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(54) Apparatus for making containers from a semifinished cardboard product

(57) An apparatus (1) for making containers (6) from a cardboard semifinished product (5) comprises a first processing station (2) and at least one second processing station (3) of the semifinished product (5), said second processing station (3) being arranged downstream of said first processing station (2) in an advancing direction (F) of the semifinished product (5) through the apparatus (1), there being provided dragging elements (26, 27) that are suitable for moving said semifinished product (5) through said first processing station (2) and said second processing station (3), said apparatus (1) further comprising a frame element (31) that is supported on a fixed frame (30) of the apparatus (1) and is movable thereto with respect to a direction that is substantially perpendicular to said advancing direction (F) to adapt the apparatus (1) to the varying of the transversal dimensions of the semifinished product (5).

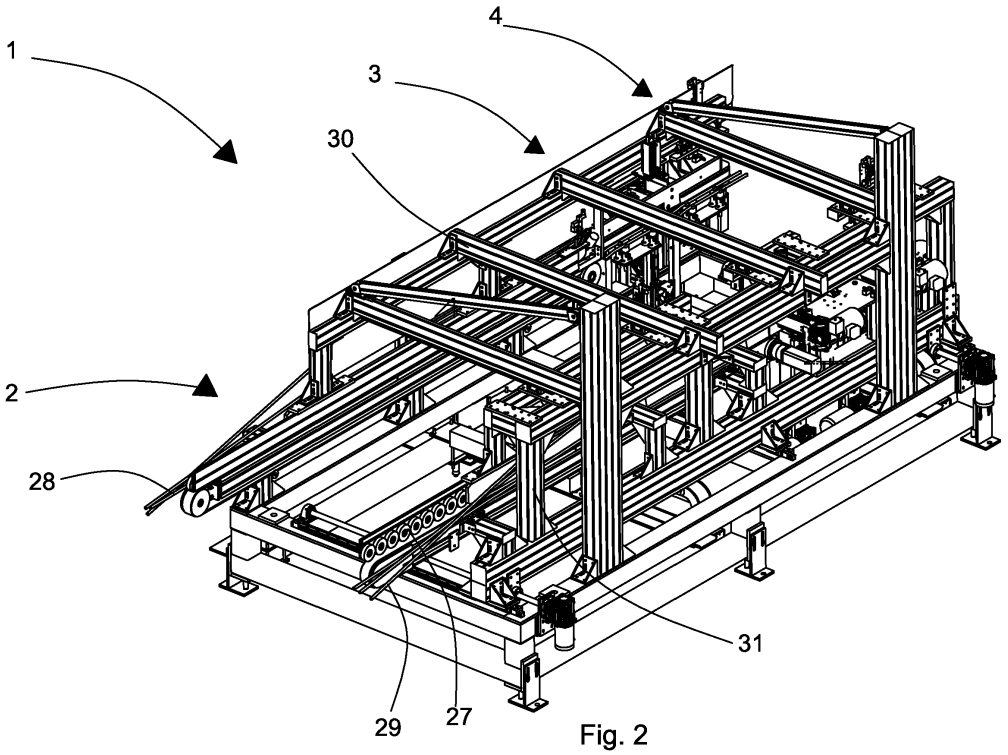

Fig. 2

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Description

[0001] The invention relates to an apparatus for making containers, in particular box-shaped containers, from a cardboard semifinished product provided with flaps that are foldable along preset folding lines.

[0002] From the prior art, apparatuses are known for making cardboard boxes from cardboard semifinished products provided with foldable flaps, in which a processing station is provided in which the flaps of the semifinished product are folded and glued together to make the body of the box. The folding and the gluing of the flaps occur whilst the semifinished product is in a stationary position in the processing station. When forming of the box has been completed, the latter has to be removed from the processing station before a new semifinished product can be introduced into said station to make a subsequent box. This entails prolongation of the total manufacturing time of the boxes and subsequent reduced productivity of the apparatus. Further, when the dimensions of the semifinished product to be used vary, all the devices intended for folding the flaps have to be repositioned to adapt the position thereof to the new dimensions of the semifinished product. This entails significant downtime in the box-manufacturing process, in particular if small quantities of boxes of different dimensions have to be made.

[0003] One object of the present invention is to provide an apparatus for making containers from cardboard semifinished products that permits greater productivity, reduces processing downtime and enables the maximum flexibility of use.

[0004] The object of the present invention is achieved with an apparatus according to claim 1.

[0005] Owing to the invention, it is possible to reduce drastically the downtime in the manufacture of the containers as the apparatus can work in a substantially continuous cycle, without it being necessary to remove from the apparatus a formed container before starting to form the subsequent container.

[0006] Further, adapting the apparatus to different sizes of containers to be made is extremely simple and rapid.

[0007] One embodiment of the invention is illustrated merely by way of non-limiting example in the following description with reference to the attached drawings, in which:

Figure 1 is a plan view of an apparatus according to the invention;
Figure 2 is a perspective view of the apparatus in Figure 1;
Figure 3 is a schematic perspective view of the apparatus in
Figure 1 that illustrates the entry of a cardboard semifinished product into the apparatus in Figure 1;
Figure 4 is a schematic perspective view of the apparatus in
Figure 1, which illustrates a first forming step of a container;
Figure 5 is a cross section of the apparatus in Figure 1 that illustrates the first forming step of the container illustrated in Figure 4;
Figure 6 is a cross section of the apparatus in Figure 1 that illustrates an application of adhesive substance to the semifinished product;
Figure 7 is a schematic perspective view of the apparatus in
Figure 1, which illustrates a second forming step of a container;
Figure 8 is a cross section of the apparatus in Figure 1, which illustrates the second forming step of the container;
Figure 9 is a schematic perspective view of the apparatus in
Figure 1, which illustrates a third forming step of a container;
Figure 10 is a schematic perspective view of the apparatus in Figure 1, which illustrates a fourth forming step of a container;
Figure 11 is a schematic perspective view of the apparatus in Figure 1, which illustrates a fifth forming step of a container;
Figure 12 is a schematic perspective view of the apparatus in Figure 1, which illustrates a sixth forming step of a container;
Figure 13 is a schematic perspective view of the apparatus in Figure 1, which illustrates a seventh forming step of a container;
Figure 14 is a cross section of the apparatus in Figure 1, which illustrates the seventh forming step of the container.

In the embodiment illustrated in the figures, an apparatus 1 according to the invention comprises a first processing station 2, a second processing station 3 and a third processing station 4. Into the first processing station 2 a cardboard semifinished product 5 (Figure 3) is introduced from which a container 6 (Figure 13) will be obtained, for example a box, and a first forming step of the container 6 is performed.

[0008] In the second processing station 3 second third and fourth forming step of the container 6 are performed and in the third processing station 4 fifth, sixth and seventh forming step of the container 6 are performed, the container 6 finally being evacuated from the apparatus 1 according to the invention.

[0009] The cardboard semifinished product 5 from which the container 6 is obtained comprises a first part 7 intended for constituting the bottom of the container 6, a second part 8 intended for constituting the cover of the container 6 and a third part 9 intended for constituting one of the side walls of the container 6. The third part 9 is connected to the first part 7 along a first folding line 10 and to the second part 8 along a second folding line 11. The first part 7 is further provided with a first flap 12,

intended for constituting a second side wall of the container 6, with a second flap 13 and with a third flap 14 intended for constituting front and rear walls of the container 6. The first flap 12 is connected to said first part 7 along a third folding line 15, the second flap 13 is connected to said first part 7 along a fourth folding line 16 and the third flap 14 is connected to said first part 7 along a fifth folding line 17.

[0010] Further, the third part 9 is provided with a first end portion 18 connected to the third part 9 along a sixth folding line 20 and with a second end portion 19, opposite said first end portion 18, connected to the third part 9 along a seventh folding line 21.

[0011] Also the first flap 12 is provided with a first end portion 22 and with a second end portion 23 connected to the first flap 12 respectively along an eighth folding line 24 and a ninth folding line 25.

[0012] The end portions 18 and 19 of the second part 9 and the end portions 22 and 23 of the first flap 12 are intended for constituting connecting elements between the side walls and the front walls of the container 6.

[0013] The apparatus 1 according to the invention is provided with a plurality of first dragging elements 26 and of second dragging elements 27, arranged on opposite parts compared to a longitudinal axis A of the apparatus 1 and extending through said first processing station 2, said second processing station 3 and said third processing station 4. Said first dragging elements 26 and said second dragging elements 27 can be, for example, driven rollers, intended for advancing the semifinished product 5 along the apparatus 1 in a direction indicated by an arrow F in Figures 3, 4, 7, 9, 10, 11, 12 and 13.

[0014] The first dragging elements 26 are supported on a fixed frame 30 of the apparatus 1, whereas the seconds dragging elements 27 are supported on a frame element 31 that is supported on the frame 30 and is movable in relation thereto in a direction that is perpendicular to the longitudinal axis A of the apparatus 1, i.e. perpendicular to said advancing direction F.

[0015] The moving of the frame element 31 in said direction that is perpendicular to the longitudinal axis A of the apparatus 1 is used to adapt the apparatus 1 rapidly to the varying of the cross sections of the semifinished products 5 when containers 6 with different transversal dimensions have to be made. The apparatus 1 does not need to be adapted to varying of the longitudinal dimensions of the semifinished product 5, owing to the fact that the semifinished product 5 is processed in processing stations arranged in succession along the advancing direction F.

[0016] In the first processing station 2 first folding elements 28 and second folding elements 29 are provided, consisting, for example, of a plurality of rods converging from the bottom to the top and towards the longitudinal axis A of the apparatus 1. The first folding elements 28 and the second folding elements 29 are arranged in symmetrical positions compared with said longitudinal axis A.

[0017] The first folding elements 28 are intended for folding the second part 8 and the third part 9 of the semifinished product 5 with respect to the first part 7, along the folding line 10, up to arranging the second part 8 and the third part 9 in a position that is substantially perpendicular to the first part 7. The second folding elements 29 are intended for folding the first flap 12 of the first part 7 along the third folding line 15, up to arranging the first flap 12 in a position that is substantially perpendicular to the first part 7.

[0018] The first folding elements 28 are fixed to the frame 30 of the apparatus 1, whereas the second folding elements 29 are fixed to the frame element 31.

[0019] As illustrated in Figures 3 and 4, the semifinished product 5 reaches the apparatus 1 according to the invention along a conveying line that is not shown, until it comes into contact with the first dragging elements 26 and the second dragging elements 27, which make the semifinished product 5 advance inside the first processing station 2 of the apparatus 1.

[0020] By entering the first processing station 2 of the apparatus 1, the cardboard semifinished product 5 comes into contact below with the first folding elements 28 and with the second folding elements 29, which, through the effect of the tilt thereof upwards and of the convergence thereof towards the longitudinal axis A of the apparatus 1, start to fold upwards the second part 8 and the third part 9 of the semifinished product 5 and the first flap 12 of the first part 7 of the semifinished product 5.

[0021] In particular, as already said, the first folding elements 28 progressively fold the second part 8 and the third part 9 of the semifinished product 5 along the first folding line 10, up to arranging the second part 8 and the third part 9 in a position substantially perpendicular to the first part 7 of the semifinished product 5. The second folding elements 29 progressively fold the first flap 12 along the third folding line 15, up to arranging the first flap 12 in a position that is substantially perpendicular to the first part 7 of the semifinished product 5.

[0022] This first forming step of the container 6 is illustrated in Figures 4 and 5.

[0023] At the end of this folding operation, the second part 8 and the third part 9 of the semifinished product 5 are maintained in said position substantially perpendicular to the first part 7 by first resting elements 32, which are fixed to the frame 30 of the apparatus 1 and extend parallel to the longitudinal axis A of the apparatus 1.

[0024] The first flap 12 is maintained in said position substantially perpendicular to the first part 7 by second resting elements 33 fixed to the frame element 31.

[0025] At the end of folding of the second part 8 and of the third part 9 of the semifinished product 5 and of the first flap 12 of the first part 7 of the semifinished product 5, the latter is advanced in the direction of the arrow F by the first dragging elements 28 and the second dragging elements 29 until it reaches the second processing station 3 of the apparatus 1.

[0026] Before the semifinished product 5 reaches the second processing station 3, an adhesive substance is

applied to the end zones of the second flap 13 intended for coming into contact, after folding, as will be explained below, with the first end portion 18 of the third part 9 of the semifinished product 5 and with the first end portion 22 of the first flap 12. The adhesive substance is applied whilst the semifinished product 5 moves in the advancing direction F and is applied by a first applicating device 42, supported on the frame 30 of the apparatus 1, and a second applicating device 43 supported on the movable frame element 31. When the semifinished product 5 reaches the second processing station 3 of the apparatus 1, the first end portion 18 of the third part 9 of the semifinished product 5 and the first end portion 22 of the first flap 12 are folded towards the longitudinal axis A of the apparatus 1, along the sixth folding line 20 and along the eighth folding line 24, respectively, by a first pair of pushing elements, comprising a first upper pushing element 34 and a second lower pushing element 35, placed at different heights and supported on the frame 30 of the apparatus 1, and a second pair of pushing elements, comprising a third upper pushing element 36 and a fourth lower pushing element 37, which are also placed at different heights and supported on the movable frame element 31. Each pair of pushing elements is driven to move in a direction that is perpendicular to the advancing direction F of the semifinished product 5. The first upper pushing element 34 and the third upper pushing element 36 assist the second lower pushing element 35 and the fourth lower pushing element 37, respectively, in folding end portions 18, 22, when the latter exceed a preset height.

[0027] The first pair of pushing elements 34, 35 is driven by a first motor 38 supported on the frame 30 of the apparatus 1, for example an electric motor, and the second pair of pushing elements 36, 37 is driven by a second motor 39 supported on the movable frame element 31, for example an electric motor.

[0028] There are also provided a first stop element 40, which is fixed, supported above on the frame 30, and a second stop element 41, which is also fixed, supported above on the movable frame element 31. The first stop element 40 and the second stop element 41 limit by about 90° the rotation of the end portions 18 and 22 due to the effect of folding. When folding of the end portions 18 and 22 has been completed, the pushing elements 34, 35, 36, 37 are retracted and the second flap 13 is folded upwards, by a third pair of pushing elements comprising a fifth pushing element 44 and a sixth pushing element 45, up to coming into contact with said end portions 18 and 22 and adhering thereto due to the effect of the action of said adhesive substance. The fifth pushing element 44 and the sixth pushing element 45 are movable vertically and arranged below the advancing plane of the semifinished product 5. The fifth pushing element 44 is supported on the frame 30 of the apparatus 1, whilst the sixth pushing element 45 is supported on the movable frame element 31.

[0029] At this point, the front side of the container 6 is completed and the semifinished product 5 is advanced towards the third processing station 4 of the apparatus in which the rear side of the container 6 is made, thus completing the body of the container 6.

[0030] When the third flap 14 reaches the applicating devices 42 and 43, the latter apply said adhesive substance in the end zones of the third flap 14 of the first part 7 of the semifinished product 5 intended for coming into contact, after folding, with the second end portion 19 of the third part 9 of the semifinished product 5 and the second end portion 23 of the first flap 12, as will be explained below. In the third processing station 4 of the apparatus 1 a fourth pair of pushing elements is provided, comprising a seventh upper pushing element 46 and an eighth lower pushing element 47, placed at different heights and supported on the frame 30 of the apparatus 1, and a fifth pair of pushing elements, comprising a ninth upper pushing element 48 and a tenth lower pushing element 49, which are also placed at different heights and supported on the movable frame element 31.

[0031] The fourth pair of pushing elements 46, 47 is driven by a third motor 50 supported on the frame 30 of the apparatus 1, for example an electric motor, and the fifth pair of pushing elements 48, 49 is driven by a fourth motor 51 supported on the movable frame element 31, for example an electric motor. The fourth pair of pushing elements 46, 47 is used to fold towards the longitudinal axis A of the apparatus 1 the second end portion 19 of the third part 9 of the semifinished product 5 along the seventh folding line 21 and the fifth pair of pushing elements 48, 49 is used to fold the second end portion 23 of the first flap 12 along the ninth folding line 25.

[0032] There are also provided a third stop element 52, which is movable in a direction that is perpendicular to the advancing plane of the semifinished product 5 and supported on the frame 30, and a fourth stop element 53, which is also movable in said direction that is perpendicular to the advancing plane of the semifinished product 5 and supported on the movable frame element 31. The third stop element 52 and the fourth stop element 53 limit to about 90° the rotation of the end portions 19 and 23 due to the effect of the folding.

[0033] When the rear part of the semifinished product 5 reaches the third processing station 4 of the apparatus, the third stop element 52 and the fourth stop element 53 are lowered in such a manner as to be substantially at the fifth folding line 17. Subsequently, the fourth pair of pushing elements 46, 47 and the fifth pair of pushing elements 48, 49 fold the end portions 19 and 23 until the latter come to rest against the third stop element 52 and the fourth stop element 53.

[0034] Lastly, the third flap 14 is folded upwards, by a sixth pair of pushing elements comprising an eleventh pushing element 54 and a twelfth pushing element 55, up to coming into contact with said end portions 19 and 23 and adhering thereto due to the effect of the action of said adhesive substance. The eleventh pushing element 54 and the twelfth pushing element 55 are movable ver-

tically and arranged below the advancing plane of the semifinished product 5. The eleventh pushing element 54 is supported on the frame 30 of the apparatus 1, whilst the twelfth pushing element 55 is supported on the movable frame element 31.

[0035] At this point, also the rear side of the container 6 is completed and thus the body of the container 6 is completed that can be evacuated from the apparatus 1 to be used subsequently to put objects therein such as, for example, furniture panels. The closure of the container 6, with the fixing of the cover, consisting of the second part 8 of the semifinished product 5, to the body of the container 6 can be achieved with a closing apparatus like the one disclosed in the patent application for the invention MO2009A000077 in the name of the same applicant.

[0036] The arrangement of the first processing station 2, of the second processing station 3 and of the third processing station 4 in succession along the advancing direction F of the semifinished product 5 in the apparatus 1 according to the invention enables the productivity of the apparatus to be increased over known apparatuses of the prior art, because it is not necessary to wait for the processing of a semifinished product 5 to terminate before starting to process the next semifinished product 5. In fact, for example, whilst the third processing station 4 completes processing of a semifinished product 5, the first processing station 2 and the second processing station 3 can start processing a subsequent semifinished product 5, in such a manner as to obtain an almost continuous processing cycle. It should be noted that the third processing station 4 can be omitted, inasmuch as the second processing station 3 can also perform all the operations that are performed by the third processing station 4. An apparatus 1 with only the first and second processing station has lower productivity than an apparatus with three processing stations, but costs significantly less.

Claims

1. Apparatus (1) for making containers (6) from a cardboard semifinished product (5) comprising a first processing station (2) and at least one second processing station (3) for processing the semifinished product (5), said second processing station (3) being arranged downstream of said first processing station (2) in an advancing direction (F) of the semifinished product (5) through the apparatus (1), there being provided dragging elements (26, 27) that are suitable for advancing said semifinished product (5) through said first processing station (2) and said second processing station (3), **characterised in that** said apparatus (1) further comprises a frame element (31) that is supported on a fixed frame (30) of the apparatus (1) and is movable in relation to the fixed frame (30) in a direction that is substantially perpendicular to said advancing direction (F) to adapt the apparatus (1) to the varying of the transversal dimensions of the semifinished product (5).

2. Apparatus (1) according to claim 1, further comprising a third processing station (4) arranged downstream of said second processing station (3) in said advancing direction (F), said dragging elements (26, 27) being suitable for making said semifinished product (5) advance through said third processing station (4).

3. Apparatus (1) according to claim 1, or 2, wherein said dragging elements (26, 27) comprise first dragging elements (26) supported on said fixed frame (30) and second dragging elements supported on said frame element (31).

4. Apparatus (1) according to any one of claims 1 to 3, wherein said first processing station (2) comprises first folding elements (28) and second folding elements (29) arranged in symmetrical positions with respect to a longitudinal axis (A) of the apparatus (1), said first folding elements (28) being suitable for folding upwards along a first folding line (10) a second part (8) and a third part (9) of the semifinished product (5) up to arranging said second part (8) and said third part (9) in a position substantially perpendicular to a first part (7) of the semifinished product (5), said first part (7) being intended for constituting the bottom of a container (6), said second folding elements (29) being suitable for folding upwards a first flap (12) of said first part (7) for processing the semifinished product (5) along a third folding line (15) up to arranging said first flap (12) substantially perpendicular to said first part (7), said first folding elements (28) being fixed to said fixed frame (30) and said second folding elements (29) being fixed to said frame element (31).

5. Apparatus (1) according to claim 4, wherein said first folding elements (28) and said second folding elements (29) comprise a plurality of rods converging upwards and towards said longitudinal axis (A) of the apparatus (1).

6. Apparatus (1) according to claim 4, or 5, further comprising first resting elements (32), that are suitable for maintaining said second part (8) and said third part (9) in said position substantially perpendicular to said first part (7), and second resting elements (33) that are suitable for maintaining said first flap (12) in said position that is substantially perpendicular to said first part (7), said first resting elements (32) being fixed to said fixed frame (30) and said second resting elements (33) being fixed to said frame element (31).

7. Apparatus (1) according to any preceding claim,

wherein said second processing station (3) comprises a first pair of pushing elements (34, 35), consisting of a first upper pushing element (34) and of a second lower pushing element (35), and a second pair of pushing elements (36, 37) consisting of a third upper pushing element (36) and of a fourth lower pushing element (37), said first pair of pushing elements (34, 35) being movable in a direction that is perpendicular to said advancing direction (F) and being suitable for folding a first end portion (18) of said third part (9) of the semifinished product (5) along a sixth folding line (20) in the direction of said longitudinal axis (A), said second pair of pushing elements (36, 37) being movable in a direction that is perpendicular to said advancing direction (F) and being suitable for folding a first end portion (22) of said first flap (12) along an eighth folding line (24) in the direction of said longitudinal axis (A), said first pair of pushing elements (34, 35) being supported on said fixed frame (30) and said second pair of pushing elements (36, 37) being supported on said frame element (31).

8. Apparatus according to claim 7, wherein said second processing station (3) further comprises a first stop element (40), supported above on the frame (30), and a second stop element (41), supported above on the frame element (31), said first stop element (40) and second stop element (41) being suitable for limiting to about 90° a rotation of said end portions (18, 22) in the direction of said longitudinal axis (A).

9. Apparatus according to claim 8, wherein said first stop element (40) and said second stop element (41) are movable vertically.

10. Apparatus (1) according to any preceding claim, wherein said second processing station (3) further comprises a first applicating device (42) of an adhesive substance and a second applicating device (43) of said adhesive substance, said first applicating device (42) being supported on said fixed frame (30) and said second applicating device (43) being supported on said frame element (31).

11. Apparatus (1) according to any preceding claim, wherein said second processing station (3) further comprises a third pair of pushing elements (44, 45) comprising a fifth pushing element (44) and a sixth pushing element (45) arranged below the advancing plane of said semifinished product (5) and movable perpendicularly to said plane, said fifth pushing element (44) and sixth pushing element (45) being suitable for folding upwards a second flap (13) of said first part (7) of the semifinished product (5), said fifth pushing element (44) being supported on said fixed frame (30) and said sixth pushing element (45) being supported on said frame element (31).

12. Apparatus (1) according to any one of claims 2 to 11, wherein said third processing station (4) comprises a fourth pair of pushing elements (46, 47), consisting of a seventh upper pushing element (46) and of an eighth lower pushing element (47), and a fifth pair of pushing elements (48, 49) consisting of a ninth upper pushing element (48) and of a tenth lower pushing element (49), said fourth pair of pushing elements (34, 35) being movable in a direction that is perpendicular to said advancing direction (F) and being suitable for folding a first end portion (19) of said third part (9) of the semifinished product (5) along a seventh folding line (21) in the direction of said longitudinal axis (A), said fifth pair of pushing elements (48, 49) being movable in a direction that is perpendicular to said advancing direction (F) and being suitable for folding a second end portion (23) of said first flap (12) along a ninth folding line (25) in the direction of said longitudinal axis (A), said fourth pair of pushing elements (46, 47) being supported on said fixed frame (30) and said fifth pair of pushing elements (48, 49) being supported on said frame element (31).

13. Apparatus according to claim 12, wherein said third processing station (4) further comprises a third stop element (52), supported on the frame (30), and a fourth stop element (53), supported on the frame element (31), said third stop element (52) and fourth stop element (53) being suitable for limiting to about 90° a rotation of said end portions (19, 23) in the direction of said longitudinal axis (A), said third stop element (52) and fourth stop element (53) being vertically movable.

14. Apparatus (1) according to any one of claims 2 to 13, wherein said third processing station (4) further comprises a sixth pair of pushing elements (54, 55) comprising an eleventh pushing element (54) and a twelfth pushing element (55) arranged below an advancing plane of said semifinished product (5) and movable perpendicularly to said plane, said eleventh pushing element (54) and twelfth pushing element (55) being suitable for folding upwards a third flap (14) of said first part (7) of the semifinished product (5), said eleventh pushing element (54) being supported on said fixed frame (30) and said twelfth pushing element (55) being supported on said frame element (31).

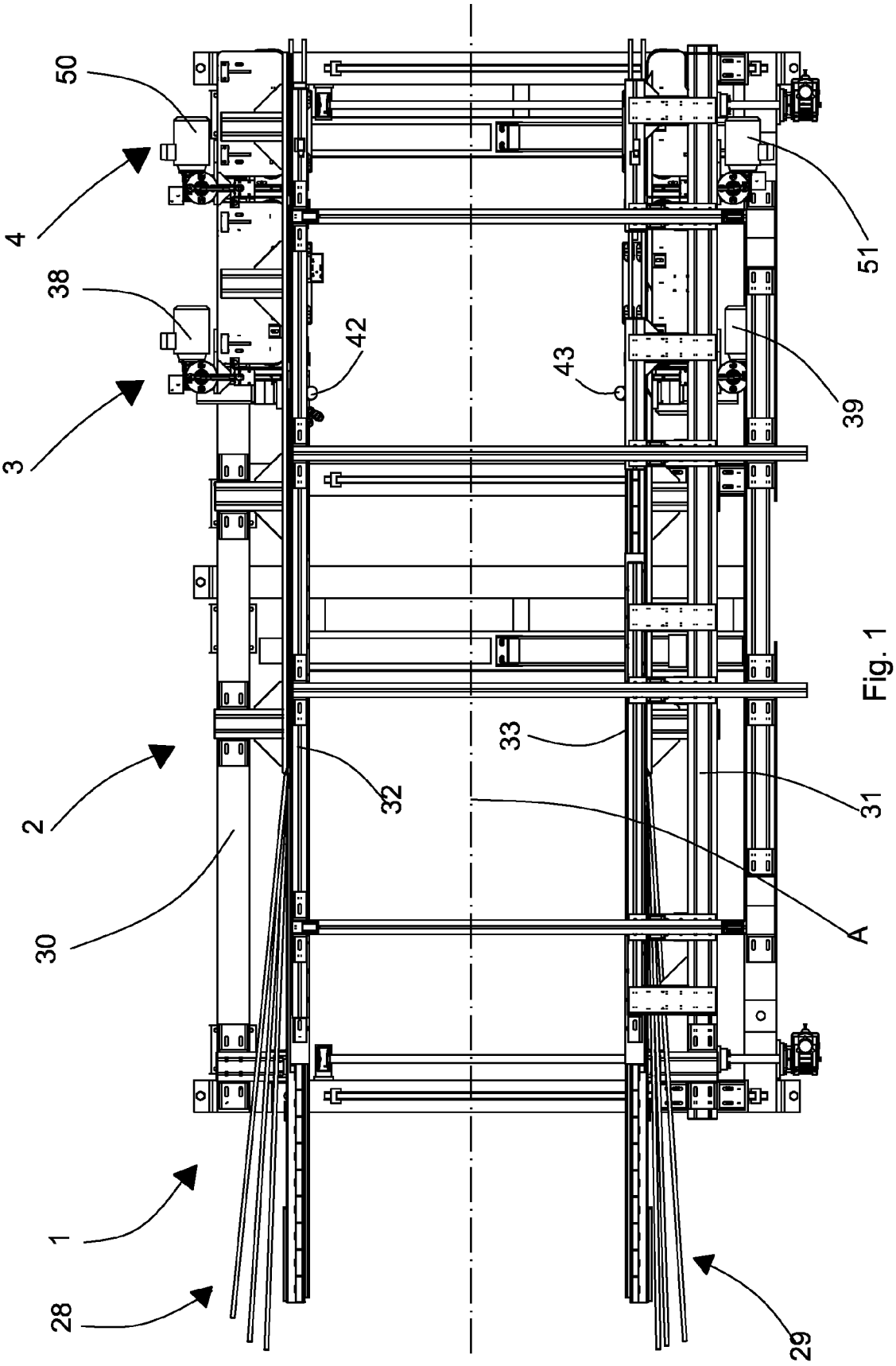

Fig. 1

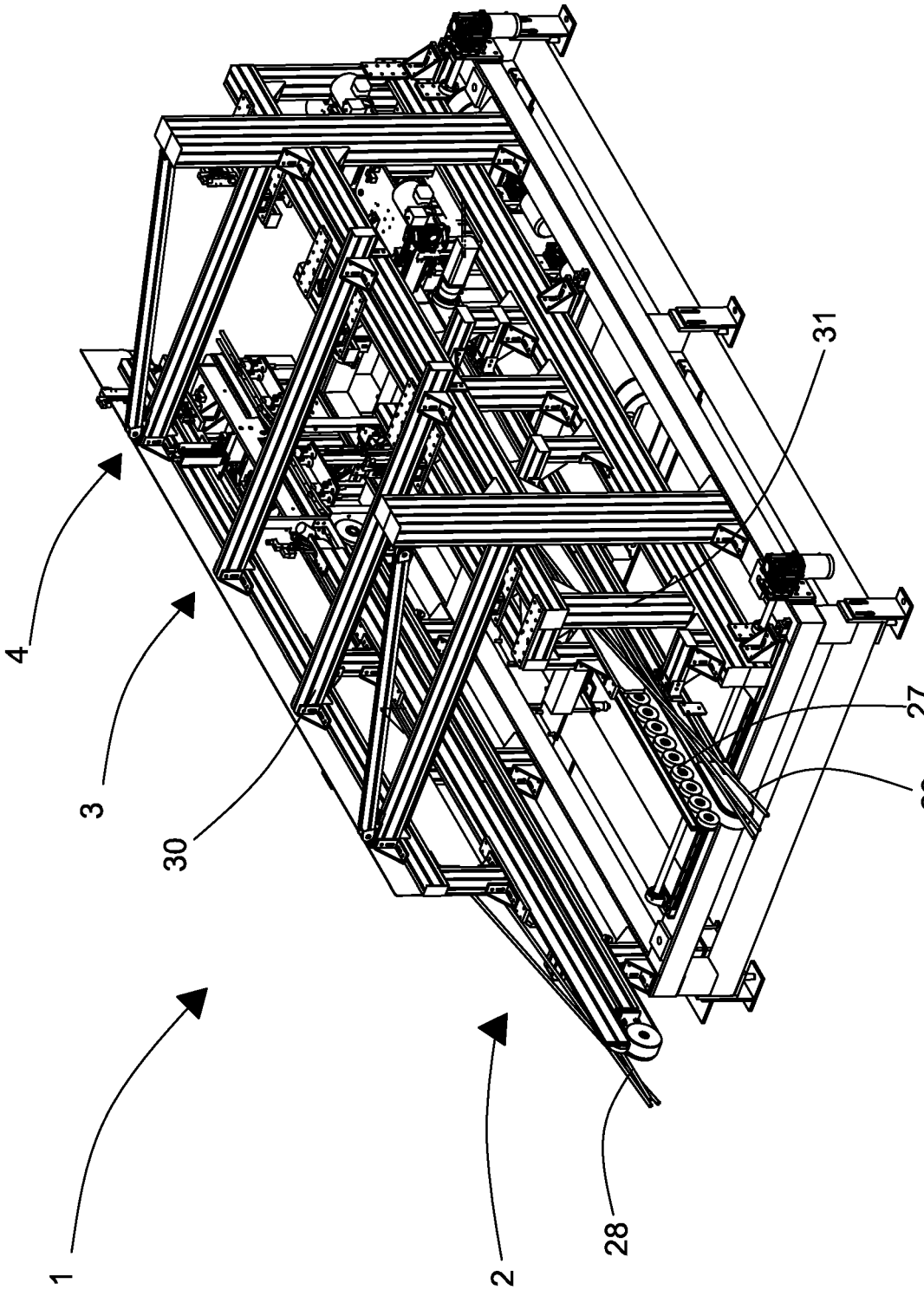

Fig. 2

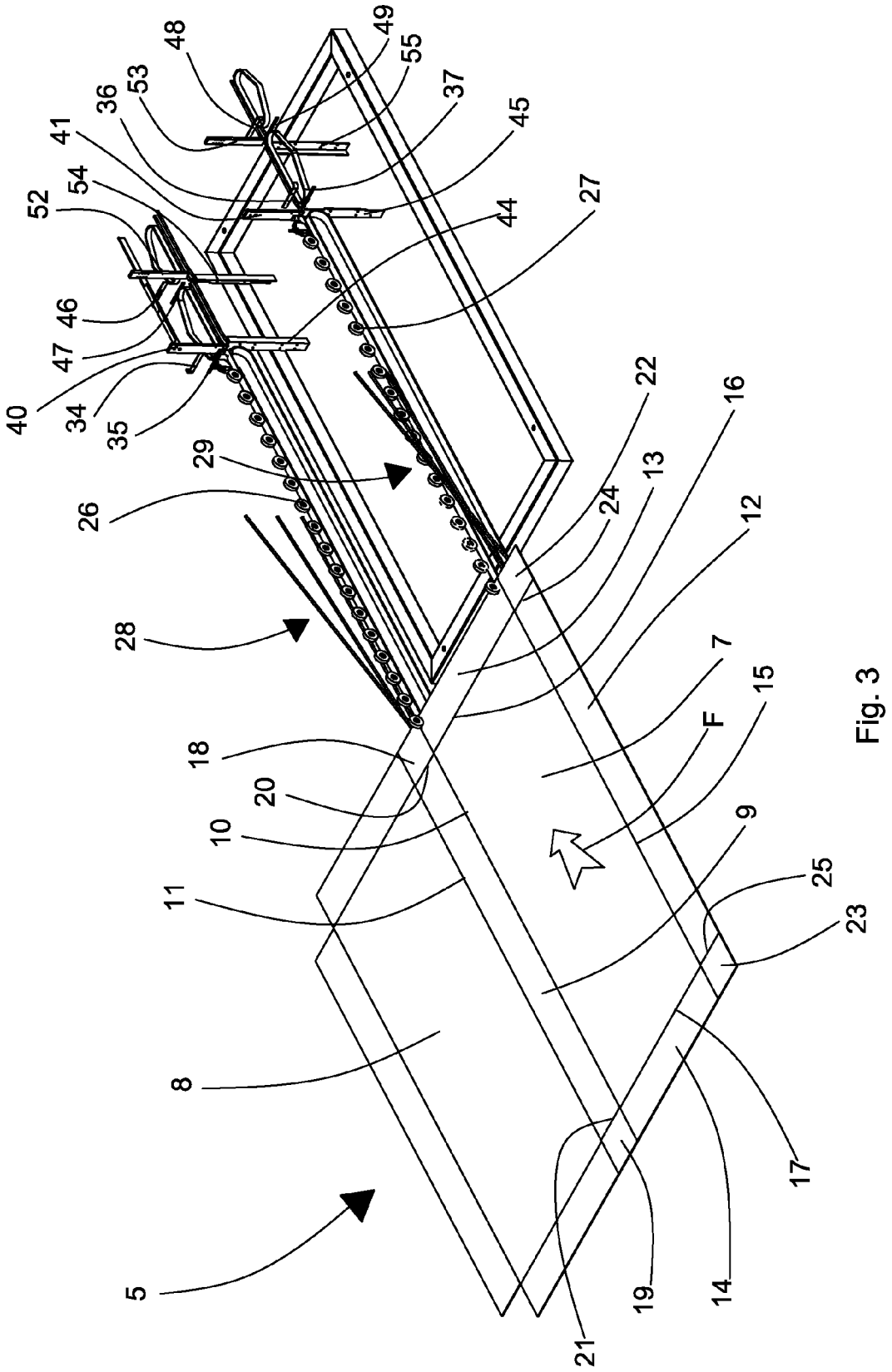
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Fig. 3

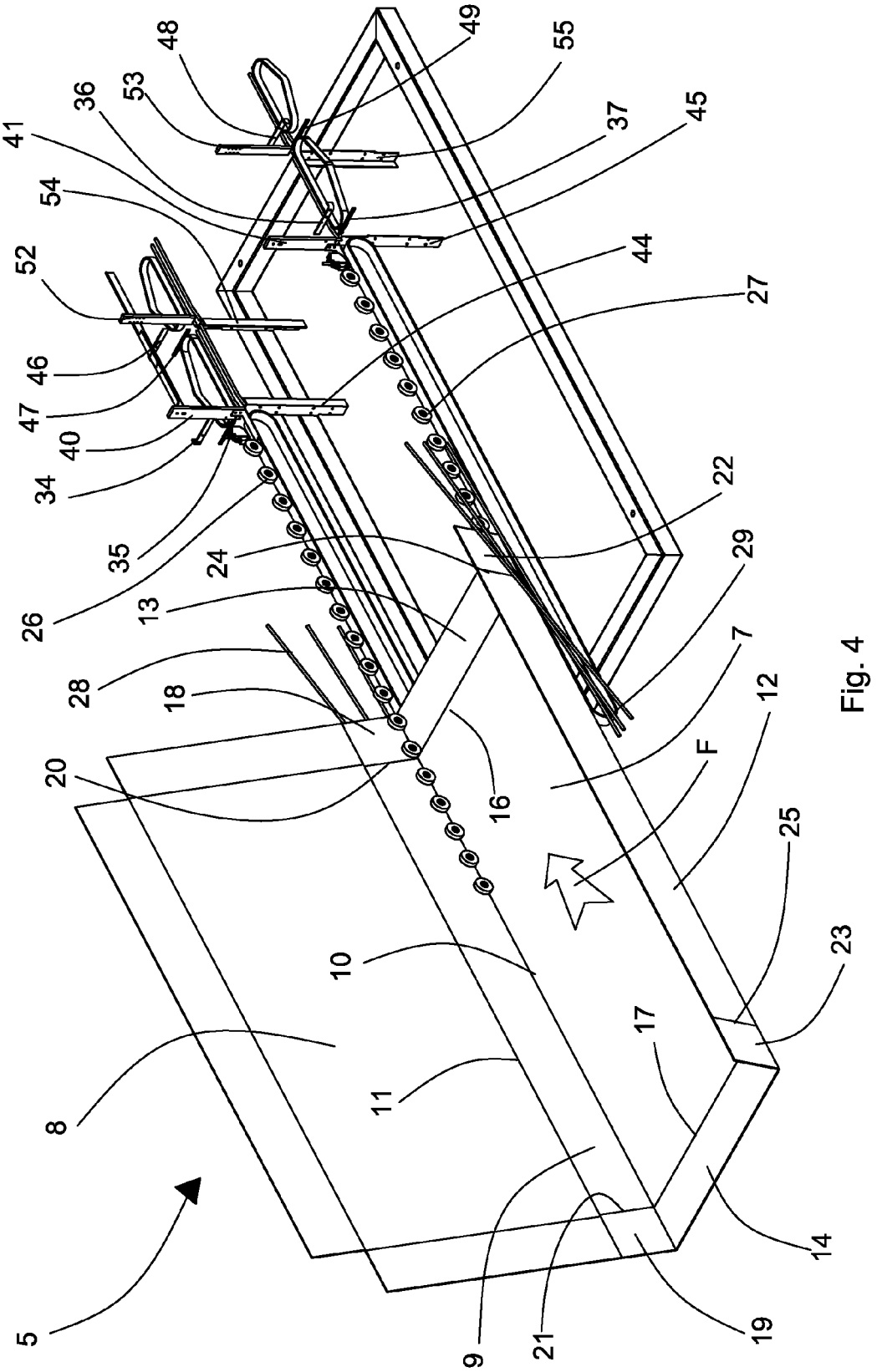
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Fig. 4

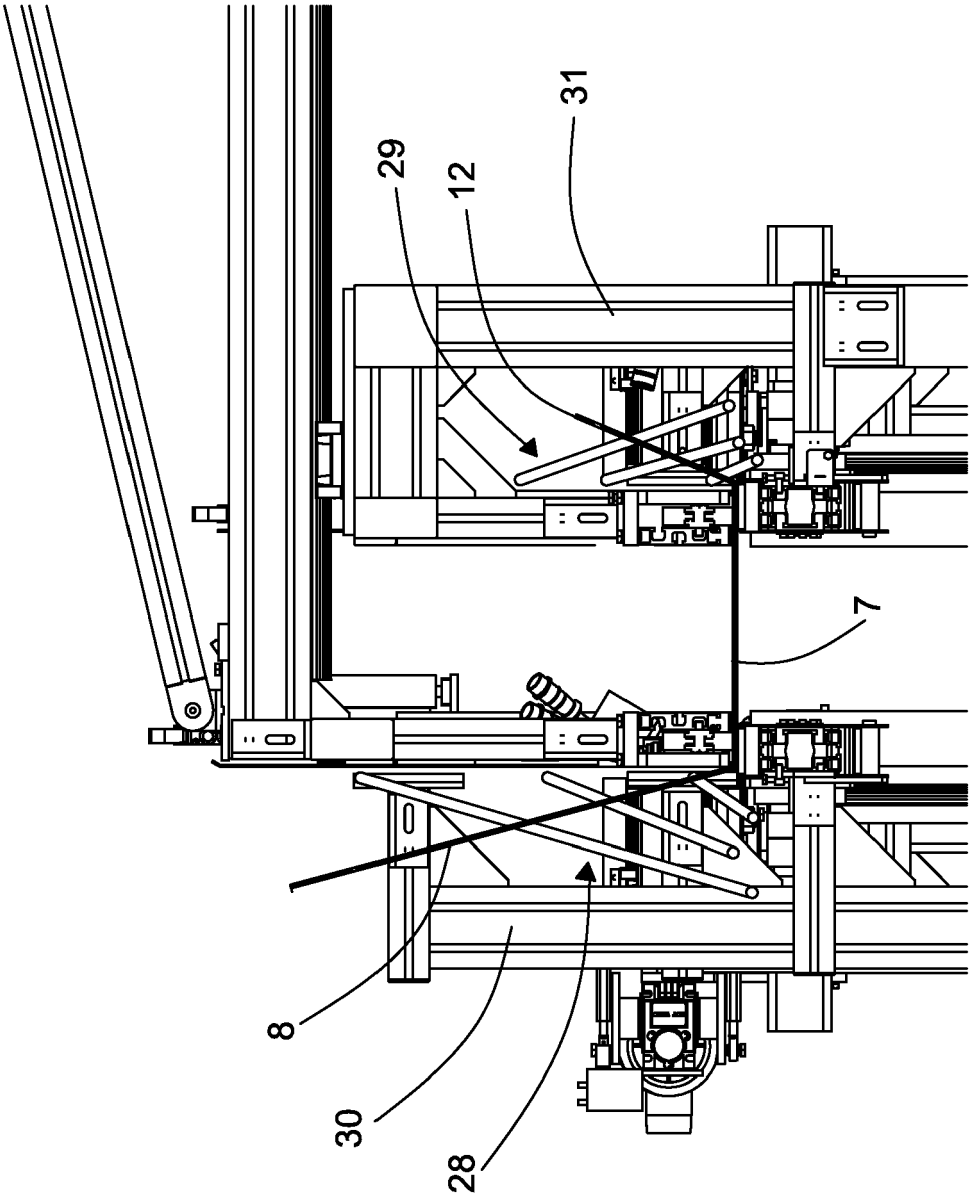

Fig. 5

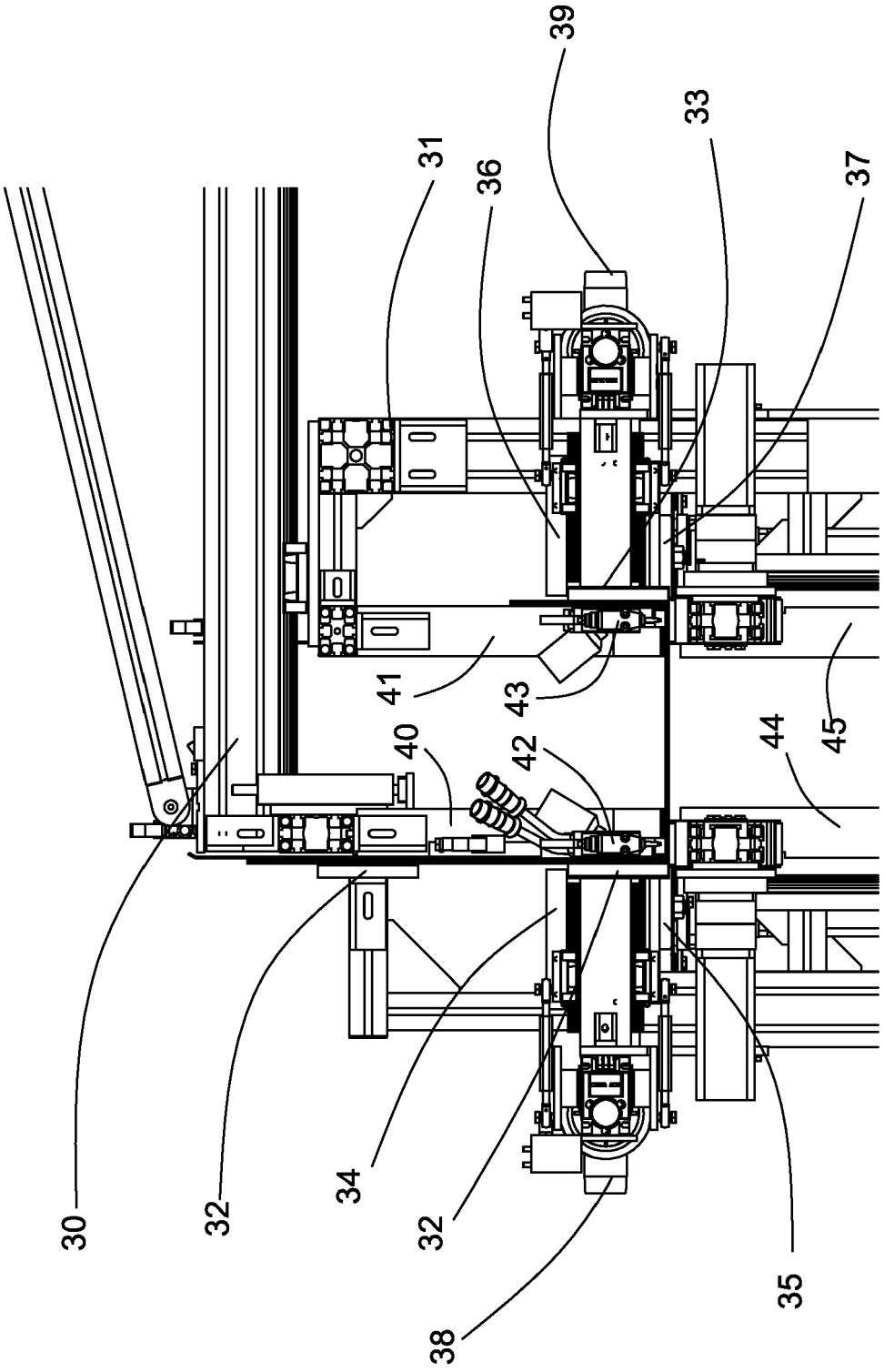

Fig. 6

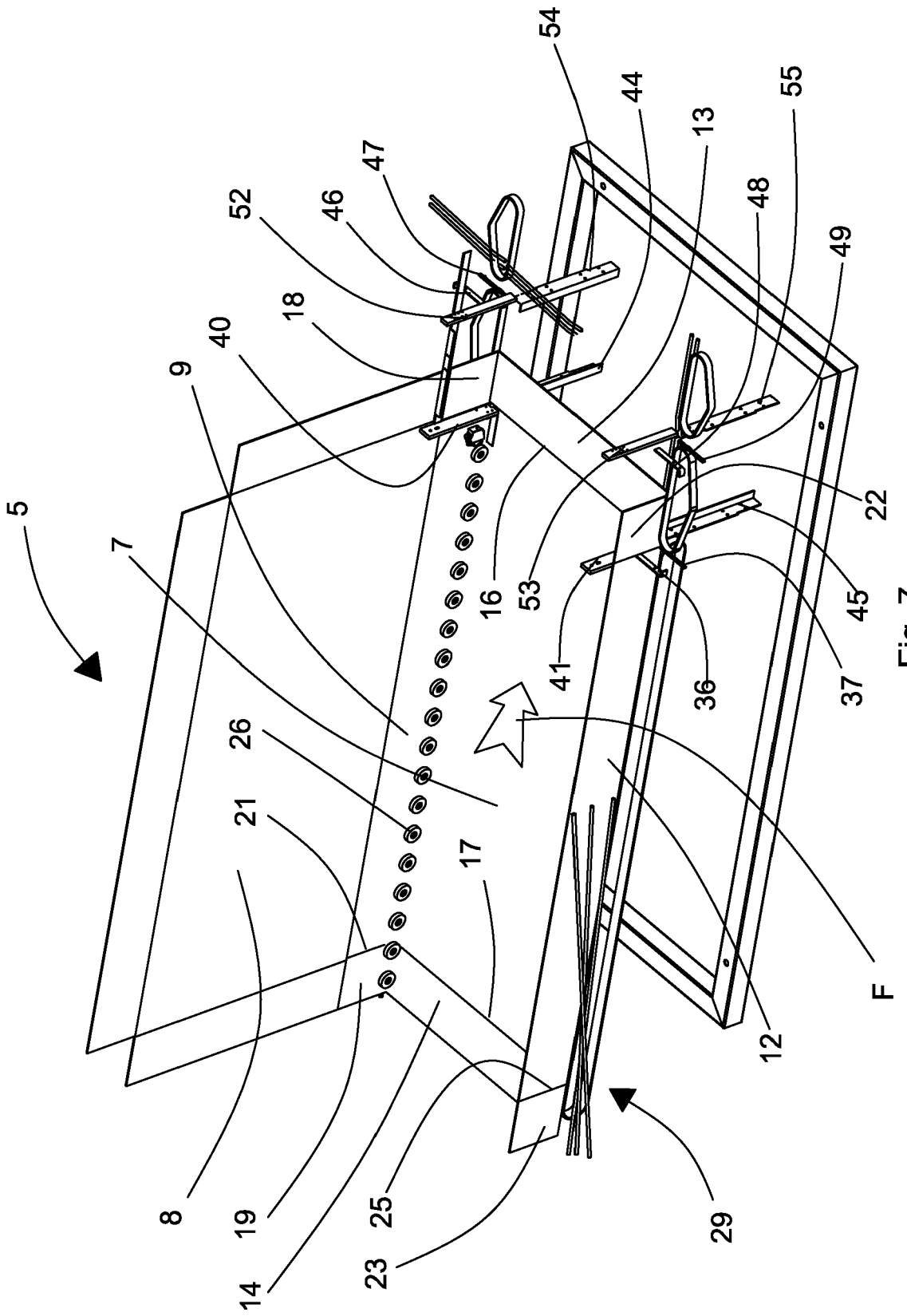
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Fig. 7

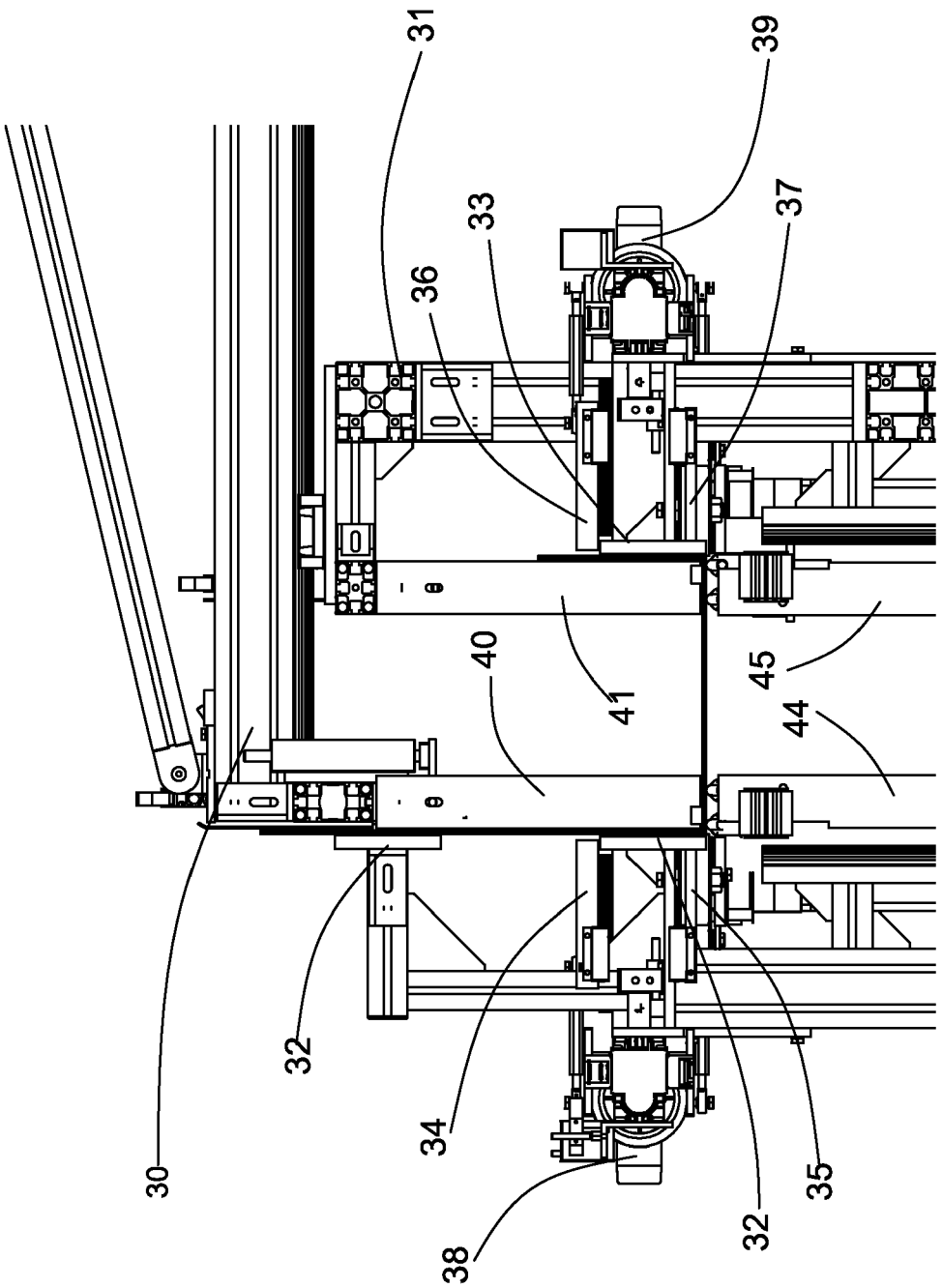

Fig. 8

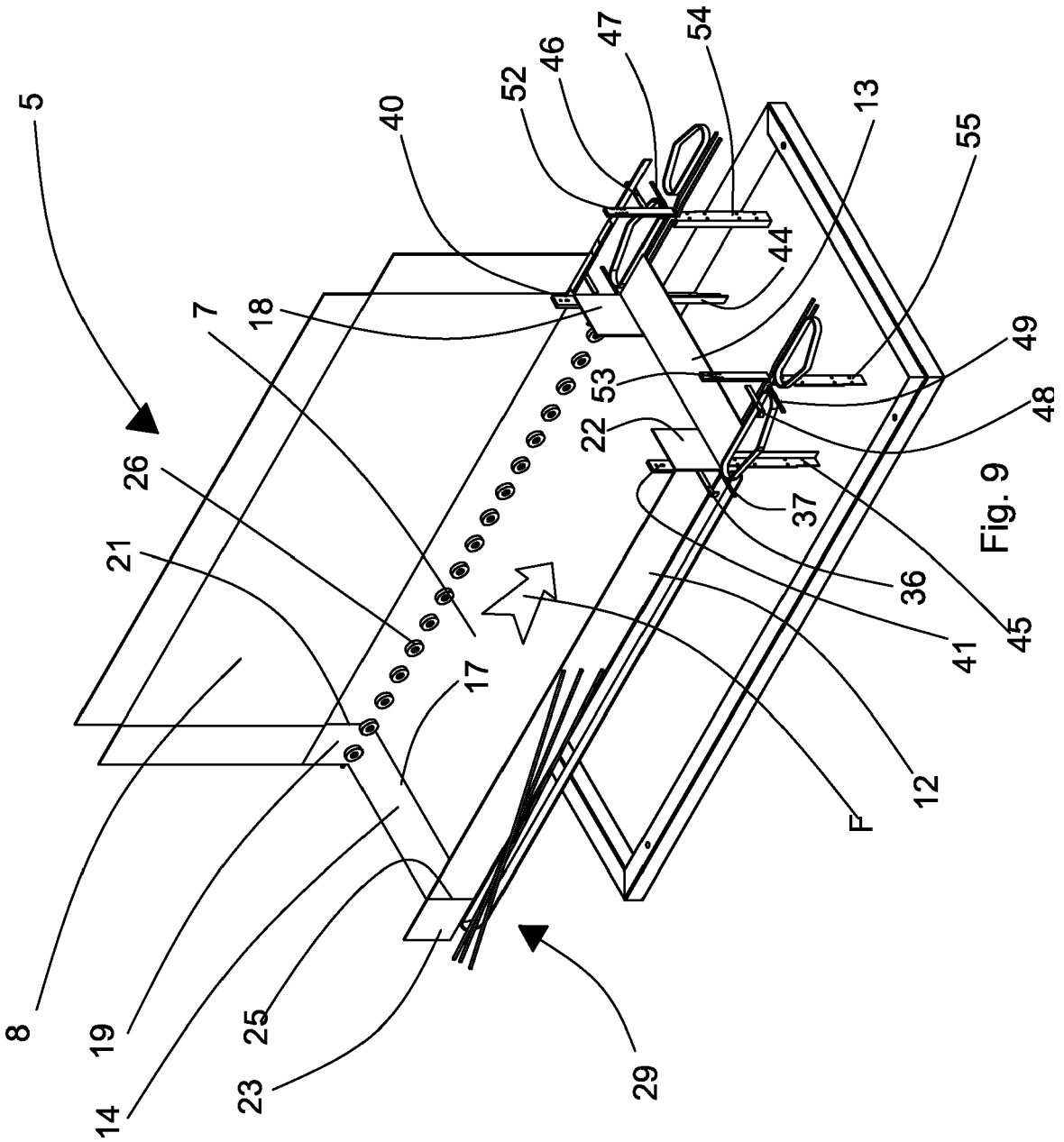
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Fig. 9

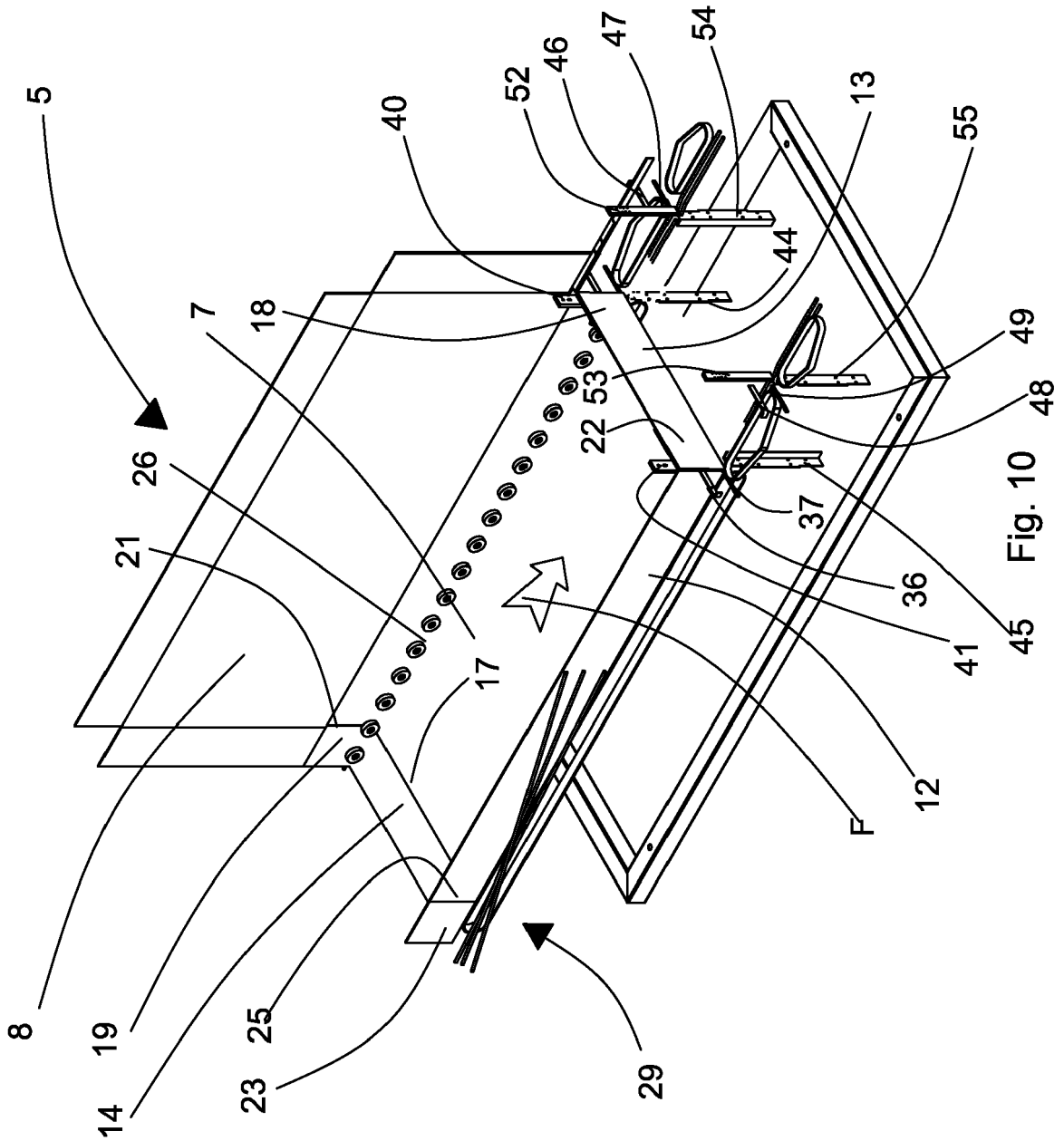
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Fig. 10

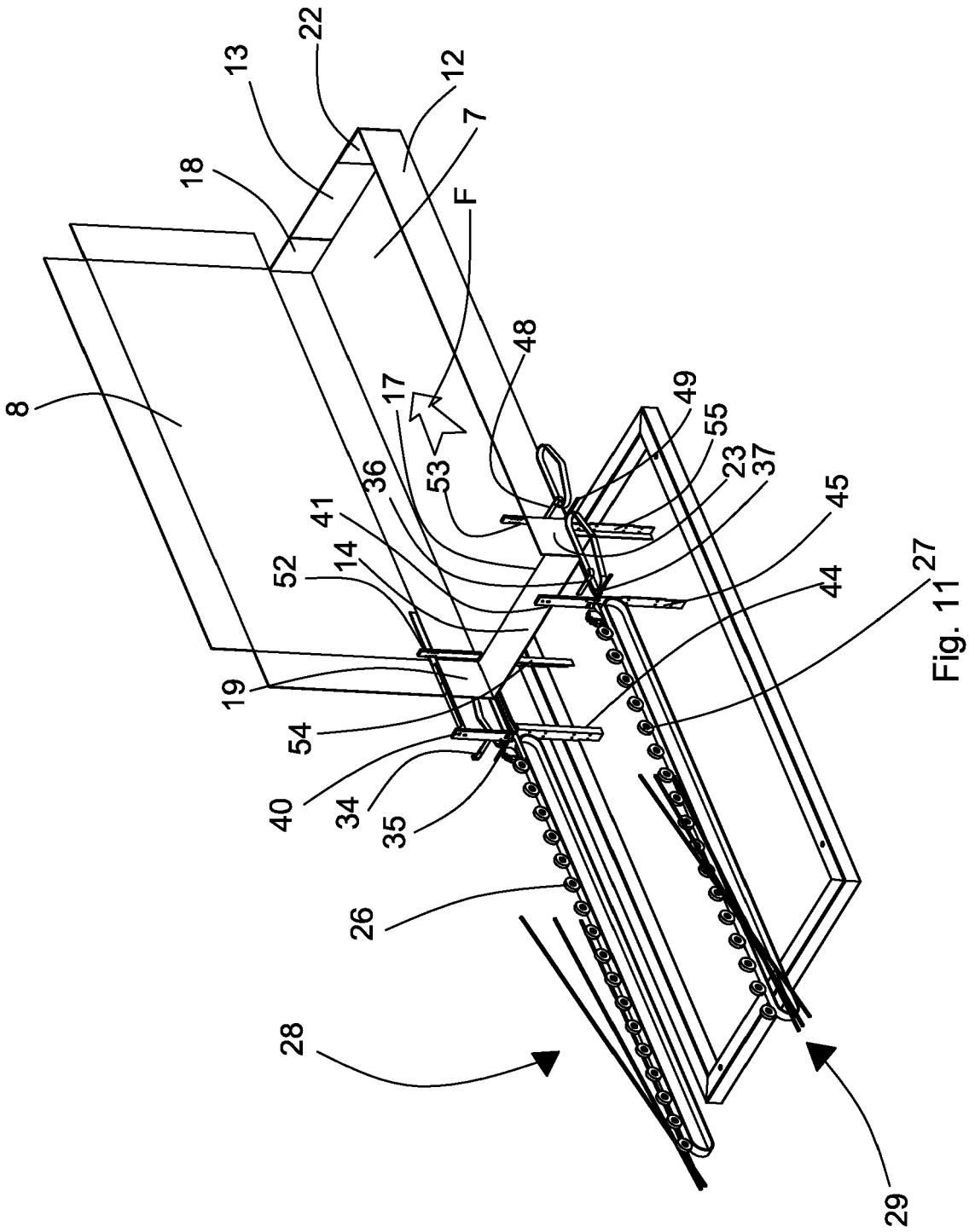
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Fig. 11

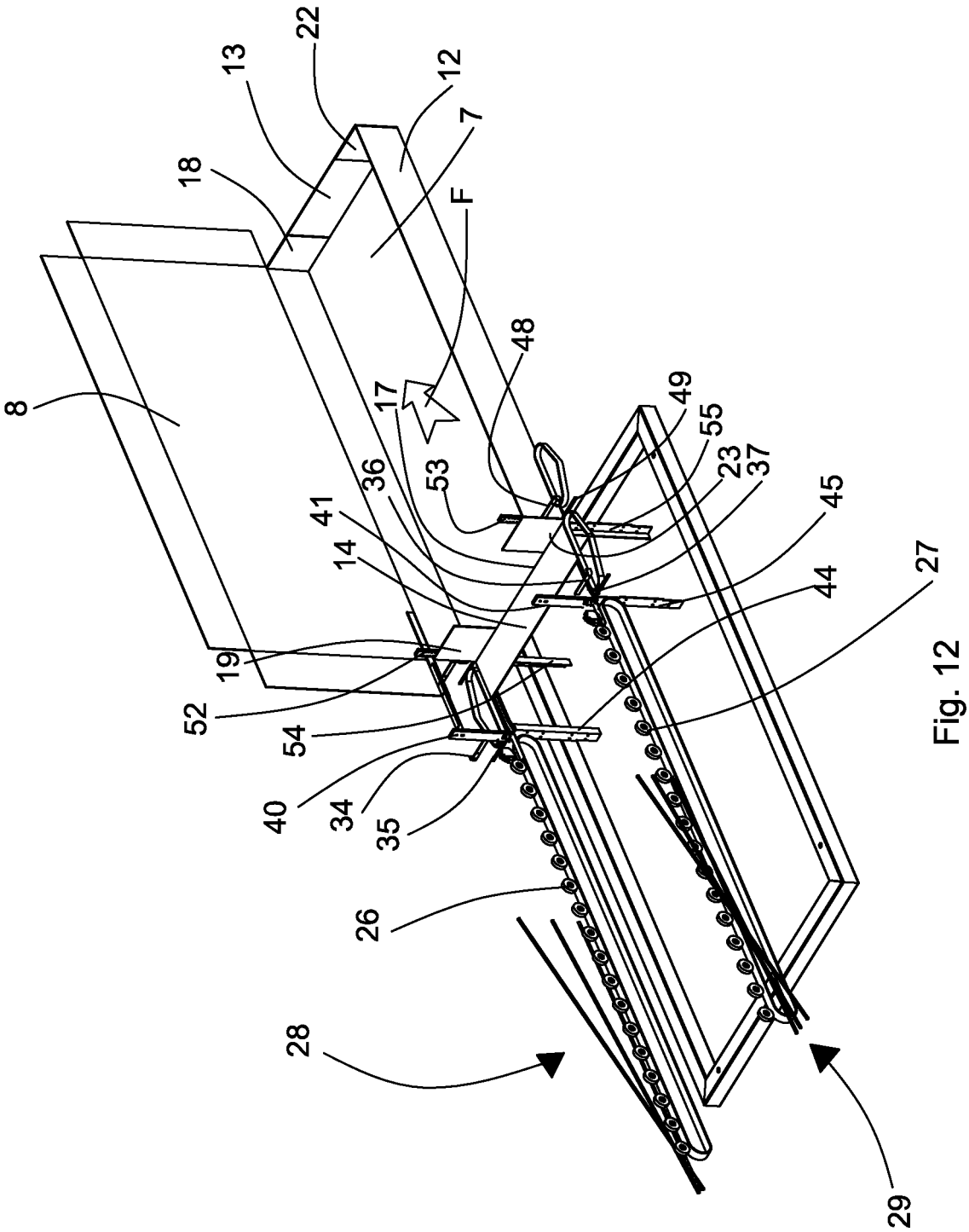
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Fig. 12

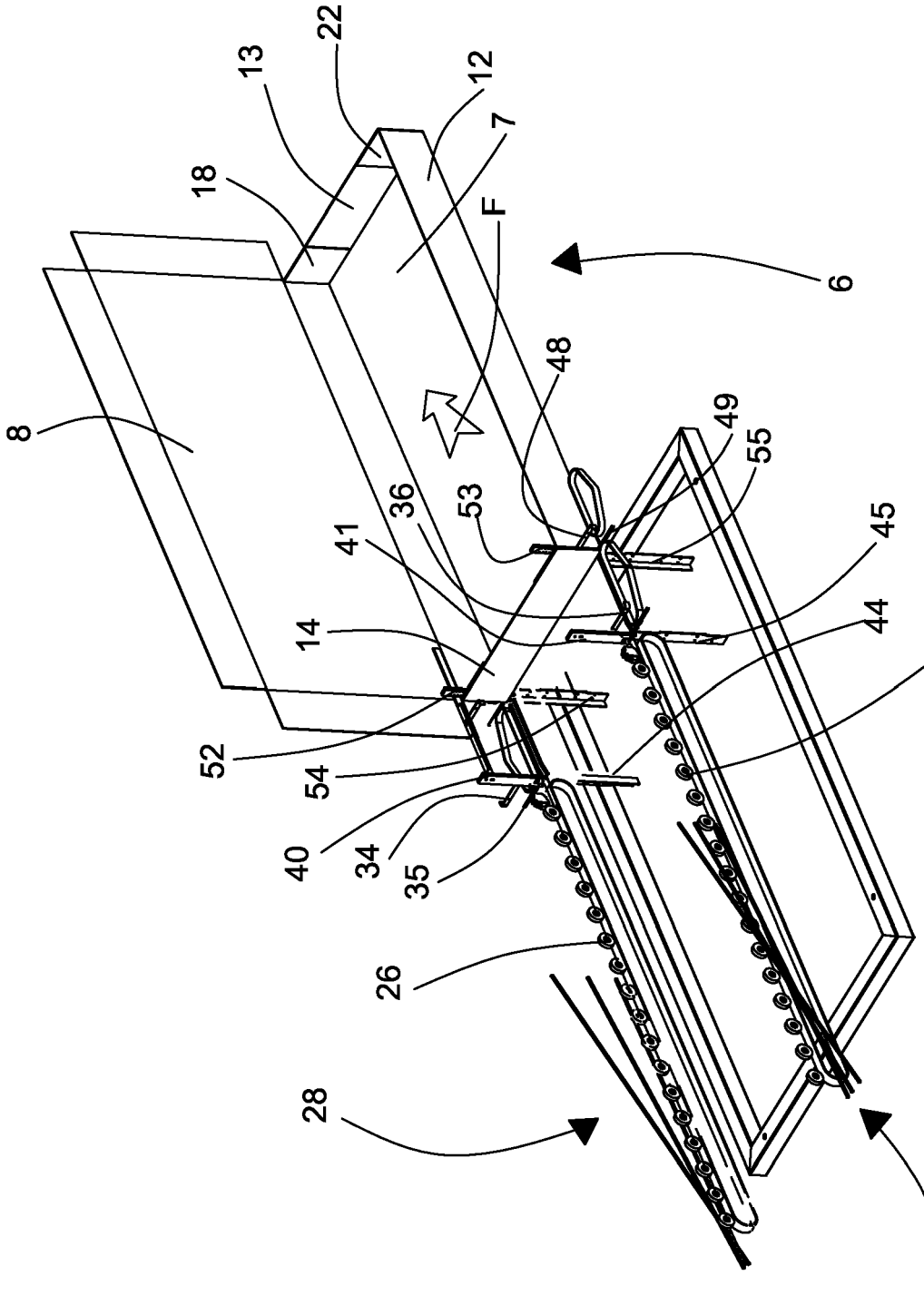

Fig. 13

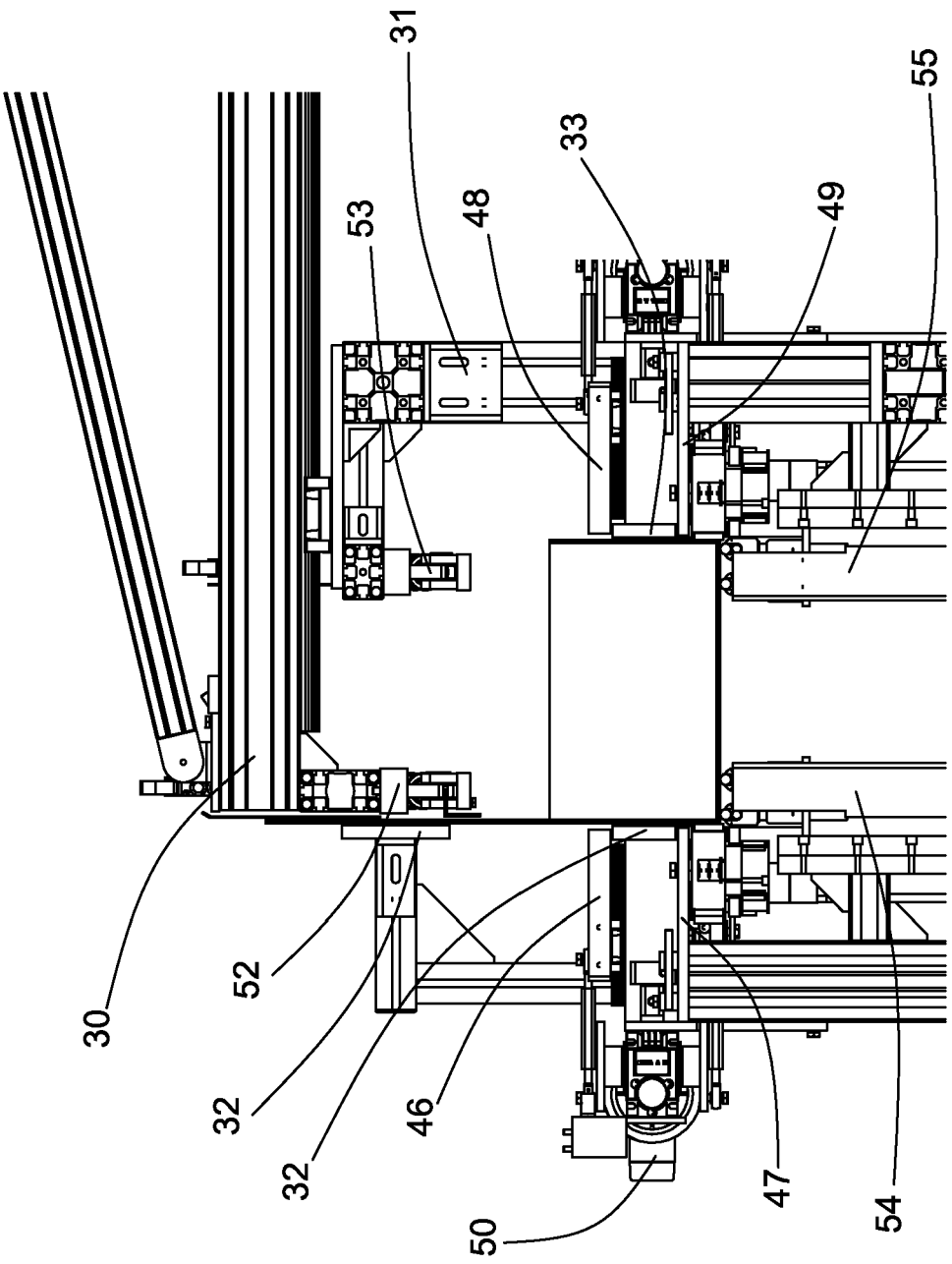

Fig. 14

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EUROPEAN SEARCH REPORT

Application Number
EP 11 16 4659

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	US 5 782 732 A (HERRIN ROBERT M [US]) 21 July 1998 (1998-07-21) * column 4, line 28 - column 8, line 53; figures 1,8-14 * -----	1	INV. B31B1/36 B31B1/62 B31B3/00 B31B3/26
A	US 1 949 495 A (SIMMONS PAUL R) 6 March 1934 (1934-03-06) * abstract; figure 1 * -----	1	B31B3/36 B31B1/54

TECHNICAL FIELDS SEARCHED (IPC)

B31B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	30 August 2011	Farizon, Pascal

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30-08-2011

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US 5782732 A	21-07-1998	US 5971906 A	26-10-1999
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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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