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(54) **MACHINE FOR MAKING COMPOSITE FILTERS**

MASCHINE ZUR HERSTELLUNG VON VERBUNDFILTERN

MACHINE POUR LA FABRICATION DE FILTRES COMPOSITES

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Description

Technical field

[0001] This invention relates to a machine for making composite filters.

Background art

[0002] It is known that the harmful effects of cigarette smoke are reduced by applying composite filters to cigarettes. Composite filters are filters obtained by juxtaposing two or more filter sticks having different filtering properties.

[0003] Machines for making filters of this kind comprise one or more combining units capable of feeding a plurality of groups of filter sticks having different filtering properties to a forming beam for forming one or two filter rods.

[0004] On leaving the combining units, these groups of filter sticks are transferred to the forming beam by rotary transfer means typically embodied by rollers equipped with respective pickup elements and/or splined rollers.

[0005] These transfer rollers are driven in rotation by a respective motor unit.

[0006] A group of filter sticks aligned axially with each other is thus formed in each of the pickup elements and/or in each of the grooves on the rollers. The groups of filter sticks are then made to move in a direction transversal to their longitudinal axes in order to transfer them to a common receiving conveyor roller, provided with respective peripheral hold-down seats, which feeds the forming beam.

[0007] A continuous succession of groups of sticks touching end to end is made to advance along the forming beam and to pass through a forming station where the succession of sticks is wrapped in a web of wrapping material to make at least one filter rod.

[0008] The filter rod or rods are then subdivided into individual filters by a rotary knife located at the outfeed end of the forming beam.

[0009] Depending on the size of the composite filter to be obtained, the number of filter sticks making up each group of sticks varies.

[0010] Thus, the transfer means which carry these groups from the combining feed unit to the forming beam must be able to adapt the spacing of the pickup elements to the length of the groups of sticks transferred in order to prevent overlapping or excessive spacing between two successive groups placed on the forming beam.

[0011] At present, in the event of a changeover, that is to say, when the length of the groups of filter sticks transferred changes, the number of pickup elements at least of the last roller is varied or, alternatively, the entire roller is substituted for one having either a different number of pickup elements or a different diameter with the same number of pickup elements.

[0012] In the latter case, the pickup elements of the common receiving conveyor roller may describe a plurality of circles ranging from a circle with a minimum radius to a circle with a maximum radius when the length of the groups of filter sticks increases.

[0013] When the circle described by the pickup elements of the common receiving conveyor roller varies, it is necessary to reposition and fine tune the new position of the transfer rollers upstream of the common conveyor roller itself.

[0014] Such repositioning is a highly complex operation because it involves substituting each transfer roller for the respective roller of appropriate size and then precisely adjusting it. Moreover, for every changeover, the entire drive unit of the transfer rollers must be substituted which in turn translates as extended machine downtime. A machine for making composite filters is known from EP 1 787 534 A1.

Aim of the invention

[0015] This invention has for an aim to provide a machine for making composite filters capable of overcoming the disadvantages of the prior art and as set out in the annexed independent claim 1.

Brief description of the drawings

[0016] The invention is described below with reference to the accompanying drawings, which illustrate a non-limiting embodiment and in which:

- Figure 1 is a schematic front view of a machine for making composite filters according to this invention;
- Figures 2 to 4 illustrate a detail from Figure 1 in different configurations, each of which corresponds to a respective size of groups of filter sticks;
- Figure 5 is a schematic plan view, with some parts cut away in order to better illustrate others, of a transfer unit illustrated in Figure 1;
- Figure 6 illustrates the detail of Figure 5 during changeover;
- Figure 7 illustrates the machine of Figure 1 in a schematic plan view from above, with some parts cut away in order to better illustrate others;
- Figure 8 illustrates a second, alternative embodiment of the machine of Figure 7.

Detailed description of preferred embodiments of the invention

[0017] With reference to Figure 1, the numeral 1 denotes a machine for making composite filters.

[0018] More specifically, the machine 1 comprises a combining unit 2 for combining groups 3 of filter sticks which have different filtering properties and whose length is variable from a minimum value to a maximum value; The groups 3 of filter sticks are aligned with each other along a main axis of extension 3a and advance along a

first feed path P1 at a first spacing. The machine 1 comprises a first conveyor 4 which rotates about its axis 4a parallel to the axis 3a of the groups 3 of filter sticks.

[0019] The first conveyor 4 is equipped with a plurality of first carrier assemblies 5, each having at least one first hold-down seat 6 with axis 6a parallel to the axis 3a of the groups 3 of filter sticks.

[0020] The first conveyor 4 receives the groups 3 of filter sticks from the combining unit 2.

[0021] More specifically, at least one transfer roller 17 conveys the groups 3 of filter sticks from the combining unit 2 to the first conveyor 4.

[0022] The machine 1 comprises a second conveyor 7 which rotates about its axis 7a parallel to the axis 4a of the first conveyor 4.

[0023] The second conveyor 7 is equipped with a plurality of second carrier assemblies 8, each having at least one second hold-down seat 9 with axis 9a substantially perpendicular to the axis 6a of the first seat 6 of the first carrier assemblies 5 of the first conveyor 4.

[0024] It should be noted that along the first path P1, the main axis of extension 3a of the groups of filter sticks 3 is transversal to the first path P1 until the filter sticks reach the second conveyor 7.

[0025] Downstream of the second conveyor 7, the groups 3 of filter sticks advance with their main axis of extension 3a parallel to the first path P1. The second seats 9 of the second conveyor 7 can describe a circle whose radius varies from a minimum to a maximum with variation of the length of the groups 3 of filter sticks.

[0026] More precisely, the second seats 9 of the second conveyor 7 describe a circle whose radius varies from a minimum to a maximum when the length of the groups 3 of filter sticks increases.

[0027] The machine 1 comprises a forming beam 10 for forming at least one continuous succession 11 of groups 3 of filter sticks aligned and in contact with each other to eventually define a respective single continuous rod of filter sticks.

[0028] In an alternative embodiment, as illustrated in Figure 8, the machine 1 comprises a forming beam 10 for forming two continuous successions 11 of groups 3 of filter sticks aligned and in contact with each other to eventually define two respective individual continuous rods of filter sticks. The forming beam 10 extends along a forming line 12 substantially parallel to the first feed path P1. The machine 1 comprises a transfer unit 13 interposed between the first and the second rotating conveyor 4 and 7. The transfer unit 13 comprises a first, cylindrical splined roller 14 with axis 14a parallel to the first and the second rotating conveyor 4, 7 and a second, tapered splined roller 15 with axis 15a inclined to the first, cylindrical roller 14 and tangent thereto.

[0029] More specifically, the first, cylindrical splined roller 14 is tangent to the first rotating conveyor 4 and the second, tapered splined roller 15 is tangent to the second rotating conveyor 7.

[0030] The first, cylindrical splined roller 14 and the second, tapered splined roller 15 are coupled to a respective shaft 19, 29.

[0031] The transfer unit 13 comprises at least one drive shaft 27, which rotates about its axis of rotation 27a, for moving the first and second splined rollers 14 and 15.

[0032] The drive shaft 27 is driven in rotation by a motor unit schematically represented as a block 34.

[0033] The transfer unit 13 comprises adapter means 16 capable of adapting the transfer unit 13 to variations of the circle described by the second seats 9 of the second conveyor 7, that is to say, to variations of the length of the groups 3 of filter sticks.

[0034] Advantageously, at every size changeover, the adapter means 16 allow the axis 15a of the second, tapered roller 15 to be kept fixed while varying the position of the axis 14a of the first, cylindrical roller 14 relative to the transfer unit 13.

[0035] Alternatively, in a second embodiment not illustrated, at every size changeover, the adapter means 16 allow the axis 14a of the first, cylindrical roller 14 to be kept fixed while varying the position of the axis 15a of the second, tapered roller 15 relative to the transfer unit.

[0036] In this specification, the adapter means 16 refer preferably to the first, cylindrical roller 14 .

[0037] In an alternative embodiment not illustrated, the considerations made in this specification with regard to the adapter means 16 apply just as well to the second, tapered roller 15.

[0038] The adapter means 16 comprise a supporting element 18 for supporting the first, cylindrical roller 14.

[0039] The transfer unit 13 comprises a containment box 20 relative to which the supporting element 18 is interchangeable with variation of the length of the groups 3 of filter sticks, that is, with variation of the circle described by the second seats 9 of the second conveyor 7.

[0040] The box 20 contains at least the first, cylindrical splined roller 14, the second, tapered splined roller 15 and the drive shaft 27.

[0041] The supporting element 18 comprises rapid connect/disconnect means 21 allowing it to be quickly interchanged relative to the transfer unit 13.

[0042] More specifically, the supporting element 18 comprises a spacer sleeve 22 having a hole 23 in it for receiving the shaft 19 of the first, cylindrical roller 14 - or the shaft 29 of the second, tapered roller 15 in the alternative embodiment, not illustrated - the position of whose respective axis 14a must be changed relative to the transfer unit 13.

[0043] The sleeve 22 has an outside surface 24 designed to be stably coupled to a respective receiving seat 25 formed on the box 20 of the transfer unit 13.

[0044] It should be noted that the spacer sleeve 22 is made in as many different shapes as there are positions which may be adopted by the axis of rotation 14a of the shaft 19 of the respective first, cylindrical roller 14, the position of whose respective axis 14a must be changed relative to the transfer unit 13.

[0045] In effect, for each position adopted by the spac-

er sleeve 22, the position of the hole 23 which receives the shaft 19 of the respective first roller 14 changes in such a way that, once mounted on the respective receiving seat 25, the axis of rotation 14a of the shaft 19 of the respective first roller 14 is in the correct position when the length of the groups 3 of the filter sticks varies.

[0046] In other words, the spacer sleeve 22 is interchangeable with variation of the circle described by the second seats 9 of the second conveyor 7. With variation of the spacer sleeve 22, the position of the axis 14a of the shaft 19 of the respective first, cylindrical roller 14 varies relative to the receiving seat 25 of the box 20.

[0047] The adapter means 16 comprise a plurality of transmission means 26 which kinematically connect the motor drive shaft 27 and the shaft 19 of the respective first, cylindrical roller 14 the position of whose respective axis 14a must be changed relative to the transfer unit 13.

[0048] The plurality of transmission means 26 comprise at least one transmission wheel 28 whose position can be varied to adapt the transmission means 26 when the supporting element 18 is interchanged and which allows keeping the transmission means 26 mutually meshed when the position of the axis 14a of the shaft 19 of the first, cylindrical roller 14 varies.

[0049] The transmission wheel 28 is movable when the supporting element 18 is interchanged, that is to say, the transmission wheel 28 varies the position of its axis 28a relative to the receiving seat 25 of the box 20 when the spacer sleeve 22 varies.

[0050] Preferably, the transmission means 26 comprise at least a first, a second and a third transmission wheel 30, 31, 32 which mesh with one and the other in succession.

[0051] The first, second and third wheels 30, 31, 32 rotate about respective axes of rotation 30a, 31 a, 32a which are parallel to each other and parallel to the axis of rotation 14a of the first, cylindrical roller 14.

[0052] The axes of rotation 30a, 31 a, 32a of the first, second and third wheels 30, 31, 32 are parallel to the axis 28a of the movable transmission wheel 28 and of the shaft 19 of the first, cylindrical roller 14.

[0053] More specifically, the first wheel 30 is keyed to the drive shaft 27 and transmits motion from the latter to the second wheel 31 and, consequently, to the third wheel 32.

[0054] The third wheel 32 is kinematically connected to the movable transmission wheel 28 and is adaptable for every size changeover. More specifically, the third wheel 32 is meshed directly with the movable transmission wheel 28.

[0055] Advantageously, the first, second and third transmission wheels 30, 31, 32 maintain their position relative to the movable transmission wheel 28 when the supporting element 18 is interchanged.

[0056] The transmission means comprise a fourth wheel 35 supported by the shaft 19 of the first, cylindrical roller 14.

[0057] The fourth wheel 35 is meshed with the movable transmission wheel 28. Figures 2 to 4 illustrate the configurations adopted by the transmission means 26 and by the shaft 19 of the first, cylindrical roller 14 when the supporting element 18 is interchanged for every size changeover, that is, from groups 3 of filter sticks of maximum length (Figure 2) to groups 3 of filter sticks of minimum length (Figure 4).

[0058] Figure 2 shows the configuration with the groups 3 of filter sticks of maximum length. Taking as reference the drive shaft 27 rotating about its axis of rotation 27a, the axis 14a of the shaft 19 of the first, cylindrical roller 14 is spaced at a maximum distance from the axis 27a of the drive shaft 27.

[0059] With reference to Figure 4, showing the configuration with the groups 3 of filter sticks of minimum length, the axis 14a of the shaft 19 of the first, cylindrical roller 14 is spaced at a minimum distance from the axis 27a of the drive shaft 27.

[0060] With reference to Figure 3, the axis 14a of the shaft 19 of the first, cylindrical roller 14 is spaced at a distance from the axis 27a of the drive shaft 27 which is intermediate between the distances in the configurations shown in Figure 2 and Figure 4.

[0061] Generalizing, the axis 14a of the shaft 19 of the first, cylindrical roller 14 moves towards and away from the axis 27a of the drive shaft 27 with variation of the circle described by the second seats 9 of the second conveyor 7.

[0062] Considering the variations in position of the axis 14a of the shaft 19 of the first, cylindrical roller 14, the transmission wheel 28 can be repositioned to follow the variations in position of the axis 14a of the shaft 19 of the first, cylindrical roller 14, thus remaining meshed with the latter and with the third transmission wheel 32.

[0063] The second, tapered roller 15 is supported by a respective shaft 29, rotating about the axis 15a.

[0064] Advantageously, the second, tapered roller 15 is driven in rotation about its axis 15a by means of the drive shaft 27.

[0065] More precisely, the adapter means 16 comprise a single bevel gear pair 33 which kinematically connects the shaft 29 of the second, tapered roller 15 to the drive shaft 27.

[0066] Advantageously, when the circle described by the second carrier assemblies 8 of the second conveyor 9 varies from the minimum value to the maximum value, the first, cylindrical roller 14 and the second, tapered roller 15 are substituted for respective rollers 14, 15 which are larger in diameter.

[0067] As illustrated in Figure 6, thanks to the adapter means 16, when the dimensions of the first, cylindrical roller 14 and of the second, tapered roller 15 vary, the axis 15a of the shaft 29 of the second, tapered roller 15 remains in the same position, whilst the axis 14a of the shaft 19 of the first, cylindrical roller 14 changes position relative to the axis 15a of the shaft 29 of the second, tapered roller 15, thus allowing changeover to be performed quickly.

[0068] Since each size of the first, cylindrical roller 14 has an integrated spacer sleeve 22 and a respective wheel 35 which meshes with the movable transmission wheel 28, substituting the first, cylindrical roller 14 is easier than in the prior art.

Claims

1. A machine for making composite filters comprising at least one combining unit (2) for combining groups (3) of filter sticks, the groups (3) having, relative to their axis (3a), a length which is variable from a minimum to a maximum value,
a first conveyor (4) rotating about an axis (4a) parallel to the axis (3a) of the groups (3) of filter sticks and equipped with a plurality of first carrier assemblies (5), each having at least one first hold-down seat (6) with axis (6a) parallel to the axis (3a) of the groups (3) of filter sticks;
a second conveyor (7) rotating about an axis (7a) parallel to the first conveyor (4) and equipped with a plurality of second carrier assemblies (8), each having at least one second hold-down seat (9) with axis (9a) substantially perpendicular to the axis (6a) of the first seat (6), the second seats (6) being able to describe a circle whose radius varies from a minimum to a maximum with variation of the length of the groups (3) of filter sticks;
a forming beam (10) for forming at least one continuous succession (11) of groups (3) of filter sticks in reciprocal contact and alignment along the axis (3a), each succession (11) forming a continuous rod of filter sticks;
a transfer unit (13) interposed between the first and the second rotating conveyor (4, 7); the machine being **characterized in that** the transfer unit (13) comprises adapter means (16) capable of adapting the selfsame transfer unit (13) to variations of the circle described by the second seats (9) of the second conveyor (7).

2. The machine according to claim 1, **characterized in that** the transfer unit (13) comprises a first, cylindrical splined roller (14) with axis (14a) parallel to the first and the second rotating conveyor (4, 7) and a second, tapered splined roller (15) with axis (15a) inclined to the first, cylindrical roller (14) and tangent thereto; the first, cylindrical splined roller (14) and the second, tapered splined roller (15) being coupled to a respective shaft (19, 29).

3. The machine according to claim 2, **characterized in that** the adapter means (16) keep the axis (15a) of the second, tapered roller (15) fixed and vary the position of the axis (14a) of the first, cylindrical roller (14) relative to the transfer unit (13) or they keep the axis (14a) of the first, cylindrical roller (14) fixed and vary the position of the axis (15a) of the second, tapered roller (15) relative to the transfer unit (13).

4. The machine according to claim 2 or 3, **characterized in that** the adapter means (16) comprise a supporting element (18) for supporting the first, cylindrical roller (14) or the second, tapered roller (15); the transfer unit (13) comprising a containment box (20) relative to which the supporting element (18) is interchangeable with variation of the circle described by the second seats (9) of the second conveyor (7).

5. The machine according to claim 4, **characterized in that** the supporting element (18) comprises a spacer sleeve (22) having a hole (23) in it for receiving the shaft (19, 29) of the respective first, cylindrical roller (14) or second, tapered roller (15); the sleeve (22) having an outside surface (24) designed to be stably coupled to a respective receiving seat (25) formed on the box (20) of the transfer unit (13).

6. The machine according to claim 5, **characterized in that** the spacer sleeve (22) is interchangeable with variation of the circle described by the second seats (9) of the second conveyor (7); with variation of the spacer sleeve (22), the position of the axis (14a, 15a) of the shaft (19, 29) of the respective first, cylindrical roller (14) or second, tapered roller (15) varying relative to the receiving seat (25) of the box (20).

7. The machine according to any one of claims 2 to 6, **characterized in that** the adapter means (16) comprise at least one motor drive shaft (27) for moving the first and the second roller (14, 15) and a plurality of transmission means (26) which kinematically connect the drive shaft (27) and the shaft (19, 29) of the respective first, cylindrical roller (14) or second, tapered roller (15).

8. The machine according to claim 7, **characterized in that** the transmission means (26) comprise at least one transmission wheel (28) which rotates about its axis of rotation (28a); the transmission wheel (28) varying the position of its axis (28a) relative to the receiving seat (25) of the box (20) with variation of the spacer sleeve (22).

9. The machine according to claim 7 or 8, **characterized in that** the axis (14a, 15a) of the shaft (19, 29) of the respective first, cylindrical roller (14) or second, tapered roller (15) moves towards or away from the axis (27a) of the drive shaft (27) with variation of the circle described by the second seats (9) of the second conveyor (7).

10. The machine according to any one of claims 7 to 9, **characterized in that** the box (20) contains at least the first, cylindrical splined roller (14), the second,

tapered splined roller (15) and the drive shaft (27).

Patentansprüche

1. Maschine zur Herstellung von Verbundfiltern, umfassend mindestens eine Kombinierungseinheit (2) zum Kombinieren von Gruppen (3) von Filterstäbchen (3), aufweisend relativ zu ihrer Achse (3a) eine Länge, die von einem Mindest- bis zu einem Höchstwert variabel ist;
einen ersten Förderer (4), der sich um eine Achse (4a) dreht, die parallel zur Achse (3a) der Gruppen (3) von Filterstäbchen angeordnet und mit einer Vielzahl an ersten Trägeraggregaten (5) ausgestattet ist, die jeweils mindestens einen ersten Niederhaltesitz (6) mit einer Achse (6a) aufweisen, die parallel zur Achse (3a) der Gruppen (3) von Filterstäbchen angeordnet ist; einen zweiten Förderer (7), der sich um eine Achse (7a) dreht, die parallel zum ersten Förderer (4) angeordnet und mit einer Vielzahl an zweiten Trägeraggregaten (8) ausgestattet ist, die jeweils mindestens einen zweiten Niederhaltesitz (9) mit einer Achse (9a) aufweisen, die im Wesentlichen senkrecht zur Achse (6a) des ersten Sitzes (6) verläuft, wobei die zweiten Sitze (6) in der Lage sind, einen Kreis zu beschreiben, dessen Radius von einem Mindestwert bis zu einem Höchstwert mit der Änderung der Länge der Gruppen (3) von Filterstäbchen variiert;
einen Formungsbalken (10) zum Formen von mindestens eine durchgehende Abfolge (11) von Gruppen (3) von Filterstäbchen in gegenseitigem Kontakt und gegenseitiger Ausrichtung entlang der Achse (3a), wobei eine jede Abfolge (11) eine durchgehende Stange an Filterstäbchen formt;
eine Transfereinheit (13), die zwischen dem ersten und dem zweiten Drehförderer (4, 7) eingesetzt ist, wobei die Maschine **dadurch gekennzeichnet ist, dass** die Transfereinheit (13) Anpassungsmittel (16) umfasst, die in der Lage sind, die Transfereinheit (13) an die Änderungen des von den zweiten Sitzen (9) des zweiten Förderers (7) beschriebenen Kreises anzupassen.

2. Maschine nach Anspruch 1, **dadurch gekennzeichnet, dass** die Transfereinheit (13) eine erste zylindrische Keilprofilwalze (14) umfasst, deren Achse (14a) parallel zum ersten und zum zweiten Drehförderer (4, 7) angeordnet ist, und eine zweite kegelförmige Keilprofilwalze (15), deren Achse (15a) geneigt zur ersten zylindrischen Walze (14) und tangential zu dieser angeordnet ist, wobei die erste zylindrische Keilprofilwalze (14) und die zweite kegelförmige Keilprofilwalze (15) mit einer jeweiligen Welle (19, 29) gekuppelt sind.

3. Maschine nach Anspruch 2, **dadurch gekennzeichnet, dass** die Anpassungsmittel (16) die Achse (15a) der zweiten kegelförmigen Walze (15) fixiert halten und die Position der Achse (14a) der ersten zylindrischen Walze (14) relativ zur Transfereinheit (13) variieren oder die Achse (14a) der ersten zylindrischen Walze (14) fixiert halten und die Position der Achse (15a) der zweiten kegelförmigen Walze (15) relativ zur Transfereinheit (13) variieren.

4. Maschine nach Anspruch 2 oder 3, **dadurch gekennzeichnet, dass** die Anpassungsmittel (16) ein Stützelement (18) umfassen, um die erste zylindrische Walze (14) oder die zweite kegelförmige Walze (15) zu stützen, wobei die Transfereinheit (13) einen Aufnahmekasten (20) umfasst, relativ zu dem das Stützelement (18) mit der Änderung des von den zweiten Sitzen (9) des zweiten Förderers (7) beschriebenen Kreises austauschbar ist.

5. Maschine nach Anspruch 4, **dadurch gekennzeichnet, dass** das Stützelement (18) eine Abstandshülse (22) umfasst, aufweisend ein Loch (23) darin, um die Welle (19, 29) der jeweiligen ersten zylindrischen Walze (14) oder der zweiten kegelförmigen Walze (15) aufzunehmen, wobei die Hülse (22) eine außenseitige Oberfläche (24) aufweist, die ausgestaltet ist, um stabil mit einem jeweiligen Aufnahmesitz (25) gekuppelt zu werden, der auf dem Kasten (20) der Transfereinheit (13) ausgebildet ist.

6. Maschine nach Anspruch 5, **dadurch gekennzeichnet, dass** die Abstandshülse (22) mit der Änderung des durch die zweiten Sitze (9) des zweiten Förderers (7) beschriebenen Kreises austauschbar ist, wobei die Position der Achse (14a, 15a) der Welle (19, 29) der jeweiligen ersten zylindrischen Achse (14) oder der zweiten keilförmigen Walze (15) mit der Änderung der Abstandshülse (22) relativ zum Aufnahmesitz (25) des Kastens (20) variiert.

7. Maschine nach einem der Ansprüche 2 bis 6, **dadurch gekennzeichnet, dass** die Anpassungsmittel (16) mindestens eine Motorantriebswelle (27) umfassen, um die erste und die zweite Walze (14, 15) zu bewegen,
und eine Vielzahl an Antriebsmitteln (26), die kinematisch mit der Antriebswelle (27) und der Welle (19, 29) der jeweiligen ersten zylindrischen Walze (14) oder der zweiten keilförmigen Walze (15) verbunden sind.

8. Maschine nach Anspruch 7, **dadurch gekennzeichnet, dass** die Antriebsmittel (26) mindestens ein Antriebsrad (28) umfassen, dass sich um seine Rotationsachse (28a) dreht, wobei das Antriebsrad (28) die Position seiner Achse (28a) relativ zum Aufnahmesitz (25) des Kastens (20) mit der Änderung der Abstandshülse (22) variiert.

9. Maschine nach Anspruch 7 oder 8, **dadurch gekennzeichnet, dass** sich die Achse (14a, 15a) der Welle (19, 29) der jeweiligen ersten zylindrischen Walze (14) oder der zweiten kegelförmigen Walze (15) hinführend zur oder wegführend von der Achse (27a) der Antriebswelle (27) mit der Änderung des von den zweiten Sitzen (9) des zweiten Förderers (7) beschriebenen Kreises bewegt.

10. Maschine nach einem der Ansprüche 7 bis 9, **dadurch gekennzeichnet, dass** der Kasten (20) mindestens die erste zylindrische Keilprofilwalze (14), die zweite kegelförmige Keilprofilwalze (15) und die Antriebswelle (27) enthält.

Revendications

1. Machine pour la fabrication de filtres composites comprenant au moins une unité de combinaison (2) pour combiner des groupes (3) de bâtonnets-filtres, les groupes (3) ayant, par rapport à leur axe (3a), une longueur étant variable d'une valeur minimum à une valeur maximum,
un premier convoyeur (4) tournant autour d'un axe (4a) parallèle à l'axe (3a) des groupes (3) de bâtonnets-filtres et équipé d'une pluralité de premiers assemblages de support (5), chacun comportant au moins un premier siège de retenue (6) avec l'axe (6a) parallèle à l'axe (3a) des groupes (3) des bâtonnets-filtres ;
un second convoyeur (7) tournant autour d'un axe (7a) parallèle au premier convoyeur (4) et équipé d'une pluralité de seconds assemblages de support (8), chacun comportant au moins un second siège de retenue (9) avec l'axe (9a) substantiellement perpendiculaire à l'axe (6a) du premier siège (6), les seconds sièges (6) pouvant décrire un cercle dont le rayon varie d'un minimum à un maximum avec une variation de la longueur des groupes (3) de bâtonnets-filtres ;
une poutre de formation (10) servant à former au moins une succession continue (11) de groupes (3) de bâtonnets-filtres en contact et alignement réciproque le long de l'axe (3a), chaque succession (11) formant une tige continue de bâtonnets-filtres ;
une unité de transfert (13) interposée entre les premier et second convoyeurs rotatifs (4, 7) ; la machine étant **caractérisée en ce que** l'unité de transfert (13) comprend des moyens adaptateurs (16) pouvant adapter la même unité de transfert (13) aux variations du cercle décrit par les seconds sièges (9) du second convoyeur (7).

2. Machine selon la revendication 1, **caractérisée en ce que** l'unité de transfert (13) comprend un premier rouleau cylindrique à cannelures (14) avec l'axe (14a) parallèle aux premier et au second convoyeurs rotatifs (4, 7) et un second rouleau conique à cannelures (15) avec l'axe (15a) incliné par rapport au premier rouleau cylindrique (14) et tangent à celui-ci ; le premier rouleau cylindrique à cannelures (14) et le second rouleau conique à cannelures (15) étant couplés à un arbre respectif (19, 29).

3. Machine selon la revendication 2, **caractérisée en ce que** les moyens adaptateurs (16) conservent l'axe (15a) du second rouleau conique (15) fixe et modifient la position de l'axe (14a) du premier rouleau cylindrique (14) par rapport à l'unité de transfert (13) ou conservent l'axe (14a) du premier rouleau cylindrique (14) fixe et modifient la position de l'axe (15a) du second rouleau conique (15) par rapport à l'unité de transfert (13).

4. Machine selon les revendications 2 ou 3, **caractérisée en ce que** les moyens adaptateurs (16) comprennent un élément de support (18) pour supporter le premier rouleau cylindrique (14) ou le second rouleau conique (15) ; l'unité de transfert (13) comprenant un boîtier de confinement (20) par rapport à laquelle l'élément de support (18) est interchangeable avec la variation du cercle décrit par les seconds sièges (9) du second convoyeur (7).

5. Machine selon la revendication 4, **caractérisée en ce que** l'élément de support (18) comprend un manchon entretoise (22) comportant un orifice (23) en son sein pour recevoir l'arbre (19, 29) des premier rouleau cylindrique (14) ou second rouleau conique (15) respectifs ; le manchon (22) comportant une surface extérieure (24) conçue pour être stablement couplée à un siège de réception (25) respectif formé sur le boîtier (20) de l'unité de transfert (13).

6. Machine selon la revendication 5, **caractérisée en ce que** le manchon entretoise (22) est interchangeable avec la variation du cercle décrit par les seconds sièges (9) du second convoyeur (7) ; avec la variation du manchon entretoise (22), la position de l'axe (14a, 15a) de l'arbre (19, 29) des premier rouleau cylindrique (14) ou second rouleau conique (15) respectifs variant par rapport au siège de réception (25) du boîtier (20).

7. Machine selon l'une quelconque des revendications de 2 à 6, **caractérisée en ce que** les moyens adaptateurs (16) comprennent au moins un arbre d'entraînement motorisé (27) pour déplacer le premier et le second rouleau (14, 15) et une pluralité de moyens de transmission (26) reliant cinématiquement l'arbre d'entraînement (27) et l'arbre (19, 29) des premier rouleau cylindrique (14) ou second rouleau conique (15) respectifs.

8. Machine selon la revendication 7, **caractérisée en**

ce que les moyens de transmission (26) comprennent au moins une roue de transmission (28) tournant autour de son axe de rotation (28a) ; la roue de transmission (28) modifiant la position de son axe (28a) par rapport au siège de réception (25) du boîtier (20) avec la variation du manchon entretoise (22).

9. Machine selon les revendications 7 ou 8, **caractérisée en ce que** l'axe (14a, 15a) de l'arbre (19, 29) du premier rouleau cylindrique (14) ou du second rouleau conique (15) respectif se rapproche ou s'éloigne de l'axe (27a) de l'arbre d'entraînement (27) avec la variation du cercle décrit par les seconds sièges (9) du second convoyeur (7).

10. Machine selon l'une quelconque des revendications de 7 à 9, **caractérisée en ce que** le boîtier (20) contient au moins le premier rouleau cylindrique à cannelures (14), le second rouleau conique à cannelures (15) et l'arbre d'entraînement (27).

FIG.1

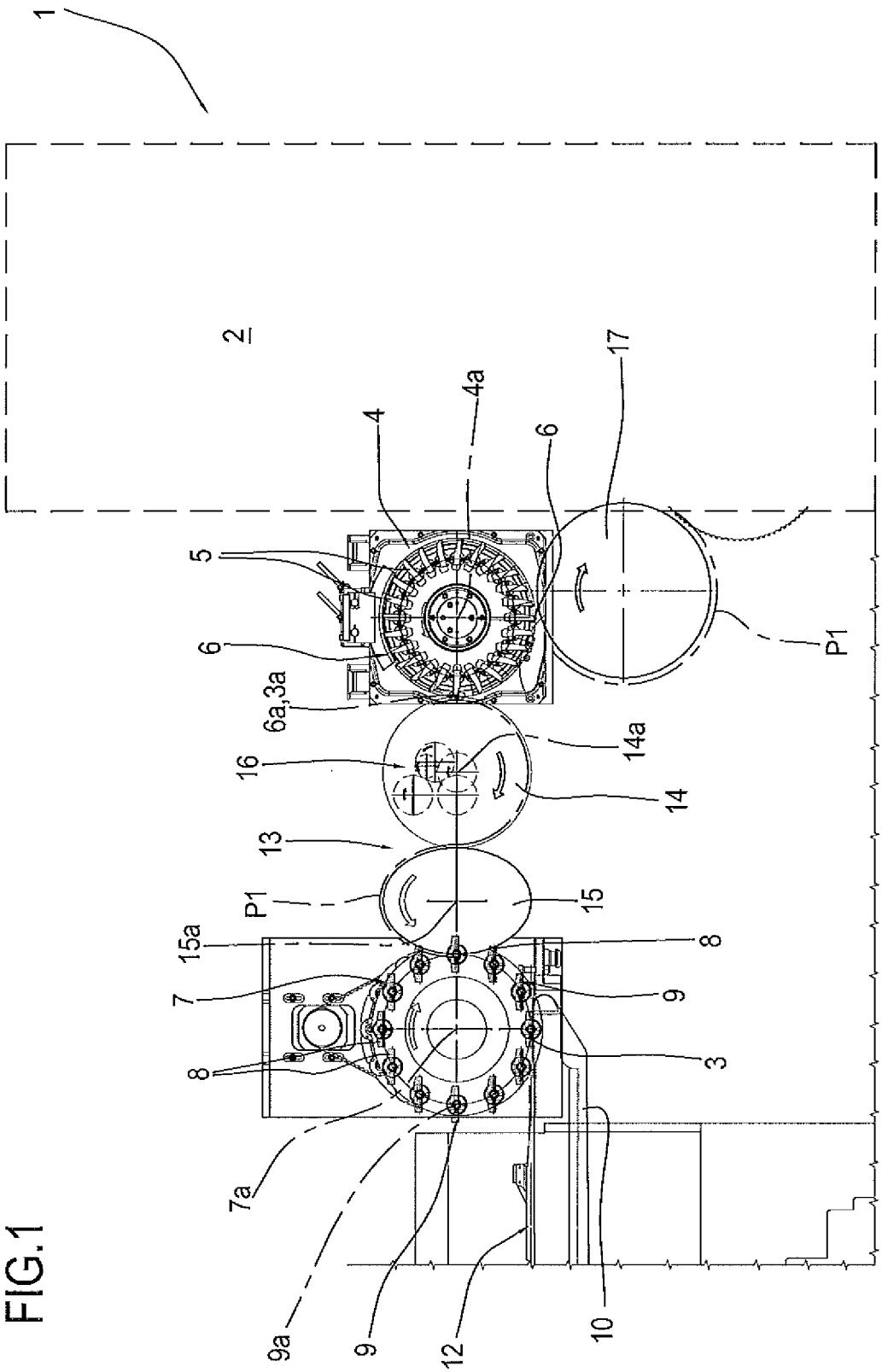


FIG.2

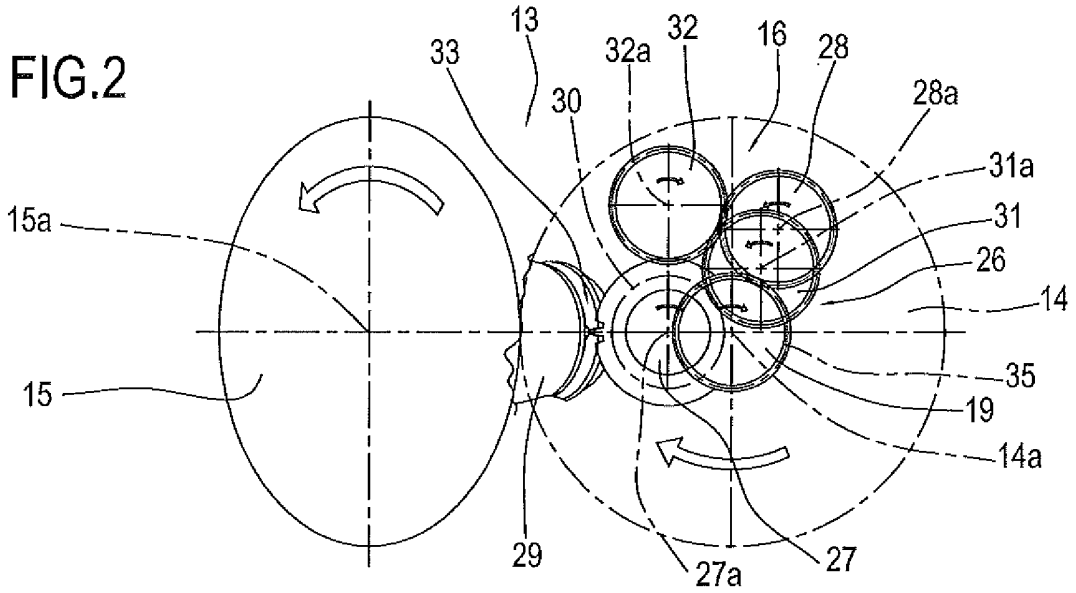


FIG.3

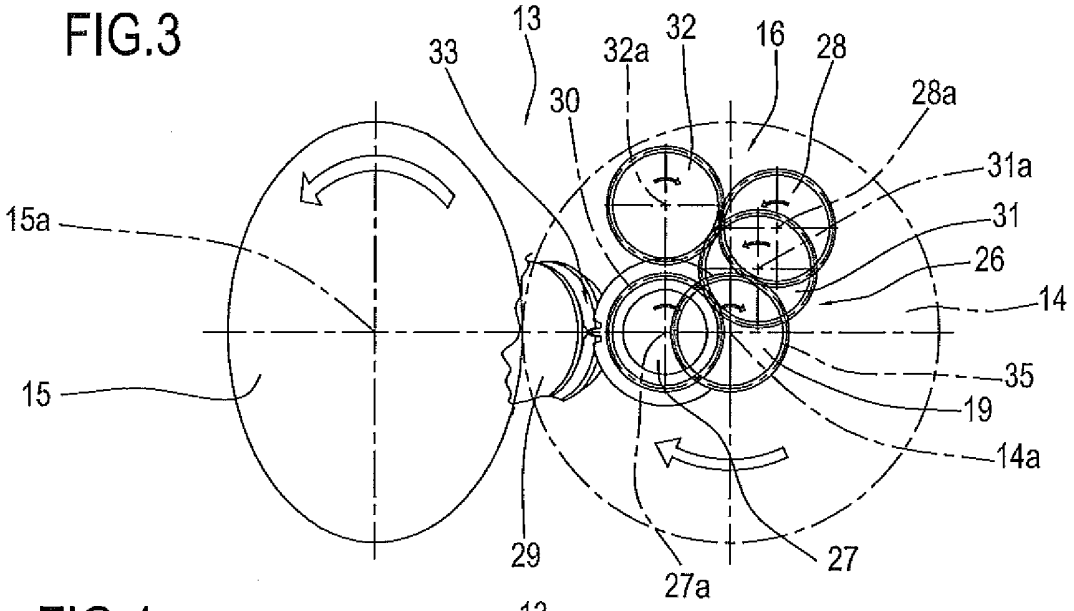


FIG.4

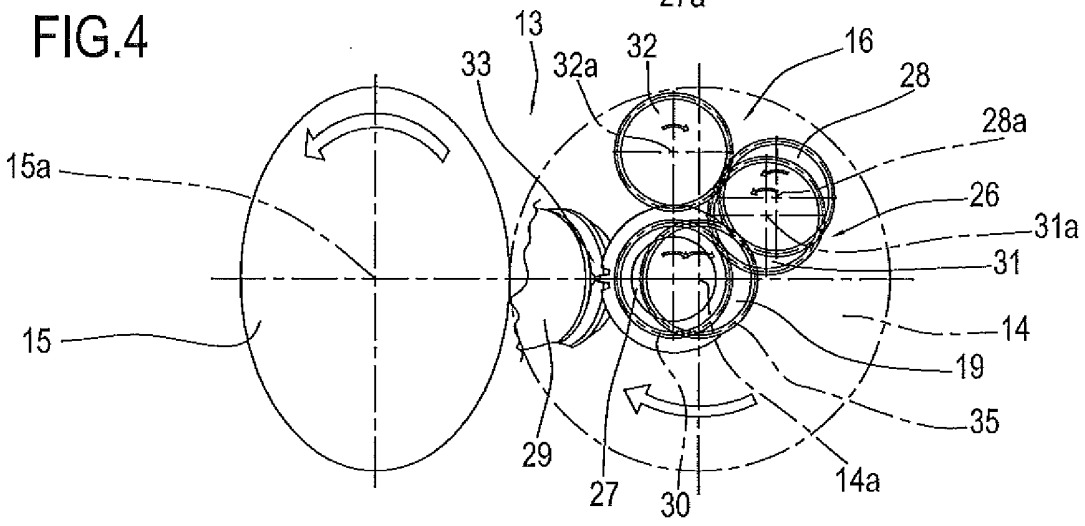


FIG.5

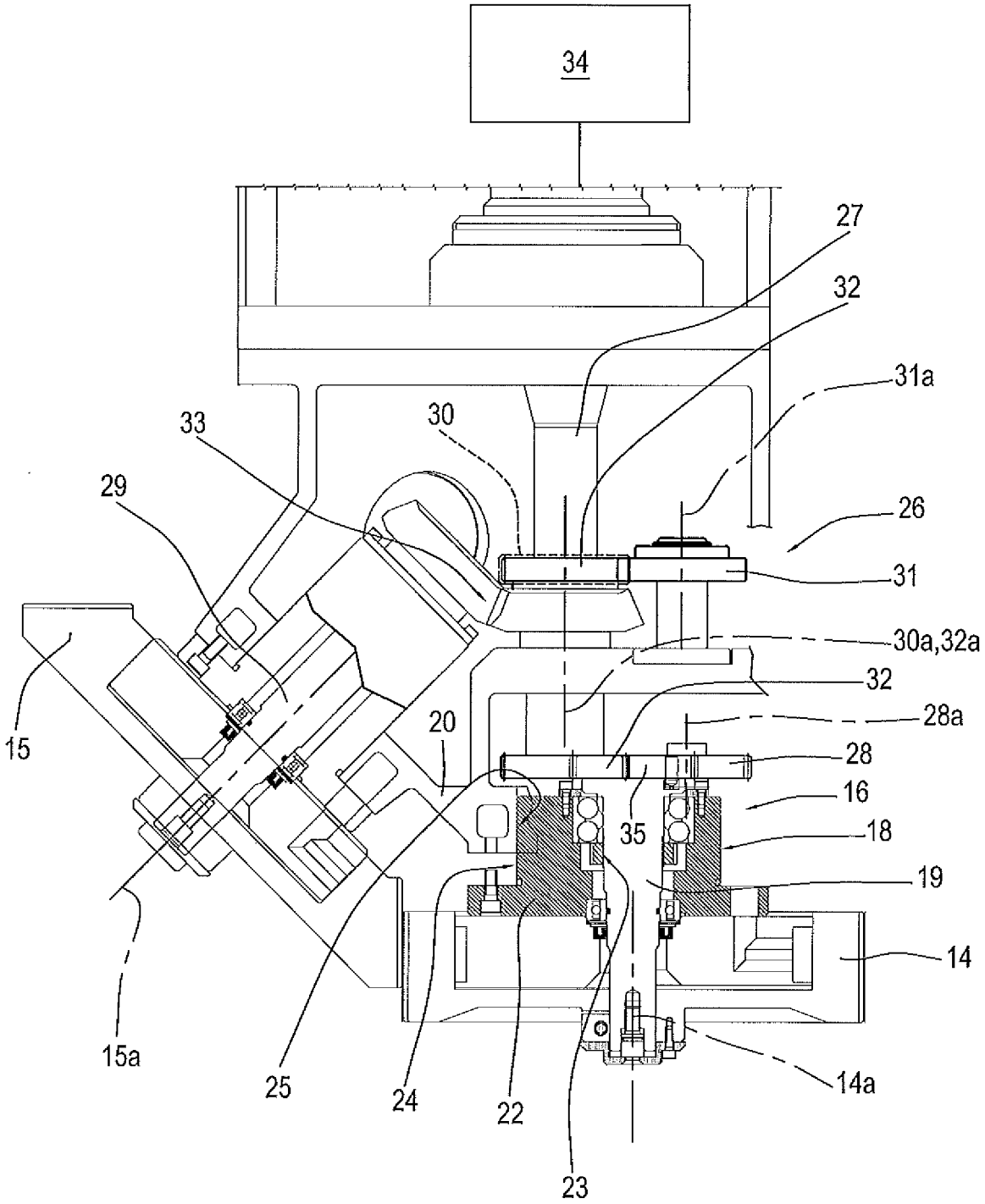
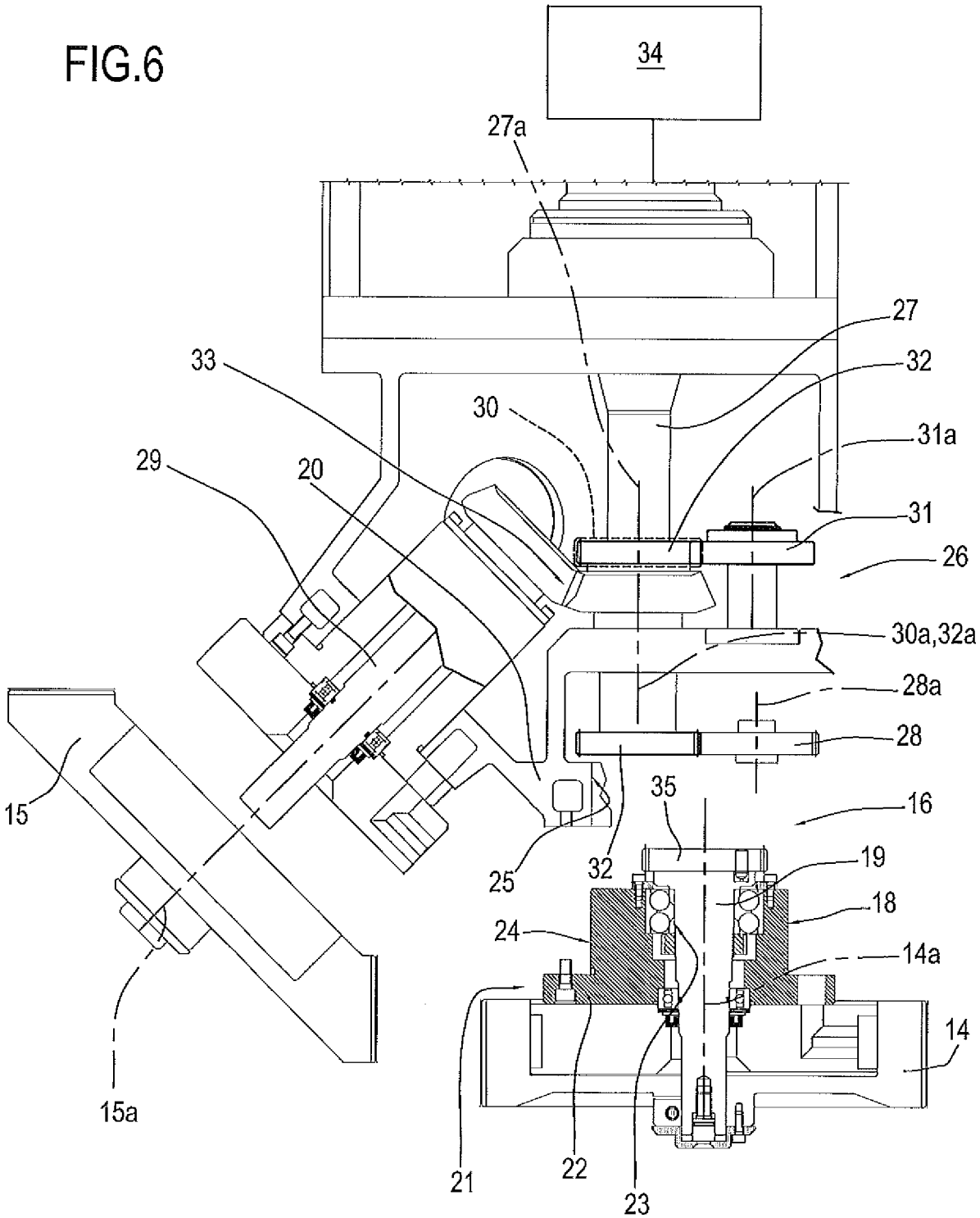

34
27
32
31a
33
30
29
26
31
30a,32a
32
28a
20
28
16
35
18
19
14
15
15a
25
24
22
23
14a

FIG.6


34
27a
27
33
32
30
31a
29
20
31
26
30a,32a
28a
28
15
35
16
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32
19
18
24
14a
14
15a
21
22
23

FIG.7

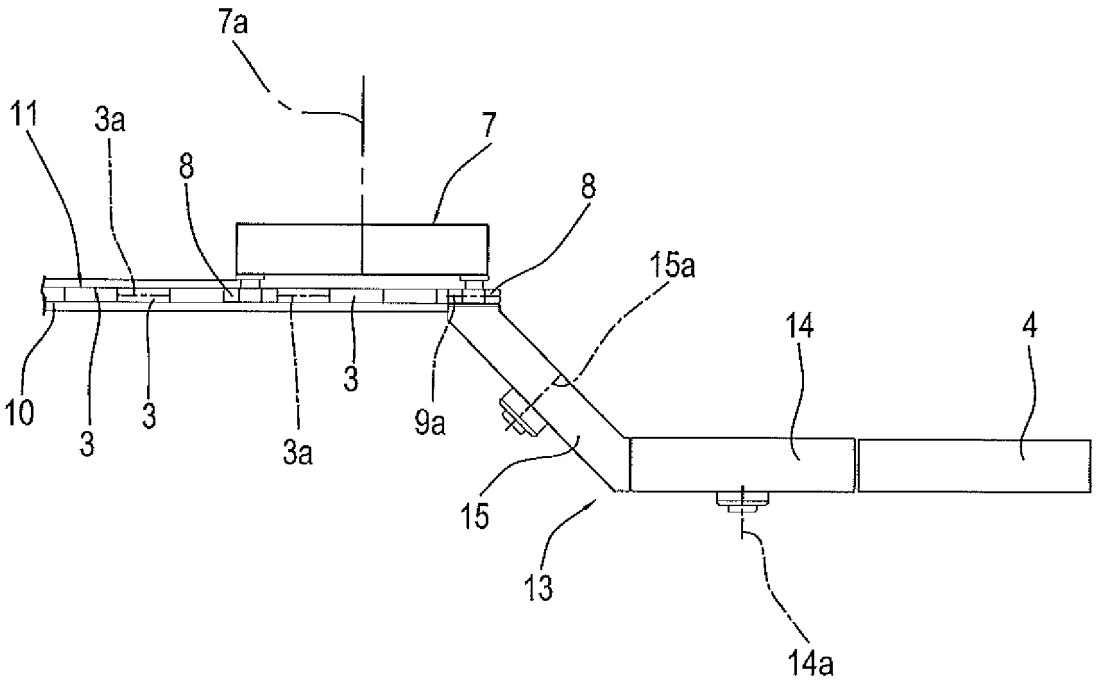
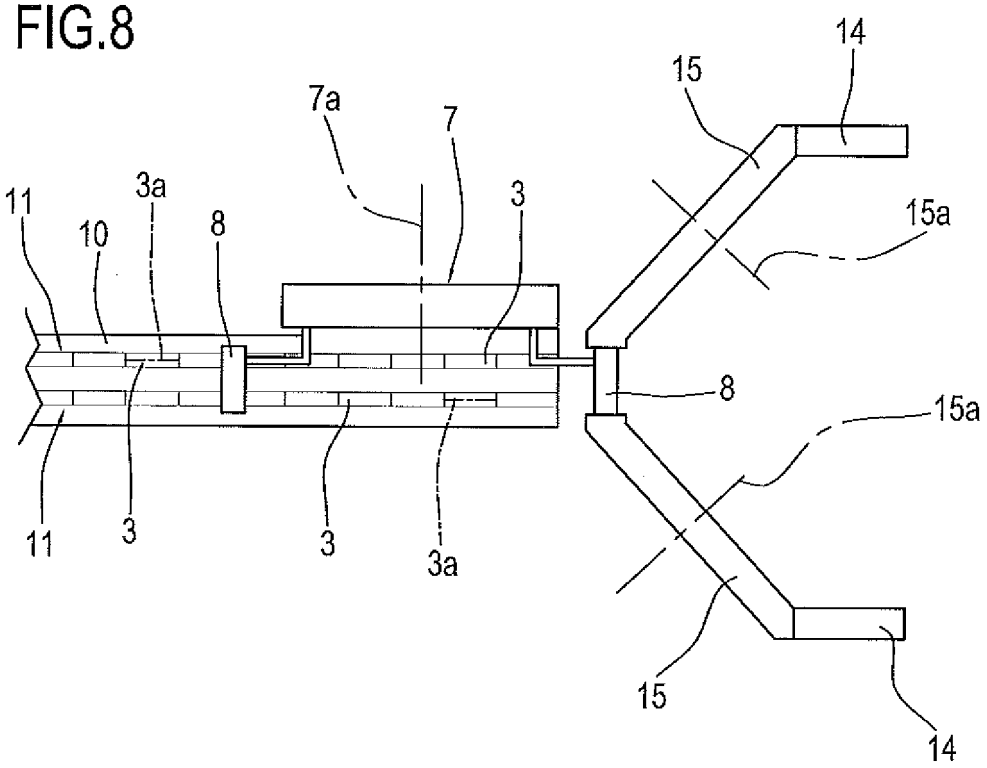

7a
11
3a
8
7
8
15a
14
4
10
3
3
3a
3
9a
15
13
14a

FIG.8


14
15
7a
7
3a
3
11
10
8
15a
8
15a
11
3
3
3a
15
14

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- EP 1787534 A1 **[0014]**