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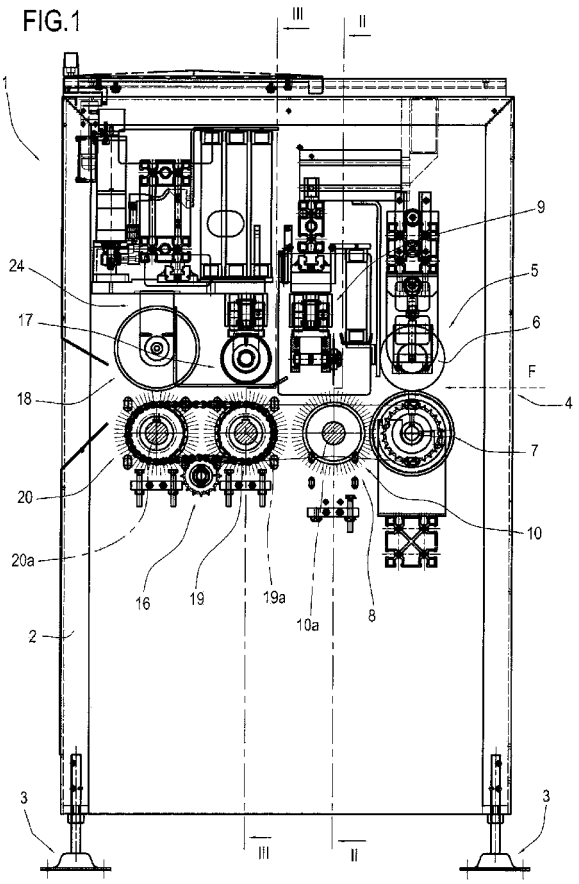
(54) A machine for working cardboard and similar materials

(57) A machine for working cardboard and similar materials comprises a supporting frame (2), means (5) for feeding the cardboard in a predetermined feed direction (F), operating elements (9, 17, 18) designed to make cuts, creases and/or for other working on the cardboard, cardboard supporting and opposing rollers (10, 19, 20) which are positioned on the opposite side of the cardboard to the operating elements (9, 17, 18), for opposing the force applied to the cardboard by the operating elements (9, 17, 18).

FIG.1



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Description

[0001] This invention is in the technical sector relating to cardboard working.

[0002] In particular, this invention relates to a machine for working cardboard and similar materials.

[0003] Working cardboard, whether it is in slabs, sheets or strips, corrugated or single-layer, basically involves making cuts, creases and the like.

[0004] There are prior art cardboard working machines which are equipped with disk-type, blade-type or even punch elements for making cuts, creases, intermittent pre-breaking line cuts, both longitudinal and transversal.

[0005] In order to carry out said working effectively, the prior art machines are equipped with suitable opposing means located on the opposite side of the cardboard to be worked to the disk-type elements for cutting or punching.

[0006] These opposing means carry out the necessary function of preventing the cardboard from deforming or bending excessively when it is subjected to the forces with components which are perpendicular to it applied by the cutting elements.

[0007] In the prior art solutions the opposing means comprise steel rollers positioned opposite the disk-type or roller-type cutting or creasing elements. An alternative solution to the rollers uses flat opposing elements, such as plates and the like.

[0008] Both types of opposing means mentioned above, although effective are not without disadvantages.

[0009] Whilst on one hand the plate means generate unwanted friction which opposes rapid cardboard feed, the roller means, in order to overcome said disadvantage must be made to rotate at the same speed of rotation as the cutting elements, with consequent complications due to the complexity of the plant, both as regards their motorisation and for controlling their speed.

[0010] To overcome the disadvantages of the prior art, the Applicant created a new solution consisting of a machine for working cardboard in which the opposing means are brushes which form respective flat surfaces on which the pieces of cardboard can slide. Said solution forms the subject-matter of industrial invention patent application number BO2006A000381.

[0011] Even that solution, although solving most of the problems associated with the use of pre-existing means, is not without disadvantages.

[0012] In particular, a first disadvantage is the fact that the bristles forming the brushes, extending longitudinally so that they are perpendicular to the surface for cardboard feed along the machine, may cause the cardboard being fed to jam if the cardboard has sharp cuts which are transversal to the feed direction.

[0013] A second disadvantage linked to use of brush-type means of the known type is the high resistance to cardboard feed caused by the bristles distributed along the feed surface.

[0014] This invention therefore has for an aim to provide a machine for working cardboard and similar materials which is free of the disadvantages described above and which at the same time has a simple structure, is easy to produce and operates effectively.

[0015] The technical features of the invention according to the aforementioned aim may be easily inferred from the content of the appended claims, especially claim 1, and preferably any of the claims that depend, either directly or indirectly, on claim 1.

[0016] The advantages of the invention are more apparent from the detailed description which follows, with reference to the accompanying drawings which illustrate a preferred embodiment of the invention provided merely by way of example without restricting the scope of the inventive concept, and in which:

- Figure 1 is a schematic side elevation view of a first embodiment of the machine according to this invention;
- Figure 2 is a cross-section according to the line II - II of Figure 1, with some parts cut away for clarity;
- Figure 3 is a cross-section according to the line III - III of Figure 1, with some parts cut away for clarity;
- Figures 4 and 5 show, in respective side elevation views, an apparatus belonging to the machine in the previous figures, in two different operating steps;
- Figure 6 is a schematic side elevation view of a second embodiment of the machine according to this invention;
- Figure 7 is a schematic perspective top view of a detail of the machines in the previous figures;
- Figure 8 is a schematic perspective top view of a preferred embodiment of the detail of Figure 7;
- Figure 9 is an exploded schematic view of the detail of Figure 8.

[0017] With reference to the accompanying drawings from 1 to 5, the numeral 1 denotes as a whole a preferred but non-limiting embodiment of a machine for working cardboard and similar materials.

[0018] As shown in Figure 1, the machine 1 comprises a frame 2 consisting of a plurality of uprights and cross-pieces, not indicated in detail, and resting on the ground with a plurality of feet 3.

[0019] The machine 1 has a zone 4 for insertion of a piece of cardboard C, visible in Figures 2 and 3, according to a predetermined direction indicated by the arrow F, towards a series of operating elements designed to make cuts, creases or for other working on the cardboard, the operating elements being described in detail below.

[0020] Again with reference to Figure 1, close to the insertion zone 4, the machine 1 comprises means 5 for feeding the cardboard comprising two rollers 6, 7 opposite one another, of the substantially known type and not described in detail.

[0021] Downstream of the zone 4 according to the direction of the arrow F, the machine 1 has a first operating unit 8 for cutting and creasing the pieces of cardboard

transversally, where the term transversally refers to a direction which is substantially at a right angle to the cardboard C feed direction in the machine 1, the feed direction being indicated by the arrow F in Figure 1.

[0022] As Figure 2 also shows, the first operating unit 8 comprises an operating element 9 and a roller 10 for supporting and opposing the cardboard C.

[0023] The operating element 9 advantageously comprises a disk-type cutting device 11, and two creasing devices 12, 13, respectively continuous and intermittent.

[0024] The three devices 11, 12, 13 are mounted on a carriage 14 which can move by sliding, in the substantially known way, on a respective guide 15 extending transversally to the cardboard C feed direction F.

[0025] The devices 11, 12, 13 can be operated independently of each other using respective actuators, advantageously of the pneumatic type, which bring each of them from a respective first, raised non-operating position to a second, lowered operating position in which it engages with the cardboard C.

[0026] The supporting and opposing roller 10 rotates about a respective axis of rotation 10a which is transversal to the feed direction F.

[0027] Also with reference to Figure 1, downstream of the first operating unit 8 according to the direction of the arrow F, the machine 1 has a second operating unit 16 for cutting and creasing the pieces of cardboard C longitudinally, where the term longitudinally refers to a direction which is substantially parallel with the cardboard C feed direction F in the machine 1.

[0028] The second operating unit 16 comprises two operating elements 17, 18 and two respective rollers 19, 20 for supporting and opposing the cardboard C.

[0029] As is also illustrated in Figure 3, the operating element 17 comprises two disk-type cutting devices 21 each designed to make longitudinal cuts in the cardboard C by operating in conjunction with a respective supporting and opposing roller 19 below. As shown in Figures 4 and 5, the device 21 can be operated using respective actuators 22 between a first, raised non-operating position, visible in Figure 4, in which the cutting disk 23 does not engage with the cardboard C, and a second, lowered operating position, visible in Figure 5, in which the cutting disk 23 engages with the cardboard C.

[0030] The supporting and opposing roller 19 rotates about a respective axis of rotation 19a which is transversal to the feed direction F.

[0031] The operating element 18 comprises a creasing device 24 designed to make longitudinal creases in the cardboard C by operating in conjunction with a respective supporting and opposing roller 20 below. Like the devices 11, 12, 13, 21 described above, the creasing device 24 can move between two respective positions, non-operating and operating.

[0032] The supporting and opposing roller 20 also rotates about a respective axis of rotation 20a which is transversal to the feed direction F.

[0033] Each of the supporting and opposing rollers 10, 19, 20, a portion of which is illustrated in Figure 7, is covered by a brush-type surface 25 whose bristles, or thread-like segments, are designed to support the cardboard C and to offer suitable opposition to the operating element 9, 17, 18 during operation of any of its devices 11, 12, 13, 21, 24.

[0034] As illustrated in Figures 2 to 5, the rollers 10, 19, 20 are opposite respective operating elements 9, 17, 18, which are on the opposite side of the cardboard C.

[0035] In their action supporting the cardboard C and opposing the operating elements 9, 17, 18, the tips of the bristles forming the surface 25 react with both the weight of the cardboard C and the force applied to the cardboard C by the cutting and creasing devices.

[0036] Preferably, in forming the brush-type surface 25, the bristles are gathered in groups distributed in a regular fashion on the outer cylindrical face of the rollers 10, 19, 20.

[0037] Advantageously, according to the preferred non-limiting embodiment illustrated in Figures 8 and 9, the bristles, or thread-like segments, are arranged one after another and are fixed on a support 30 which extends longitudinally, the support 30 being wound in a spiral about the roller 10, 19, 20 to form the brush-type surface 25.

[0038] As Figures 8 and 9 show, the support 30 is a profile with a U-shaped cross-section.

[0039] The profile forming the support 30 is advantageously a metal profile, in particular made of steel or aluminium.

[0040] Advantageously, the lateral walls of the support 30 are at least partly bent inwards towards each other to form a U shape so as to mechanically hold the bristles or thread-like segments.

[0041] Advantageously, thanks to its concave U shape, the support 30 accommodates an adhesive material able to secure the bristles or thread-like segments.

[0042] As already indicated, during production the profile forming the support 30 is wound in a spiral about the roller 10, 19, 20 so that it adheres to the outer surface of the latter and forms the above-mentioned brush-type surface 25.

[0043] Advantageously, the support 30 wound in a spiral is fixed to the roller 10, 19, 20 by suitable fixing means.

[0044] In particular, the fixing means, not illustrated, comprise welding spots when possible depending on the materials used. Alternatively, the support 30 may be fixed to the roller 10, 19, 20 by forcing the former onto the latter.

[0045] The support 30 which can be wound in a spiral about the roller 10, 19, 20, has the advantage of being easy to adapt to any different roller diameter and easily and rapidly substituted in the event of wear or deterioration of the bristles or thread-like segments.

[0046] The bristles are advantageously made of nylon or another synthetic material or even of metal, depending on the material to be supported and on other operating parameters to be selected by the machine user.

[0047] In the embodiment of the machine 1 illustrated

in Figures 1 to 5, the supporting and opposing rollers 10, 19, 20 of all of the operating units 8, 16, transversal and longitudinal, are shown as the type covered by a brush-type surface 25, although said representation does not limit the scope of the invention in any way.

[0048] In other words, without departing from the protective scope of this invention, there are machines which are also equipped with only one roller covered with the brush-type surface 25, whilst the other rollers are of conventional types such as solid rubber rollers or steel rollers.

[0049] The rollers 10, 19, 20 advantageously have motor means, not illustrated, which are designed to make the roller 10, 19, 20 rotate in such a way that it is synchronised with cardboard C feed.

[0050] Advantageously, rotation of the rollers 10, 19, 20 contributes to cardboard C feed in the direction F.

[0051] Figures 2 and 3 show, by way of example, at one longitudinal end of the roller 10, 19, a pulley 26 designed to engage with respective elements, not illustrated, which are designed to pull the roller 10, 19 so that it rotates about its axis 10a, 19a.

[0052] Alternatively, the roller 10, 19 is positioned idly on its axis of rotation 10a, 19a.

[0053] According to an alternative embodiment, not illustrated, the machine according to this invention comprises a belt conveyor, in which the belt is covered by a brush-type surface. Said embodiment, like the roller, allows the cardboard C to be supported during operation of the operating elements.

[0054] The belt conveyor may also be equipped with a motor or may be idle.

[0055] The rollers 10, 19, 20 together with the belt conveyors referred to but not illustrated, covered by brush-type surfaces 25, form, for the machine 1, respective movable elements for supporting and opposing the cardboard C.

[0056] Figure 6 shows an alternative embodiment of the machine 1 described above. For brevity the features of the machine shared by that described above are not described.

[0057] According to the embodiment illustrated in Figure 6, the machine 1 according to this invention advantageously comprises means 27 for cutting up cardboard C waste pieces obtained after cuts were made in the cardboard by the cutting devices 21. Downstream of the cutting means 27, the machine 1 comprises means 28 for unloading the cut up waste pieces.

[0058] In practice, the use of cardboard C supporting and opposing means according to this invention advantageously makes it possible to prevent the cardboard C from jamming as it is fed along inside the machine 1.

[0059] Another advantage linked to the use of the movable supporting and opposing means according to this invention is that of limiting the friction in the cardboard C sliding.

[0060] A further advantage linked to use of the rollers 10, 19, 20 having a brush-type surface 25 is the fact that they are very light and economical compared with conventional solid rubber or steel rollers.

[0061] The invention described above is susceptible of industrial application and may be modified and adapted in several ways without thereby departing from the scope of the inventive concept. Moreover, all details of the invention may be substituted by technically equivalent elements.

Claims

1. A machine for working cardboard (C) and similar materials, comprising

   - a supporting frame (2),
   - means (5) for feeding the cardboard (C) in a predetermined feed direction (F),
   - operating elements (9, 17, 18) designed to make cuts, creases and/or for other working on the cardboard (C),
   - cardboard (C) supporting and opposing means, positioned on the opposite side of the cardboard (C) to the operating elements (9, 17, 18) so as to oppose the force applied to the cardboard (C) by the operating elements (9, 17, 18), the machine being **characterised in that** the supporting and opposing means comprise at least one movable element which is at least partly covered by a brush-type surface (25) and designed to support the cardboard (C) during operation of the operating elements (9, 17, 18).

2. The machine according to claim 1, **characterised in that** the movable element comprises a roller (10, 19, 20) able to rotate about a respective axis of rotation (10a, 19a, 20a) which is transversal relative to the cardboard (C) predetermined longitudinal direction of feed (F), the brush-type surface (25) at least partly covering the roller (10, 19, 20).

3. The machine according to claim 1, **characterised in that** the movable element comprises a belt conveyor, the brush-type surface (25) at least partly covering the belt of the conveyor.

4. The machine according to any of the claims from 1 to 3, **characterised in that** the brush-type surface (25) consists of a plurality of thread-like segments.

5. The machine according to claim 4, **characterised in that** the thread-like segments are gathered in groups.

6. The machine according to claim 4 or 5, **characterised in that** the thread-like segments are arranged one after another and are fixed on a support (30) which extends longitudinally, said longitudinal

support being wound in a spiral about the roller (10, 19, 20).

7. The machine according to claim 6, **characterised in that** the longitudinal support (30) is made of metal material.

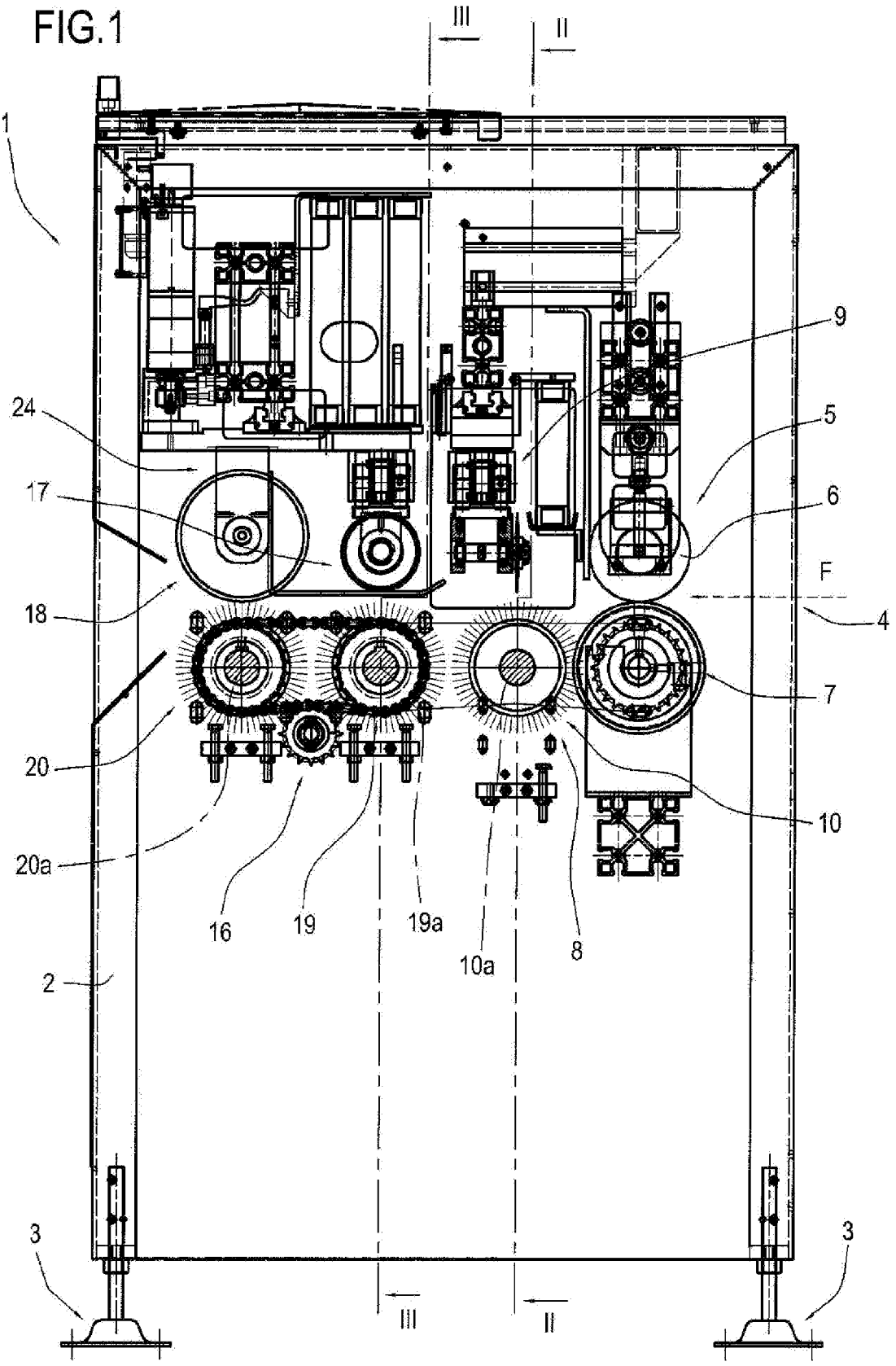
8. The machine according to claim 6 or 7, **characterised in that** the support (30) has a U-shaped cross-section.

9. The machine according to any of the claims from 1 to 8, **characterised in that** it comprises motor means designed to move the movable element in such a way that it is synchronised with cardboard (C) feed.

10. The machine according to any of the claims from 1 to 9, **characterised in that** it comprises means (27) for cutting up cardboard (C) waste pieces obtained after cuts were made in the cardboard.

11. The machine according to claim 10, **characterised in that** it comprises means (28) for unloading the cut up waste pieces.

FIG.1



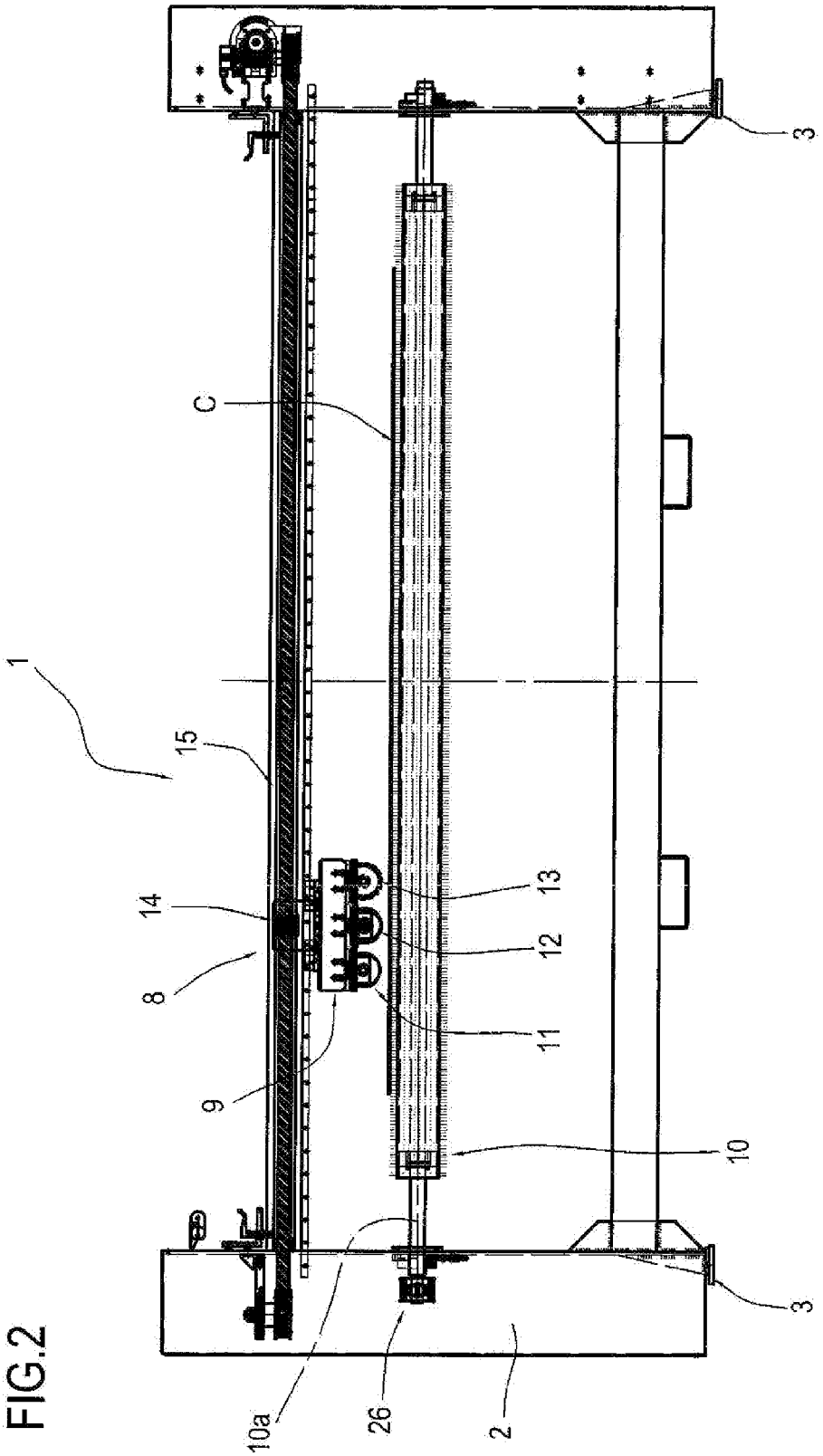


FIG.2

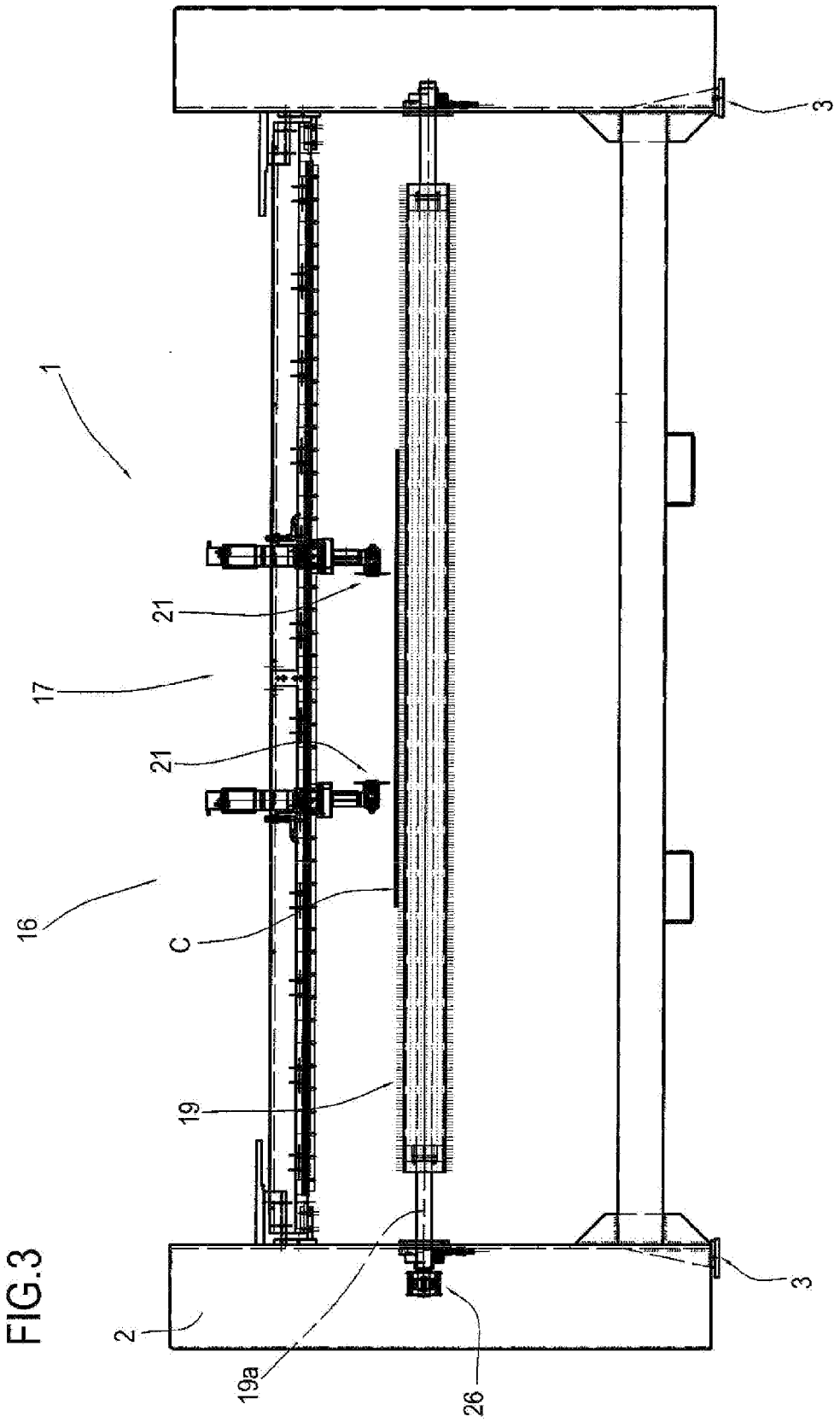


FIG.3

FIG.4

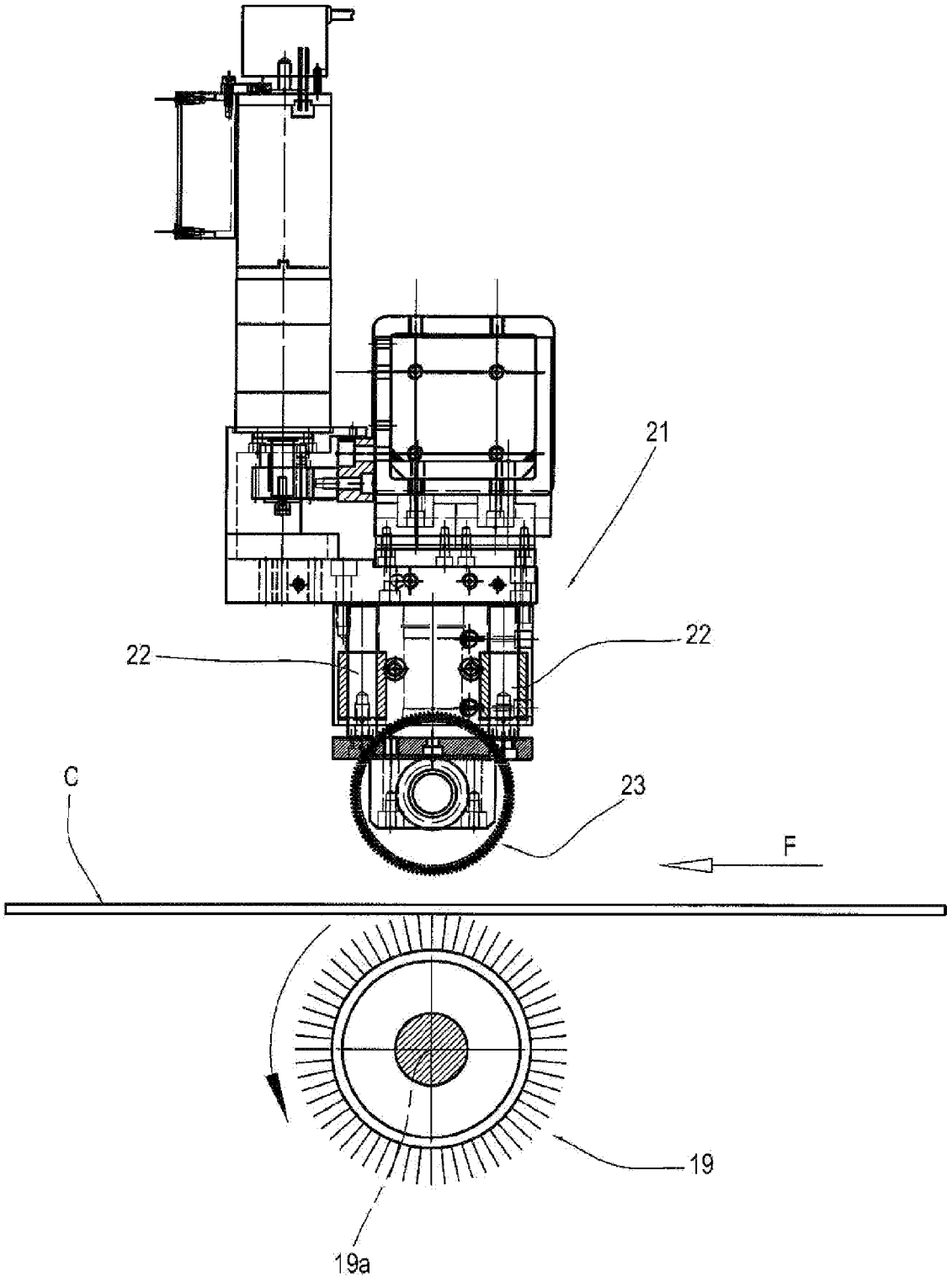


FIG.5

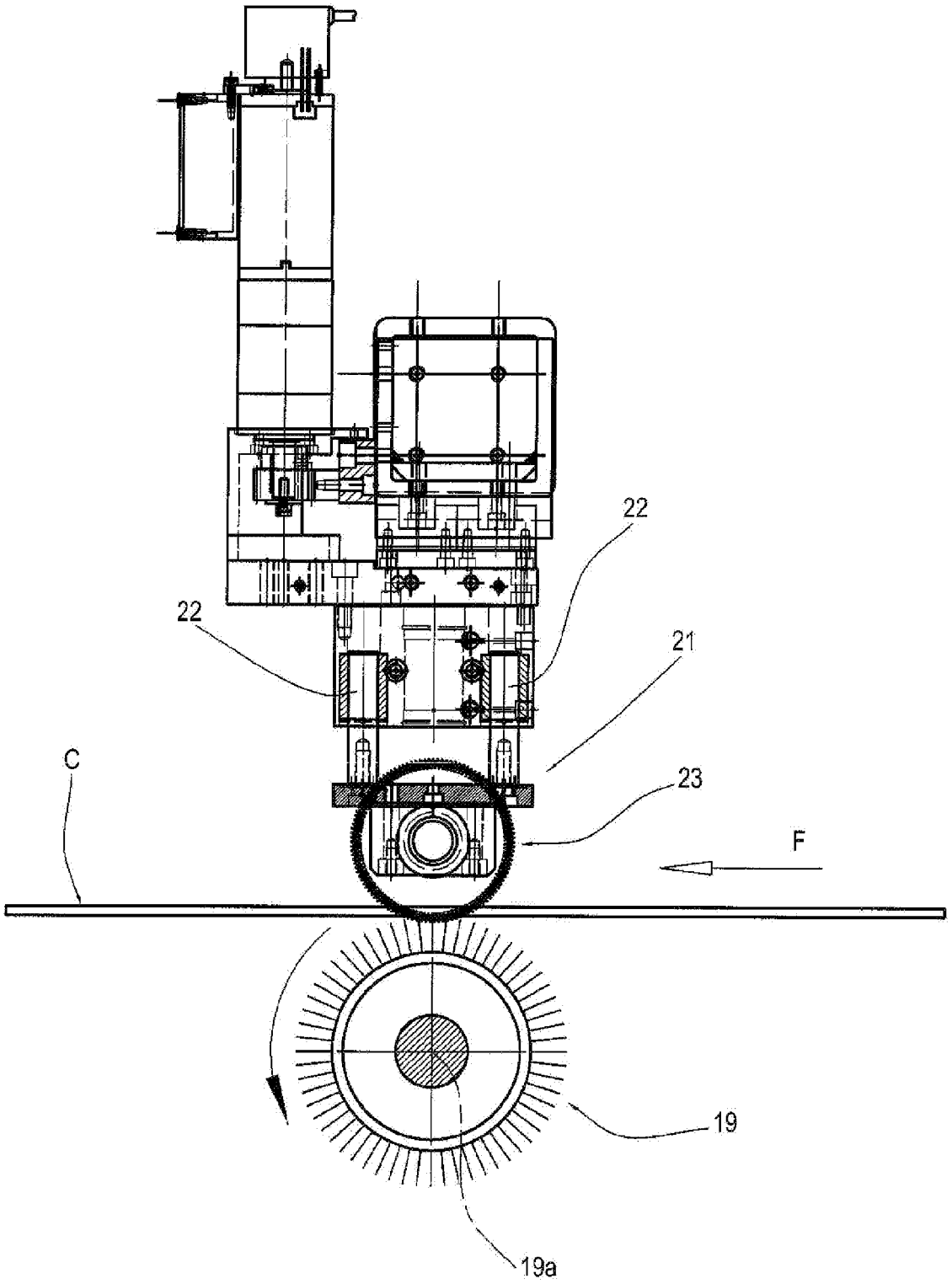


FIG.6

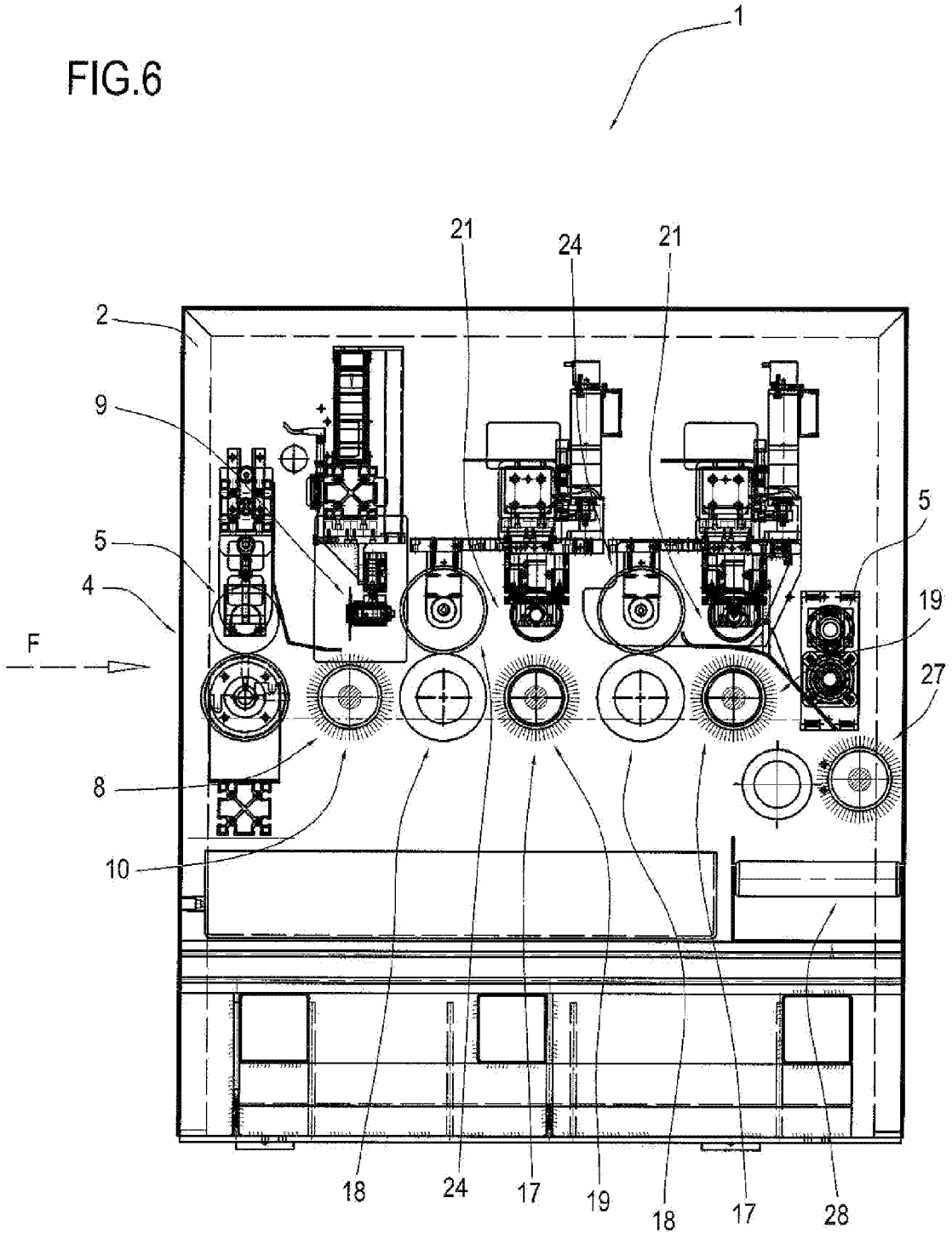


FIG.7

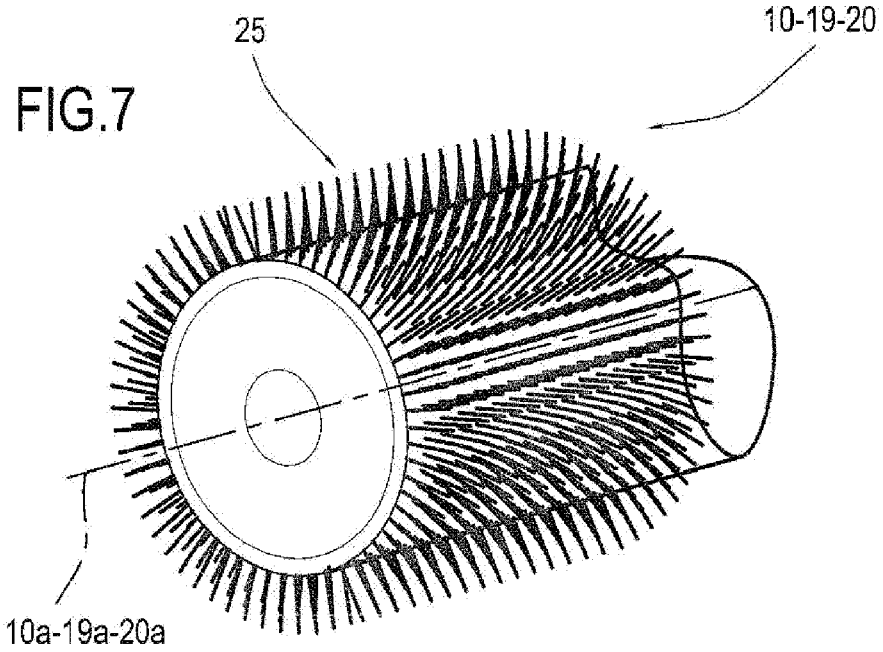


FIG.8

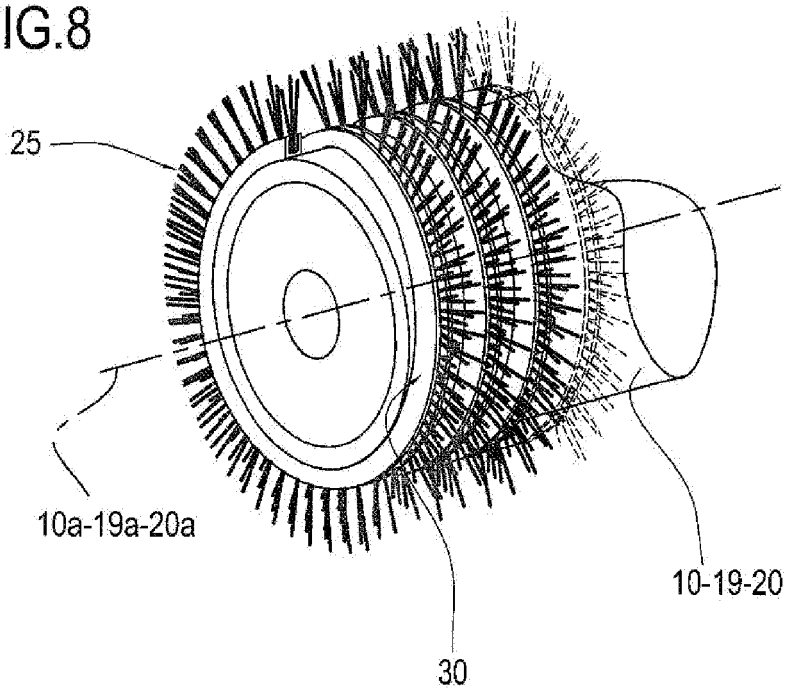
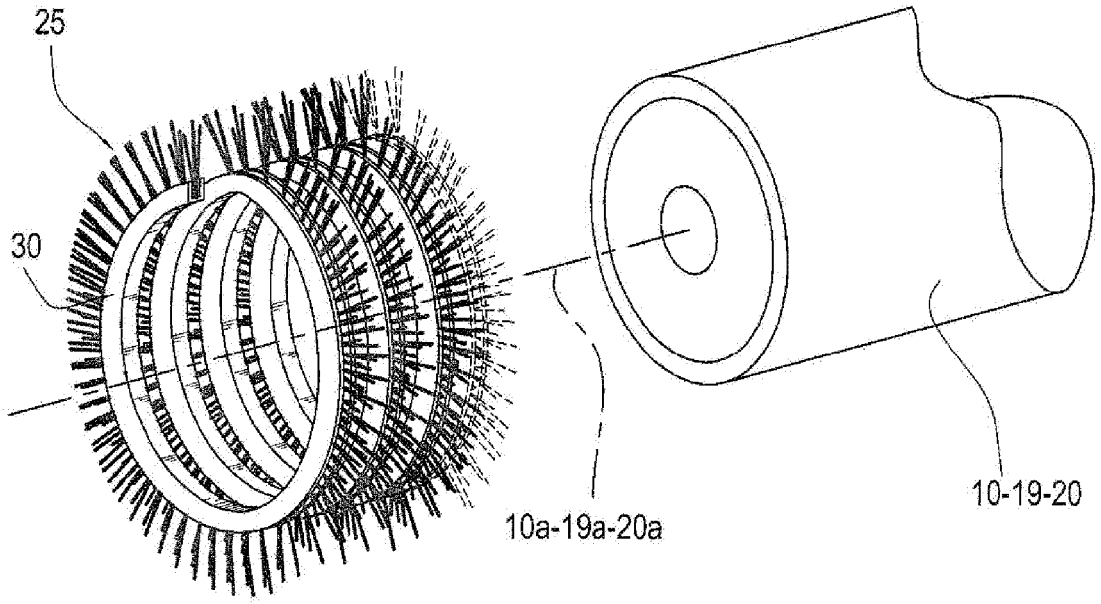


FIG.9



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EUROPEAN SEARCH REPORT

Application Number
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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
Munich	31 March 2010	Canelas, Rui

CATEGORY OF CITED DOCUMENTS

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