

(19)



**Octrooi Centrum
Nederland**

(11)

2016826

(12) B1 OCTROOI

(21)

Aanvraagnummer: **2016826**

(22)

Aanvraag ingediend: **25/05/2016**

(51)

Int. Cl.:

B29C 47/02 (2016.01) **B29C 47/10** (2017.01) **B29C 47/14** (2017.01) **B29C 47/08** (2017.01) **B29L 29/00** (2017.01) **B29C 47/56** (2017.01) **B29C 47/00** (2017.01) **B29D 30/38** (2017.01)

(41)

Aanvraag ingeschreven:
30/11/2017

(43)

Aanvraag gepubliceerd:
30/11/2017

(47)

Octrooi verleend:
12/12/2017

(45)

Octrooischrift uitgegeven:
19/01/2018

(73)

Octrooihouder(s):
VMI Holland B.V. te EPE.

(72)

Uitvinder(s):
Ronald Gerardus Maria de Bruijn te EPE.
Emiel Hendricus de Jong te EPE.
Gerardus Johannes Catharina van Laar te EPE.

(74)

Gemachtigde:
ir. F.A. Geurts c.s. te Den Haag.

(54)

Extruder head for extruding cord-reinforced extrudate

(57)

The invention relates to an extruder head for extruding cord reinforced extrudate, wherein the extruder head comprises a die and a cord guide, wherein the extruder head further comprises a first flow channel that extends along a first flow path through the extruder head at and debouches into the die from a first side of a cord plane and a second flow channel that extends along a second flow path through the extruder head at and debouches into the die from a second side of the cord plane, wherein the first flow path and the second flow path each comprise a supply section and a coat-hanger section, wherein the first flow path and the second flow path, in their respective coat-hanger sections, extend within a first range of eighty-five to ninety-five degrees with respect to the cord plane along at least seventy percent of the coat-hanger sections.

NLP199016A

5 Extruder head for extruding cord-reinforced extrudate

10 BACKGROUND

The invention relates to an extruder head for extruding cord reinforced extrudate.

EP 0 339 510 A2 discloses an extrusion head for
15 producing a sheet of elastomeric material, reinforced internally with relatively close-packed metal or textile cords. The extrusion head comprises a die defined by a top die and a bottom die and a cord guide member consisting of a top plate and a bottom plate. The top and bottom parts of
20 the die and the cord guide are mounted together on opposite sides of the cord plane by an outer casing. The extruder head defines two tapered, converging channels to supply plastic elastomeric material to the die.

When the elastomeric material is supplied to the
25 tapered, converging channels of the extrusion head, pressure builds and pressure forces are exerted outwards onto the circumferential walls of said channels. A considerable component of said pressure forces is exerted in a direction perpendicular to the cord plane onto the
30 parts of the extrusion head, causing the top and bottom parts of the die, the top and bottom parts of the cord guide member, and/or the outer casing to move. Consequently, the relatively positioning of said parts becomes inaccurate. Accurate positioning is particularly
35 critical for the top and bottom parts of the die, which determine the thickness of the sheet of elastomeric material. Moreover, inaccurate positioning of the top and

bottom parts of the cord guide can result in damage to said parts and/or inaccurate embedding of the cords in the elastomeric material.

It is an object of the present invention to
5 provide an alternative extruder head for extruding cord reinforced extrudate, wherein the at least one of the aforementioned drawbacks can be reduced and/or prevented.

10 SUMMARY OF THE INVENTION

According to a first aspect, the invention provides an extruder head for extruding cord reinforced extrudate, wherein the extruder head comprises a die for
15 receiving cords and extrusion material in a cord direction and a cord guide for guiding the cords side-by-side in a cord plane parallel to said cord direction into the die, wherein the extruder head further comprises a first flow channel that extends along a first flow path through the
20 extruder head at and debouches into the die from a first side of the cord plane and a second flow channel that extends along a second flow path through the extruder head at and debouches into the die from a second side of the cord plane opposite to the first side, wherein the first
25 flow path and the second flow path each comprise a supply section and a coat-hanger section with a widening cross section downstream of the supply section, wherein the first flow path and the second flow path, in their respective coat-hanger sections, extend under an angle within a first
30 range of eighty-five to ninety-five degrees with respect to the cord plane along at least seventy percent of the respective coat-hanger sections.

Because of the steep, perpendicular or almost perpendicular orientation of the coat-hanger sections with
35 respect to the cord plane, it can be prevented that a large component of the pressure forces, as a result of pressure building up in the flow channels, is directed towards

and/or is generated in the die opening in a direction perpendicular to the cord plane. In particular, a considerable component of the pressure forces can be directed via the circumferential walls of the coat-hanger sections in a direction parallel or substantially parallel to the cord plane. Consequently, the extruder head is less prone to inaccuracies in the direction normal or perpendicular to the cord plane. In particular the accuracy of the thickness of the extrudate can be improved.

In an embodiment thereof, the first flow path and the second flow path, in their respective coat-hanger sections and up to the cord plane, extend under an angle within the first range with respect to the cord plane along at least seventy percent of the respective coat-hanger sections. Hence, the flow channels, up to the debouching thereof into the die, can be arranged as steep as possible with respect to the cord plane.

In a preferred embodiment the first range is eighty-eight to ninety-two degrees. Most preferably, the respective flow paths extend perpendicular to the cord plane in the respective coat-hanger sections. The steeper the angle with respect to the cord plane, the smaller the component of the pressure force that is exerted in the direction normal or perpendicular to the cord plane.

In another preferred embodiment the respective flow paths extend within the first range with respect to the cord plane along at least eighty percent, and preferably at least ninety percent of respective coat-hanger sections. Most preferably, the respective flow paths extend within the first range with respect to the cord plane in the entire respective coat-hanger sections. By ensuring that a considerable part of the respective coat-hanger sections extends within the first range, the pressure force are exerted in a direction parallel to the mating plane.

In an embodiment the coat-hanger sections debouch into the die in a direction perpendicular or substantially

perpendicular to the cord plane. Hence, the flow of extrusion material can be deflected into the die directly after leaving the coat-hanger sections, e.g. by the leading end of the cord guide as described hereafter.

5 In an embodiment the cord guide comprises a leading end that extends at least partially into the die, wherein the leading end is provided with a first deflecting surface and a second deflecting surface extending on opposite sides of the cord plane and facing in the cord
10 direction towards the die, wherein the coat-hanger sections of the first flow channel and the second flow channel debouch onto the first deflecting surface and the second deflecting surface, respectively, in a direction perpendicular or substantially perpendicular to the cord
15 plane, wherein the first deflecting surface and the second deflecting surface are arranged for deflecting the extrusion material from the first flow channel and the second flow channel, respectively, towards and/or into the die. The cord guide can thus be used to deflect the flow of
20 extrusion material in the cord direction, wherein any tolerances of the cord guide with respect to the casing can be absorbed without negatively impacting the accuracy of the extruder head in the height direction.

 In an embodiment thereof the first deflecting
25 surface and the second deflecting surface are tangent or substantially tangent to the respective coat-hanger sections and the cord plane. The flow of extrusion material can thus be deflected smoothly from the respective flow channels into the die.

30 In an embodiment the coat-hanger sections of the first flow channel and the second flow channel each comprise a circumferential wall, wherein the extruder head for each flow channel comprises a first coat-hanger half and a second coat-hanger half which are arranged to be
35 placed in mutual abutment on opposite sides of a mating plane to form the circumferential wall of the respective flow channel. By forming the circumferential wall at the

respective coat-hanger sections by two parts opposite to each other with respect to the mating plane, said parts can absorb the pressure forces that are being exerted onto the circumferential wall in a direction parallel or
5 substantially parallel to the cord plane. Any tolerances between those parts in the said direction will not negatively influence the accuracy of the extruder in the height direction.

In an embodiment thereof the mating plane extends
10 transverse or perpendicular to the cord plane and the cord direction. Hence, the coat-hanger halves can be mated along a plane that is transverse or perpendicular to the cord plane.

In a further embodiment thereof the respective
15 flow paths extend parallel or substantially parallel to the mating plane along at least seventy percent of the respective coat-hanger sections. Consequently, the extrusion material can be made to flow through the respective coat-hanger sections in a direction parallel to
20 mating plane, and perpendicular to the cord plane.

In an embodiment the first flow path and the second flow path intersect with and/or at least partly extend in the mating plane at the respective coat-hanger sections. Hence, the flow paths and/or the flow channels
25 may extend close to or symmetrically along the mating plane at the respective coat-hanger sections.

In a preferred embodiment the circumferential wall of each flow channel is symmetrical or substantially symmetrical about the mating plane along at least seventy
30 percent of the respective coat-hanger sections. Hence, the pressure forces can be distributed equally over the circumferential wall in a direction parallel to the cord plane.

In a further preferred embodiment at least
35 seventy percent of the surface area of the circumferential wall at the respective coat-hanger sections extends within the first range with respect to the cord plane. Preferably,

at least eighty percent, and most preferably at least ninety percent of the surface area of the circumferential wall at the respective coat-hanger sections extends within the first range with respect to the cord plane. The
5 pressure forces are exerted onto the circumferential wall in a direction normal to the surface area. By having a considerable part of the surface area extending under an angle within the first range with respect to the cord plane, it can be prevented that the pressure forces are
10 directed in a direction normal or perpendicular to the cord plane.

In a further embodiment the first coat-hanger half and the second coat-hanger half are separable in a separation direction parallel to the cord direction. Hence,
15 the pressure forces exerted onto the coat-hanger halves can be absorbed by the separation of the coat-hanger halves in the separation direction.

In one embodiment the extruder head comprises a first head member for holding or forming the die and a
20 second head member for holding or forming the cord guide, wherein the first coat-hanger halves are formed by the first head member and wherein the second coat-hanger halves are formed by the second head member. Hence, the extruder head can be of relatively simple design.

25 In an alternative embodiment the extruder head comprises a first head member for holding or forming the die and a second head member for holding or forming the cord guide, wherein the first coat-hanger halves are inserts held by the first head member and wherein the
30 second coat-hanger halves are inserts held by the second head member. As inserts, the coat-hanger halves can be replaced by other inserts depending on the required shape of the flow channels at the respective coat-hanger sections.

35 In an embodiment thereof the first head member and the second head member are separable in a separation direction parallel to the cord plane. The head members can

thus be separated for maintenance or replacement of the die and/or the cord guide.

In a preferred embodiment thereof the first head member and the second head member are arranged to be placed
5 in mutual abutment on opposite sides of the mating plane. The head members can thus be mated about the same mating plane as the coat-hanger halves.

In one embodiment the extruder head comprises an escape channel extending at the mating plane, wherein the
10 escape channel is separated from the first flow channel and the second flow channel when the first head member and the second head member are in abutment at the mating plane and wherein the escape channel is in fluid communication with the first flow channel and/or the second flow channel when
15 the first head member and the second head member are separated in the separation direction. The escape channel can relieve some of the pressure in the extrusion material by allowing some of the extrusion material to escape from the extruder head in the event of dangerous pressure
20 levels.

In an alternative embodiment the extruder head comprises an escape channel extending at the mating plane, wherein the escape channel is separated from the first flow channel and the second flow channel by the inserts when
25 inserts are in abutment at the mating plane and wherein the escape channel is in fluid communication with the first flow channel and/or the second flow channel when the inserts are separated in the separation direction. The separation of the inserts can thus allow the extrusion
30 material to escape. Hence, the inserts, rather than the head members, can be separated.

More preferably the head members are arranged to remain in mutual abutment outside of the escape channel while the inserts are separated in the separation
35 direction. The head members can prevent that the released extrusion material and/or pressure exits the extruder head uncontrollably.

In a further embodiment the second head member comprises a first casing member at the first side of the cord plane and a second casing member at the second side of the cord plane, wherein the first casing member and the
5 second casing member together form a receiving space for receiving the cord guide, wherein the first casing member and the second casing member are inseparable in a normal direction perpendicular to the cord plane.

In an embodiment thereof the first casing member
10 and the second casing member form a single piece. By having a single piece, tolerances between the casing members in a direction normal or perpendicular to the cord plane can be prevented or even eliminated.

In an embodiment the die comprises a first die
15 member at the first side of the cord plane and a second die member at the second side of the cord plane, wherein the first die member and the second die member together form a die opening through which the extrudate leaves the extruder head, wherein the first die member and the second die
20 member are inseparable in a normal direction perpendicular to the cord plane. By having inseparable die members, tolerances between the die members in a direction normal or perpendicular to the cord plane can be prevented. Thus, the die is less prone to inaccuracies of the die opening in the
25 height direction.

In an embodiment thereof the first die member and the second die member form a single piece. By having a single piece, tolerances between the die members in a direction normal or perpendicular to the cord plane can be
30 prevented or even eliminated.

In an embodiment the cord guide is slidable into and out of an operational position in the extruder head in the cord direction and a sliding direction opposite to the cord direction, respectively. By sliding the cord guide in
35 the cord direction and the sliding direction, the first casing member and the second casing member do not have to be separated.

In an embodiment thereof the extruder head further comprising a locking member that is arranged to lock the cord guide against sliding in the sliding direction when the cord guide is in the operational position. Thus, the cord guide can be securely held in place in the operational position during extrusion, so that the pressure forces generated by the extrusion material in the flow channels does not push the cord guide out of the extruder head.

In an embodiment the cord guide comprises a first guide member at the first side of the cord plane and a second guide member at the second side of the cord plane, wherein one of the first guide member and the second guide member comprises a plurality of interchangeable guide blocks which are arranged side-by-side in a lateral direction parallel to the cord plane and perpendicular to the cord direction, wherein each block comprises a plurality of guide channels extending in the cord direction at and parallel to the cord plane for receiving the cords. The guide channels in the blocks break easily because of the relatively thin walls between the guide channels. The blocks can easily be replaced when broken. It can be less costly to replace one block instead of an entire guide member.

In one embodiment thereof the extruder head further comprises a set of replacement blocks to replace one or more of the guide blocks of the cord guide, wherein at least one of the replacement blocks comprises the same plurality of guide channels as the guide blocks of the cord guide. The set can be provided together with the cord guide to ensure that the guide blocks can be replaced instantly when broken.

In an alternative embodiment thereof the extruder head further comprises a set of replacement blocks to replace one or more of the guide blocks of the cord guide, wherein at least one of the replacement blocks comprises a different number or shape of guide channels than the guide

blocks of the cord guide. The replacement blocks can be used to adapt the cord guide to a different configuration of guide channels, e.g. larger guide channels, a larger or smaller number of guide channels and/or guide channels
5 extending over a greater or smaller width of the cord guide in the lateral direction.

In a further embodiment the plurality of guide channels comprises at least one guide channel that is defined by two directly adjacent guide blocks. By providing
10 a half guide channel at the end of a guide block instead of a relatively thin end wall, the guide block can be less prone to damage.

According to a second aspect, the invention provides a method for extruding cord reinforced extrudate
15 with the use of the aforementioned extruder head, wherein the method comprises the steps of feeding pressurized extrusion material into the first flow channel and the second flow channel and absorbing the pressure forces generated by said pressurized extrusion material in the
20 respective coat-hanger sections in a direction parallel or substantially parallel to the cord plane.

Again, because of the steep, perpendicular or almost perpendicular orientation of the flow channels with respect to the cord plane, it can be prevented that a large
25 component of the pressure forces, as a result of pressure building up in the flow channels, is directed in a direction perpendicular to the cord plane.

In an embodiment of the method, the extruder head comprises an escape channel, wherein the method comprises
30 the step of allowing the extrusion material to escape from the first flow channel and/or the second flow channel via the escape channel when the pressure level of the extrusion material rises towards a dangerous level. The escape channel can relieve some of the pressure in the extrusion
35 material by allowing some of the extrusion material to escape from the extruder head in the event of dangerous pressure levels.

In a further embodiment, the method comprises the step of sliding the cord guide into and out of an operational position in the extruder head in the cord direction and a sliding direction opposite to the cord direction, respectively. By sliding the cord guide in the cord direction and the sliding direction, the first casing member and the second casing member do not have to be separated.

The various aspects and features described and shown in the specification can be applied, individually, wherever possible. These individual aspects, in particular the aspects and features described in the attached dependent claims, can be made subject of divisional patent applications.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be elucidated on the basis of an exemplary embodiment shown in the attached schematic drawings, in which:

figure 1 shows a side view in cross section of an extruder head with a die, a cord guide and two flow channels, according to a first embodiment of the invention;

figure 2 shows a cross section of the extruder according to the line II-II in figure 1;

figure 3 shows a cross section of the extruder according to the line III-III in figure 2;

figures 4A and 4B show the extruder according to figure 1, wherein the cord guide is locked and unlocked, respectively, against sliding with respect to the extruder head;

figure 5A shows a front view of the cord guide of figure 4 in more detail;

figure 5B shows a side view of the cord guide of figure 5A;

figure 6 shows a side view in cross section of

the extruder head of figure 1, with the cord guide slid into an inoperative position; and

figure 7 shows a side view in cross section of an alternative extruder head with a die, a cord guide and two flow channels, according to a second embodiment of the invention.

DETAILED DESCRIPTION OF THE INVENTION

10

Figures 1 and 2 show an extruder head 1 for extruding cord reinforced extrudate 90, in particular cord reinforced tire components for tire building, according to an exemplary embodiment of the invention.

15

The extruder head 1 comprises a first head member H1 that holds or forms a die 2, a second head member H2 that forms or holds a cord guide 3 with respect to the die 2. In this exemplary embodiment, the first head member H1 forms the die 2 and the second head member H2 comprises a casing 4 for holding the cord guide 3 with respect to the die 2. The die 2 is arranged for receiving a plurality of cords 8 and extrusion material 9 in a cord direction X. The extrusion material 9 is an elastomeric material, e.g. rubber. The cords 8 are made of a metal or a synthetic fiber. The cord guide 3 is arranged for guiding the plurality of cords 8 in a side-by-side relationship in a cord plane P into the die 2. The first head member H1 and the second head member H2 are mated or placed in mutual abutment at a mating plane M that extends transverse or perpendicular to the cord direction X and the cord plane P. The cord guide 3 and the casing 4 are located at a first side A of the mating plane M while the die 2 is located at a second side B of the mating plane M opposite to the first side A.

35

The extruder head 1 further comprises a first flow channel 11 and a second flow channel 12 extending through the second head member H2 at the first side A of

the mating plane M and at least partly in the second head member H2 at the second side B of the mating plane M. The first flow channel 11 and the second flow channel 12 are arranged to be placed in fluid communication with a first extruder 71 and a second extruder 72, respectively. Preferably, a first gear pump 73 is provided between the first extruder 71 and the first flow channel 11 and a second gear pump 74 is provided between the second extruder 72 and the second flow channel 12 to provide a pressurized and/or uniform flow of extrusion material into the respective flow channels 11, 12.

As shown in figure 1, the die 2 comprises a first die member 21 that is arranged on a first side C of the cord plane P and a second die member 22 that is arranged on a second side D of the cord plane P, opposite to the first die member 21 at the first side C. The first die member 21 and the second die member 22 form a die opening 23 for shaping the extrusion material 9 in the desired shape of the extrudate 90. The die opening 23 has a height in a height direction H that defines the thickness T of the extrudate 90. In this exemplary embodiment, the first die member 21 and the second die member 22 are inseparable, integral, monolithic or form a single piece. Preferably, the die 2 is made from a rigid material such as metal. Hence, the first die member 21 and the second die member 22 are substantially tolerance free in the height direction H of the die opening 23.

As shown in figure 1, the first flow channel 11 extends through the first casing member 41 of the second head member H2 and debouches into the die opening 23 from the first side C of the cord plane P. The second flow channel 12 extends through the second casing member 42 of the second head member H2 and debouches into the die opening 23 from the second side D of the cord plane P. The first flow channel 11 is formed by a first circumferential wall 13 that defines or extends along a first flow path F1 for the extrusion material 9 through the second head member

H2 and into the die opening 23. The second flow channel 12 is formed by a second circumferential wall 14 that defines a second flow path F2 for the extrusion material 9 through the second head member H2 and into the die opening 23. Both
5 circumferential walls 13, 14 extend coaxially to the respective flow paths F1, F2. In other words, the flow paths F1, F2 extend through the heart and/or the center of the circumferential walls 13, 14.

As shown in figures 1 and 2, the first flow
10 channel 11 and the second flow channel 12 each comprises a supply section S1, S3 for receiving the extrusion material 9 from the respective extruders 71, 72 and a so-called 'coat-hanger' section S2, S4 downstream of the respective supply sections S1, S3 for distributing the extrusion
15 material 9 from the supply sections S1, S3 towards the die opening 23. The supply sections S1, S3 are circular or substantially circular in cross section. The cross sections of the supply sections S1, S3 are relatively constant through the extruder head 1. As best seen in figure 2, the
20 coat-hanger sections S2, S4 diverge or widen in a lateral direction L parallel to the cord plane P and perpendicular to the cord direction X from or with respect to the relatively constant, cross section of the supply sections S1, S3 into a relatively flat and wide cross section that
25 substantially corresponds to or merges into the die opening 23. Optionally, the flow channel 11, 12 is provided with edges, flow dividers or other features (not shown) for optimizing the flow and/or the distribution of the extrusion material 9 in the coat-hanger sections S2, S4.
30 The widening cross section of the coat-hanger sections S2, S4 gives these sections their characteristic shape, resembling the shape of a coat-hanger.

The supply section S1 of the first flow channel
35 11 extends at an oblique angle with respect to the cord plane P through the first casing member 41 at the first side A of the mating plane M from the first extruder 71 and/or the first gear pump 73 towards the first die member

21. The supply section S1 intersects with the mating plane M from the first side A to the second side B at a first intersection W1. At or near the first intersection W1, the supply section S1 deflects steeply towards the cord plane P. The coat-hanger section S2 of the first flow channel 11 starts at the widening of the first circumferential wall 13 in the lateral direction L, as shown in figure 2 and continues downstream of the supply section S1 until the debouching of the first flow channel 11 into the die opening 23.

In said coat-hanger section S2, the first flow path F1 extends within a first range of eighty-five to ninety-five degrees with respect to the cord plane P along at least seventy percent, preferably at least eighty percent and most preferably at least ninety percent of the coat-hanger section S2. Preferably, as in this exemplary embodiment, the first range is eighty-eight to ninety-two degrees. More in particular, at least seventy percent, preferably at least eighty percent and most preferably at least ninety percent of the surface area of the first circumferential wall 13 at said coat-hanger section S2 extends within the first range with respect to the cord plane P.

As a result, a considerable part of the first flow channel 11 and/or the first flow path F1 extends parallel or substantially parallel, e.g. within a deviation of five degrees or less, to the mating plane M.

As shown in figure 1, the second flow channel 12 is mirror-symmetrical to the first flow channel 11 with respect to the cord plane P. As such, the second flow channel 12 comprises a corresponding supply section S3 that extends at an oblique angle with respect to the cord plane P through the second casing member 42 of the second head member H2 at the first side A of the mating plane M from the second extruder 72 and/or the second gear pump 74 towards the die 2. The second flow channel 12 intersects with the mating plane M from the first side A to the second

side B at a second intersection W2. The supply section S3 of the second flow channel 12 deflects steeply towards the cord plane P. The second flow channel 12 further comprises a coat-hanger section S4 that starts at the widening of the second circumferential wall 14 in the lateral direction L, as shown in figure 2, and continues downstream of the supply section S3 until the debouching of the second flow channel 12 into the die opening 23.

The supply section S3 and the coat-hanger section S4 of the second flow channel 12 extend mirror-symmetrically at the second side D of the cord plane P to the supply section S1 and the coat-hanger section S2, respectively, of the first flow channel 11 at the first side C of the cord plane P and thus meet the same first range, surface area and other conditions as previously discussed for the supply section S1 and the coat-hanger section S2. As a result, a considerable part of the coat-hanger section S4 of the second flow channel 12 also extends parallel or substantially parallel, e.g. within a deviation of five degrees or less, to the mating plane M.

Because of the steep, perpendicular or almost perpendicular orientation of the coat-hanger sections S2, S4 of both first flow channel 11 and the second flow channel 12 with respect to the cord plane C, a large component of the pressure forces, as a result of pressure building up in the extrusion material 9 in the first flow channel 11 and the second flow channel 12, can be directed in a direction perpendicular or substantially perpendicular to the mating plane M and/or parallel or substantially parallel to the cord plane P. Consequently, forces perpendicular to the cord plane P can be reduced and/or prevented, thereby rendering the extruder head 1 less prone to inaccuracies in the height direction H. In particular the accuracy of the thickness T of the extrudate 90 can be improved.

In this exemplary embodiment, as shown in figure 1, the extruder head 1 comprises a plurality of

interchangeable inserts 15-18 that form the circumferential walls 13, 14 of the respective flow channels 11, 12, at least at or along the coat-hanger sections S2, S4. Said inserts 15-18 are held in place by the head members H1, H2.

5 The inserts 15-18 are replaceable by other inserts depending on the required shape of the flow channels 11, 12. Figures 1 and 3 show that the first flow channel 11 is formed by an first insert formed as a first coat-hanger half 15 on the first side A of the mating plane M and a

10 second insert formed as a second coat-hanger half 16 on the second side B of the mating plane M. Similarly, as shown in figure 1, the second circumferential wall 14 at the coat-hanger section S4 of the second flow channel 12 is formed by a third insert in the form of a first coat-hanger half

15 17 on the first side A of the mating plane M and a fourth insert in the form of a second coat-hanger half 18 on the second side B of the mating plane M. As shown in figure 3, the head members H1, H2 are securely clamped together with clamping members 24 about the mating plane M in the outer

20 area around the escape channel 6 with the coat-hanger halves 15-18 mated about the same mating plane M in between.

As shown in figure 1, the first head member H1 and the second head member H2 are mated about the mating

25 plane M. For maintenance or replacement of die 2, the cord guide 3 and/or the coat-hanger halves 15-18, the first head member H1 and the second head member H2 can be moved apart in a separation direction Z perpendicular to the mating plane M. As shown in figures 1 and 2, the extruder head 1

30 is further provided with an escape channel 6 extending at or in the mating plane M in between the first head member H1 and the second head member H2. The escape channel 6 is preferably formed in the die 2, the casing 4 or both. As best seen in figure 2, the escape channel 6 extends around

35 the die opening 23, the first flow channel 11 and the second flow channel 12 in the mating plane M and is fluidically separated from said die opening 23 and said

flow channels 11, 12 by the mutual abutment of the first head member H1 and the second head member H2 at the mating plane M. In particular, the escape channel 6 comprises a ring-like main channel 61 extending circumferentially around a group of features including the first flow channel 11, the second flow channel 12 and the die opening 23, and a plurality of discharge channels 62 branching off from the main channel 61 to the outside of the extruder head 1.

At the coat-hanger halves 15-18, the head members H1, H2 are provided with a negative tolerance, i.e. a gap 45, to ensure that the coat-hanger halves 15-18 are clamped together securely. Preferably, the gap 45 extends from the coat-hanger halves 15-18 to the escape channel 6. When the pressure of the extrusion material 9 in the die opening 23, first flow channel 11 and/or the second flow channel 12 rises towards dangerous levels, e.g. a level that would cause the extruder head 1 to explode, the coat-hanger halves 15-18 are allowed to move apart slightly in the separation direction Z, while the parts of the head members H1, H2 outside of the escape channel 6 are still in mutual abutment about the mating plane M. The spacing allows the high pressure extrusion material 9 to escape into the escape channel 6 and out of the extruder head 1. This should relieve the pressure in the extrusion material 9 to acceptable levels.

As shown in figures 5A and 5B, the cord guide 3 comprises a first guide member 31 on the first side C of the cord plane P, a second guide member 32 substantially on the second side B of the cord plane P and a holder 38 for holding the first guide member 31 and the second guide member 32 together on said opposite sides C, D of the cord plane P. One of the first guide member 31 and the second guide member 32 or both form a plurality of mutually parallel guide channels 33 extending side-by-side in the cord plane P, parallel or substantially parallel to the cord direction X. Each guide channel 33 is arranged for individually receiving a cord 8. Preferably, the guide

channels 33 are formed in or are at least partly located in the second guide member 32. The guide channels 33 are closed by abutment of the second guide member 32 with the first guide member 31. The cord guide 3 is provided with a leading end 30 facing towards the die 2 in the cord direction X. At said leading end 30, the first guide member 31 comprises a first deflecting surface 34 extending at the first side C of the cord plane P for deflecting the flow of extrusion material from the coat-hanger sections S2 of the first flow channel 11 towards and/or into the die opening 23. At the same leading end 30, the second guide member 32 comprises a second deflecting surface 35 extending at the second side D of the cord plane P for deflecting the flow of extrusion material from the coat-hanger sections S4 of the second flow channel 12 towards and/or into the die opening 23.

In this particular embodiment, as shown in figures 5A and 5B, the second guide member 32 comprises a plurality of guide blocks 36 which are arranged side-by-side in a lateral direction L in the holder 38, parallel to the cord plane P and perpendicular to the cord direction X. Each guide block 36 comprises a number of the guide channels 33. At the sides of the guide blocks 36 in the lateral direction L, each guide block 36 is provided with a half guide channel 33 that forms a complete guide channel 33 with a half guide channel 33 of a directly adjacent guide block 36.

The guide channels 33 are easily damaged because of the thin walls between them. The extruder head 1 comes with a set of replacement blocks 37 to replace one or more guide blocks 36 when damaged or to change the configuration of the guide channels 33. The guide blocks 36 can be interchanged easily for one or more of the replacement blocks 37. The replacement blocks 37 may comprise alternatively shaped guide channels. When the die width is reduced, the replacement blocks 37 at the opposite ends of the plurality of guide blocks 36 may have less guide

channels 33.

As shown in figure 1, the casing 4 comprises a first casing member 41 on the first side C of the cord plane P and a second casing member 42 on the second side D of the cord plane P. As best seen in figure 6, the first casing member 41 and the second casing member 42 form a receiving space 43 for receiving the cord guide 3. The casing 4 is arranged for holding and positioning the cord guide 3 with respect to the cord plane P and the die 2. In this exemplary embodiment, the first casing member 41 and the second casing member 42 are inseparable, integral, monolithic or form a single piece. Preferably, the casing 4 is made from a rigid material such as metal. Hence, the first casing member 41 and the second casing member 42 are substantially tolerance free in the height direction H of the receiving space 43.

The cord guide 3 is slidably insertable into the receiving space 43 of the casing 4 in the cord direction X, parallel to the cord plane P, into an operative position as shown in figure 1. The cord guide 3 is slidably removable from the casing 4 in a sliding direction Y opposite to the cord direction X into an inoperative position as shown in figure 6. The cord guide 3 is preferably supported on a carriage (not shown) to keep the cord guide 3 level with the cord plane P. Hence, the cord guide 3 can be slid in the sliding direction Y over the plurality of cords 8, without removing said cords 8 from the cord guide 3. The cord guide 3 can be spaced apart from the extruder head 1 and the extruders 71, 72 in the inoperative position to allow the first guide member 31 to be lifted from the second guide member 32 and out of the holding member 38. Subsequently, new cords 8 can be inserted into the guide channels 33 of the cord guide 3.

To lock the cord guide 3 in the operative position against sliding in the sliding direction Y, the extruder head 1 is provided with a locking member 5. The locking member 5 is received in a slot 44 in the casing 4

and is slidable with respect to said casing 4 in the lateral direction L between a locking position, as shown in figure 4A and a release position as shown in figure 4B. The locking member 5 comprises a locking plate 50 with a main opening 51 and a plurality of recesses 52. In the locking position, the recesses 52 are misaligned with the protrusions 53 of the cord guide 3 in the sliding direction Y. Hence, the cord guide 3 is retained with respect to the casing 4 in the sliding direction Y. In the release position, the recesses 52 are aligned with the protrusions 53 of the cord guide 3 such that the cord guide 3 is removable from the casing 4 in the sliding direction Y.

The individual aspects of the cord guide 3, in particular of the interchangeable guide blocks 36, the slidability in the sliding direction Y and/or the locking member 5, are independent from the aspects described hereafter in relation to the flow channels 11, 12 and can be made subject of divisional patent applications.

As shown in figure 1, the first deflecting surface 34 and the second deflecting surface 35 at the leading end 30 of the cord guide 3 are tangent or substantially tangent to the circumferential walls 13, 14 of the first flow channel 11 and the second flow channel 12, respectively, at the respective coat-hanger sections S2, S4 to smoothly receiving the flow of extrusion material 9 from the respective flow paths F1, F2. The deflecting surfaces 34, 35 are concave in the cord direction X. Preferably, the deflecting surfaces 34, 35 are tangent to the cord plane P on the opposite sides C, D of said cord plane P. The deflecting surfaces 34, 35 are thus arranged for smoothly receiving and deflecting the flow of extrusion material 9 from the respective flow paths F1, F2 into the cord direction X.

Alternatively, the deflecting surfaces 34, 35 can be substantially planar (not shown) and arranged at an angle in a second range of thirty to fifty degrees, and preferably approximately forty-five degrees, with respect

to the cord plane P. In both cases, the first flow channel 11 and the second flow channel 12 debouch onto the first deflecting surface 34 and the second deflecting surface 35, respectively, in a direction perpendicular or substantially perpendicular to the cord plane P and/or in a direction parallel or substantially parallel to the mating plane M. At said deflecting surfaces 34, 35, the extrusion material 9 will exert a pressure force onto the cord guide 3, with at least a component of said pressure force acting in the sliding direction Y opposite to the cord direction X. The cord guide 3 is locked by the locking member 5 in the operational position as shown in figure 1. However, any tolerances between the cord guide 3 and the casing 4 in said sliding direction Y do not negatively influence the accuracy of the extruder head 1 in the height direction H.

It is to be understood that the above description is included to illustrate the operation of the preferred embodiments and is not meant to limit the scope of the invention. From the above discussion, many variations will be apparent to one skilled in the art that would yet be encompassed by the scope of the present invention.

For example, figure 7 shows an alternative extruder head 101 which differs from the previously discussed extruder head 1 in that its flow channels 111, 112 are formed by the head members H1, H2 rather than the inserts 15-18 of figure 1. In particular, the first flow channel 111 is formed by the first die member 121 of the die 102 and the first casing member 141 of the casing 104 and the second flow channel 112 is formed by the second die member 122 of the die 102 and the second casing member 142 of the casing 104. Although this alternative embodiment is slightly less flexible without the inserts 15-18, one skilled in the art will appreciate that the flow channels 111, 112 are still divided into a supply sections S1, S3 with a relatively constant, circular cross section and widening coat-hanger sections S2, S4, similar to the sections S1-S4 in figures 1, 2 and 3. The coat-hanger

sections S2, S4 still meet the previously discussed first range. Instead of the inserts 15-18 separating in the separation direction Z, the head members H1, H2 are separable when the pressure exceeds a threshold value, to
5 relieve the pressure in the extrusion material 9.

Moreover, many variations in shapes and designs of the flow channels will be apparent to one skilled in the art and are encompassed by the scope of the present invention when they meet the ranges as specified in the
10 claims.

In summary, the invention relates to an extruder head 1, 101 for extruding cord reinforced extrudate, wherein the extruder head 1, 101 comprises a die 2, 102 and a cord guide 3, wherein the extruder head 1, 101 further
15 comprises a first flow channel 11, 111 that extends along a first flow path F1 through the extruder head 1, 101 at and debouches into the die 2, 102 from a first side C of a cord plane P and a second flow channel 12, 112 that extends
20 along a second flow path F2 through the extruder head 1, 101 at and debouches into the die 2, 102 from a second side D of the cord plane P, wherein the first flow path F1 and the second flow path F2 each comprise a supply section S1, S3 and a coat-hanger section S2, S4, wherein the first flow
25 path F1, and the second flow path F2, in their respective coat-hanger sections S2, S4, extend within a first range of eighty-five to ninety-five degrees with respect to the cord plane P along at least seventy percent of the coat-hanger sections S2, S4.

C O N C L U S I E S

1. Extrudeerkop voor het extruderen van door
koorden versterkt extrudaat, waarbij de extrudeerkop een
matrijs omvat voor het ontvangen van koorden en
extrusiemateriaal in een koordrichting en een
5 koordgeleiding voor het naast elkaar geleiden van koorden
in een koordvlak evenwijdig aan de koordrichting tot in de
matrijs, waarbij de extrudeerkop verder een eerste
stromingskanaal omvat dat zich uitstrekt langs een eerste
stromingsbaan door de extrudeerkop aan en uitmondend in de
10 matrijs vanaf een eerste zijde van het koordvlak en een
tweede stromingskanaal dat zich uitstrekt langs een tweede
stromingsbaan door de extrudeerkop aan en uitmondend in de
matrijs vanaf een tweede zijde van het koordvlak
teggengesteld aan de eerste zijde, waarbij de eerste
15 stromingsbaan en de tweede stromingsbaan elk een
toevoersectie omvatten en een klerenhangersectie met een
verbredende dwarsdoorsnede stroomafwaarts van de
toevoersectie, waarbij de eerste stromingsbaan en de tweede
stromingsbaan, in hun respectievelijke klerenhangersecties,
20 zich onder een hoek binnen een eerste bereik van
vijfentachtig tot vijfennegentig graden ten opzichte van
het koordvlak uitstrekken langs ten minste zeventig procent
van de respectievelijke klerenhangersecties.

2. Extrudeerkop volgens conclusie 1, waarbij de
25 eerste stromingsbaan en de tweede stromingsbaan, in hun
respectievelijke klerenhangersecties en tot aan het
koordvlak, zich onder een hoek binnen het eerste bereik ten
opzichte van het koordvlak uitstrekken langs ten minste
zeventig procent van de respectievelijke
30 klerenhangersecties.

3. Extrudeerkop volgens conclusie 1 of 2,
waarbij het eerste bereik achtentachtig tot tweeënnegentig
graden is.

4. Extrudeerkop volgens een der voorgaande conclusies, waarbij de respectievelijke stromingsbanen zich loodrecht op het koordvlak uitstrekken in de respectievelijke klerenhangersecties.

5 5. Extrudeerkop volgens een der voorgaande conclusies, waarbij de respectievelijke stromingskanalen zich uitstrekken binnen het eerste bereik ten opzichte van het koordvlak langs ten minste tachtig procent, en bij voorkeur ten minste negentig procent van de
10 respectievelijke klerenhangersecties.

6. Extrudeerkop volgens een der voorgaande conclusies, waarbij de respectievelijke stromingsbanen zich binnen het eerste bereik uitstrekken ten opzichte van het koordvlak in de gehele respectievelijk klerenhangersecties.

15 7. Extrudeerkop volgens een der voorgaande conclusies, waarbij de klerenhangersecties uitmonden in de matrijs in een richting loodrecht of in hoofdzaak loodrecht op het koordvlak.

8. Extrudeerkop volgens een der voorgaande
20 conclusies, waarbij de koordgeleiding een voorlopend uiteinde omvat dat zich ten minste gedeeltelijk tot in de matrijs uitstrekt, waarbij het voorlopende uiteinde is verschaft met een eerste afbuigoppervlak en een tweede afbuigoppervlak die zich uitstrekken aan tegengestelde
25 zijden van het koordvlak en die gericht zijn in de koordrichting in de richting van de matrijs, waarbij de klerenhangersecties van het eerste stromingskanaal en het tweede stromingskanaal uitmonden op het eerste afbuigoppervlak en het tweede afbuigoppervlak op
30 respectievelijk het eerste afbuigoppervlak en het tweede afbuigoppervlak in een richting loodrecht of in hoofdzaak loodrecht op het koordvlak, waarbij het eerste afbuigoppervlak en het tweede afbuigoppervlak zijn ingericht voor het afbuigen van extrusiemateriaal vanuit
35 respectievelijk het eerste stromingskanaal en het tweede stromingskanaal in de richting van en/of tot in de matrijs.

9. Extrudeerkop volgens conclusie 8, waarbij het

eerste afbuigoppervlak en het tweede afbuigoppervlak tangentieel zijn of in hoofdzaak tangentieel zijn aan de respectievelijke klerenhangersecties en het koordvlak.

10. Extrudeerkop volgens een der voorgaande
5 conclusies, waarbij de klerenhangersecties van het eerste stromingskanaal en het tweede stromingskanaal elk een omtrekswand omvatten, waarbij de extrudeerkop voor elk stromingskanaal een eerste klerenhangerhelpt en een tweede klerenhangerhelpt omvat welke zijn ingericht ten einde in
10 onderlinge aanligging geplaatst te worden aan tegengestelde zijde van een aanligvlak voor het vormen van de omtrekswand van het respectievelijke stromingskanaal.

11. Extrudeerkop volgens conclusie 10, waarbij het aanligvlak zich dwars of loodrecht op het koordvlak en
15 de koordrichting uitstrekt.

12. Extrudeerkop volgens conclusie 10 of 11, waarbij de respectievelijke stromingsbanen zich evenwijdig of in hoofdzaak evenwijdig aan het aanligvlak uitstrekken langs ten minste zeventig procent van de respectievelijke
20 klerenhangersecties.

13. Extrudeerkop volgens een der voorgaande conclusies, waarbij de eerste stromingsbaan en de tweede stromingsbaan snijden met en/of zich ten minste gedeeltelijk uitstrekken in het aanligvlak bij de
25 respectievelijk klerenhangersecties.

14. Extrudeerkop volgens een der conclusies 10-13, waarbij de omtrekswand van elk stromingskanaal symmetrisch of in hoofdzaak symmetrisch is ten opzichte van het aanligvlak langs ten minste zeventig procent van de
30 respectievelijke klerenhangersecties.

15. Extrudeerkop volgens een der conclusies 10-14, waarbij ten minste zeventig procent van het oppervlak van de omtrekswand bij de respectievelijke klerenhangersecties zich uitstrekt binnen het eerste bereik
35 ten opzichte van het koordvlak.

16. Extrudeerkop volgens conclusie 15, waarbij ten minste 80 procent, en bij voorkeur ten minste negentig

procent van het oppervlak van de omtrekswand bij de respectievelijke klerenhangersecties zich uitstrekt binnen het eerste bereik ten opzichte van het koordvlak.

17. Extrudeerkop volgens een der conclusies 10-
5 16, waarbij de eerste klerenhangerhelpt en de tweede klerenhangerhelpt separeerbaar zijn in een separatierichting evenwijdig aan de koordrichting.

18. Extrudeerkop volgens een der conclusies 10-
17, waarbij de extrudeerkop een eerste kopdeel omvat voor
10 het vasthouden of het vormen van de matrijs en een tweede kopdeel voor het vasthouden of het vormen van de koordgeleiding, waarbij de eerste klerenhangerhelpten gevormd zijn door het eerste kopdeel en waarbij de tweede klerenhangerhelpten gevormd zijn door het tweede kopdeel.

15 19. Extrudeerkop volgens een der conclusies 10-
17, waarbij de extrudeerkop een eerste kopdeel omvat voor het vasthouden of het vormen van de matrijs en een tweede kopdeel voor het vasthouden of het vormen van de koordgeleiding, waarbij de eerste klerenhangerhelpten
20 inzetstukken zijn die worden vastgehouden door het eerste kopdeel en waarbij de tweede klerenhangerhelpten inzetstukken zijn die worden vastgehouden door het tweede kopdeel.

20. Extrudeerkop volgens conclusie 19, waarbij
25 het eerste kopdeel en het tweede kopdeel separeerbaar zijn in een separatierichting evenwijdig aan het koordvlak.

21. Extrudeerkop volgens conclusie 19 of 20, waarbij het eerste kopdeel en het tweede kopdeel zijn ingericht teneinde in onderlinge aanligging te worden
30 geplaatst aan tegengestelde zijden van het aanligvlak.

22. Extrudeerkop volgens conclusie 18, waarbij de extrudeerkop een ontsnappingskanaal omvat dat zich uitstrekt bij het aanligvlak, waarbij het ontsnappingskanaal gesepareerd is van het eerste
35 stromingskanaal en het tweede stromingskanaal wanneer het eerste kopdeel en het tweede kopdeel in aanligging zijn bij het aanligvlak en waarbij het ontsnappingskanaal in

vloeiende verbinding is met het eerste stromingskanaal en/of het tweede stromingskanaal wanneer het eerste kopdeel en het tweede kopdeel gesepareerd zijn in de separatierichting.

5 23. Extrudeerkop volgens conclusie 19, waarbij de extrudeerkop een ontsnappingskanaal omvat dat zich uitstrekt bij het aanligvlak, waarbij het ontsnappingskanaal gesepareerd is van het eerste stromingskanaal en het tweede stromingskanaal door de
10 inzetstukken wanneer de inzetstukken in aanligging zijn bij het aanligvlak en waarbij het ontsnappingskanaal in vloeiende verbinding is met het eerste stromingskanaal en/of het tweede stromingskanaal wanneer de inzetstukken gesepareerd zijn in de separatierichting.

15 24. Extrudeerkop volgens conclusie 23, waarbij de kopdelen zijn ingericht teneinde in onderlinge aanligging te blijven buiten het ontsnappingskanaal wanneer de inzetstukken gesepareerd zijn in de separatierichting.

 25. Extrudeerkop volgens een der conclusies 18-
20 24, waarbij het tweede kopdeel een eerste behuizingsdeel omvat aan de eerste zijde van het koordvlak en het tweede behuizingsdeel aan de tweede zijde van het koordvlak, waarbij het eerste behuizingsdeel en het tweede behuizingsdeel samen een opneemruimte vormen voor het
25 opnemen van de koordgeleiding, waarbij het eerste behuizingsdeel en het tweede behuizingsdeel niet separeerbaar zijn in een normaalrichting loodrecht op het koordvlak.

 26. Extrudeerkop volgens conclusie 25, waarbij
30 het eerste behuizingsdeel en het tweede behuizingsdeel een enkel deel vormen.

 27. Extrudeerkop volgens een der voorgaande conclusies, waarbij de matrijs een eerste matrijsdeel omvat aan de eerste zijde van het koordvlak en een tweede
35 matrijsdeel aan de tweede zijde van het koordvlak, waarbij het eerste matrijsdeel en het tweede matrijsdeel samen een matrijsopening vormen waardoorheen het extrudaat de

extrudeerkop verlaat, waarbij het eerste matrijsdeel en het tweede matrijsdeel niet separeerbaar zijn in een normaalrichting loodrecht op het koordvlak.

28. Extrudeerkop volgens conclusie 27, waarbij
5 het eerste matrijsdeel en het tweede matrijsdeel een enkel deel vormen.

29. Extrudeerkop volgens een der voorgaande conclusies, waarbij de koordgeleiding verschuifbaar is in en uit een operationele positie in de extrudeerkop in een
10 koordrichting in respectievelijk de koordrichting en een schuifrichting tegengesteld aan de koordrichting.

30. Extrudeerkop volgens conclusie 29, waarbij de extrudeerkop verder een vergrendeldeel omvat dat is ingericht teneinde de koordgeleiding te vergrendelen tegen
15 het verschuiven in de schuifrichting wanneer de koordgeleiding in de operationele positie is.

31. Extrudeerkop volgens een der voorgaande conclusies, waarbij de koordgeleiding een eerste geleidingsdeel omvat aan de eerste zijde van het koordvlak
20 en een tweede geleidingsdeel aan de tweede zijde van het koordvlak, waarbij een van het eerste geleidingsdeel en het tweede geleidingsdeel een meervoud van uitwisselbare geleidingsblokken omvat welke naast elkaar zijn aangebracht in een laterale richting evenwijdig aan het koordvlak en
25 loodrecht op de koordrichting, waarbij elk blok een meervoud van geleidingskanalen omvat die zich uitstrekken in de koordrichting bij een evenwijdig aan het koordvlak voor het ontvangen van de koorden.

32. Extrudeerkop volgens conclusie 31, waarbij de
30 extrudeerkop verder een set vervangingsblokken omvat voor het vervangen van een of meer van de geleidingsblokken van de koordgeleiding, waarbij ten minste een van de vervangingsblokken hetzelfde meervoud aan geleidingskanalen omvat als de geleidingsblokken van de koordgeleiding.

33. Extrudeerkop volgens conclusie 31, waarbij de
35 extrudeerkop verder een set vervangingsblokken omvat voor het vervangen van een of meer van de geleidingsblokken van

de koordgeleiding, waarbij ten minste een van de vervangingsblokken een ander aantal of vorm van geleidingskanalen omvat dan de geleidingsblokken van de koordgeleiding.

5 34. Extrudeerkop volgens een der conclusies 31-33, waarbij het meervoud van geleidingskanalen ten minste één geleidingskanaal omvat dat bepaald wordt door twee direct naast elkaar gelegen geleidingsblokken.

10 35. Werkwijze voor het extruderen van door koorden versterkt extrudaat met gebruikmaking van de extrudeerkop volgens een der voorgaande conclusies, waarbij de werkwijze de stappen omvat van het toevoeren van op druk gebracht extrusiemateriaal tot in het eerste stromingskanaal en het tweede stromingskanaal en het
15 opvangen van de drukkrachten die gegenereerd worden door het op druk gebrachte extrusiemateriaal in de respectievelijke klerenhangersecties in een richting evenwijdig of in hoofdzaak evenwijdig aan het koordvlak.

20 36. Werkwijze volgens conclusie 35, waarbij de extrudeerkop een ontsnappingskanaal omvat, waarbij de werkwijze de stap omvat van het toelaten dat het extrusiemateriaal ontsnapt vanuit het eerste stromingskanaal en/of het tweede stromingskanaal via het ontsnappingskanaal wanneer het drukniveau van het
25 extrusiemateriaal stijgt tot een gevaarlijk niveau.

30 37. Werkwijze volgens conclusie 35 of 36, waarbij de werkwijze de stap omvat van het schuiven van de koordgeleiding in en uit een operationele positie in de extrudeerkop in respectievelijk de koordrichting en een schuifrichting tegengesteld aan de koordrichting.

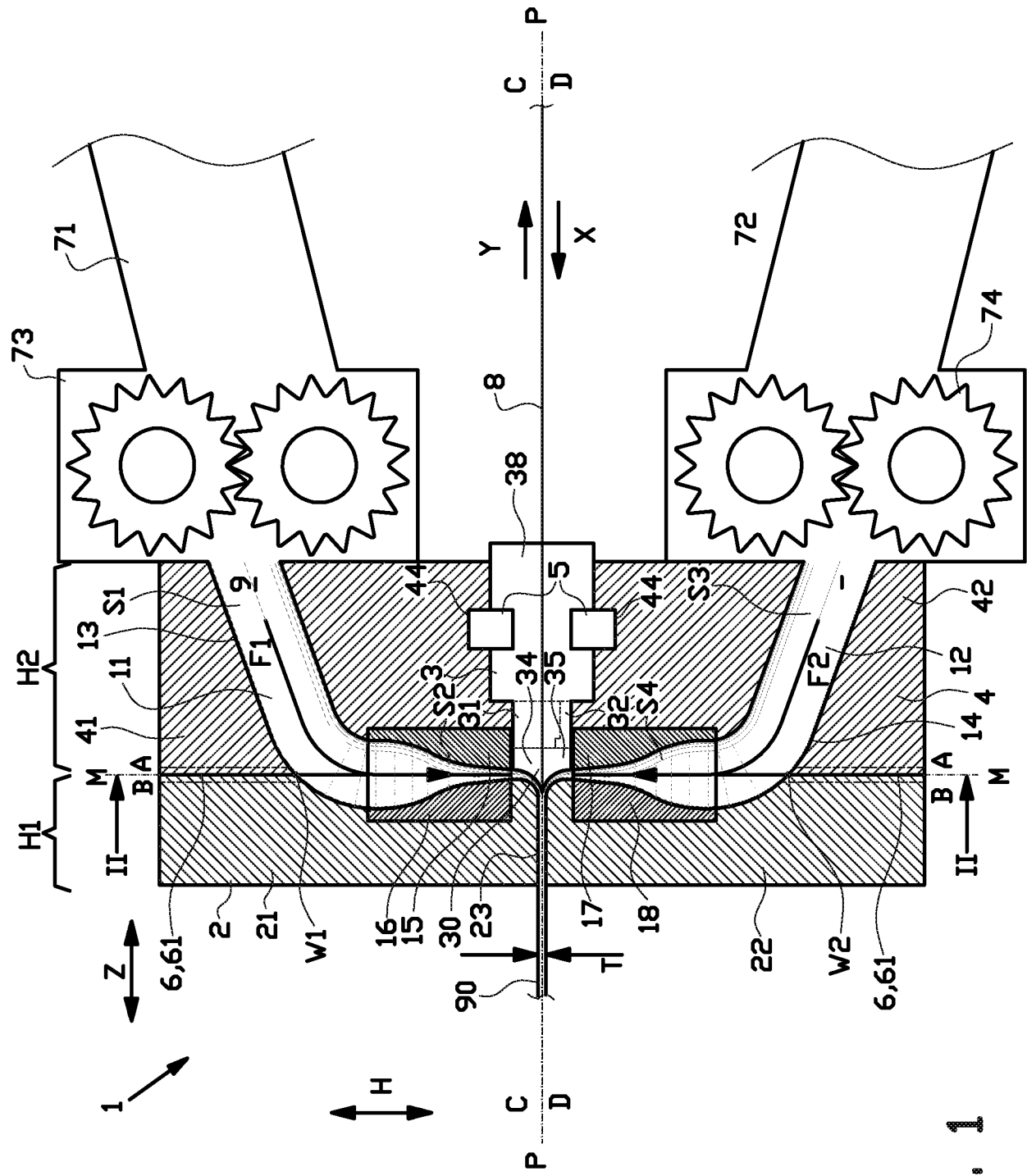


FIG. 1

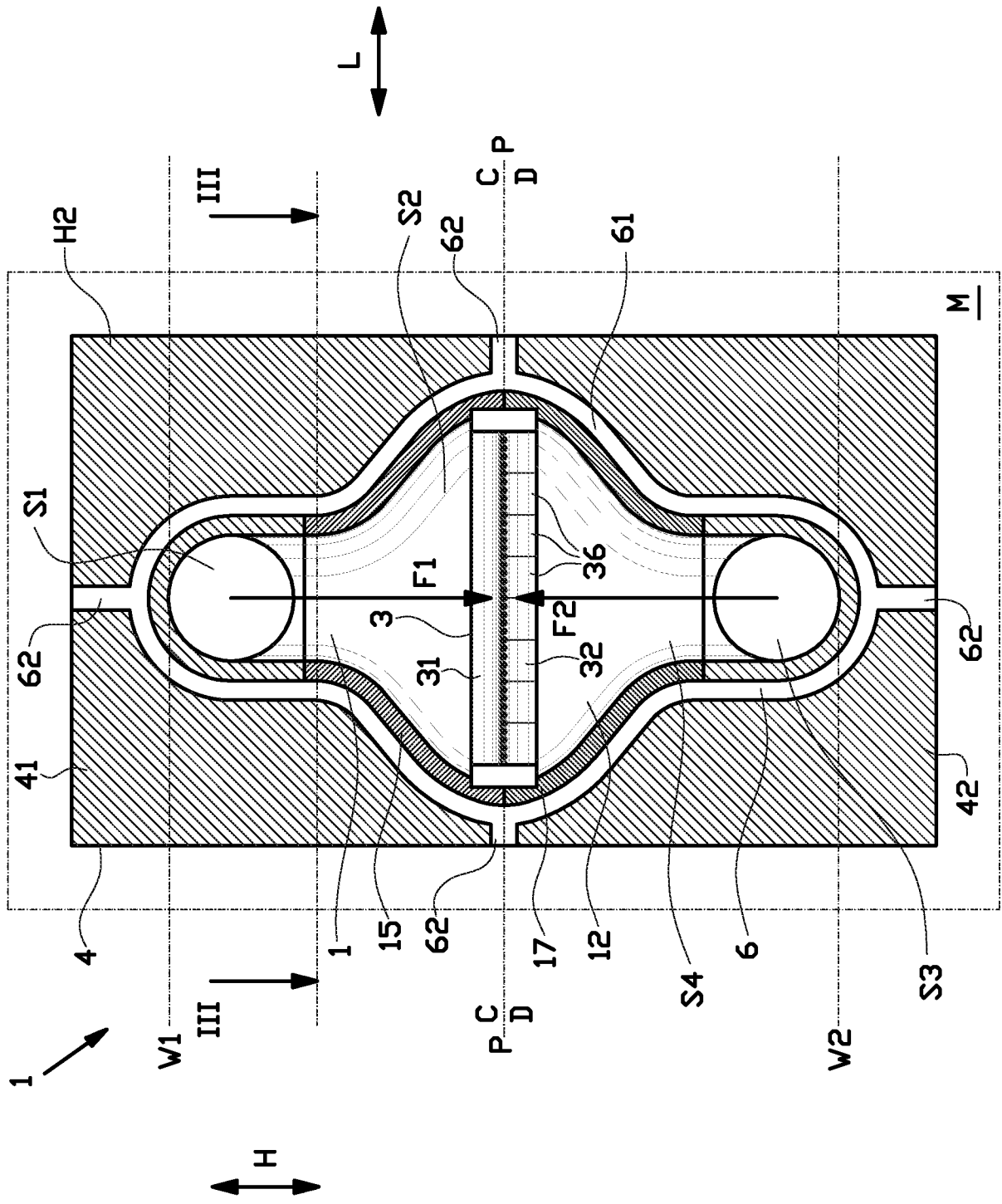


FIG. 2

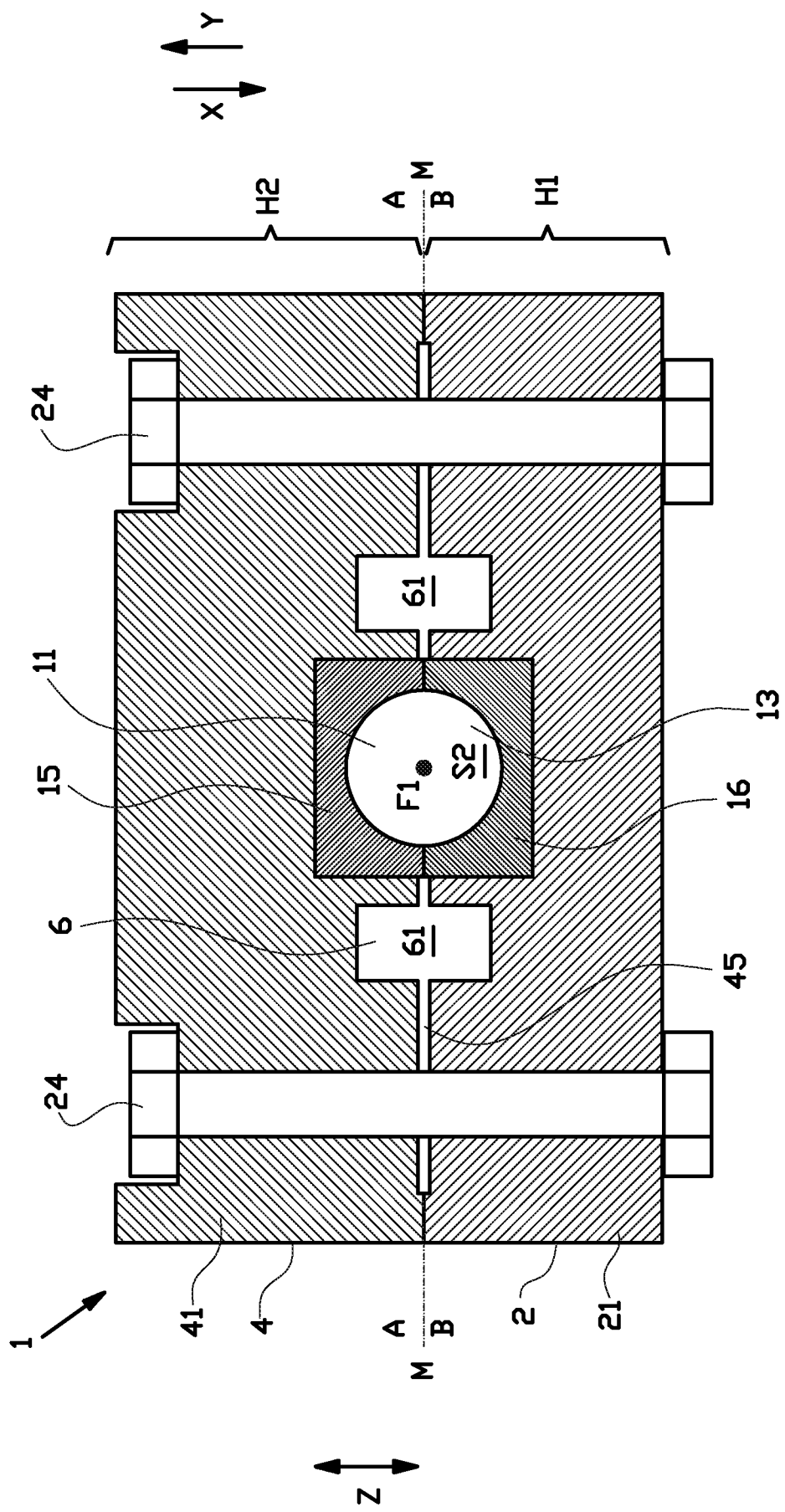
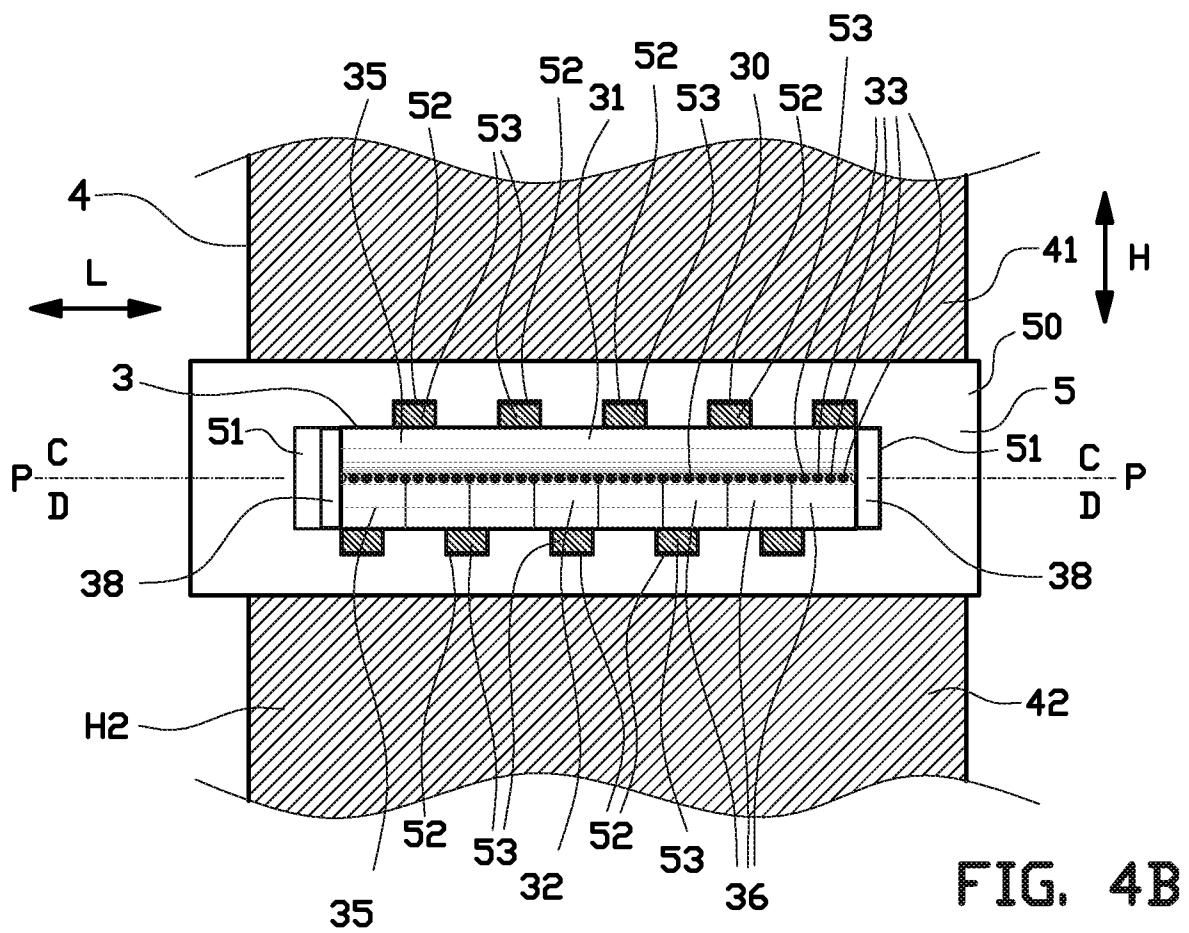
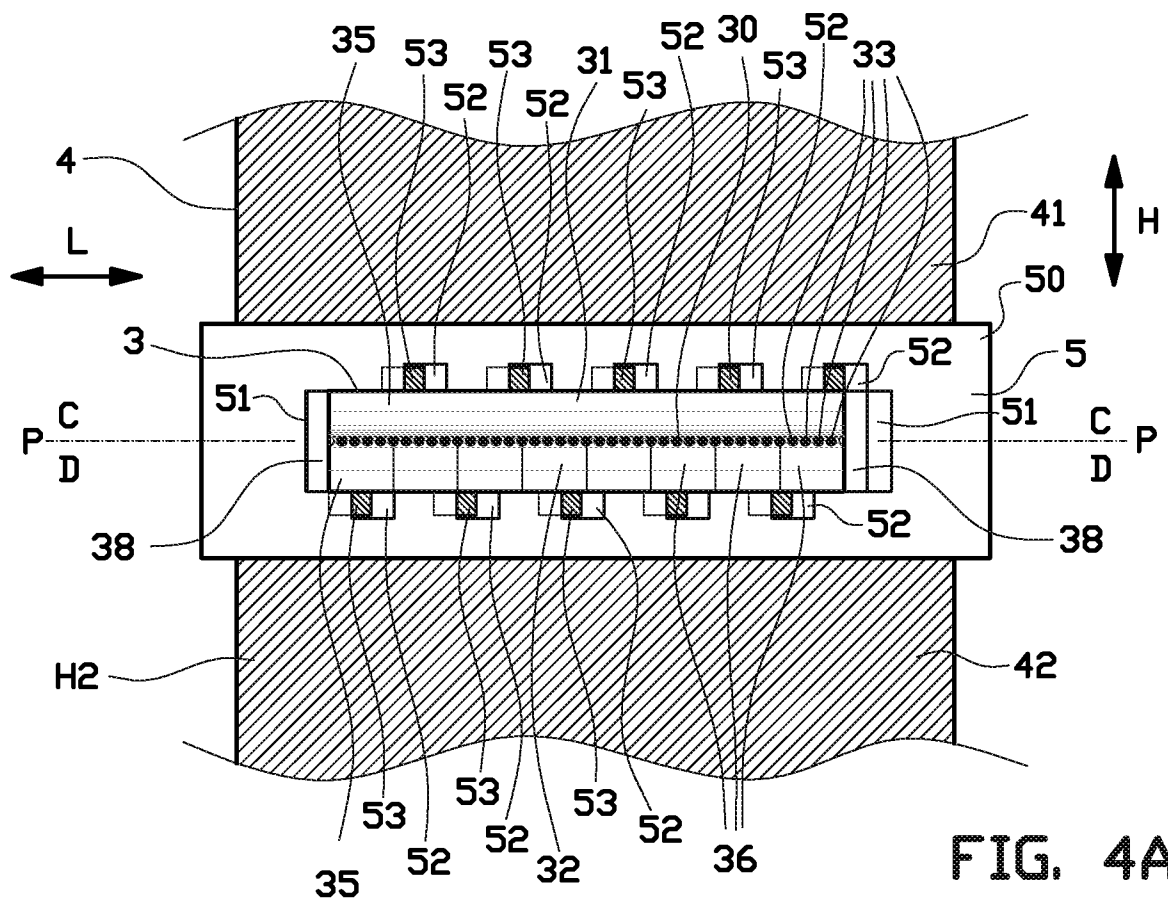


FIG. 3



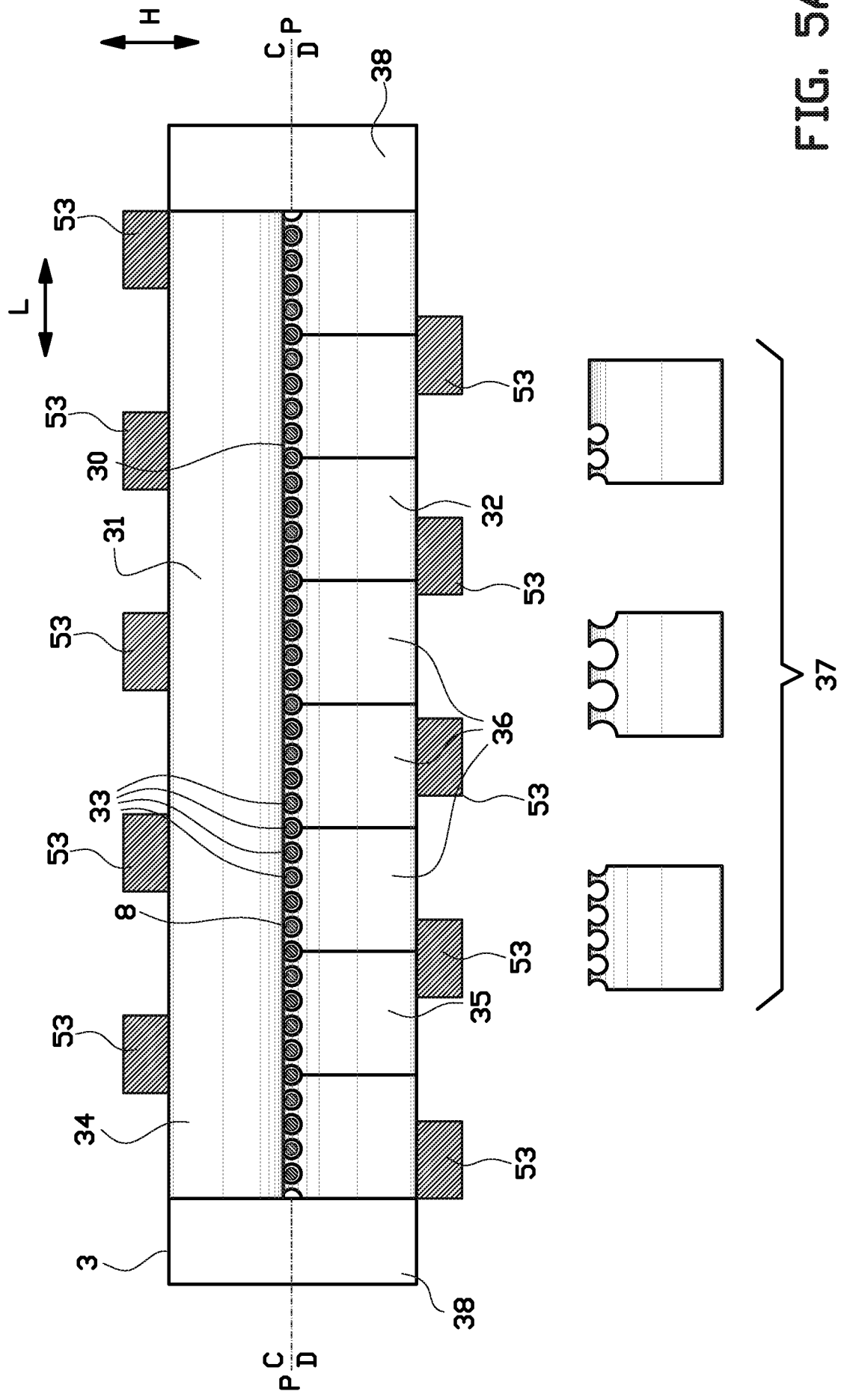
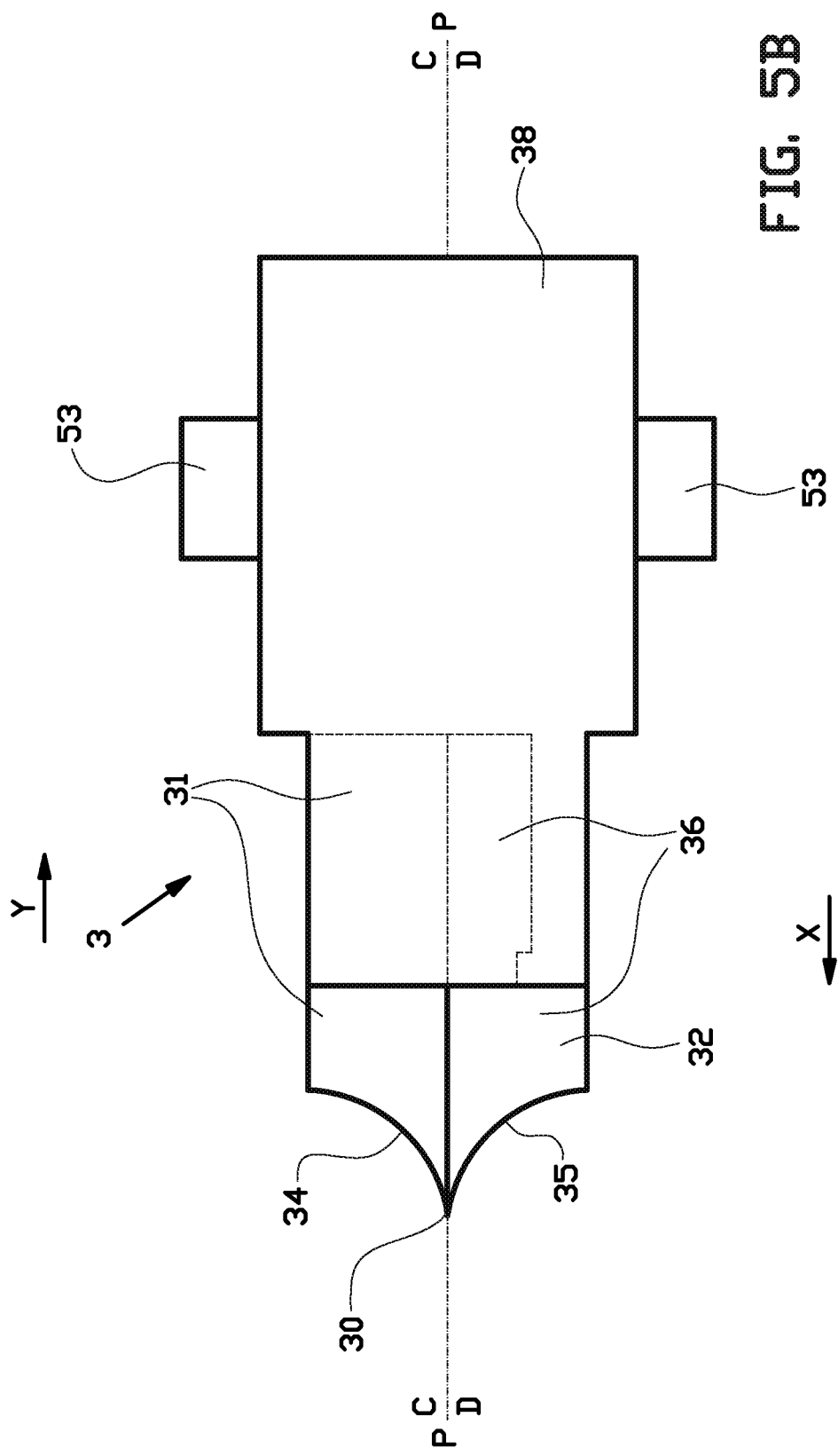
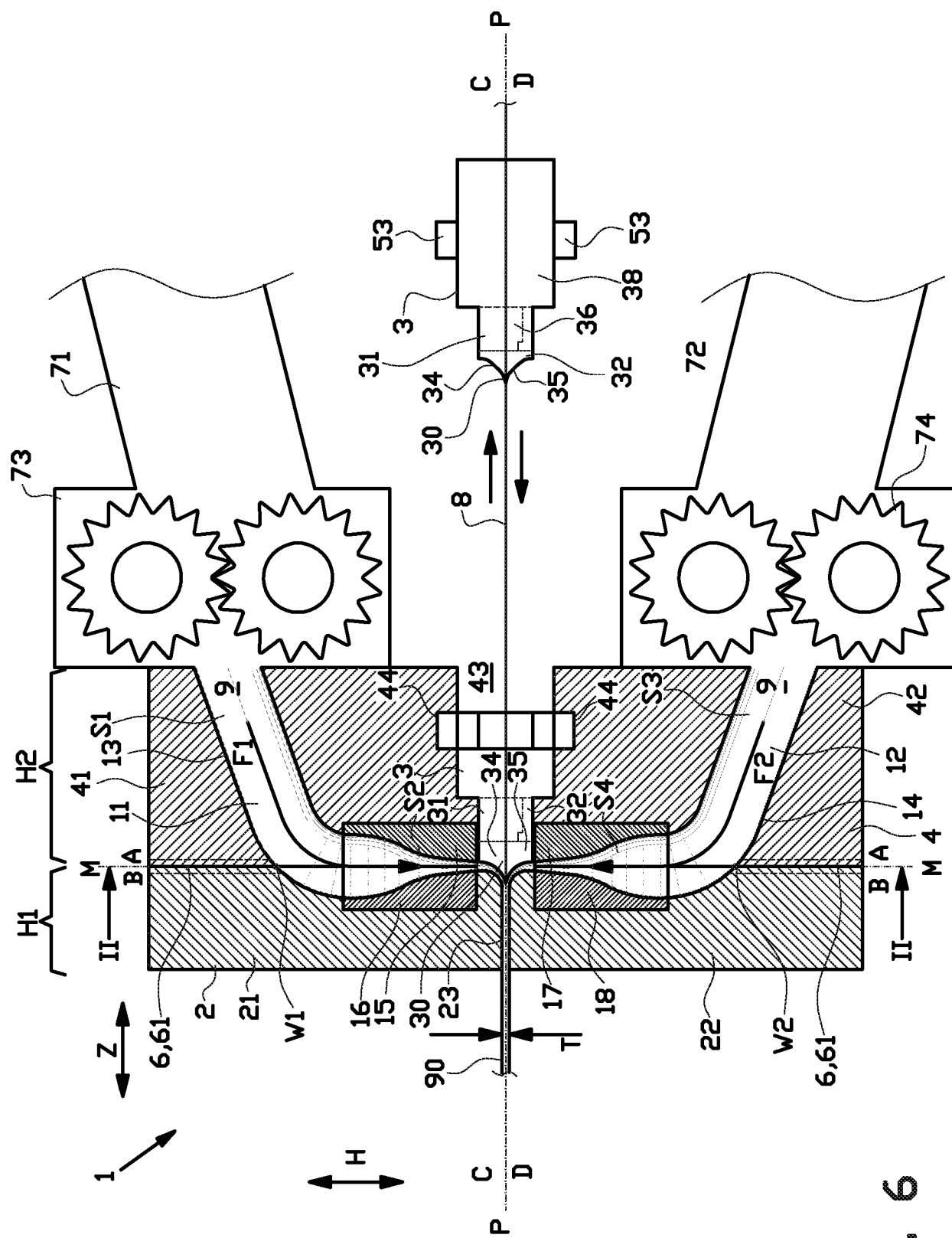


FIG. 5A





515

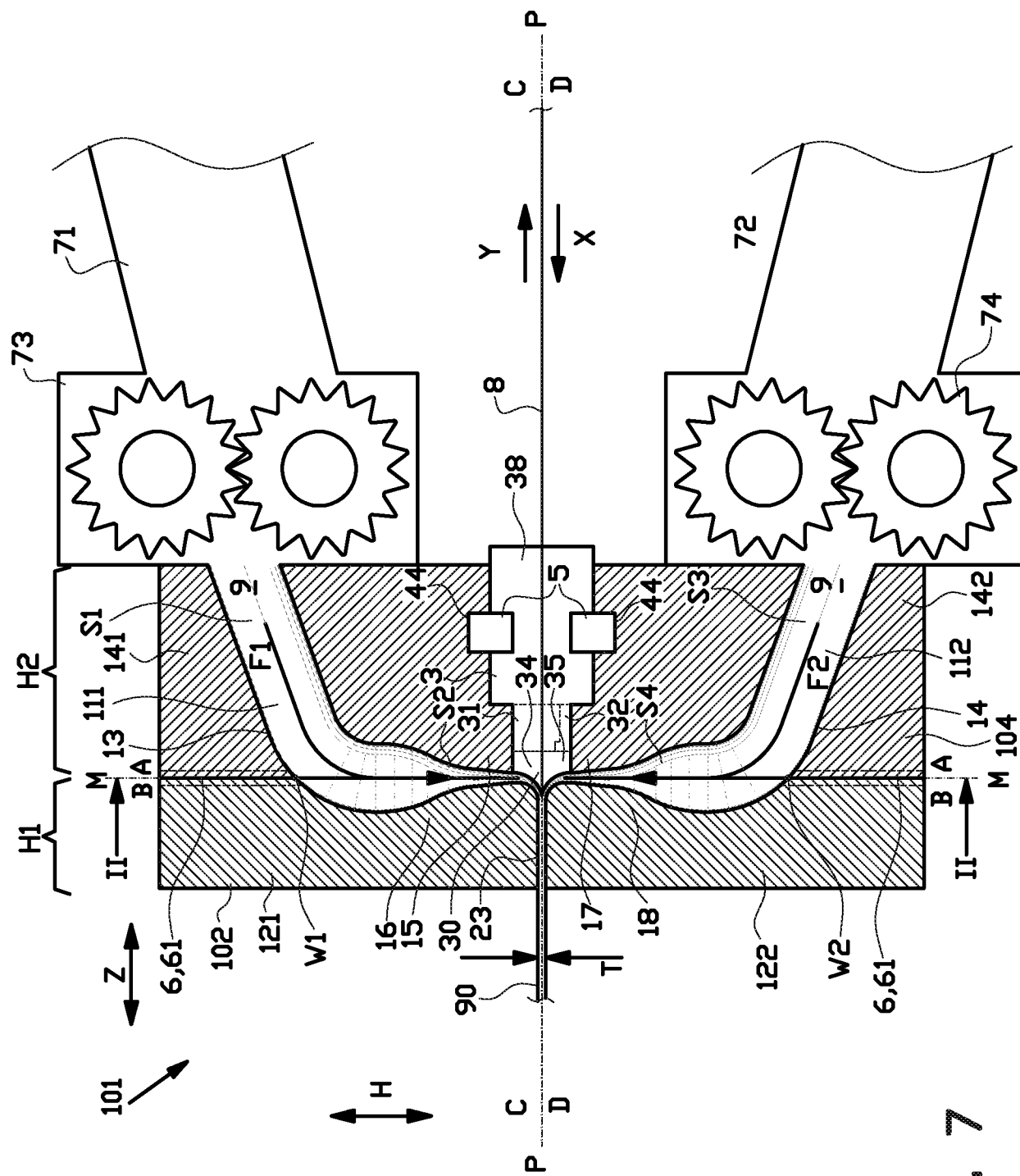


FIG. 7

A B S T R A C T

The invention relates to an extruder head for extruding cord reinforced extrudate, wherein the extruder head comprises a die and a cord guide, wherein the extruder head further comprises a first flow channel that extends
5 along a first flow path through the extruder head at and debouches into the die from a first side of a cord plane and a second flow channel that extends along a second flow path through the extruder head at and debouches into the die from a second side of the cord plane, wherein the first
10 flow path and the second flow path each comprise a supply section and a coat-hanger section, wherein the first flow path and the second flow path, in their respective coat-hanger sections, extend within a first range of eighty-five to ninety-five degrees with respect to the cord plane along
15 at least seventy percent of the coat-hanger sections.

SAMENWERKINGSVERDRAG (PCT)

RAPPORT BETREFFENDE NIEUWHEIDSONDERZOEK VAN INTERNATIONAAL TYPE

IDENTIFICATIE VAN DE NATIONALE AANVRAGE	KENMERK VAN DE AANVRAGER OF VAN DE GEMACHTIGDE
	NLP199016A
Nederlands aanvraag nr.	Indieningsdatum
2016826	25-05-2016
	Ingeroepen voorrangsdatum
Aanvrager (Naam)	
VMI Holland B.V.	
Datum van het verzoek voor een onderzoek van internationaal type	Door de Instantie voor Internationaal Onderzoek aan het verzoek voor een onderzoek van internationaal type toegekend nr.
09-07-2016	SN 66807
I. CLASSIFICATIE VAN HET ONDERWERP (bij toepassing van verschillende classificaties, alle classificatiesymbolen opgeven) Volgens de internationale classificatie (IPC)	
B29C47/02;B29C47/10;B29C47/14;B29C47/08;B29L29/00;B29C47/56;B29C47/00 B29D30/38	
II. ONDERZOCHE GEBIEDEN VAN DE TECHNIEK	
Onderzochte minimumdocumentatie	
Classificatiesysteem	Classificatiesymbolen
IPC	B29C;B29L;B29D
Onderzochte andere documentatie dan de minimum documentatie, voor zover dergelijke documenten in de onderzochte gebieden zijn opgenomen	
III.	☐ GEEN ONDERZOEK MOGELIJK VOOR BEPAALDE CONCLUSIES (opmerkingen op aanvullingsblad)
IV.	☐ GEBREK AAN EENHEID VAN UITVINDING (opmerkingen op aanvullingsblad)

**ONDERZOEKSRAPPORT BETREFFENDE HET
RESULTAAT VAN HET ONDERZOEK NAAR DE STAND
VAN DE TECHNIEK VAN HET INTERNATIONALE TYPE**

Nummer van het verzoek om een onderzoek naar
de stand van de techniek

NL 2016826

A. CLASSIFICATIE VAN HET ONDERWERP

INV. B29C47/02 B29C47/10 B29C47/14 B29C47/08
ADD. B29L29/00 B29C47/56 B29C47/00 B29D30/38

Volgens de Internationale Classificatie van octrooien (IPC) of zowel volgens de nationale classificatie als volgens de IPC.

B. ONDERZOCHETE GEBIEDEN VAN DE TECHNIEK

Onderzochte minimum documentatie (classificatie gevolgd door classificatiesymbolen)

B29C B29L B29D

Onderzochte andere documentatie dan de minimum documentatie, voor dergelijke documenten, voor zover dergelijke documenten in de onderzochte gebieden zijn opgenomen

Tijdens het onderzoek geraadpleegde elektronische gegevensbestanden (naam van de gegevensbestanden en, waar uitvoerbaar, gebruikte trefwoorden)

EPO-Internal, WPI Data

C. VAN BELANG GEACHTE DOCUMENTEN

Categorie "	Geïsoleerde documenten, eventueel met aanduiding van speciaal van belang zijnde passages	Van belang voor conclusie nr.
A	US 2015/283750 A1 (KENNY ANDREW OLIVER [CA] ET AL) 8 oktober 2015 (2015-10-08) * samenvatting * * figuren 3,11 *	1-37
A	WO 2015/105413 A1 (VMI HOLLAND BV [NL]) 16 juli 2015 (2015-07-16) * samenvatting * * figuren 1,2,4 *	1-37
A	JP S54 36374 A (SUMITOMO RUBBER IND) 17 maart 1979 (1979-03-17) * samenvatting * * figuur 10 *	1-37

-/-



Verdere documenten worden vermeld in het vervolg van vak C.



Leden van dezelfde octrooifamilie zijn vermeld in een bijlage

* Speciale categorieën van aangehaalde documenten

"A" niet tot de categorie X of Y behorende literatuur die de stand van de techniek beschrijft

"D" in de octrooiaanvraag vermeld

"E" eerdere octrooi(aanvraag), gepubliceerd op of na de indieningsdatum, waarin dezelfde uitvinding wordt beschreven

"L" om andere redenen vermelde literatuur

"O" niet-schriftelijke stand van de techniek

"P" tussen de voorrangsdatum en de indieningsdatum gepubliceerde literatuur

"T" na de indieningsdatum of de voorrangsdatum gepubliceerde literatuur die niet bezwarend is voor de octrooiaanvraag, maar wordt vermeld ter verheldering van de theorie of het principe dat ten grondslag ligt aan de uitvinding

"X" de conclusie wordt als niet nieuw of niet inventief beschouwd ten opzichte van deze literatuur

"Y" de conclusie wordt als niet inventief beschouwd ten opzichte van de combinatie van deze literatuur met andere geïsoleerde literatuur van dezelfde categorie, waarbij de combinatie voor de vakman voor de hand liggend wordt geacht

"Z" lid van dezelfde octrooifamilie of overeenkomstige octrooipublicatie

Datum waarop het onderzoek naar de stand van de techniek van internationaal type werd voltooid

1 februari 2017

Verzenddatum van het rapport van het onderzoek naar de stand van de techniek van internationaal type

Naam en adres van de instantie

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040
Fax: (+31-70) 340-3016

De bevoegde ambtenaar

Koning, Erik

**ONDERZOEKSRAPPORT BETREFFENDE HET
RESULTAAT VAN HET ONDERZOEK NAAR DE STAND
VAN DE TECHNIEK VAN HET INTERNATIONALE TYPE**

Nummer van het verzoek om een onderzoek naar
de stand van de techniek

NL 2016826

C.(Vervolg). VAN BELANG GEACHTE DOCUMENTEN

Categorie *	Geciteerde documenten, eventueel met aanduiding van speciaal van belang zijnde passages	Van belang voor conclusie nr.
A,D	EP 0 339 510 A2 (FIRESTONE TIRE & RUBBER CO [US]) 2 november 1989 (1989-11-02) in de aanvraag genoemd * samenvatting * * figuur 1 * -----	1-37

**ONDERZOEKSRAPPORT BETREFFENDE HET
RESULTAAT VAN HET ONDERZOEK NAAR DE STAND
VAN DE TECHNIEK VAN HET INTERNATIONALE TYPE**

Informatie over leden van dezelfde octrooifamilie

Nummer van het verzoek om een onderzoek naar
de stand van de techniek

NL 2016826

In het rapport genoemd octrooigeschrift	Datum van publicatie	Overeenkomend(e) geschrift(en)	Datum van publicatie
US 2015283750	A1	08-10-2015	GEEN
WO 2015105413	A1	16-07-2015	CN 105899352 A 24-08-2016
		EP 3092120 A1 16-11-2016	
		JP 2017501909 A 19-01-2017	
		KR 20150131311 A 24-11-2015	
		NL 2012075 C 13-07-2015	
		US 2016325478 A1 10-11-2016	
		WO 2015105413 A1 16-07-2015	
JP S5436374	A	17-03-1979	GEEN
EP 0339510	A2	02-11-1989	AR 241765 A1 30-12-1992
		BR 8901972 A 05-12-1989	
		CA 1319800 C 06-07-1993	
		DE 68911980 D1 17-02-1994	
		DE 68911980 T2 28-04-1994	
		EP 0339510 A2 02-11-1989	
		ES 2047597 T3 01-03-1994	
		IT 1219242 B 03-05-1990	
		MX 169857 B 28-07-1993	
		US 4948354 A 14-08-1990	

WRITTEN OPINION

File No. SN66807	Filing date (day/month/year) 25.05.2016	Priority date (day/month/year)	Application No. NL2016826
International Patent Classification (IPC) INV. B29C47/02 B29C47/10 B29C47/14 B29C47/08 ADD. B29L29/00 B29C47/56 B29C47/00 B29D30/38			
Applicant VMI Holland B.V.			

This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☒ Box No. VII Certain defects in the application
- ☒ Box No. VIII Certain observations on the application

	Examiner Koning, Erik
--	--------------------------

WRITTEN OPINION

Application number

NL2016826

Box No. I Basis of this opinion

1. This opinion has been established on the basis of the latest set of claims filed before the start of the search.
2. With regard to any **nucleotide and/or amino acid sequence** disclosed in the application and necessary to the claimed invention, this opinion has been established on the basis of:
 - a. type of material:
 - ☐ a sequence listing
 - ☐ table(s) related to the sequence listing
 - b. format of material:
 - ☐ on paper
 - ☐ in electronic form
 - c. time of filing/furnishing:
 - ☐ contained in the application as filed.
 - ☐ filed together with the application in electronic form.
 - ☐ furnished subsequently for the purposes of search.
3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
4. Additional comments:

Box No. V Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty	Yes: Claims	1-37
	No: Claims	
Inventive step	Yes: Claims	1-37
	No: Claims	
Industrial applicability	Yes: Claims	1-37
	No: Claims	

2. Citations and explanations

see separate sheet

WRITTEN OPINION

Application number

NL2016826

Box No. VII Certain defects in the application

see separate sheet

Box No. VIII Certain observations on the application

see separate sheet

Re Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1 Prior art

Reference is made to the following document:

D1 US 2015/283750 A1 (KENNY ANDREW OLIVER [CA] ET AL) 8 oktober 2015 (2015-10-08)

2 Novelty and inventive step

The present application appears to meet the criteria of patentability, because the subject-matter of claim 1 appears to be novel over the prior art found.

2.1 Independent claim 1

D1 discloses (the references in parenthesis referring to this document):

Extrudeerkop (fig.3) voor het extruderen van door koorden versterkt extrudaat, waarbij de extrudeerkop een matrijs (fig.3, ref.32) omvat voor het ontvangen van koorden en extrusiemateriaal in een koordrichting en een koordgeleiding (fig.3, ref.48) voor het naast elkaar geleiden van koorden in een koordvlak evenwijdig aan de koordrichting tot in de matrijs, waarbij de extrudeerkop verder een eerste stromingskanaal (fig. 11, ref.74) omvat dat zich uitstrekt langs een eerste stromingsbaan door de extrudeerkop aan en uitmondend in de matrijs vanaf een eerste zijde van het koordvlak en een tweede stromingskanaal (fig.11, ref.40) dat zich uitstrekt langs een tweede stromingsbaan door de extrudeerkop aan en uitmondend in de matrijs vanaf een tweede zijde van het koordvlak tegengesteld aan de eerste zijde, waarbij de eerste stromingsbaan en de tweede stromingsbaan elk een toevoersectie (fig.11, ref.72, ref.38) omvatten

en de eerste stromingsbaan een klerenhangersectie met een verbredende dwarsdoorsnede stroomafwaarts van de toevoersectie omvat, waarbij de eerste stromingsbaan in zijn respectievelijke klerenhangersectie

zich onder een hoek binnen een eerste bereik van vijftientig tot vijfennegentig graden (fig.11, ref.74, see fig.3) ten opzichte van het koordvlak uitstrekt langs ten minste zeventig procent van de respectievelijke klerenhangersecties (fig.3).

The subject-matter of claim 1 therefore differs from this known extruder head in that also the second flow channel comprises a coat hanger section flowing into the die in angle of 85 - 95 ° along at least 70% of its coat hanger section.

Therefore, the subject-matter of **claim 1** is new in view of the disclosure of D1.

The problem to be solved by the present invention may therefore be regarded as to provide an alternative extruder head for extruding cord reinforced extrudate that improves the thickness of accuracy of the extrudate (p.3, l.8-9 of the present application).

Since D1 remains silent about the problem of thickness deviations and does not give any hint to replacing the central feed section by a further coat hanger section flowing into the cord plane from the downside, the skilled person is not prompted to the solution proposed.

The subject-matter of claim 1 is therefore regarded as being inventive over the prior art found.

2.2 Independent claim 35

The same reasoning applies mutatis mutandis for independent method claim 35.

The subject-matter of claim 35 is therefore regarded as being novel and inventive over the prior art found.

2.3 Dependent claims

The dependent claims comprise all features of the respective independent claims and are therefore also regarded as being novel and inventive over the prior art found.

Re Item VII

Certain defects in the international application

3 Cited prior art

The relevant background art disclosed in D1 is not mentioned in the description, nor is this document identified therein.

4 Formal objections

Independent claim 1 is not in the two-part form, which in the present case would be appropriate, with those features known in combination from the prior art being placed in the preamble and the remaining features being included in the characterising part.

Re Item VIII

Certain observations on the international application

5 Clarity

- 5.1 The vague statement in the description on page 22, lines 16 - 21, implies that the subject-matter for which protection is sought may be different to that defined by the claims, thereby resulting in lack of clarity when used to interpret them.