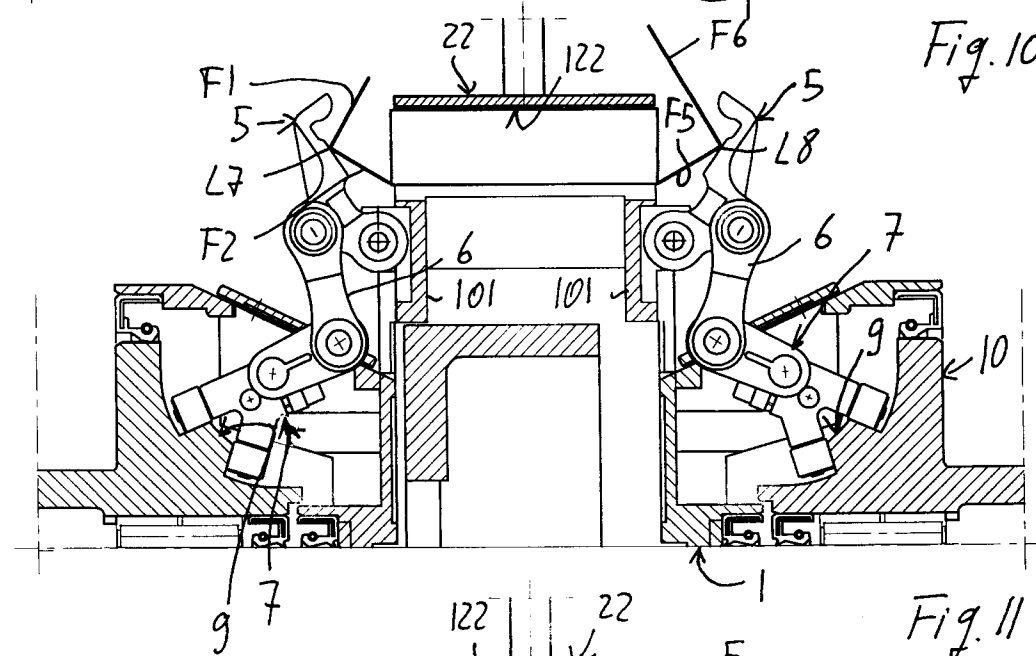


Fig. 11

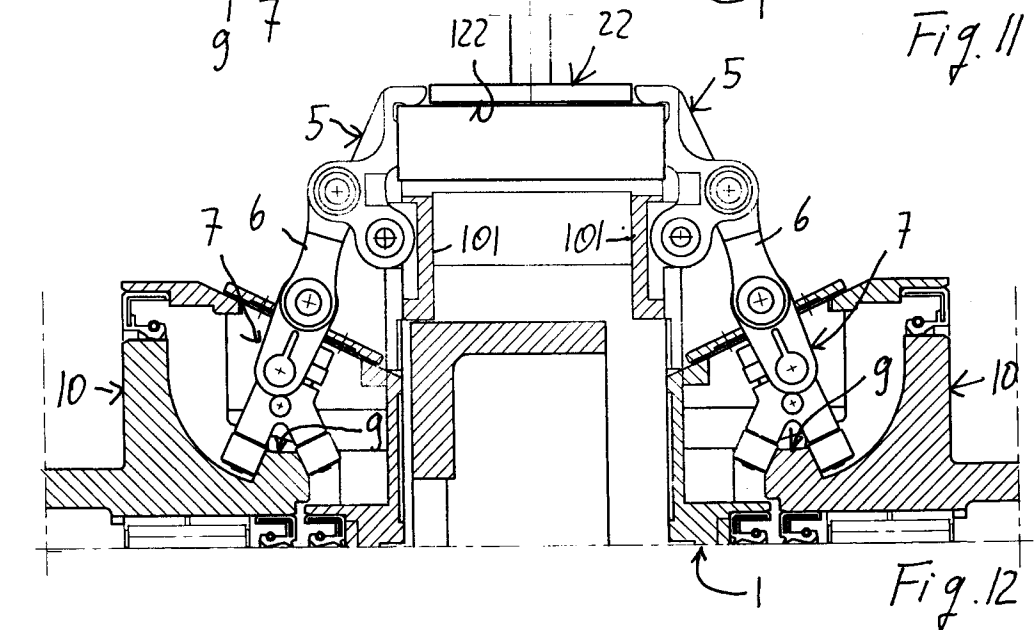
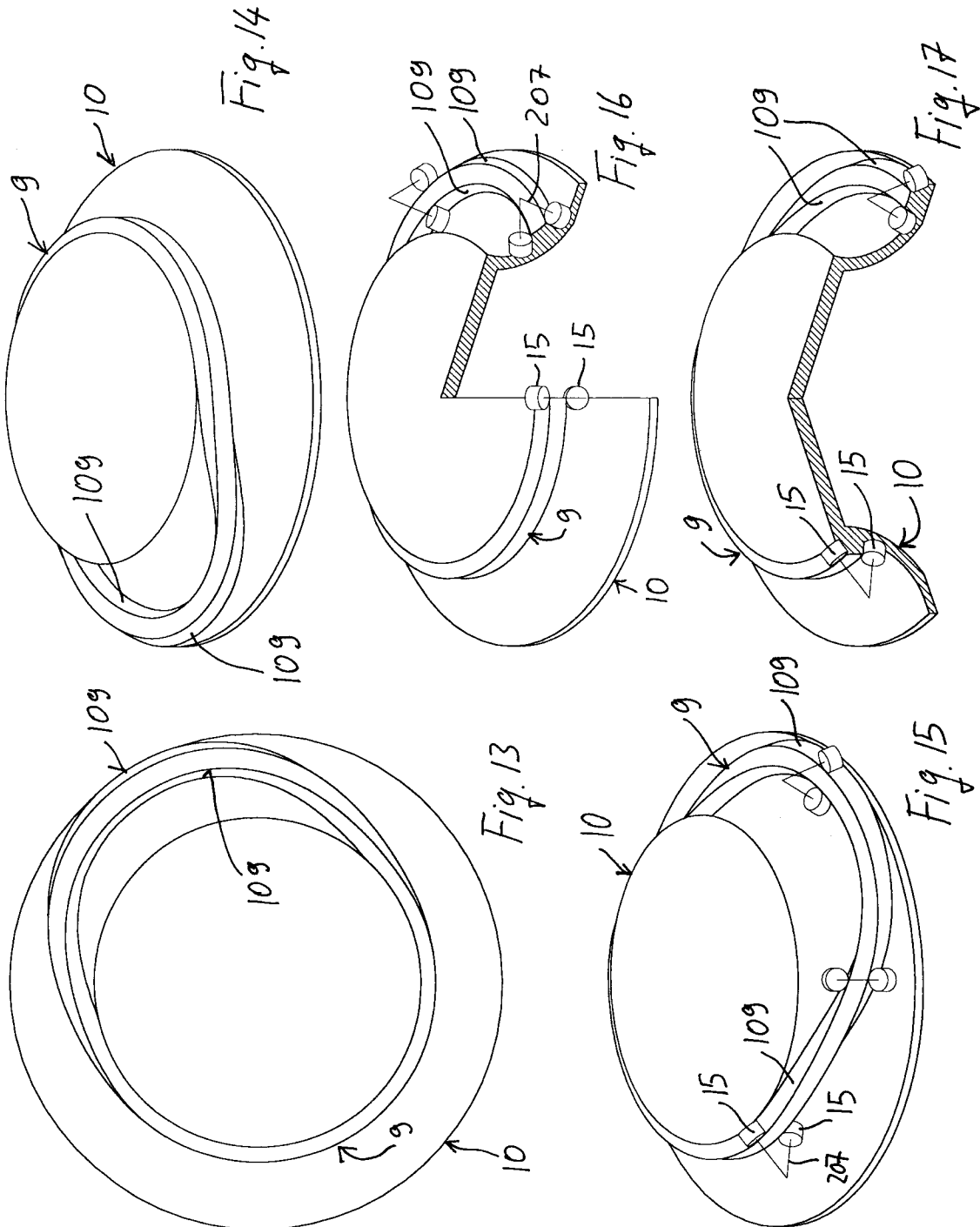
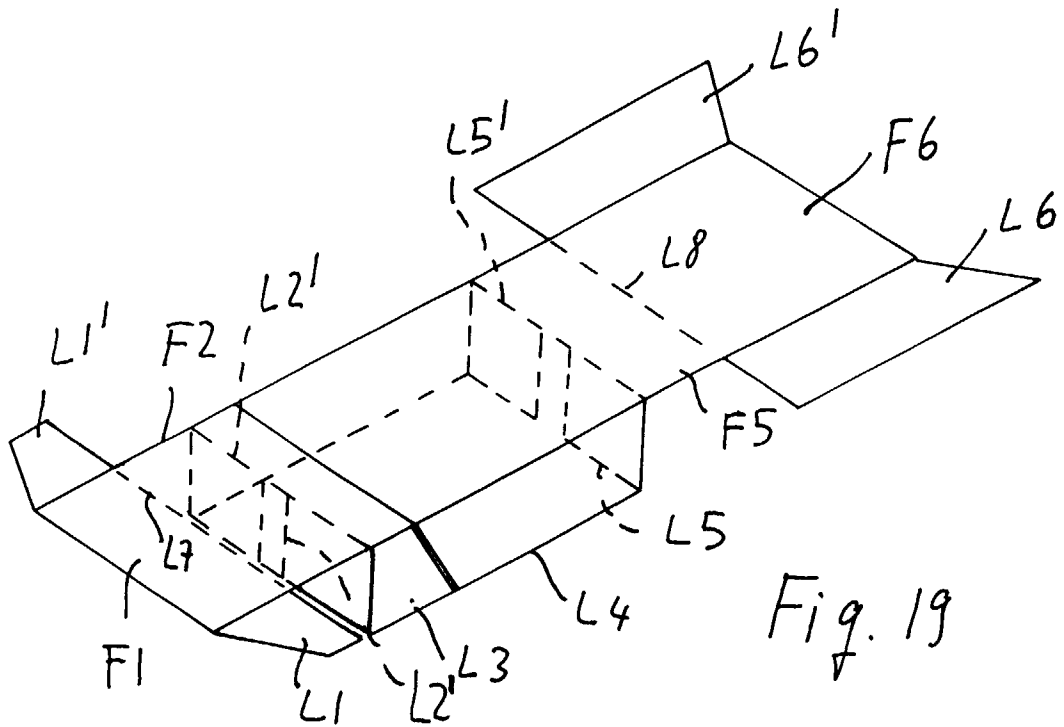
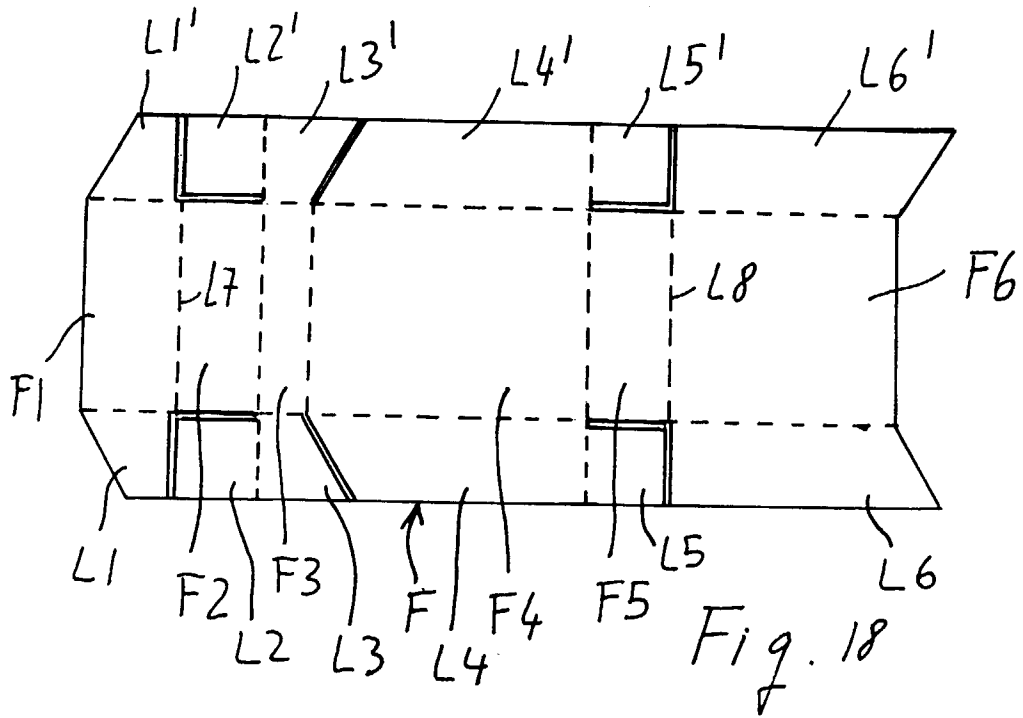
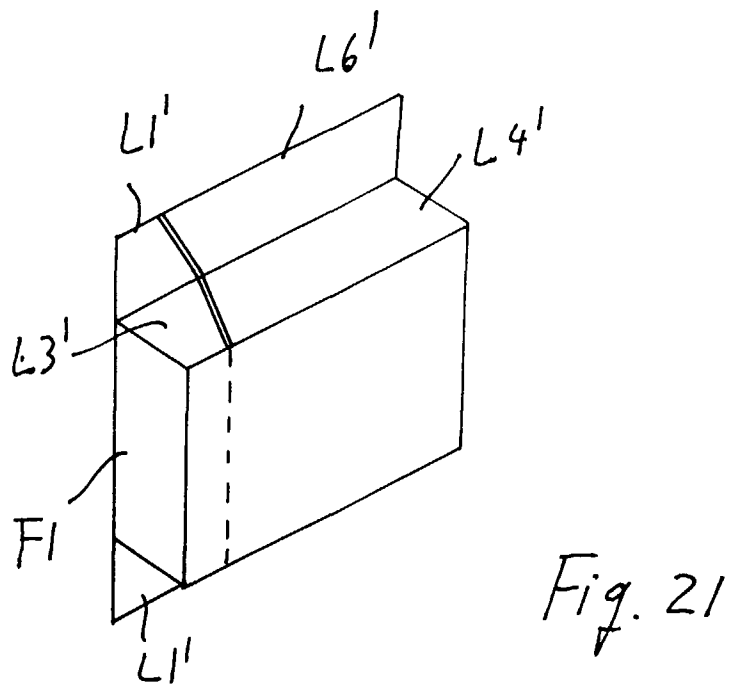
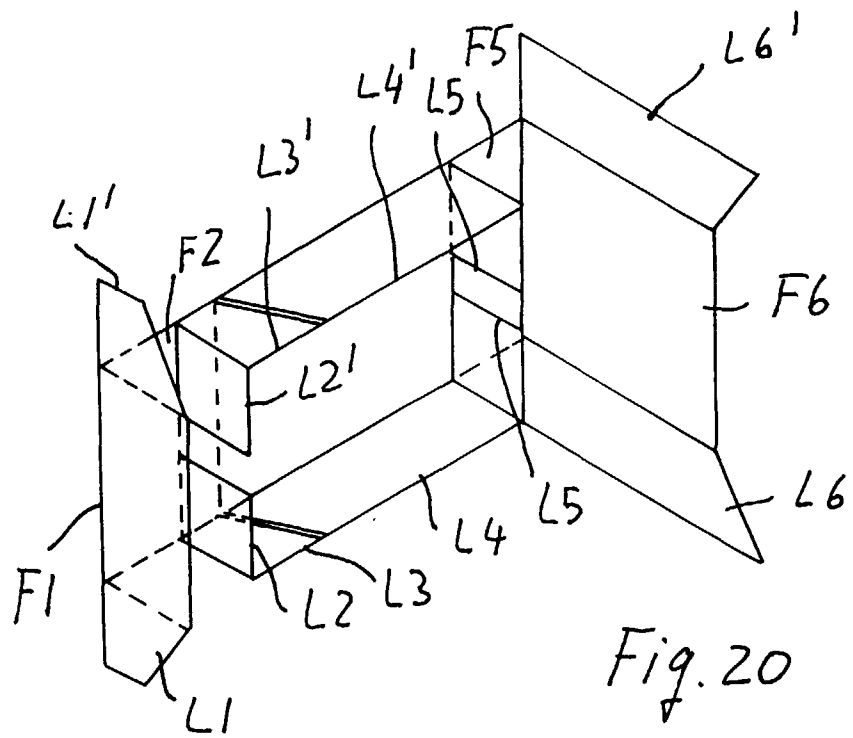


Fig. 12









European Patent  
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# EUROPEAN SEARCH REPORT

Application Number  
EP 99 10 0250

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
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Place of search <b>THE HAGUE</b>		Date of completion of the search <b>23 April 1999</b>	Examiner <b>Lenoir, C</b>
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone  Y : particularly relevant if combined with another document of the same category  A : technological background  O : non-written disclosure  P : intermediate document</p> <p>T : theory or principle underlying the invention  E : earlier patent document, but published on, or after the filing date  D : document cited in the application  L : document cited for other reasons  &amp; : member of the same patent family, corresponding document</p>			

EPO FORM 1503 03.82 (P04C01)

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EP 99 10 0250

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