



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
31.12.2014 Bulletin 2015/01

(51) Int Cl.:
A24D 3/02 (2006.01)

(21) Application number: **14173361.8**

(22) Date of filing: **20.06.2014**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
 Designated Extension States:
BA ME

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(30) Priority: **21.06.2013 IT BO20130314**

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(54) **Cigarette filter manufacturing machine**

(57) A cigarette filter manufacturing machine (1); the machine (1) having: at least one feed line (4) for supplying a continuous strip (13) of filtering material; at least one forming beam (2) for forming a continuous filter rod (3); and a twisting unit (18) located between the feed line (4) and the forming beam (2), and which has at least one jet (25; 26), and a following insertion finger (27) that terminates inside the forming beam (2); the insertion finger

(27) has a tapering tubular main body (40), and a tubular adjuster (41) which has an inlet opening (49) and an outlet opening (50), is inserted inside an inlet opening of the main body (40), and is slightly detached from the main body (40) to define, between an outer surface of the adjuster (41) and an inner surface of the main body (40), an annular compressed-air feed channel (42) that comes out inside the main body (40), at an annular gap (43).

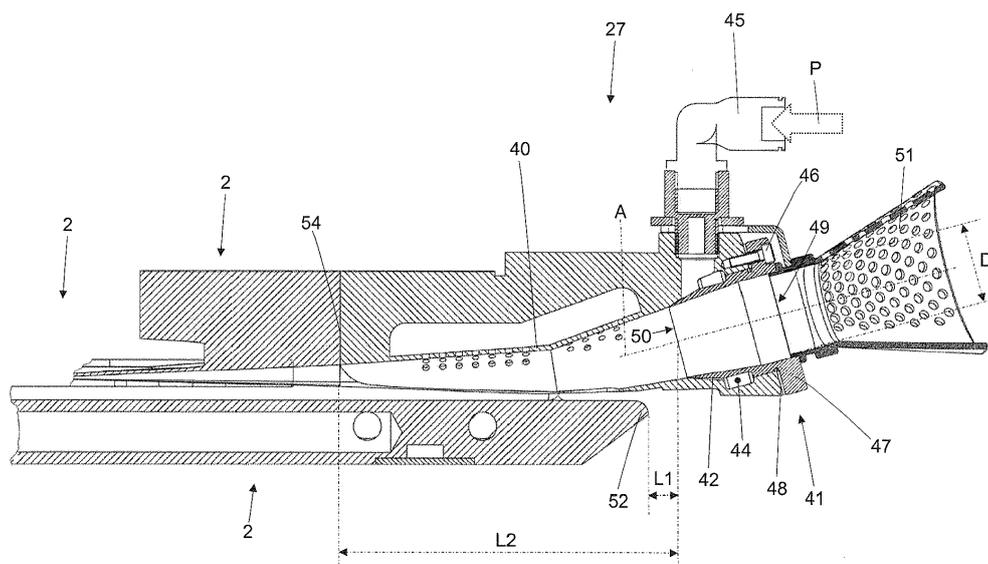


Fig.7

DescriptionTECHNICAL FIELD

[0001] The present invention relates to a cigarette filter manufacturing machine.

[0002] The present invention may be used to advantage on a dual cigarette filter manufacturing machine, to which the following description refers purely by way of example.

BACKGROUND ART

[0003] Examples of dual cigarette filter manufacturing machines are described in Patent Applications WO2005058079A1, GB2265298A and WO2007087848A2.

[0004] A dual cigarette filter manufacturing machine comprises two forming beams for forming respective continuous filter rods; and a filtering material feed line for each beam. The feed lines are supplied with the filtering material by a conveyor line, which extends between an input station of the feed lines and a store containing two bales of filtering material. Respective round-section strands are unwound off the bales and fed along the conveyor line to a suction device located at the input station and designed to draw out the two strands crosswise into two flat-section strips. Downstream from the suction device, the two strips are fed along the respective feed lines and through a pressing unit, a dilating device which blows air into the strips to increase their volume, and, finally, a processing unit where chemical substances are added to the strips to impart aroma and plasticity to the filtering material.

[0005] Each feed line is connected to the corresponding forming beam by a twisting unit which receives a strip from the feed line, twists the strip into a rope of filtering material, and feeds the filtering material rope onto a strip of gummed paper on the forming beam. For each feed line, the twisting unit normally comprises a jet, into which the strip is fed to twist it and so form the filtering material rope. To improve the uniformity of the filtering material in the rope, air is blown into the jet, as described, for example, in US4522616A1.

[0006] Along each forming beam, the paper strip is wound crosswise about the rope to form a continuous filter rod. And, at the end of the forming beams, a control station checks the density of the filter rods, and a cutting head cuts the filter rods crosswise into respective successions of filter portions.

[0007] Tests show that known twisting units produce ropes of fairly, but not highly, uniform filtering material. So, to achieve the desired (nominal) filter performance, more filtering material than theoretically necessary must be used, thus obviously increasing production cost.

DESCRIPTION OF THE INVENTION

[0008] It is an object of the present invention to provide a cigarette filter manufacturing machine designed to eliminate the above drawbacks, to produce ropes of highly uniform filtering material, and which is cheap and easy to produce.

[0009] According to the present invention, there is provided a cigarette filter manufacturing machine as claimed in the accompanying Claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] A non-limiting embodiment of the present invention will be described by way of example with reference to the attached drawings, in which:

Figure 1 shows a schematic front view of a dual filter manufacturing machine in accordance with the present invention;

Figure 2 shows a plan view of the Figure 1 machine; Figure 3 shows a partly sectioned side view, with parts removed for clarity, of a twisting unit of the Figure 1 machine;

Figure 4 shows a section along line IV-IV of the Figure 3 twisting unit;

Figure 5 shows a plan view of a pair of insertion fingers of the Figure 1 machine;

Figure 6 shows a three-dimensional view, with parts removed for clarity, of the Figure 5 fingers;

Figure 7 shows a longitudinal section of one finger in Figure 5;

Figure 8 shows a larger-scale view of a detail in Figure 7;

Figure 9 shows a larger-scale view of a detail in Figure 8.

PREFERRED EMBODIMENTS OF THE INVENTION

[0011] Number 1 in Figure 1 indicates as a whole a dual cigarette filter manufacturing machine. Machine 1 comprises two forming beams 2a and 2b for forming respective continuous filter rods 3a and 3b; and, for each beam 2a, 2b, a respective filtering material feed line 4a, 4b. Feed lines 4a and 4b are supplied with the filtering material by a conveyor line 5, which forms part of machine 1 and extends between an input station 6 of feed lines 4a, 4b and a store 7 containing two bales 8a and 8b of filtering material.

[0012] As shown in Figures 1 and 2, respective round-section strands 9a and 9b are unwound off respective bales 8a and 8b and pulled along conveyor line 5 by a roller traction unit 10a located at input station 6.

[0013] Conveyor line 5 comprises a guide device 11 located over bales 8a and 8b to guide strands 9a and 9b; and a draw-out device 12 located at input station 6, directly upstream from traction unit 10a, to draw out round-section strands 9a and 9b crosswise, by means of jets

of compressed air, into respective flat-section strips 13a and 13b which are then fed to roller traction unit 10a.

[0014] Downstream from traction unit 10a, the two strips 13a and 13b are fed, along respective feed lines 4a and 4b and in a substantially horizontal direction 14, through a pressing unit 15 comprising two roller traction units 10b and 10c similar to unit 10a. Next, the two strips 13a and 13b are fed, along respective feed lines 4a and 4b in direction 14, through a dilating device 16, which blows air into strips 13a, 13b to increase their volume, and then through a processing unit 17 where chemical substances (typically triacetine) are added to strips 13a, 13b to impart aroma and plasticity to the filtering material. Finally, the two strips 13a and 13b are fed, along respective feed lines 4a and 4b in direction 14, through a roller traction unit 10d similar to units 10a, 10b, 10c and defining an output portion of feed lines 4a and 4b. Feed lines 4a and 4b are connected to forming beams 2a and 2b by a twisting unit 18 located directly downstream from roller unit 10d. Twisting unit 18 receives strips 13a, 13b from feed lines 4a, 4b, twists strips 13a, 13b into two ropes of filtering material, and feeds the ropes of filtering material to forming beams 2a, 2b. On each forming beam 2a, 2b, the filtering material rope is fed onto a paper strip 19a, 19b gummed beforehand at a gumming station 20, and which is wound crosswise about the filtering material rope to form a continuous filter rod 3a, 3b.

[0015] At the end of forming beams 2a, 2b, a control station 21 checks the density of filter rods 3a, 3b, and a cutting head 22 cuts filter rods 3a, 3b crosswise into respective successions of filter portions (not shown).

[0016] As shown in Figures 3 and 4, twisting unit 18 comprises a box body 23 fixed to the frame of machine 1 and fitted inside with two side by side twisting lines 24a, 24b, which converge to reduce the distance between the two ropes of filtering material.

[0017] Each twisting line 24 comprises an input jet 25 into which the strip 13 from feed line 4 is fed; and an output jet 26, through which the filtering material rope is fed to an insertion finger 27 (shown schematically in Figure 3) terminating in forming beam 2. Each input jet 25 has a straight central axis of symmetry 28 parallel to the travelling direction of strip 13 from feed line 4. Each output jet 26 has a straight central axis of symmetry 29, which slopes slightly with respect to both the travelling direction of the filtering material rope from input jet 25, and the travelling direction of the filtering material rope along forming beam 2. A tubular diverter 30 is interposed between each input jet 25 and output jet 26, and has a curved portion for diverting the travelling direction of the filtering material rope from input jet 25. Each diverter 30 is preferably fitted directly to the outlet of input jet 25.

[0018] Air is blown into each jet 25, 26 to enhance the uniformity of the filtering material in the rope. More specifically, each jet 25, 26 comprises a tubular body 31, which has a sharply tapering initial portion (i.e. in which the diameter of the feed channel decreases gradually), and a cylindrical intermediate portion (i.e. with a constant-

diameter feed channel). Each jet 25, 26 also comprises a further tubular body 32 downstream from tubular body 31, and which flares slightly (i.e. in which the diameter of the feed channel increases gradually).

[0019] Tubular body 31 is screwed into tubular body 32, and remains slightly detached from tubular body 32 to define, between an outer surface of tubular body 31 and an inner surface of tubular body 32, an annular air-flow channel 33 which terminates at a number of blow holes 34 formed through the inner surface of the cylindrical intermediate portion of tubular body 31. Tubular body 32 has a number of through feed channels 35, through which, in use, compressed air is fed into annular channel 33 and through blow holes 34 into the feed channel of tubular body 31.

[0020] Blow holes 34 of input jet 25 are oriented with respect to central axis of symmetry 28 so that the air jets have both an axial component (i.e. parallel to central axis of symmetry 28) and a radial component (i.e. perpendicular to central axis of symmetry 28). The axial component of the air jets is predominant, in that it also serves to push the filtering material through input jet 25, while the radial component simply serves to produce a swirling movement of the air jets. Blow holes 34 of output jet 26 are oriented with respect to central axis of symmetry 29 so that the air jets only have an axial component (i.e. parallel to central axis of symmetry 29) to exert maximum thrust on the filtering material.

[0021] When adjusting and setting up twisting unit 18, the airflow section of each annular channel 33 can be adjusted by screwing or unscrewing tubular body 31 with respect to tubular body 32 to adjust air speed and flow through blow holes 34.

[0022] It is important to note that, between each input jet 25 and output jet 26, the filtering material rope passes freely, i.e. unguided, through a clear area 36, the purpose of which is to allow the compressed air blown through blow holes 34 of each input jet 25 to expand freely (and avoid unwanted counterpressure phenomena), and to allow the filtering material rope to release the surplus chemical substances added by processing unit 17. To collect and drain off the chemical substances released by the filtering material ropes, box body 23 tilts downwards and, at its lowest point, has a catch channel terminating in a drain pan. To prevent the chemical substances released by the filtering material ropes from escaping from box body 23 and fouling the rest of machine 1, box body 23 is substantially sealed, and only has compressed-air relief openings 37 located in a mid-portion of box body 23 and shielded against direct cast-off.

[0023] To allow the compressed air blown through blow holes 34 of each output jet 26 to expand freely (and avoid unwanted counterpressure phenomena), each output jet 26 is fitted with a perforated, slightly conical tubular body 38 having a number of through holes 39 and located directly downstream from output jet 26. Through holes 39 are preferably only formed in the top part of each tubular body 38 to avoid directing air jets downwards, i.e. onto

forming beam 2.

[0024] As shown in Figure 3, each insertion finger 27 is located directly downstream, and a given distance, from corresponding output jet 26. In a different embodiment not shown, there is no distance between output jet 26 and insertion finger 27 (i.e. output jet 26 terminates precisely at the inlet of insertion finger 27). In another embodiment, output jet 26 is inserted partly inside insertion finger 27.

[0025] As shown in Figures 5-8, each insertion finger 27 comprises a tapering tubular main body 40 (i.e. in which the diameter of the feed channel decreases gradually) which terminates inside forming beam 2. More specifically, each main body 40 connects seamlessly to forming beam 2, i.e. the structure of main body 40 contacts the structure of forming beam 2 directly with no gaps (as shown clearly in Figure 7), so the outlet of each main body 40 coincides perfectly and seamlessly with the inlet of forming beam 2.

[0026] A tubular adjuster 41 extending about a central axis of symmetry A is inserted inside an inlet opening of main body 40. Adjuster 41 remains slightly detached from main body 40 to define, between an outer surface of adjuster 41 and an inner surface of main body 40, an annular airflow channel 42 which terminates inside main body 40, at an annular gap 43. In other words, annular channel 42 and annular gap 43 at the end of annular channel 42 are bounded externally by an inner surface of main body 40, and internally by an outer surface of adjuster 41. Annular channel 42 originates at an annular chamber 44 surrounding adjuster 41, and terminates in annular gap 43 which is located inside main body 40, at one end of adjuster 41, to direct a compressed-air jet of pressure P into main body 40. Annular chamber 44 is connected by a radial pipe to a socket 45 connected to a compressed-air supply of pressure P. According to the present invention, compressed-air pressure P ranges between 0.05 and 0.4 MPa (i.e. between 0.5 and 4 bars) and is preferably 0.22 ± 0.01 MPa (i.e. 2.2 ± 0.1 bar).

[0027] Each annular channel 42 is oriented so the air jet has both an axial and a radial component. The axial component of the air jet is predominant, in that it also serves to push the filtering material through main body 40, while the radial component simply serves to produce a swirling movement of the air jet.

[0028] When making adjustments and setting up, the width W of annular gap 43 (Figure 9), i.e. the width W of the airflow section through annular gap 43, of each annular channel 42 can be adjusted by moving adjuster 41 closer to/away from main body 40 (i.e. by inserting/withdrawing adjuster 41 inside/from main body 40). In a preferred embodiment, adjuster 41 is fixed to main body 40 by one or more screws 46; and an interchangeable spacer ring 48 is interposed between main body 40 and an outer edge 47 of adjuster 41 to set the distance between main body 40 and adjuster 41, and therefore the width W of annular gap 43 of annular channel 42. According to the present invention, the width W of annular gap 43,

i.e. the width of the airflow section, ranges between 0.02 and 1 mm, and is preferably 0.1 ± 0.05 mm. More specifically, the width W of annular gap 43, i.e. the width of the airflow section through annular gap 43, ranges between 0.05 and 0.3 mm and is preferably 0.1 ± 0.05 mm.

[0029] In a preferred embodiment, each main body 40 has a number of aeration holes downstream from adjuster 41 and formed solely in a top portion of main body 40.

[0030] As shown in Figures 7 and 8, adjuster 41 has an inlet opening 49 and an outlet opening 50; and an end portion of adjuster 41 tapers slightly (i.e. the diameter of the feed channel decreases gradually) so inlet opening 49 is slightly larger in diameter than outlet opening 50.

[0031] In a preferred embodiment, an inlet funnel 51, with aeration holes on its top portion only, is fitted (e.g. joint-connected) inside each adjuster 41. An end portion of inlet funnel 51 has a constant inside diameter D, and is inserted inside inlet opening 49 of adjuster 41. In other words, inlet funnel 51 comprises a sharply tapering initial portion (i.e. in which the diameter of the feed channel decreases gradually) with the aeration holes; and the non-tapering (i.e. constant-diameter) end portion of inside diameter D and inserted inside inlet opening 49 of adjuster 41. According to the present invention, diameter D of the end portion of inlet funnel 51 ranges between 10 and 45 mm and is preferably 25 ± 1 mm.

[0032] As shown in Figure 7, each forming beam 2 has a start end 52 located beneath insertion finger 27 (i.e. beneath main body 40 of insertion finger 27). And a distance L1, measured longitudinally (i.e. parallel to the travelling direction of the filtering material along machine 1), exists between the centre of outlet opening 50 of adjuster 41 and the start end 52 of forming beam 2. According to the present invention, distance L1 between the centre of outlet opening 50 of adjuster 41 and the start end 52 of forming beam 2 ranges between 1.5 and 7.5 mm and is preferably 4.5 ± 0.5 mm.

[0033] As shown in Figure 7, main body 40 of each insertion finger 27 has a terminating end 54 which, as stated, rests seamlessly on forming beam 2. And a distance L2, measured longitudinally (i.e. parallel to the travelling direction of the filtering material along machine 1), exists between the centre of outlet opening 50 of adjuster 41 and the terminating end 54 of main body 40 of insertion finger 27. According to the present invention, distance L2 between the centre of outlet opening 50 of adjuster 41 and the terminating end 54 of main body 40 of insertion finger 27 ranges between 67 and 127 mm and is preferably 97 ± 5 mm.

[0034] In other words, each forming beam 2 extends substantially lower than main body 40 of insertion finger 27, and commences at start end 52 beneath insertion finger 27 (i.e. beneath main body 40 of insertion finger 27); and each forming beam 2 comprises a top part positioned contacting, and forming a natural seamless continuation of, main body 40 of insertion finger 27.

[0035] In an alternative embodiment shown by the dash line in Figure 3, a suction device 55 is inserted be-

tween each output jet 26 and corresponding insertion finger 27 to generate suction around the whole of filter rod 3 and collect any substances released by filter rod 3. Suction device 55 is especially useful when a feed device is provided upstream from twisting unit 18 to feed a solid powdered and/or granular additive (typically, but not exclusively, active carbon). In fact, part of the solid additive in the filtering material is also released during twisting as a result of the compressed-air jets and, unless collected by suction device 55, tends to foul the component parts of machine 1.

[0036] A different embodiment not shown also has a further suction device inside box body 23.

[0037] In another embodiment not shown, machine 1 described above is a single-rod machine, and so comprises one forming beam 2 for forming one continuous filter rod 3; and one filtering material feed line 4. And twisting unit 18 comprises one twisting line 24 with an input jet 25, output jet 26, and insertion finger 27 as described above. Similarly, machine 1 described above may be a three- or four-rod machine, and so comprise three or four forming beams 2 for respectively forming three or four continuous filter rods 3; and three or four filtering material feed lines 4. And twisting unit 18 comprises three or four twisting lines 24, each with an input jet 25, output jet 26, and insertion finger 27 as described above.

[0038] Machine 1 described has numerous advantages.

[0039] First and foremost, machine 1 described produces a rope of highly uniform filtering material. So, to achieve the desired (nominal) filter performance, the minimum possible amount of filtering material is used, thus reducing production cost. In other words, to produce filters of a given (nominal) performance, machine 1 described employs the minimum possible amount of filtering material, i.e. with no waste. In connection with the above, it should be pointed out that filter performance is normally defined in terms of the pressure drop across the filter when subjected to a given calibrated air stream.

[0040] It is also important to note the surprising way in which the geometric dimensions and pressure P described above combine to achieve the end result, i.e. ropes of highly uniform filtering material. In other words, the geometric dimensions and pressure P described above operate synergically to give an end result greater than the sum of their individual results.

[0041] Moreover, machine 1 described is cheap and easy to produce by simply involving fast, non-structural alterations to a similar known machine.

Claims

1. A cigarette filter manufacturing machine (1); the machine (1) comprising:

at least one feed line (4) for supplying a contin-

uous strip (13) of filtering material;
at least one forming beam (2) for forming a continuous filter rod (3); and

a twisting unit (18) located between the feed line (4) and the forming beam (2), and which comprises at least one jet (25; 26), and a following insertion finger (27) that terminates inside the forming beam (2);

wherein the insertion finger (27) comprises a tapering tubular main body (40); and a tubular adjuster (41), which has an inlet opening (49) and an outlet opening (50), is inserted inside an inlet opening of the main body (40), and is slightly detached from the main body (40) to define, between an outer surface of the adjuster (41) and an inner surface of the main body (40), an annular compressed-air feed channel (42) that comes out inside the main body (40), at an annular gap (43) ;

wherein the terminating end (54) of the main body (40) of the insertion finger (27) rests seamlessly on the forming beam (2);

wherein the start end (52) of the forming beam (2) is located beneath the main body (40) of the insertion finger (27); and

wherein the adjuster (41) is fitted inside with an inlet funnel (51), an end portion of which has a constant inside diameter (D) and is inserted inside the inlet opening (49) of the adjuster (41); the machine (1) being **characterized in that:**

the distance (L2), measured longitudinally, between the centre of the outlet opening (50) of the adjuster (41) and the terminating end (54) of the main body (40) of the insertion finger (27) ranges between 67 and 127 mm, and is preferably 97 ± 5 mm;

the distance (L1), measured longitudinally, between the centre of the outlet opening (50) of the adjuster (41) and the start end (52) of the forming beam (2) ranges between 1.5 and 7.5 mm, and is preferably 4.5 ± 0.5 mm;

the width (W) of the annular gap (43) ranges between 0.02 and 1 mm, and is preferably 0.1 ± 0.05 mm;

the pressure (P) of the compressed air fed into the annular channel (42) ranges between 0.05 and 0.4 MPa, and is preferably 0.22 ± 0.01 MPa; and

the diameter (D) of the end portion of the inlet funnel (51) ranges between 10 and 45 mm, and is preferably 25 ± 1 mm.

2. A machine (1) according to Claim 1, wherein the width (W) of the annular gap (43) ranges between 0.05 and 0.3 mm, and is preferably 0.1 ± 0.05 mm.

3. A machine (1) according to Claim 1 or 2, wherein the annular channel (42) originates at an annular chamber (44) surrounding the adjuster (41), and terminates at one end of the adjuster (41) to direct compressed air into the main body (40). 5
4. A machine (1) according to Claim 1, 2 or 3, wherein the inlet funnel (51) has a number of aeration holes formed solely in a top portion of the inlet funnel (51). 10
5. A machine (1) according to Claim 4, wherein the inlet funnel (51) comprises a tapering initial portion with the aeration holes; and the end portion, which is non-tapering, i.e. of constant diameter.
6. A machine (1) according to one of Claims 1 to 5, wherein the main body (40) has a number of aeration holes located downstream from the adjuster (41).
7. A machine (1) according to one of Claims 1 to 6, wherein an end portion of the adjuster (41) tapers, so the inlet opening (49) of the adjuster (41) is larger in diameter than the outlet opening (50) of the adjuster (41). 20
8. A machine (1) according to one of Claims 1 to 7, and comprising:
- two feed lines (4) for supplying respective continuous strips (13) of filtering material; and 30
- two forming beams (2) for forming respective continuous filter rods (3);
- wherein, for each continuous strip (13) of filtering material and each continuous filter rod (3), the twisting unit (18) comprises at least one jet (25; 26), and a following insertion finger (27) that terminates inside the forming beam (2). 35
9. A cigarette filter manufacturing machine (1); the machine (1) comprising:
- at least one feed line (4) for supplying a continuous strip (13) of filtering material; 40
- at least one forming beam (2) for forming a continuous filter rod (3); and 45
- a twisting unit (18) located between the feed line (4) and the forming beam (2), and which comprises at least one jet (25; 26), and a following insertion finger (27) that terminates inside the forming beam (2);
- wherein the insertion finger (27) comprises a tapering tubular main body (40); and a tubular adjuster (41), which has an inlet opening (49) and an outlet opening (50), is inserted inside an inlet opening of the main body (40), and is slightly detached from the main body (40) to define, between an outer surface of the adjuster (41) and an inner surface of the main body (40), an annular compressed-air feed channel (42) that comes out inside the main body (40), at an annular gap (43); and 50
- wherein the start end (52) of the forming beam (2) is located beneath the main body (40) of the insertion finger (27);
- the machine (1) being **characterized in that:**
- the distance (L1), measured longitudinally, between the centre of the outlet opening (50) of the adjuster (41) and the start end (52) of the forming beam (2) ranges between 1.5 and 7.5 mm, and is preferably 4.5 ± 0.5 mm. 55
10. A cigarette filter manufacturing machine (1); the machine (1) comprising:
- at least one feed line (4) for supplying a continuous strip (13) of filtering material; 60
- at least one forming beam (2) for forming a continuous filter rod (3); and
- a twisting unit (18) located between the feed line (4) and the forming beam (2), and which comprises at least one jet (25; 26), and a following insertion finger (27) that terminates inside the forming beam (2); 65
- wherein the insertion finger (27) comprises a tapering tubular main body (40); and a tubular adjuster (41), which has an inlet opening (49) and an outlet opening (50), is inserted inside an inlet opening of the main body (40), and is slightly detached from the main body (40) to define, between an outer surface of the adjuster (41) and an inner surface of the main body (40), an annular compressed-air feed channel (42) that comes out inside the main body (40), at an annular gap (43); and 70
- wherein the terminating end (54) of the main body (40) of the insertion finger (27) rests seamlessly on the forming beam (2);
- the machine (1) being **characterized in that** the distance (L2), measured longitudinally, between the centre of the outlet opening (50) of the adjuster (41) and the terminating end (54) of the main body (40) of the insertion finger (27) ranges between 67 and 127 mm, and is preferably 97 ± 5 mm. 75
11. A cigarette filter manufacturing machine (1); the machine (1) comprising:
- at least one feed line (4) for supplying a continuous strip (13) of filtering material; 80
- at least one forming beam (2) for forming a continuous filter rod (3); and
- a twisting unit (18) located between the feed line (4) and the forming beam (2), and which com-

prises at least one jet (25; 26), and a following insertion finger (27) that terminates inside the forming beam (2);

wherein the insertion finger (27) comprises a tapering tubular main body (40); and a tubular adjuster (41), which has an inlet opening (49) and an outlet opening (50), is inserted inside an inlet opening of the main body (40), and is slightly detached from the main body (40) to define, between an outer surface of the adjuster (41) and an inner surface of the main body (40), an annular compressed-air feed channel (42) that comes out inside the main body (40), at an annular gap (43) ;

the machine (1) being **characterized in that** the width (W) of the annular gap (43) ranges between 0.02 and 1 mm, and is preferably 0.1 ± 0.05 mm.

12. A machine (1) according to Claim 11, wherein the width (W) of the annular gap (43) ranges between 0.05 and 0.3 mm, and is preferably 0.1 ± 0.05 mm.

13. A cigarette filter manufacturing machine (1); the machine (1) comprising:

at least one feed line (4) for supplying a continuous strip (13) of filtering material;

at least one forming beam (2) for forming a continuous filter rod (3); and

a twisting unit (18) located between the feed line (4) and the forming beam (2), and which comprises at least one jet (25; 26), and a following insertion finger (27) that terminates inside the forming beam (2);

wherein the insertion finger (27) comprises a tapering tubular main body (40); and a tubular adjuster (41), which has an inlet opening (49) and an outlet opening (50), is inserted inside an inlet opening of the main body (40), and is slightly detached from the main body (40) to define, between an outer surface of the adjuster (41) and an inner surface of the main body (40), an annular compressed-air feed channel (42) that comes out inside the main body (40), at an annular gap (43) ;

the machine (1) being **characterized in that** the pressure (P) of the compressed air fed into the annular channel (42) ranges between 0.05 and 0.4 MPa, and is preferably 0.22 ± 0.01 MPa.

14. A cigarette filter manufacturing machine (1); the machine (1) comprising:

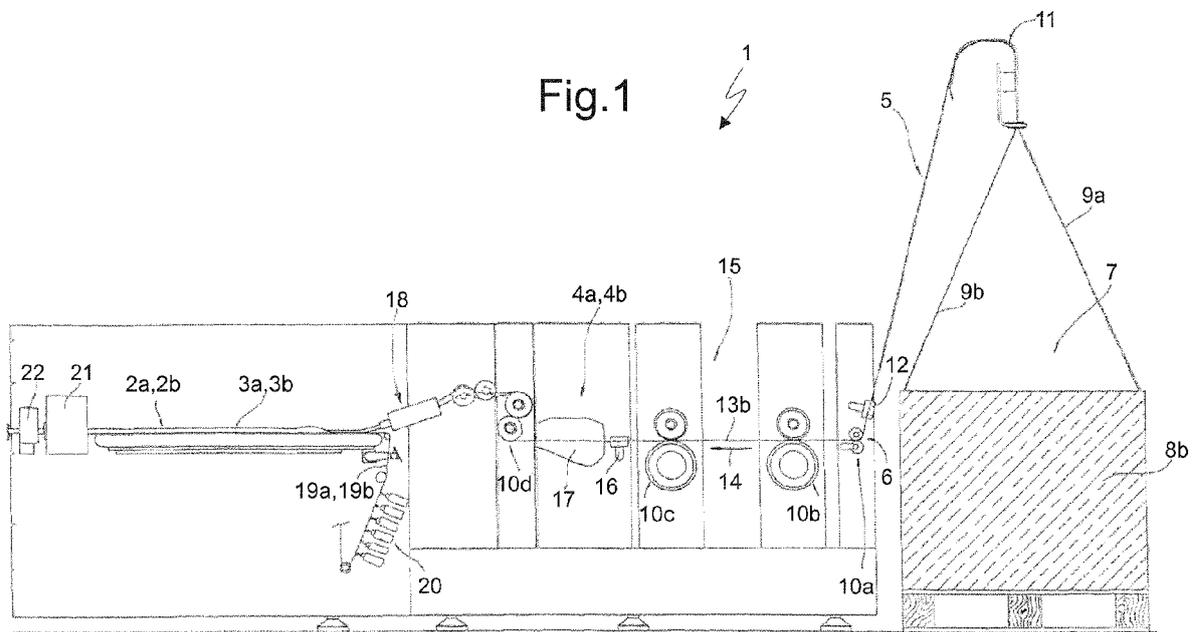
at least one feed line (4) for supplying a continuous strip (13) of filtering material;

at least one forming beam (2) for forming a continuous filter rod (3); and

a twisting unit (18) located between the feed line (4) and the forming beam (2), and which comprises at least one jet (25; 26), and a following insertion finger (27) that terminates inside the forming beam (2);

wherein the insertion finger (27) comprises a tapering tubular main body (40); and a tubular adjuster (41), which has an inlet opening (49) and an outlet opening (50), is inserted inside an inlet opening of the main body (40), and is slightly detached from the main body (40) to define, between an outer surface of the adjuster (41) and an inner surface of the main body (40), an annular compressed-air feed channel (42) that comes out inside the main body (40), at an annular gap (43) ; and

wherein the adjuster (41) is fitted inside with an inlet funnel (51), an end portion of which has a constant inside diameter (D) and is inserted inside the inlet opening (49) of the adjuster (41); the machine (1) being **characterized in that** the diameter (D) of the end portion of the inlet funnel (51) ranges between 10 and 45 mm, and is preferably 25 ± 1 mm.



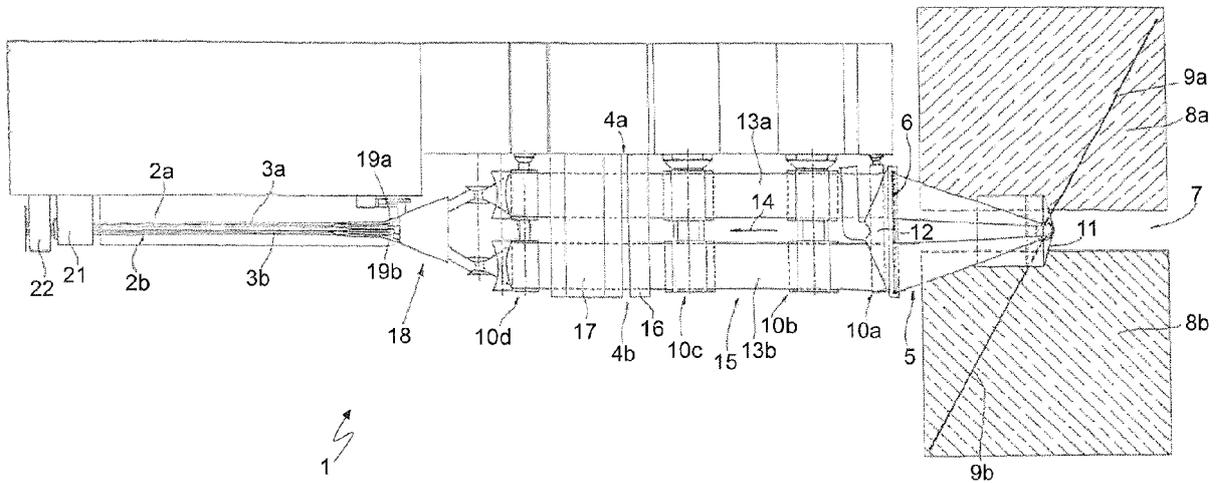


Fig.2

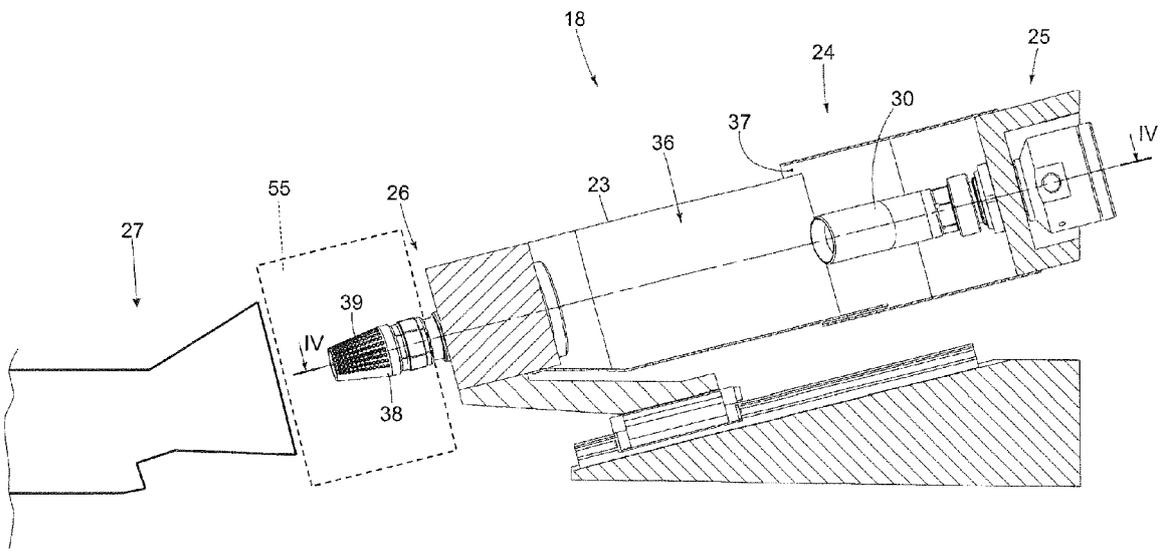
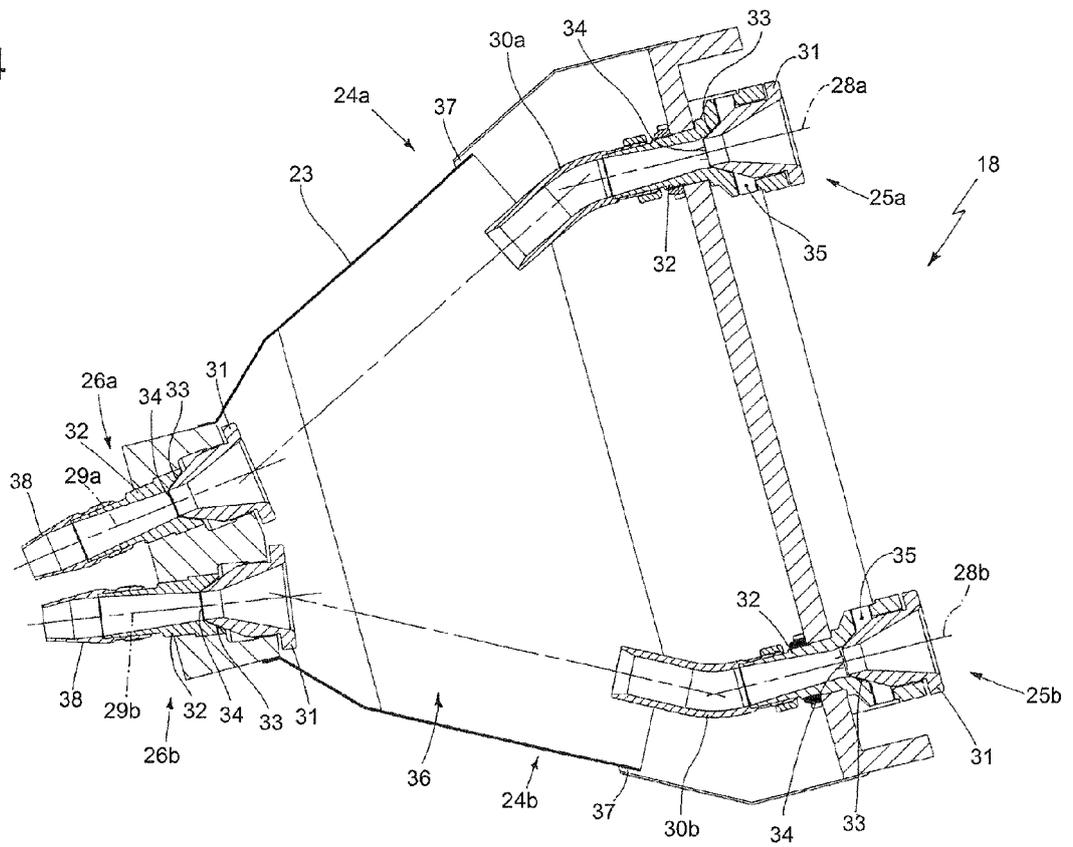


Fig.3

Fig.4



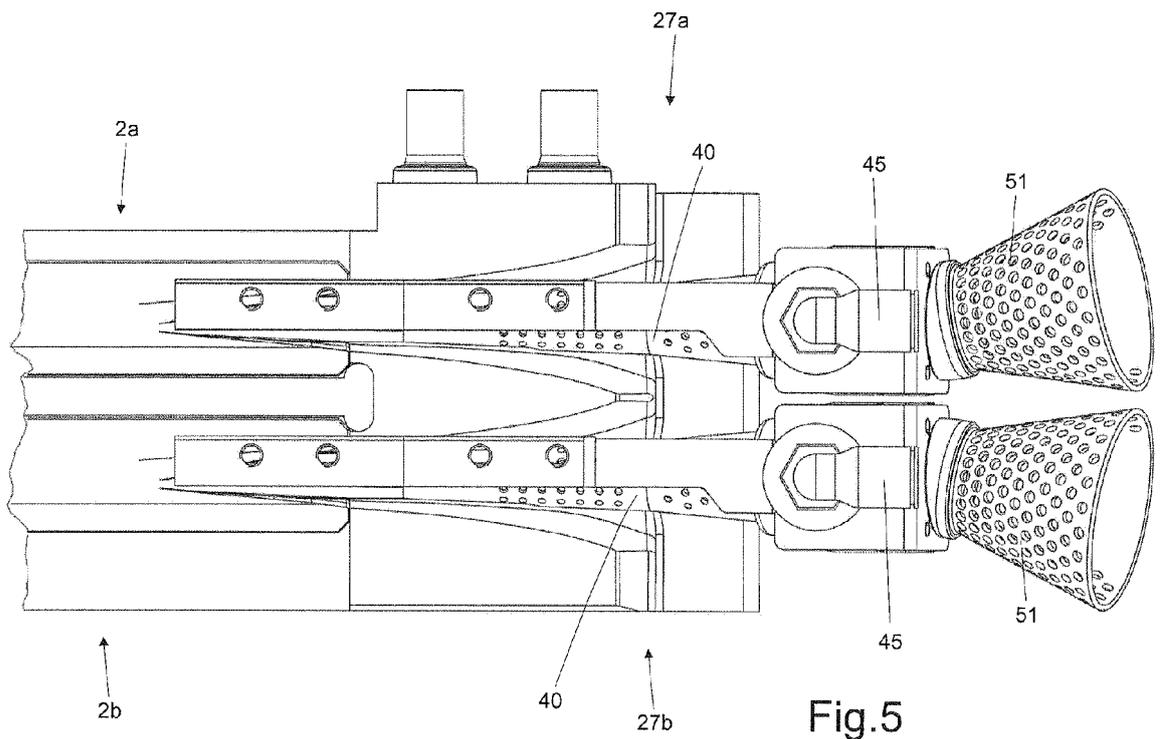
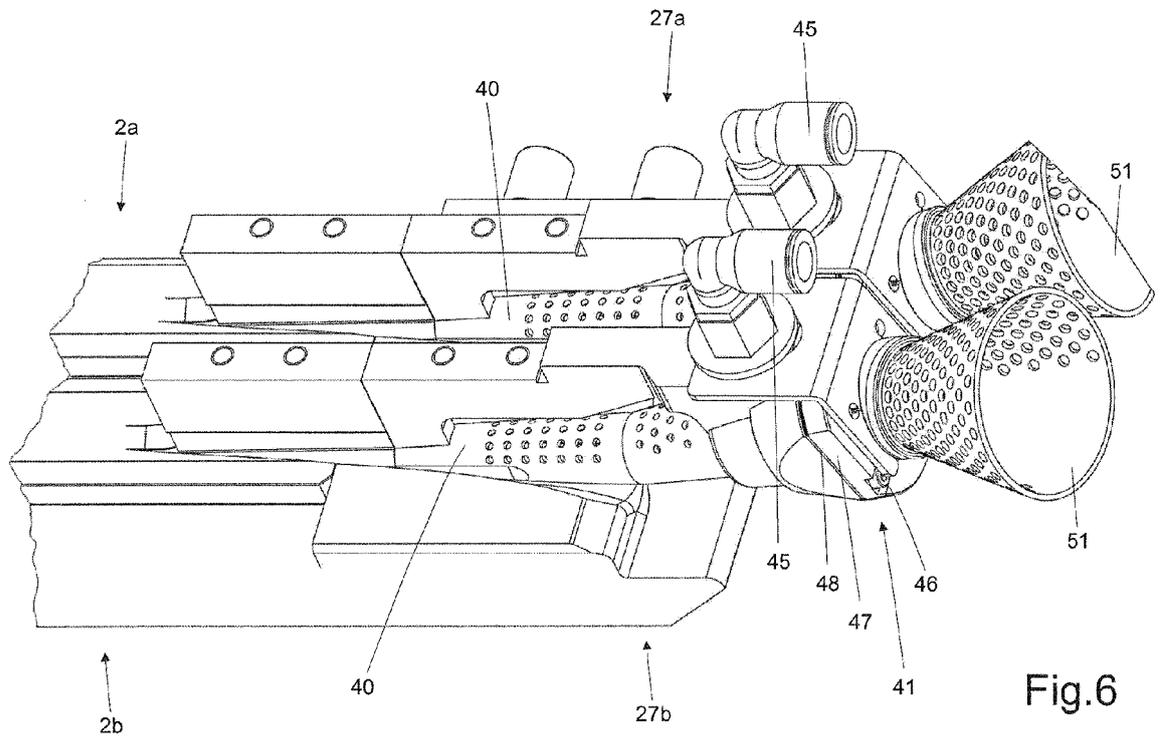


Fig.5



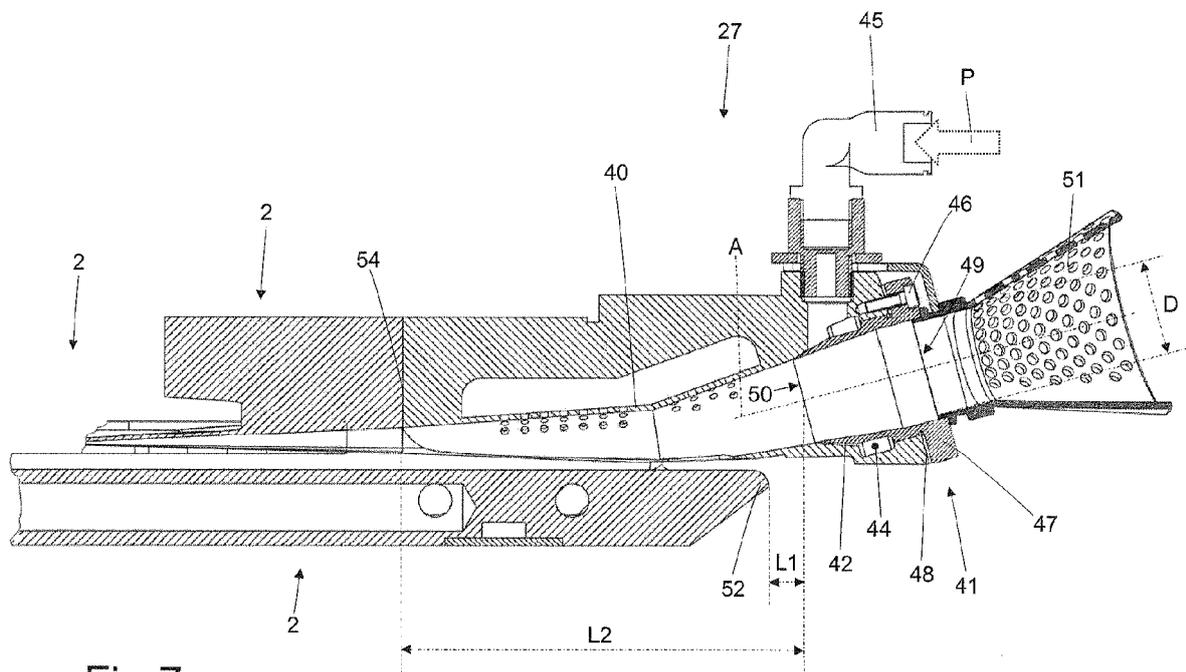
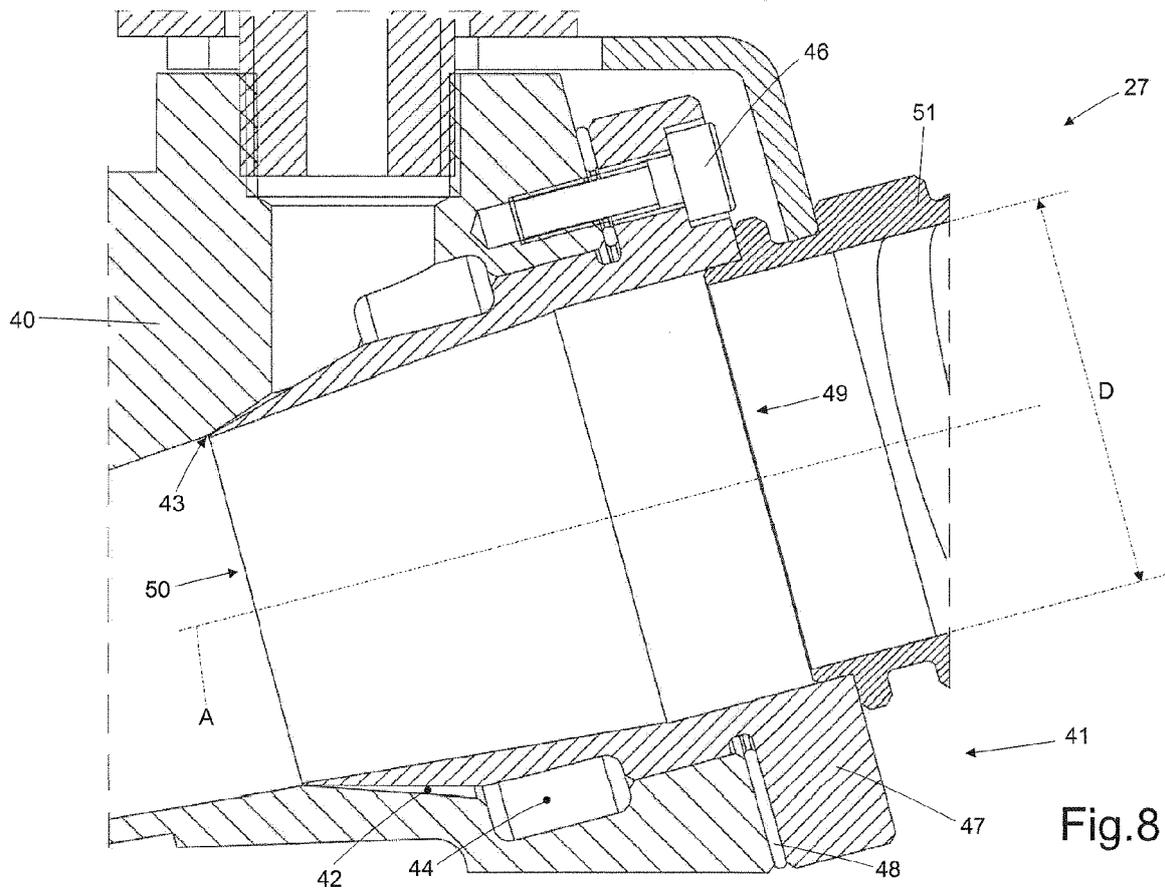


Fig.7



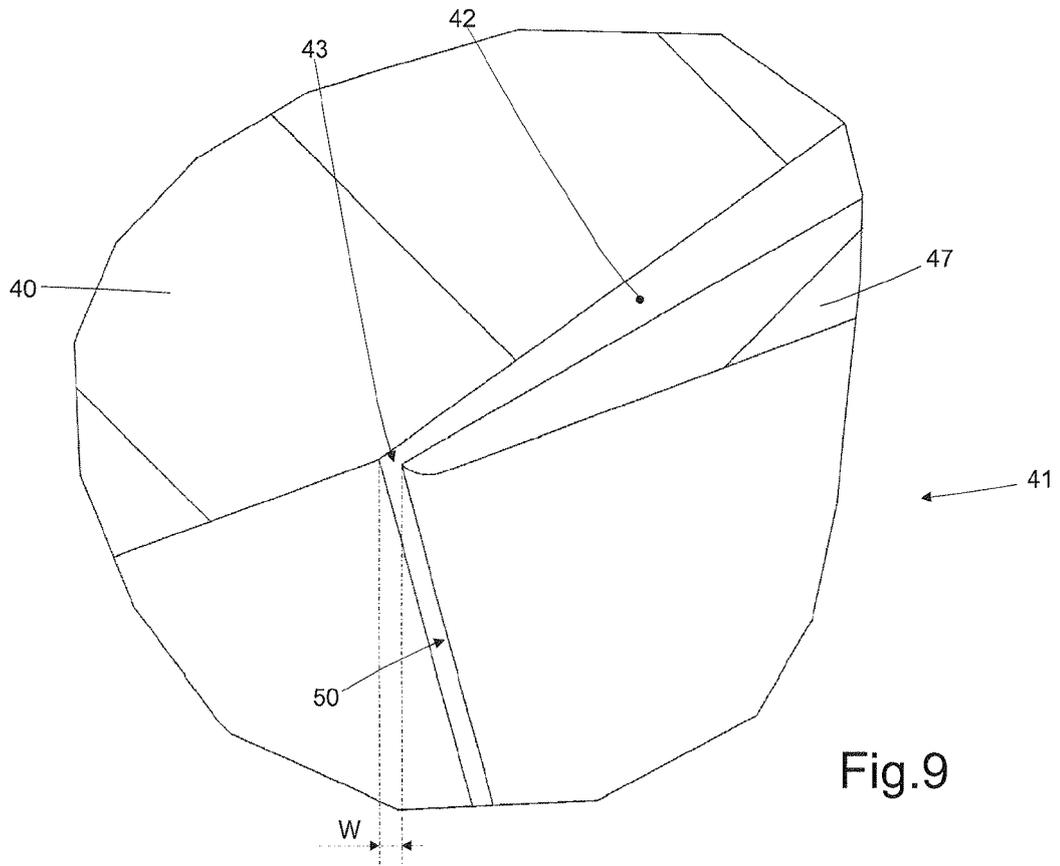


Fig.9



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