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(54) Flap disc

(57) It is provided a flap disc (1) comprising a plurality of abrasive flaps (2) having a shape substantially in the form of a parallelogram with an inner angle included between 65° and 95° and adapted to carry out working for chip removal; and a base (3) substantially having the shape of a solid of revolution around a rotation axis (3a) and comprising a plurality of housings (4), each of which is adapted to receive at least one abrasive flap (2), and having a first abutment face (4a) and a second abutment face (4b) inclined to the rotation axis (3a) respectively by a first angle of inclination (α) substantially included between 55° and 70°, and a second angle of inclination (β) substantially included between 10° and 25°.

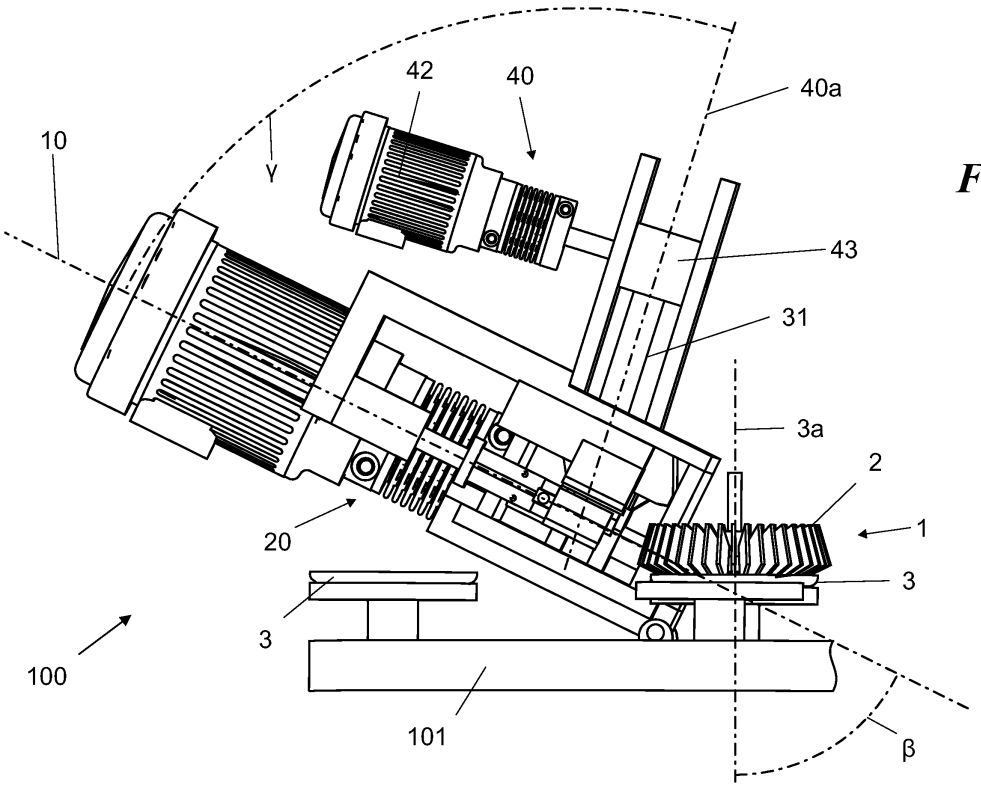

Fig. 3

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Description

[0001] The present invention relates to a flap disc of the type pointed out in the preamble of the first claim.

[0002] In particular, the present invention pertains to an abrasive flap disc adapted to polish a surface or remove a coating, as a paint for example, or remaining parts of a previous working, welding rests for example.

[0003] The invention further relates to a process for manufacturing the flap disc and a particular machine adapted to put said process into practice and to make the disc. It is known that a flap disc is an abrasive tool consisting of two main components: a support of circular shape made of nylon or glass fibre and a plurality of flaps of abrasive or emery cloth disposed radially on said support to which they are fastened by means of a special glue.

[0004] In particular, the support consists of a shaped disc having, on a base, a plurality of radial slits in each of which a flap is disposed, while the flaps have a substantially two-rectangle shape, i.e. are made up of two rectangles disposed side by side: an abrasive rectangle adapted to define the removal surface and an insertion rectangle adapted to be fitted into the slit.

[0005] In detail, preparation and arrangement of the flaps into the slits is carried out as follows.

[0006] Flaps are formed from a continuous sheet of abrasive cloth and they are subsequently brought into engagement with the support. This engagement contemplates, as above said, arrangement of the insertion rectangle in the slit and then positioning of the flaps in a direction substantially perpendicular to the support base.

[0007] Once all flaps have been positioned, supply of glue occurs, which glue enters the slits thus locking the flaps and covering the disc surface at least partly.

[0008] The flap disc is then set in rotation and a suitable abutment element is brought into contact with the flaps bending them. The flaps are bent in such a manner that they will lay down on the surface provided with glue. In particular, the abrasion rectangles, during this operation, will lay down on the support base having their abrasive face turned outwards. The abrasive portions projecting from the disc-shaped support are removed.

[0009] Once said operation has been completed, a label is placed on the flap discs and, more specifically, on the support base opposite to that provided with the flaps, said label giving some information such as the manufacturer, the type of abrasive, for example.

[0010] The known art mentioned above has some important drawbacks.

[0011] In fact, the flap discs presently made are characterised by high costs and high production times.

[0012] A first cause of this problem resides in that the operations for positioning the flaps are very long due to the complex movements required. In fact positioning is often carried out manually.

[0013] Another reason for the high costs is represented by the high volume of scraps and, in particular, the high waste of abrasive cloth. In fact, cutting of the flaps carried out on a continuous sheet, gives rise to a high amount of useless scraps, due to the particular shape of the flaps themselves.

[0014] Another cause of waste is represented by the fact that a non-negligible portion of flaps, once bending has been carried out, emerges from the disc-shaped support and therefore has to be removed. This also gives rise to an extension of the production times.

[0015] Under this situation, the technical task underlying the present invention is to conceive a flap disc capable of substantially obviating the mentioned drawbacks. Within the scope of this technical task it is an important aim of the invention to create a flap disc of low cost and characterised by reduced production times. Another important aim of the invention is to devise a disc that can be produced with a reduced amount of waste materials.

[0016] The technical task mentioned and the aims specified are achieved by a flap disc as claimed in the appended claim 1.

[0017] Preferred embodiments are highlighted in the sub-claims.

[0018] The features and advantages of the invention are hereinafter clarified by the detailed description of a preferred embodiment of the invention, with reference to the accompanying drawings, in which:

Fig. 1 shows a flap disc in accordance with the invention;
Fig. 2 shows a portion of the flap disc seen in section;
Fig. 3 is a front view of a portion of a machine adapted to be used in manufacturing the flap disc according to the invention;
Fig. 4 is a bottom view of a portion of the machine in Fig. 3;
Fig. 5 is an enlarged view of an inner portion of the machine in Fig. 3;
Fig. 6 shows a detail of Fig. 3;
Fig. 7 is an enlarged view of a detail of Fig. 3; and
Fig. 8 schematically shows a process suitable for manufacture of the flap disc in accordance with the invention.

[0019] With reference to the mentioned figures, the flap disc according to the invention is generally identified with the reference numeral **1**.

[0020] It is adapted to be used for working operations with chip removal and more specifically for carrying out surface finishing operations such as polishing. In particular, the flap disc 1 is used in machines such as a milling machine, adapted to keep the workpiece stationary and set the tool, i.e. the flap disc 1, in rotation.

[0021] The flap disc 1 comprises a plurality of abrasive flaps **2**, suitably disposed and adapted to carry out chip removal, and a base **3** substantially having a circular shape and being adapted to define a rotation axis **3a** for the flap disc 1.

[0022] Base 3, shown in Fig. 2, has a central cavity

adapted to promote placement of the flap disc 1 on a machine for chip removal. Then it has an upper portion **3b** onto which flaps 2 are fastened and a lower portion 3c of smaller section than the preceding one and suitable for promoting the gripping operations of the flap disc 1.

[0023] A label, not shown in the figure, or other similar element is preferably disposed on the surface portion defined by the difference in section between the two portions 3b and 3c, forming an annulus **3d**, for reproducing information concerning the flap disc 1. In particular, placement of the label is facilitated by the presence of a projecting step **3e** formed along the outer edge of annulus 3d, adapted to enable an adhesive substance to be laid thereon as it forms a flat surface for positioning of the label.

[0024] Formed on the upper portion 3b is a plurality of housings **4**, preferably of the partly through type, each of which is adapted to receive at least one abrasive flap 2. In particular, each housing 4 is a cut having side faces facing each other and bottom faces joining the side faces. The bottom faces comprise at least one first abutment face **4a** inclined to the rotation axis 3a and adapted to support at least one abrasive flap 2 in an inclined position.

[0025] Preferably, each cut defining a housing 4 has a first abutment face 4a and a second abut face **4b** converging towards each other and both inclined to the rotation axis 3a, i.e. two faces of housing 4 against which flap 2 abuts when it is inserted into the housing.

[0026] These faces 4a and 4b are able to enclose a portion of the abrasive flap 2 sufficient for ensuring steady engagement of said abrasive flap 2. In particular, the first abutment face 4a and second abutment face 4b are advantageously inclined to the rotation axis 3a by a first angle of inclination α and a second angle of inclination β both acute and in addition the first angle of inclination α faces housing 4 and is greater than the second angle of inclination β.

[0027] Specifically, cuts 4 are substantially radial to axis 3a and the first angle of inclination α is substantially included between 55° and 70°, while the second angle of inclination is substantially included between 10° and 25°. In greater detail, the first angle of inclination α and the second angle of inclination β are of 64° and 17°, respectively.

[0028] Possibly, the first abutment face 4a that is more inclined relative to the rotation axis 3a is discontinuous and partly defined by a strut or a supporting element **5** adapted to abut against flaps 2 and disposed in such a manner as to facilitate the fitting operations for insertion of said flaps.

[0029] The supporting element 5 therefore has an upper face **5a** for contact with a flap 2, inclined by said first angle of inclination α relative to the rotation axis 3a.

[0030] In order to ensure perfect adhesion with the abutment faces 4a and 4b, the abrasive flaps 2 advantageously have an outer profile that over a stretch thereof matches the shape of housings 4.

[0031] Preferably, flaps 2 have a quadrilateral-shaped conformation, in particular they are in the form of a parallelogram, an inner angle of which is preferably given by the sum of the first angle of inclination α and the second angle of inclination β, i.e. included between 65° and 95°. More specifically, it is of 81° and when the abrasive flap 2 is placed in the housing, it is disposed at the meeting points of the extensions of the first abutment face 4a with the extensions of the second abutment face 4b.

[0032] For forming flaps 2 and installing them on bases 3 in such a manner as to obtain the flap discs 1 according to the invention a machine **100** is provided. This machine 100 comprises a faceplate table **101** on which a plurality of bases 3 can be disposed, at least one placement head **10**, adapted to form flaps 2 and to apply them onto each base 3, and a framework or holding structure adapted to support the placement head 10 above table 101, at a separated position therefrom.

[0033] The machine 100 further comprises a head for glue deposition adapted to lay down an adhesive substance. In particular, the adhesive substance is a slow-setting glue or, alternatively, a two-component adhesive.

[0034] The framework and glue deposition head can be made in known manner and are not represented in the figures for the sake of simplicity.

[0035] The faceplate table 101 is provided with at least one motor adapted to set said table 101 in rotation along an axis substantially parallel to the rotation axis 3a so that each of the bases comes to the placement head 10, as well as to set each base in rotation around the respective rotation axis 3a.

[0036] The placement head 10 (Fig. 3) adapted to produce and apply the abrasive flaps 2 to each base 3, is particularly important and originally comprises a fitting device **20** adapted to insert the abrasive flaps 2 into the housings 4 of a base 3; a cutting device 30 adapted to create the abrasive flaps 2 by cutting of a continuous foil or sheet **31**, consisting of an abrasive cloth for example; and an unwinding device **40** including a reel **41** and adapted to unwind the continuous sheet 31 initially wound up on reel 41 according to an unwinding trajectory **40a**.

[0037] The fitting device 20, shown in Fig. 4, is adapted to translate an abrasive flap 2 for inserting it into a housing 4 moving the abrasive flap 2 along a fitting direction **20a** that advantageously is substantially rectilinear. It includes a gripping mechanism **21**, adapted to carry out gripping of an abrasive flap 2, and an actuating mechanism **23** adapted to actuate the gripping mechanism 21 along the fitting direction 20a.

[0038] In order to facilitate insertion of the abrasive flaps 2, the fitting direction 20a is advantageously inclined by said first angle of inclination α relative to the rotation axis 3a of base 3. This first angle of inclination α is therefore substantially included between 55° and 70° and more specifically it is of 64°. This movement along the fitting direction 20a of the gripping mechanism 21 is carried out by the actuating mechanism 23 comprising at least one piston **23a**, that is adapted to control advancing

of the gripping mechanism 21 along the fitting direction 20a, and at least one guide **23b** adapted to stabilise motion of the gripping mechanism 21. In detail, the actuating mechanism 23 has a single piston 23a and two guides 23b disposed laterally of piston 23a.

[0039] The gripping mechanism 21 consists of two or more fingers **22** at least one of which is susceptible of movement so as to exert the gripping action, i.e. to almost abut against the other finger 22 grasping the abrasive flap 2. In particular, fingers 22 are two in number and the actuating system is a two-finger gripper 22 known by itself. More specifically, the gripping mechanism 21 has one finger alone **22a** that is movable and is adapted to translate in a direction substantially perpendicular to the fitting direction 20a thus abutting against the other finger 21 a.

[0040] The movable finger 22a (Figs. 5 and 6) has a rest surface **22b** suitable to enable the abrasive flap 2, once cutting from the continuous sheet 31 has been carried out, not to fall and to be grasped by the gripping mechanism 21. This rest surface 22b is placed in the lower part of the movable finger 22a so as to be inserted under the other finger 22 without interfering with the grasping action of the abrasive flap 2.

[0041] The abrasive flaps 2 reach fingers 22 immediately after crossing the cutting device 30 which is adapted to form the abrasive flaps 2 obtaining them from a continuous sheet 31 through a cut substantially parallel to the fitting direction 20a.

[0042] The cutting device 30 (Fig. 4) comprises a blade **32** adapted to carry out cutting of the continuous sheet 31, a shoulder **33** on which the blade substantially bears when it carries out the cut and a first motor **34** adapted to move the blade 32 in a direction substantially perpendicular to the fitting direction 20a. In particular, blade 32 is advantageously adapted to carry out the cut between the fingers 21a of the gripping mechanism 21 and, more specifically, in the vicinity of the movable finger, promoting gripping of the abrasive flaps 2.

[0043] The cutting device 30, in order to stabilise motion of blade 32 and make it advantageously of the reciprocating type, comprises a guide **32a** on which the blade is forced to slide and a suitable kinematic mechanism **35** adapted to convert the motion from motor 34 into a reciprocating motion of blade 32. Preferably, the kinematic mechanism 35 is of the crank-connecting rod type and can therefore have two cranks **35a** placed at the motor and a connecting rod 35b enclosed between the two cranks and connected to the blade 32. Housed above the cutting device 30 is the unwinding device 40 enabling the reel 41 to be unwound and therefore the continuous sheet to be submitted to the cutting device 30. In detail, the unwinding device 40 moves the continuous sheet 31 along an unwinding trajectory 40a suitably inclined relative to the fitting direction 20a by an unwinding angle γ.

[0044] This unwinding angle γ is substantially equal to the characteristic inner angle of the abrasive flaps 2 and, therefore, is included between 65° and 95° and, more specifically, the unwinding angle γ is substantially equal to 81°.

[0045] The unwinding device 40, comprises, in addition to the aforesaid reel 41, a second motor **42** adapted to move the reel 41 and one or more rollers **43** adapted to define the unwinding trajectory 40a and to stabilise advancing or feeding of the continuous sheet 31.

[0046] The placement head 10, in addition to the aforesaid devices, comprises a pressure device **50** (Fig. 6) adapted to press the abrasive flaps 2 into the housings 4 once the abrasive flaps 2 have been positioned on a base 3. This pressure device 50 comprises a wedge 51, such shaped that it exerts pressure on the flaps without bending them, and a piston or other similar element adapted to move the wedge 51 substantially along the rotation axis 3a. Operation of the placement head 10, described above in terms of structure, is the following.

[0047] At the beginning, the placement head 10 is disposed on the machine 100 and at least one base 3 is fastened to the faceplate table 101. Placement of head 10 on the faceplate table 101 takes place in such a manner that the fitting direction 20a is inclined to the rotation axis 3a by the first angle of inclination α.

[0048] Bases 3 are secured to suitable elements setting said bases 3 in rotation around the rotation axis 3a and the base positioning is such that the projecting step 3e abuts against the aforesaid elements thus creating an empty chamber adapted to receive the adhesive substance.

[0049] Once all elements have been disposed, the machine 100 is operated, i.e. the faceplate table 101 brings one base 3 close to said glue deposition head, known by itself and not shown in the figures, which places at least part of an adhesive substance at least into housings 4. Preferably, the adhesive substance is disposed at least in housings 4 and in the upper part of base 3, i.e. the part opposite to annulus 3d. More specifically, being housings 4 of the through type, the adhesive substance also fills the aforesaid empty chamber. The adhesive substance is of the known slow-setting type or, alternatively, a two-component adhesive. In this case, said glue deposition head lays only one of the two components.

[0050] When the first component of the adhesive substance has been laid down, base 3 is set in rotation around the rotation axis 3a and, at the same time, it is brought close to the placement head 10. Simultaneously, the unwinding device 40 starts unwinding reel 41 and the continuous sheet is brought close to blade 32 that is moved by a reciprocating motion by the first motor 34, at a constant frequency.

[0051] In particular, the frequency of the reciprocating motion of blade 32 and the advancing speed of the continuous sheet 31 are set in such a manner that the length of the abrasive flap 2 along the advancing direction is adapted to enable the abrasive flaps 2 to cover at least the base of the upper portion 3b opposite to annulus 3d.

[0052] In detail, when blade 32 comes almost in con-

tact with shoulder 33, a portion of the continuous sheet 31 is compressed between the blade itself and shoulder 33 and immediately afterwards, the gripping mechanism 21 grasps said portion of the continuous sheet 31.

[0053] The movable finger 22a starts moving in a direction perpendicular to the fitting direction 20a and pushes the portion of the continuous sheet 31 towards the other finger 22 enabling the blade 32 to carry out the cut thus creating an abrasive flap 2. In particular, the advantageous presence of the rest surface 22b prevents the abrasive flap 2 from falling or incorrect engagement of same. Once fingers 22 are closed, the abrasive flap 2 is tightened between them and the actuating mechanism 23 pushes the gripping mechanism 21 along the fitting direction 20a. When the abrasive flap 2 is disposed in housing 4, the movable finger 22a moves away from the other finger and therefore the gripping mechanism 21 can be moved apart.

[0054] When all abrasive flaps 2 have been positioned, operation of the pressure device 30 takes place. In particular, wedge 51, pushed by the piston, abuts on the abrasive flaps 2 pressing them in housings 4. This movement is repeated a plurality of times so as to limit the force exerted by wedge 51 and enable the abrasive flaps 2 to adhere both to the abutment faces 4a and 4b of housing 4 and to the upper face 5a of the supporting element 5.

[0055] In particular, during such pressing action, the abrasive flaps 2, as shown in Fig. 2, emerge from the lower part of housing 4, which means that the abrasive flaps 2 come out at annulus 3d and enter the empty chamber.

[0056] When positioning of the abrasive flaps 2 has been completed, base 3 comes to a second glue deposition head that will lay the second component of the adhesive substance. Alternatively, deposition of the two components is carried out by the same deposition head.

[0057] The second component of the adhesive substance being laid, base 3 provided with the abrasive flaps 2 comes to a bending head, of known type and not shown in the figure, that will bend the abrasive flaps 2 on base 3 thus completing the flap disc 1.

[0058] By such a bending operation, the abrasive flaps 2 lay down on the upper portion 3b of base 3 and, more specifically, on the base of the upper portion 3b opposite to annulus 3d. In detail, the abrasive flaps 2 partly overlap each other giving the flap disc 1 its particular aspect.

[0059] This bending operation can lead to arrangement of the abrasive flaps 2 not only on the aforesaid base, but also on the side surface of the upper portion 3b enabling the flap disc 1 to remove material both along the base and along the side surface. Optionally, a last cutting head removes possible portions of flaps 2 projecting from the flap disc 1.

[0060] The flap disc 1 is then removed from the faceplate table 101 and completed by application of a label on base 3, said label being disposes manually or automatically at the annulus 3d and, more specifically, at the projecting step 3a. In particular, the label arrangement causes bending of the portions of the abrasive flap 2 that are disposed inside the empty chamber.

[0061] The invention comprises a new process 1000 for manufacture of the above described flap discs 1.

[0062] This process, diagrammatically shown in Fig. 8, contemplates a deposition step **1100** during which at least part of an adhesive substance, i.e. a first component of a two-component glue, is laid down. Alternatively, during such a step an adhesive substance is laid down which has a sufficient setting time to enable at least positioning of the abrasive flaps 2.

[0063] Once the deposition step 1100 has been completed, the manufacturing process 1000 contemplates a fitting step **1200** in which the abrasive flaps 2 are inserted into housings 4. This operation is preferably carried out by the previously described placement head 10 and, more specifically, the fitting device 20. In particular, the fitting step 1200 is carried out by movement of the abrasive flaps 2 in the fitting direction 20a that, as described, is substantially rectilinear and inclined by a first angle of inclination α to the rotation axis 3a. Once the fitting step 1200 has been completed, a pressing step **1300** is advantageously provided, which step is adapted to press the abrasive flaps 2 into the housings 4 ensuring perfect insertion of same. This pressing step 1300 is performed by the pressure device 50 and, more specifically, the abrasive flaps 2 are repeatedly pushed by wedge 51, so that they come into contact with faces 4a, 4b and 5a.

[0064] The manufacturing process 1000 can contemplate a second-deposition step **1400** adapted to enable deposition of the remaining part of the adhesive substance, i.e. the second component of the two-component glue.

[0065] The manufacturing process 1000 terminates with the two following steps: a finish step **1400**, adapted to bend the abrasive flaps 2 disposing them on the base of the upper portion 3b and adapted to remove possible projecting portions of flaps 2; and a labelling step **1600** in which a label is disposed by gluing on the flap disc 1. Labelling is the last step and the label is applied on base 3 on the opposite side relative to the abrasive flaps 2.

[0066] The invention enables achievement of important advantages.

[0067] In fact, the flap disc 1 is characterised by a low cost and reduced production times. This is due both to the above described particular placement head 10 and the innovative manufacturing process 1000.

[0068] In particular, the placement head 10 allows a plurality of operations to be carried out in a quick and automatic manner, which operations were previously executed partly by hand.

[0069] This advantage is also due to the particular shape of housing 4 and, therefore, of the abrasive flaps 2 enabling positioning of said flaps to be obtained in a quicker and easier manner.

[0070] Another advantage resides in the reduced volume of scraps resulting from the flap disc 1. In detail, this

advantage is obtained due to the particular shape of the abrasive flaps 2 and the particular positioning of the devices constituting the placement head 10 enabling the whole part of the continuous sheet 31 to be utilised.

[0071] The invention is susceptible of modifications and variations all falling within the scope of the inventive idea.

[0072] All of the details can be replaced by equivalent elements and the materials, shapes and sizes can be of any nature and magnitude.

Claims

1. A flap disc (1) adapted to be set in rotation around a rotation axis (3a) to carry out working for chip removal, said flap disc (1) comprising: a plurality of abrasive flaps (2) suitable to carry out said working for chip removal, and a base (3) comprising a plurality of housings (4), each of which is adapted to at least partly receive at least one of said abrasive flaps (2), **characterised in that** said housings (4) consist of cuts each having side faces facing each other and bottom faces including a first abutment face (4a) inclined to said rotation axis (3a) and adapted to support at least one of said abrasive flaps (2), and **in that** said abrasive flaps (2) have a shape partly insertable in said cuts, each of said abrasive flaps (2) comprising an outer profile at least partly substantially matching the shape of said abutment face (4a).

2. A flap disc (1) as claimed in the preceding claim, wherein each of said housings (4) has said one first abutment face (4a) and a second abutment face (4b) converging towards each other, wherein said first and second abutment faces (4a, 4b) are inclined to said rotation axis (3a) by a first and a second angle of inclination (α, β), both angles being acute, and wherein said first angle of inclination (α) faces said housing (4) and is greater than said second angle of inclination (β).

3. A flap disc (1) as claimed in claim 2, wherein said cuts are substantially radial to said rotation axis (3a), and wherein said first angle of inclination (α) is substantially included between 55° and 70° and said second angle of inclination (β) is substantially included between 10° and 25°.

4. A flap disc (1) as claimed in claim 3, wherein said first abutment face (4a) that is inclined to said rotation axis (3a) is discontinuous and partly defined by a supporting element (5).

5. A flap disc as claimed in claim 1, wherein each of said flap discs (2) has a substantially quadrilateral shape.

6. A placement head (10) for producing flap discs provided with a base (3) having a rotation axis (3a) and comprising a plurality of housings (4) each of which is adapted to receive an abrasive flap (2); said placement head (10) comprising a fitting device (20) adapted to insert said abrasive flaps (2) into said housings (4), and being **characterised in that** said fitting device (20) is adapted to move said abrasive flaps (2) along a substantially rectilinear fitting direction (20a), and **in that** said fitting direction (20a) is inclined to said rotation axis (3a) by a first angle of inclination (α) that is substantially included between 55° and 70°.

7. A placement head (10) as claimed in the preceding claim, comprising an unwinding device (40) provided with a reel (41) on which a continuous sheet (31) is wound, said unwinding device (40) being adapted to unwind said continuous sheet (31) according to an unwinding trajectory (40a) that is inclined to said fitting direction (20a) by an unwinding angle (γ), said unwinding angle (γ) being included between 65° and 95°.

8. A placement head (10) as claimed in claim 7, comprising a cutting device (30) disposed between said fitting device (20) and said unwinding device (40) and adapted to carry out a cut in said continuous sheet (31) for making said abrasive flaps (2), said cut being substantially parallel to said fitting direction (20a).

9. A placement head (10) as claimed in one or more of claims 6-8, comprising a pressure device (50) adapted to press said abrasive flaps (2) into said housings (4) so as to ensure perfect fitting of said abrasive flaps (2) in said housings (4).

10. A process for manufacturing flap discs provided with a base having a rotation axis (3a) and comprising a plurality of housings (4) each of which is adapted to receive at least one abrasive flap (2), said manufacturing process comprising a fitting step (1200) in which said abrasive flaps (2) are inserted in said housings (4), and **being characterised in that** during said fitting step (1200) said abrasive flaps (2) are moved in a fitting direction (20a) that is substantially rectilinear and inclined to said rotation axis (3a) by a first angle of inclination, said first angle of inclination (α) being substantially included between 55° and 70°.

11. A process as claimed in the preceding claim, comprising a deposition step (1100) preceding said fitting step (1200) and provided for applying at least part of an adhesive substance in said housings (4), and a pressing step (1300) following said fitting step (1200) and adapted to press said abrasive flaps (2)

in said housings (4).

12. A process as claimed in the preceding claim, comprising a labelling step (1600), adapted to dispose a label on said flap disc (1) on the opposite side relative to said abrasive flaps (2), said labelling step taking place after said pressing step.

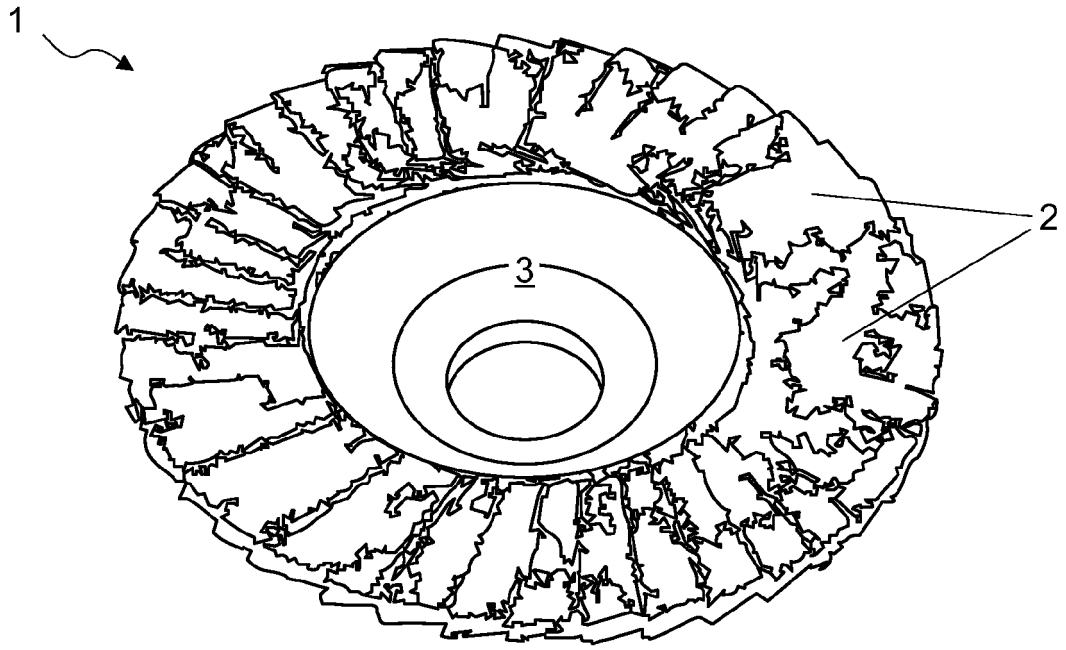


Fig. 1

Fig. 2

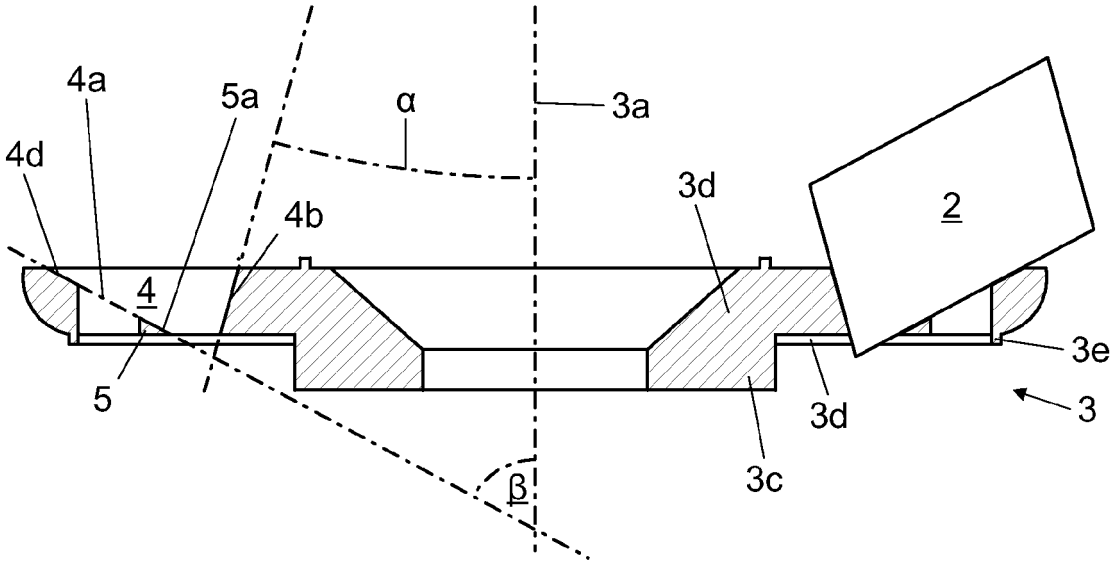
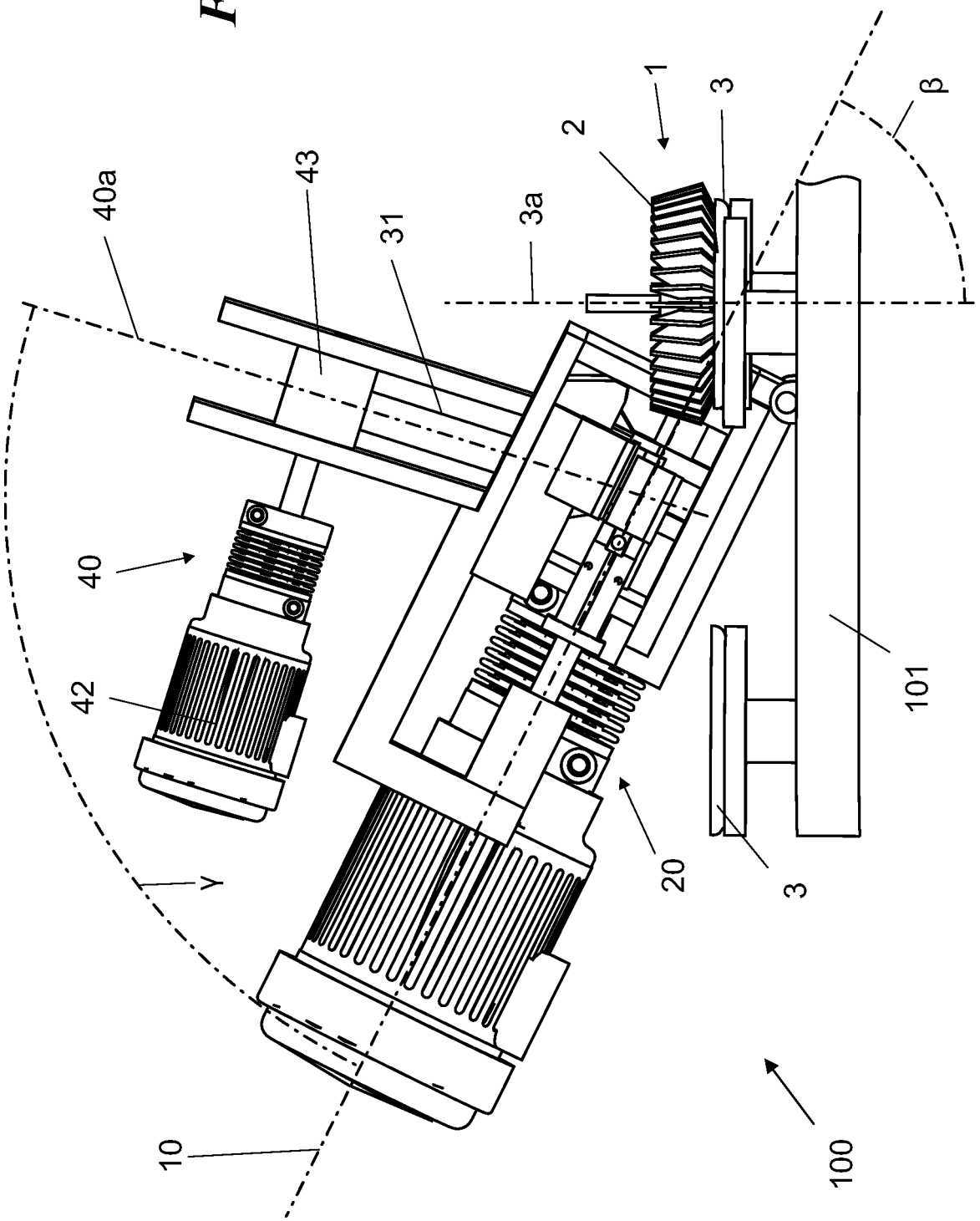


Fig. 3



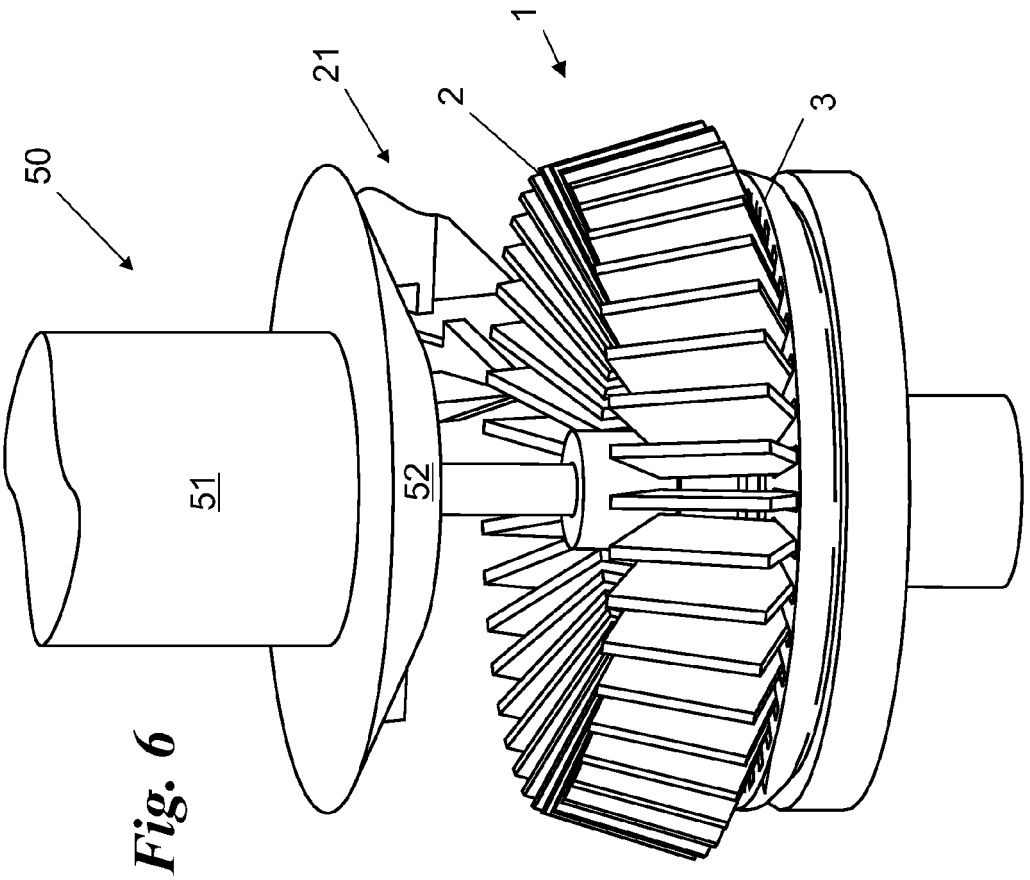
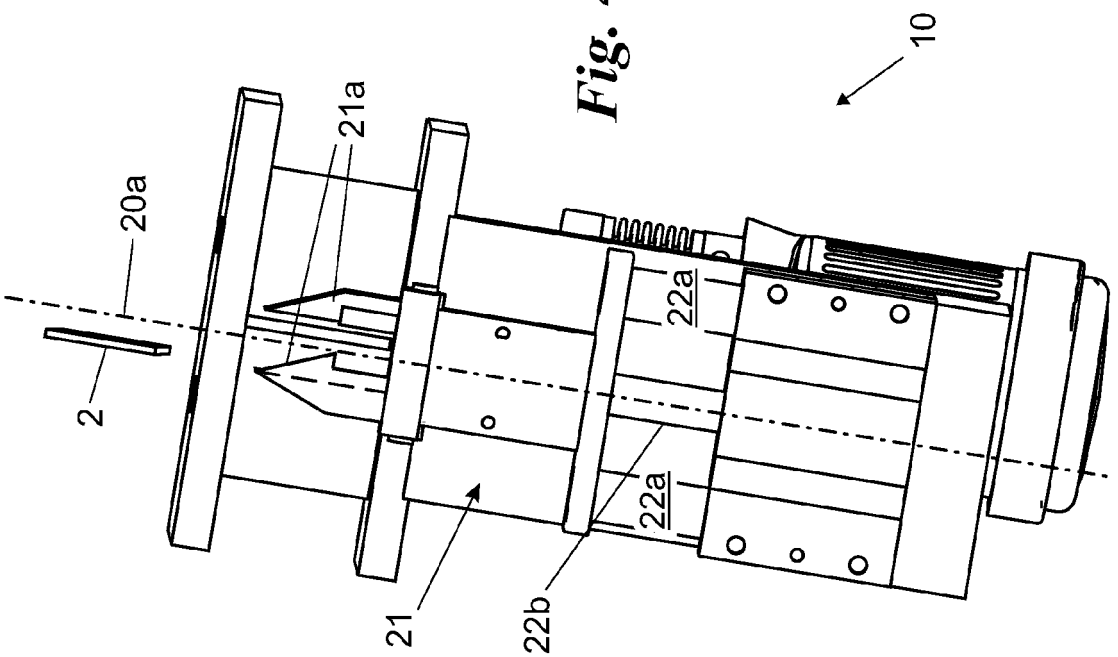


Fig. 6

Fig. 4



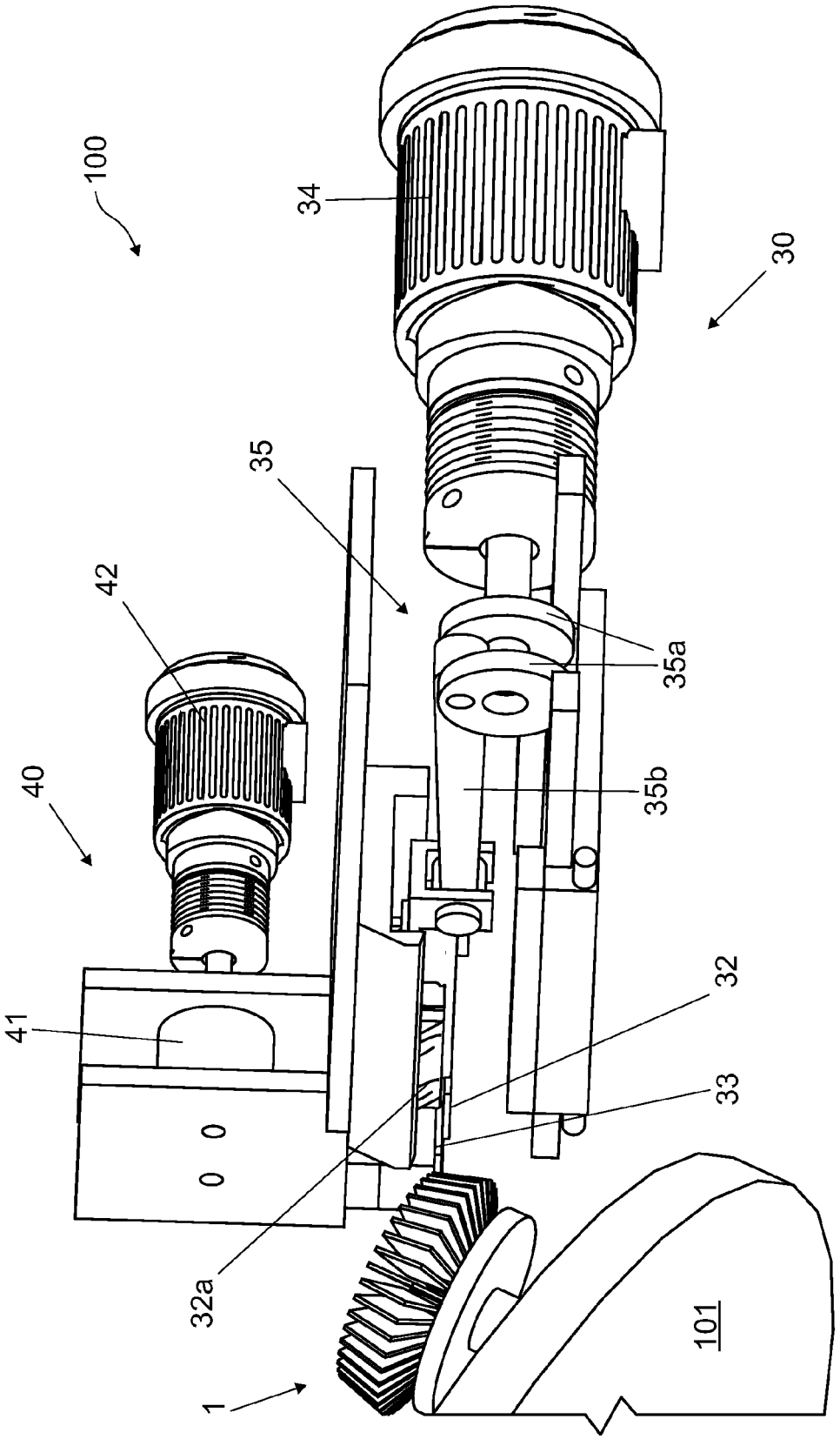


Fig. 5

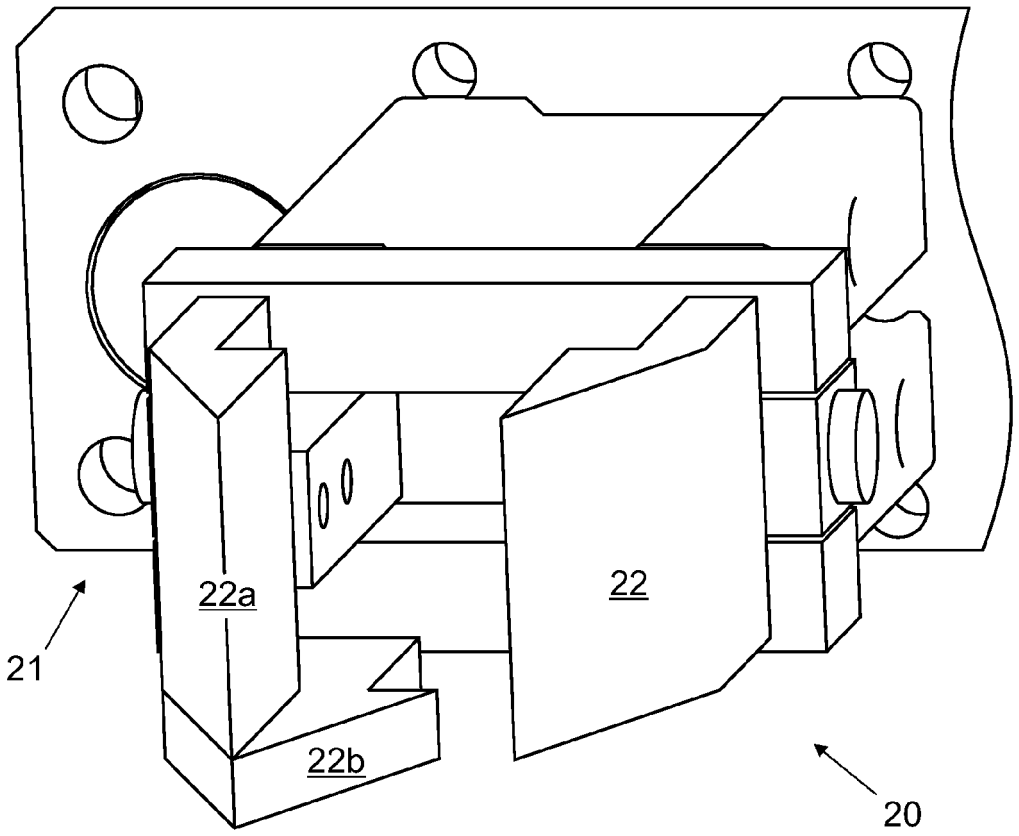


Fig. 7

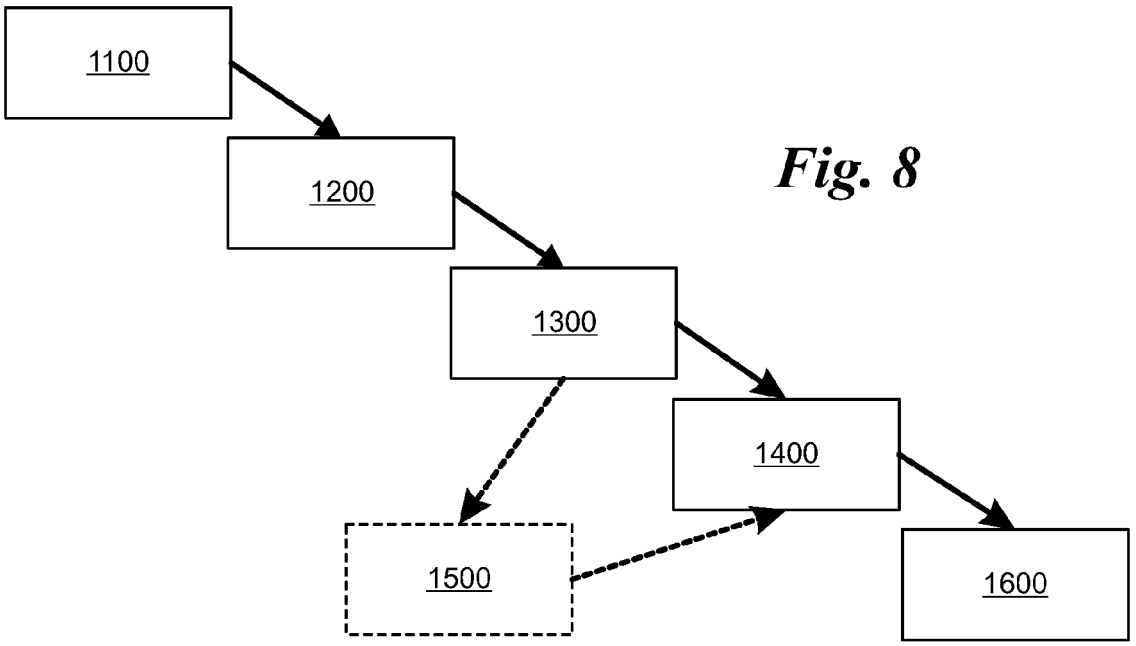


Fig. 8

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EUROPEAN SEARCH REPORT

Application Number
EP 11 16 8369

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
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