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(54) **DEVICE FOR FEEDING FILTER RODS IN AN AUTOMATIC MACHINE FOR THE TOBACCO INDUSTRY**

VORRICHTUNG ZUR ZUFÜHRUNG VON FILTERSTÄBEN IN EINE AUTOMATISCHE MASCHINE FÜR DIE TABAKINDUSTRIE

DISPOSITIF PERMETTANT D'ALIMENTER UNE MACHINE AUTOMATIQUE EN TIGES-FILTRES POUR L'INDUSTRIE DU TABAC

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Description

Technical field

[0001] This invention relates to a device for feeding filter rods in an automatic machine for the tobacco industry.

Background art

[0002] The term "filter rod" is used to mean a stick of filter material of predetermined length from which two, three or more filter plugs are obtained in a filter tip attachment machine, or filter maker, by means of a transversal cutting operation.

[0003] More specifically, these filter plugs are twice the length of the filters to be applied to a filter-tipped cigarette.

[0004] In filter tip attachment machines, which this description refers to in particular, without limiting the invention, individual filter rods are withdrawn from the bottom of a hopper by means of a pickup roller provided with suction flutes for receiving a single filter rod each.

[0005] As the pickup roller rotates, the filter rods are moved away from the hopper one by one and, at one or more cutting stations, are cut into plugs which are transferred to the next roller downstream.

[0006] Each flute on the pickup roller, besides acting as a retaining element for holding down individual filter rods, also acts as a means for opposing one or more disc knives rotating about respective axes parallel to the axis of rotation of the pickup roller during the operation by which the filter rods are cut.

[0007] More precisely, at the cutting station or stations, each knife passes through respective radial slots made in the pickup roller transversely to each flute, in such a way as to cut each filter rod transversely.

[0008] The high speed of rotation of each disc knife, which is a function of the rotation speed of the pickup roller, and the friction created between the knife blade and the filter during the cutting operation cause the disc knife to become very hot.

[0009] Indeed, in the proximity of the disc knife blade, the temperature may be in the order of 60-65°C.

[0010] The disc knife blade transfers part of the heat to the portion of the filter rod cut and, more specifically, to the corresponding cut surfaces of the filter plugs obtained from the rod.

[0011] If the filter rods are made from a material containing a polymer, and in particular, a material of plastic origin, the heat from the disc knife blade causes burning and local melting at the cut surfaces. The polymeric material vitrifies upon cooling and thereby reduces or destroys the ventilating or aerating function of the filter tip material.

[0012] A customary device for feeding filter rods which comprises the features as mentioned in the preamble of the present claim 1 is described in DE1258318B.

Disclosure of the invention

[0013] This invention has for an aim to provide a device for feeding filter rods in a filter tip attachment machine to overcome the above mentioned disadvantages.

[0014] This invention accordingly provides a device for feeding filter rods in an automatic machine for the tobacco industry having the features set out in independent claim 1.

Brief description of the drawings

[0015] The invention is described below with reference to the accompanying drawings, which illustrate a non-limiting embodiment of it, in which:

- Figure 1 is a schematic front view, with some parts cut away to better illustrate others, of a device according to the invention for feeding filter rods in a filter tip attachment machine;
- Figure 2 is scaled-up plan view of a disc knife of the device illustrated in Figure 1;
- Figure 3 illustrates a detail of the disc knife in a side view;
- Figure 4 is a side view of a first disc knife of the device illustrated in Figure 1;
- Figure 5 is a side view of a second disc knife of the device illustrated in Figure 1.

Detailed description of preferred embodiments of the invention

[0016] With reference to Figure 1, the numeral 1 denotes in its entirety a device for feeding filter rods 2 in a filter tip attachment machine not illustrated. The term "filter rod" 2 is used to mean a stick of filter material of predetermined length from which two or three filter plugs are obtained by means of a transversal cutting operation.

[0017] Each filter rod 2 comprises inside it a filter material 2a wrapped in a wrapping sheet 2b.

[0018] In this embodiment, the filter material 2a is of polymeric origin, and more specifically, of plastic origin.

[0019] Preferably, the filter material 2a is of biodegradable plastic origin.

[0020] The feeding device 1 comprises a hopper 3 for containing a mass 4 of filter rods 2.

[0021] The feeding device 1 comprises a hold-down and transfer roller 5 for holding down and transferring the filter rods 2 and located downstream of the hopper 3. With reference to Figure 1, the roller 5 rotates in a clockwise direction about its axis of rotation 6.

[0022] The axis of rotation 6 is a horizontal axis normal to the plane of Figure 1. More specifically, the bottom of the hopper 3 is closed by the hold-down and transfer roller 5.

[0023] The roller 5 is peripherally provided with a plurality of longitudinal flutes 7 running parallel to the axis

6, each of which is capable of picking up and holding down a single filter rod 2.

[0024] At the exit of the roller 5 from the hopper 3, there is an opposing roller 8, which rotates about a respective axis of rotation 8a and whose function is to stop the filter rods 2 not housed in the flutes 7 from coming out of the hopper 3.

[0025] The axis of rotation 8a of the opposing roller 8 is a horizontal axis normal to the plane of Figure 1.

[0026] More specifically, the opposing roller 8 rotates in the same direction of rotation as the roller 5.

[0027] As illustrated in Figure 1, the hold-down and transfer roller 5 conveys the filter rods 2 along a predetermined path P.

[0028] The device 1 comprises cutting means 9, in particular for transversely cutting the filter rods 2 into filter plugs 10.

[0029] In other words, the cutting means 9 cut the filter rods 2 transversely in such a way as to divide them into filter plugs 10.

[0030] Preferably, the filter plugs 10 are cut in equal lengths.

[0031] Preferably, the cutting means 9 are counter-rotating relative to the hold-down and transfer roller 5 and, with reference to Figure 1, rotate in clockwise direction.

[0032] The cutting means 9 face the hold-down and transfer roller 5 and define therewith at least one cutting station 11.

[0033] More specifically, the cutting station 11 is located downstream of the hopper 3 along the predetermined path P.

[0034] More precisely, the cutting station 11 is located downstream of the opposing roller 8.

[0035] Each flute 7 on the hold-down and transfer roller 5, besides acting as a retaining element for holding down individual filter rods 2, also acts as a means for opposing the cutting means 9 during the operation by which the filter rods 2 are cut.

[0036] The cutting means 9 comprise at least one disc knife 12 rotating about its axis of rotation 12a which is parallel to the axis of rotation 6 of the hold-down and transfer roller 5.

[0037] With reference in particular to Figures 2 and 3, the disc knife 12 comprises a front face 19 and a rear face 20, on the side opposite the front face 19, and a circumferential cutting blade 21 connecting the front face 19 to the rear face 20.

[0038] The front face 19 and the rear face 20 have a substantially circumferential surface.

[0039] More precisely, at the cutting station or stations 11, each disc knife 12 passes through respective radial slots made in the hold-down and transfer roller 5 transversely to each flute 7, in such a way as to cut each filter rod 2 transversely.

[0040] If the filter rods 2 have to be cut into two filter plugs 10, the cutting means 9 comprise a single disc knife 12.

[0041] In this case, the flutes 7 of the hold-down and transfer roller 5 each have one intermediate slot allowing the blade 21 of the disc knife 12 to pass through it.

[0042] Alternatively, in the embodiment illustrated, where the filter rods 2 have to be cut into three filter plugs 10, the cutting means 9 comprise a pair of disc knives 12: more specifically, the numeral 13 denotes a first disc knife and the numeral 14 a second disc knife.

[0043] In this case, the flutes 7 of the hold-down and transfer roller 5 each have two parallel slots at the positions where the blades 21 of the rotary disc knives 12 pass through them.

[0044] In this case, the first and second knives 13 and 14 are mounted in sequence with each other, from upstream to downstream on the path P in the direction of rotation of the hold-down and transfer roller 5.

[0045] The first disc knife 13 and the hold-down and transfer roller 5 together define a first cutting station 15.

[0046] The second disc knife 14 and the hold-down and transfer roller 5 together define a second cutting station 16.

[0047] In order to divide each filter rod 2 into three separate filter plugs 10, the first and second disc knives 13 and 14 are spaced from each other in a direction parallel to the axis 6 of the hold-down and transfer roller 5, as illustrated in Figures 4 and 5.

[0048] Downstream of the hold-down and transfer roller 5, next along the path P, there is staggering roller 17 whose function is to pick up the filter plugs 10 cut from a respective filter rod 2, stagger the positions of their axes and then transfer them towards the next operating station along the path P.

[0049] In other words, downstream of the hold-down and transfer roller 5 there is a plurality of operating rollers 18 defining the path P itself.

[0050] According to this invention, the device 1 comprises cooling means 22 for cooling the cutting means 9 and capable of removing the heat generated by the cutting means 9 themselves on account of the high speeds of rotation of the cutting means 9 and the friction created between the blade 21 of the cutting means 9 and the filter rods 2.

[0051] Advantageously, to be able to remove a large quantity of heat from the cutting means 9, the cooling means 22 are located at least downstream of the cutting station 11 in the direction of rotation of the cutting means 9, as illustrated in Figure 1.

[0052] Thus, the cooling means 22 can cool each portion of the cutting means 9 as it leaves the cutting station 11 where each filter rod 2 is cut into the filter plugs 10.

[0053] The cooling means 22, however, might equally be located upstream of the cutting station 11 in the direction of rotation of the cutting means 9 or both upstream and downstream of the cutting station 11 in the direction of rotation of the cutting means 9.

[0054] In a first variant embodiment, the cooling means 22 face at least one of either the front face 19 or the rear face 20 of each disc knife 12.

[0055] More specifically, the cooling means 22 com-

prise at least one nozzle 23 for delivering a cooling fluid 24 and positioned to face at least one of the faces 19, 20 of the cutting means 9, in such a way that the cooling fluid 24 strikes at least one of the faces 19, 20 of the cutting means 9. Advantageously, the nozzle 23 of the cooling means 22 is located in the proximity of the cutting blade 21.

[0056] The term "cooling fluid" is used to mean any fluid whose temperature is lower than the temperature reached by the cutting means 9 when hot. Advantageously, the cooling fluid is air.

[0057] More specifically, the cooling fluid is air at ambient or conditioned temperature.

[0058] Alternatively, the cooling fluid is a liquid at ambient or conditioned temperature.

[0059] Preferably, the cooling means 22 face both the front face 19 and the rear face 20 of each disc knife.

[0060] Consequently, a first nozzle 23a faces the front face 19 and a second nozzle 23b faces the rear face 20.

[0061] In an alternative embodiment not illustrated, the cooling means 22 face at least one portion of the cutting blade 21. More specifically, they face the portion of the cutting blade coming out of the cutting station 11.

[0062] In a second preferred variant embodiment, the cooling means 22 are made directly on the cutting means 9.

[0063] More specifically, the cooling means 22 are made at least at one of either the front face 19 or the rear face 20.

[0064] The cooling means 22 in the second variant embodiment are in the form of one or more recesses 25 for removing heat from the disc knife 12 formed on least at one of either the front face 19 or the rear face 20 of the disc knife 12.

[0065] In order to effectively disperse the heat, the front face 19 and the rear face 20 each have a plurality of recesses 25 which are equispaced from each other.

[0066] Advantageously, the recesses 25 on the front face 19 are offset relative to the recesses 25 on the rear face 20 so that the thickness of the disc knife 12 at the circular crown defined by the recesses 25 is constant.

[0067] As the disc knife 12 rotates, the recesses 25 promote dispersal of the heat from the disc knife 12.

[0068] It should be noted that the presence of the recesses 25 on at least one of either the front or rear face 19 or 20 reduces the thickness of the disc knife 12 compared to the rest of the disc knife 12 without the recesses 25, thus facilitating the removal of heat as the disc knife 12 rotates.

[0069] Advantageously, the recesses 25 are formed in the proximity of the cutting blade 21.

[0070] Preferably, each recess 25 has a substantially circular shape, and more specifically, an elliptic shape.

[0071] In the preferred embodiment, the device 1 comprises first cooling means 26 facing at least one of either the front face 19 or the rear face 20 of each disc knife 12, as well as second cooling means 27 made on at least one of the two faces 19, 20 of each disc knife 12.

[0072] More specifically, the first cooling means 26 comprise a first and a second nozzle 23a,23b for delivering the cooling fluid and each located to face a respective front and rear face 19 and 20 of the cutting means 9, and more specifically, the front and the rear face 19 and 20 of both the first and the second disc knife 13 and 14.

[0073] The front face 19 and the rear face 20 of the first and the second disc knife 13 and 14 have respective cooling recesses 25 which define the second cooling means 27.

[0074] More specifically, the front face 19 and the rear face 20 of the first and the second disc knife 13 and 14 have respective cooling recesses 25 which are equispaced from each other.

[0075] More specifically and advantageously, the first cooling means 26 are located at a portion of the disc knife 12 that is further towards the centre than the cooling recesses 25.

[0076] Consequently, the nozzles 23 face that portion and deliver the cooling fluid thereon.

[0077] Thus, the cooling recesses 25 prevent heat from accumulating at the cutting blade 21, whilst the first and second nozzles 23a, 23b deliver the cooling fluid directly to the front face 19 and rear face 20 so as to remove the rest of the heat.

[0078] Advantageously, the heat generated by the disc knives 12, in particular by the cutting blades 21, while they cut the filter rods 2 is removed continuously by the cooling means 22.

[0079] Thus, thanks to the cooling means 22, the portion of the cutting blade 21 coming out of the cutting station 11 disperses the heat accumulated during rotation about the axis 12a so that once the cutting blade 21 has come full circle, it can cut another filter rod 2 into filter plugs 10 without overheating the cut surfaces of the filter plugs 10 themselves.

[0080] This invention is particularly advantageous for cutting filter rods 2 made from filter material comprising material of polymeric origin, because the cooling action guaranteed by the cooling means 22 prevents the cutting blade 21 from burning or even partly melting the filter material of polymeric origin, thereby preventing it from vitrifying and obstructing the ventilation passages of the filter plug 10 itself.

Claims

1. A device for feeding filter rods (2) in an automatic machine for the tobacco industry, comprising at least one hold-down and transfer roller (5) whereby the filter rods (2) are held down and transferred along a predetermined path (P), and cutting means (9) which cut the filter rods (2) into filter plugs (10) and which are opposed to the hold-down and transfer roller (5), the hold-down and transfer roller (5) and the cutting means (9) defining at least one cutting station (11),

wherein the cutting means (9) comprise at least one disc knife (12) which rotates about a respective axis of rotation (12a); the disc knife (12) comprising a front face (19) and a rear face (20), opposite to the front face (19), and a circumferential cutting blade (21) connecting the front face (19) with the rear face (20);
characterised in that
the device further comprises cooling means (22) for cooling the cutting means (9) and capable of removing the heat generated during the cutting of the filter rods (2); wherein further at least one of either the front face (19) or the rear face (20) has one or more recesses (25) for cooling the knife (12);
wherein
the cooling means (22) comprise at least one nozzle (23) for delivering a cooling fluid and positioned to face the cutting means (9).

2. The device according to claim 1, **characterized in that** the cooling means (22) are located at the cutting means (9).

3. The device according to claim 1 or 2 , **characterized in that** the cooling means (22) face at least one of either the front face (19) or the rear face (20); the cooling means (22) operating on a portion of the face (19, 20).

4. The device according to any one of claims 1 to 3, **characterized in that** the cooling means (22) face at least one portion of the cutting blade (21).

5. The device according to any one of claims 1 to 4, **characterized in that** the at least one recess (25) is made in the proximity of the cutting blade (21).

6. The device according to any one of claims 1 to 5, **characterized in that** the front face (19) and the rear face (20) each have a plurality of recesses (25) which are equispaced from each other; the recesses (25) on the front face (19) being offset relative to the recesses on the rear face (20).

7. The device according to any one of claims 1 to 6 , **characterized in that** it comprises first cooling means (26) facing at least one of either the front face (19) or the rear face (20) of the disc knife (12) and second cooling means (27) located at at least one of either the front face (19) or the rear face (20) of the cutting means (9).

8. The device according to claim 7, **characterized in that** the first cooling means (26) comprise at least one nozzle (23) for delivering a cooling fluid and positioned to face at least one of either the front face (19) or the rear face (20) of the disc knife (12) and at least one of either the front face (19) or the rear face (20) has one or more recesses (25) defining the second cooling means (27) of the disc knife (12).

Patentansprüche

1. Vorrichtung zur Zuführung von Filterstäben (2) in eine automatische Maschine für die Tabakindustrie, umfassend mindestens eine Niederhalte- und Transferwalze (5), durch die die Filterstäbe (2) nach unten gehalten und entlang eines vorgegebenen Wegs (P) transferiert werden, und Schneidmittel (9), die die Filterstäbe (2) in Filterspitzen (10) schneiden und die gegenständig zur Niederhalte- und Transferwalze (5) angeordnet sind, wobei die Niederhalte- und Transferwalze (5) und die Schneidmittel (9) mindestens eine Schneidstation (11) definieren,

   wobei die Schneidmittel (9) mindestens ein Scheibenmesser (12) umfassen, das sich um eine jeweilige Rotationsachse (12a) dreht, wobei das Scheibenmesser (12) eine Frontseite (19) und eine Rückseite (20), die gegenständig zur Frontseite (19) angeordnet ist, und ein Umfangsschneidmesser (21) umfasst, das die Frontseite (19) mit der Rückseite (20) verbindet, **dadurch gekennzeichnet, dass** die Vorrichtung zudem Kühlmittel (22) zum Kühlen der Schneidmittel (9) umfasst, die in der Lage sind, die beim Schneiden der Filterstäbe (2) erzeugte Wärme zu beseitigen, wobei zudem mindestens entweder die Frontseite (19) und/oder die Rückseite (20) eine oder mehrere Vertiefungen (25) zum Kühlen des Messers (12) aufweisen,
   wobei die Kühlmittel (22) mindestens eine Düse (23) umfassen, um ein Kühlmedium zuzuführen, und die positioniert ist, um den Schneidmitteln (9) zugewandt zu sein.

2. Vorrichtung nach Anspruch 1, **dadurch gekennzeichnet, dass** die Kühlmittel (22) an den Schneidmitteln (9) angeordnet sind.

3. Vorrichtung nach Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** die Kühlmittel (22) mindestens entweder der Frontseite (19) und/oder der Rückseite (20) zugewandt sind, wobei die Kühlmittel (22) auf einem Abschnitt der Seite (19, 20) wirken.

4. Vorrichtung nach einem der Ansprüche 1 bis 3, **dadurch gekennzeichnet, dass** die Kühlmittel (22) mindestens einem Abschnitt des Schneidmessers (21) zugewandt sind.

5. Vorrichtung nach einem der Ansprüche 1 bis 4, **dadurch gekennzeichnet, dass** die mindestens eine Vertiefung (25) in der Nähe des Schneidmessers

(21) ausgebildet ist.

6. Vorrichtung nach einem der Ansprüche 1 bis 5, **dadurch gekennzeichnet, dass** die Frontseite (19) und die Rückseite (20) jeweils eine Vielzahl an Vertiefungen (25) aufweisen, die gleich voneinander beabstandet sind, wobei die Vertiefungen (25) an der Frontseite (19) relativ zu den Vertiefungen an der Rückseite (20) versetzt sind.

7. Vorrichtung nach einem der Ansprüche 1 bis 6, **dadurch gekennzeichnet, dass** sie erste Kühlmittel (26) umfasst, die mindestens entweder der Frontseite (19) und/oder der Rückseite (20) des Scheibenmessers (12) zugewandt sind, und zweite Kühlmittel (27), die mindestens entweder an der Frontseite (19) und/oder der Rückseite (20) der Schneidmesser (9) angeordnet sind.

8. Vorrichtung nach Anspruch 7, **dadurch gekennzeichnet, dass** die ersten Kühlmittel (26) mindestens eine Düse (23) umfassen, um ein Kühlmedium zuzuführen, und positioniert sind, um mindestens entweder der Frontseite (19) und/oder der Rückseite (20) des Scheibenmessers (12) zugewandt zu sein, wobei mindestens entweder die Frontseite (19) und/oder die Rückseite (20) eine oder mehrere Vertiefungen (25) aufweisen, definierend die zweiten Kühlmittel (27) des Scheibenmessers (12).

Revendications

1. Dispositif permettant d'alimenter en tiges-filtres (2) une machine automatique pour l'industrie du tabac, comprenant au moins un rouleau de retenue et de transfert (5) par lequel les tiges-filtres (2) sont retenues et transférées le long d'un parcours prédéterminé (P), et des moyens de découpe (9) qui coupent les tiges-filtres (2) dans des bouchons filtres (10) et qui sont opposés au rouleau de retenue et de transfert (5), le rouleau de retenue et de transfert (5) et les moyens de découpe (9) définissant au moins un poste de découpe (11),

   dans lequel les moyens de découpe (9) comprennent au moins un couteau à disque (12) qui tourne autour d'un axe de rotation (12a) respectif ; le couteau à disque (12) comprenant un côté antérieur (19) et un côté postérieur (20) opposé au côté antérieur (19), et une lame de coupe (21) circonférentielle reliant le côté antérieur (19) au côté postérieur (20) ;
   caractérisé en ce que le dispositif comprend de plus des moyens de refroidissement (22) pour refroidir les moyens de découpe (9) et pouvant éliminer la chaleur générée durant la coupe des tiges-filtres (2) ; dans lequel de plus au moins soit le côté antérieur (19) soit le côté postérieur (20) comporte un ou plusieurs renfoncements (25) pour refroidir le couteau (12) ;
   dans lequel les moyens de refroidissement (22) comprennent au moins une buse (23) pour distribuer un fluide de refroidissement et positionnée pour faire face aux moyens de découpe (9).

2. Dispositif selon la revendication 1, **caractérisé en ce que** les moyens de refroidissement (22) sont situés en correspondance des moyens de découpe (9).

3. Dispositif selon la revendication 1 ou 2, **caractérisé en ce que** les moyens de refroidissement (22) font au moins face soit au côté antérieur (19) soit au côté postérieur (20) ; les moyens de refroidissement (22) agissant sur une partie du côté (19, 20).

4. Dispositif selon l'une quelconque des revendications de 1 à 3, **caractérisé en ce que** les moyens de refroidissement (22) font face au moins à une partie de la lame de coupe (21).

5. Dispositif selon l'une quelconque des revendications de 1 à 4, **caractérisé en ce que** l'au moins un renfoncement (25) est réalisé à proximité de la lame de coupe (21).

6. Dispositif selon l'une quelconque des revendications de 1 à 5, **caractérisé en ce que** le côté antérieur (19) et le côté postérieur (20) comportent chacun une pluralité de renfoncements (25) étant équidistants les uns des autres ; les renfoncements (25) sur le côté antérieur (19) étant décalés par rapport aux renfoncements sur le côté postérieur (20).

7. Dispositif selon l'une quelconque des revendications de 1 à 6, **caractérisé en ce qu'**il comprend des premiers moyens de refroidissement (26) faisant au moins face soit au côté antérieur (19) soit au côté postérieur (20) du couteau à disque (12) et des seconds moyens de refroidissement (27) situés en correspondance d'au moins soit du côté antérieur (19) soit du côté postérieur (20) des moyens de découpe (9).

8. Dispositif selon la revendication 7, **caractérisé en ce que** les premiers moyens de refroidissement (26) comprennent au moins une buse (23) pour distribuer un fluide de refroidissement et positionnée pour faire face au moins soit au côté antérieur (19) soit au côté postérieur (20) du couteau à disque (12) et au moins soit le côté antérieur (19) soit le côté postérieur (20) comporte un ou plusieurs renfoncements (25) définissant les seconds moyens de refroidissement (27) du couteau à disque (12).

FIG.1

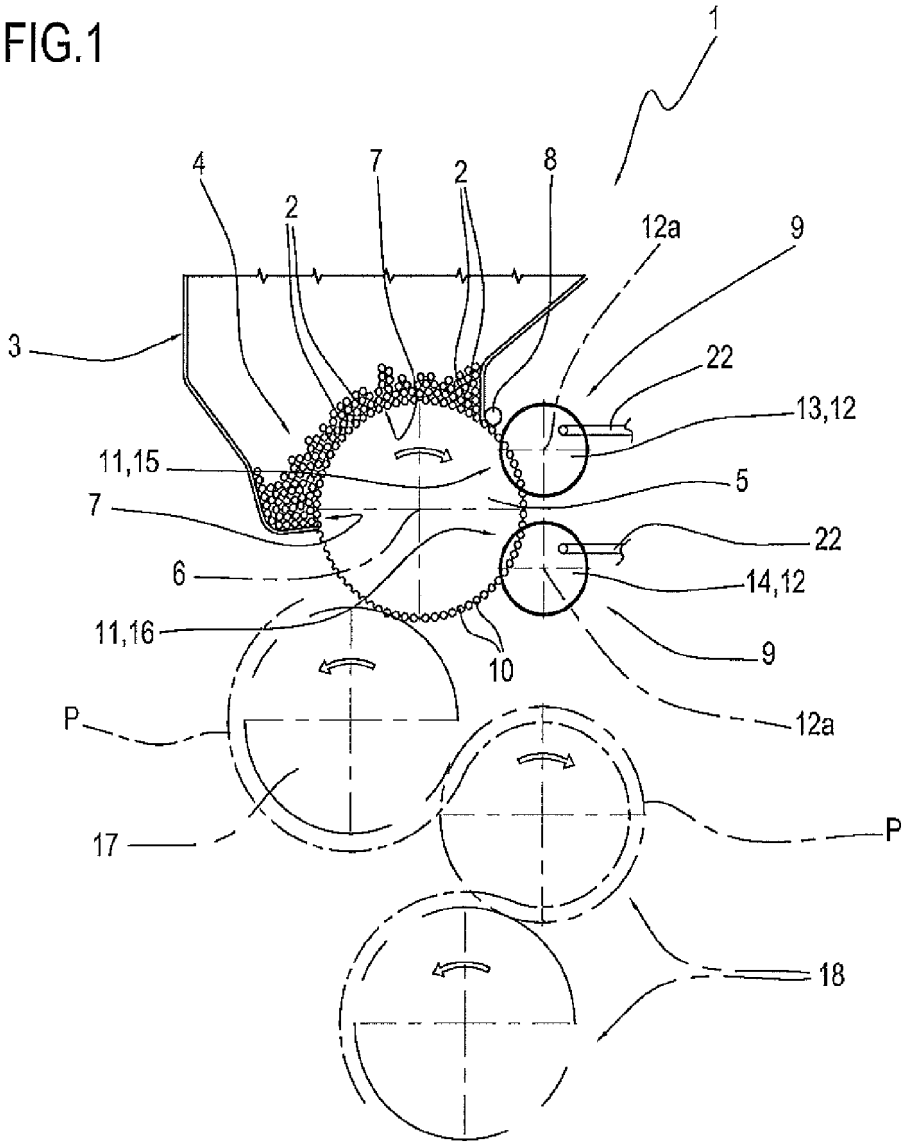


FIG.2

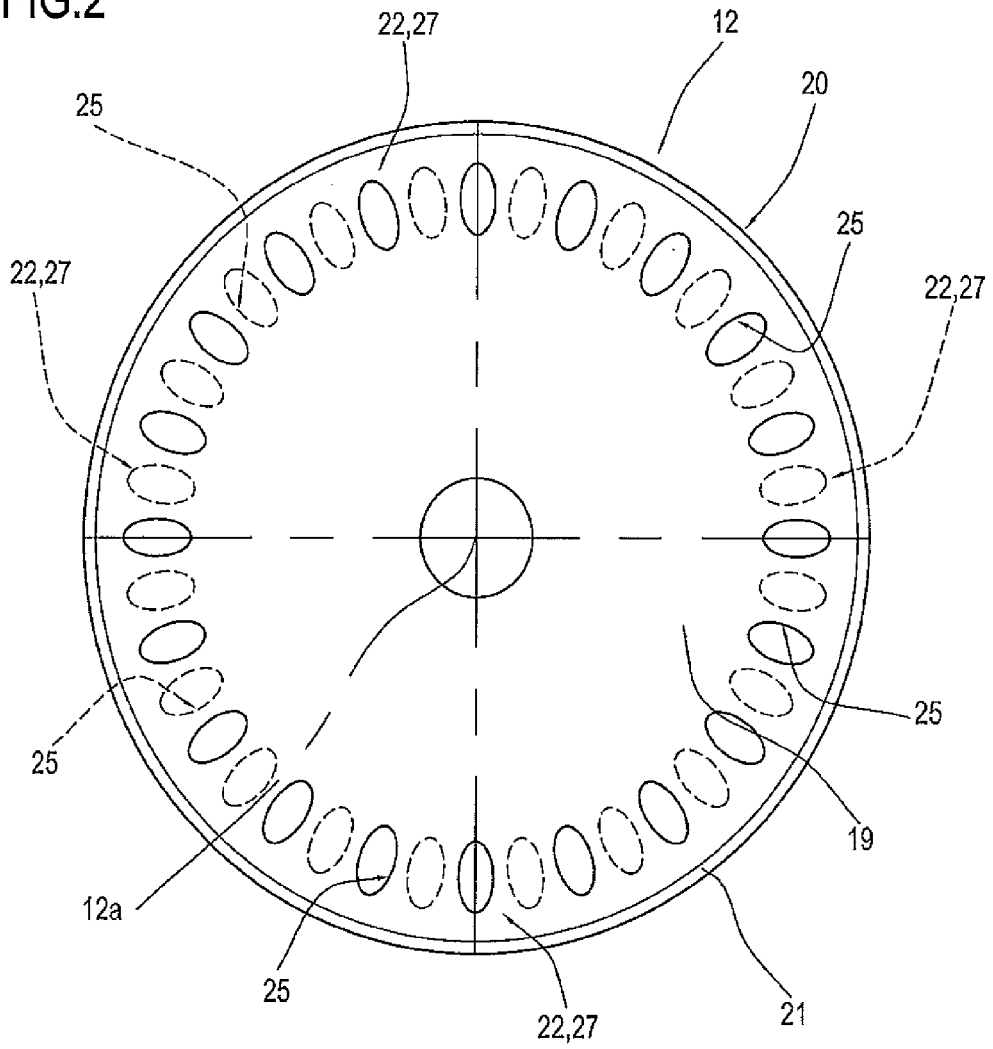


FIG.3

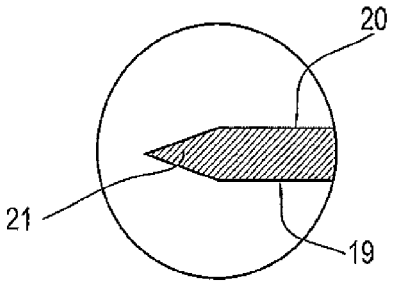


FIG.4

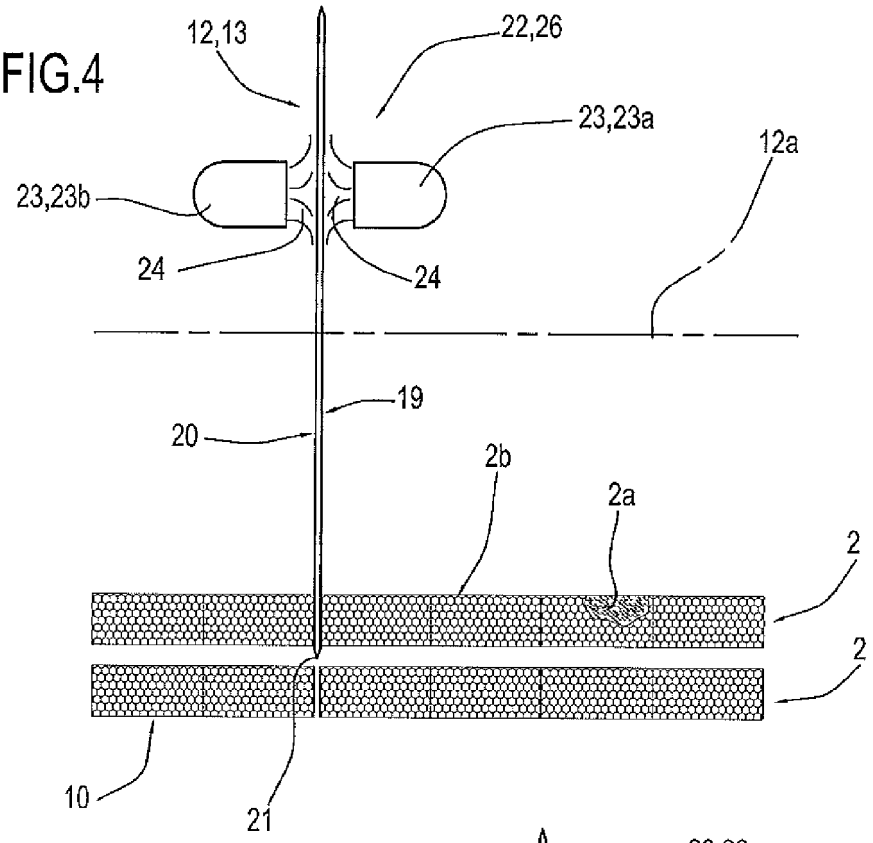
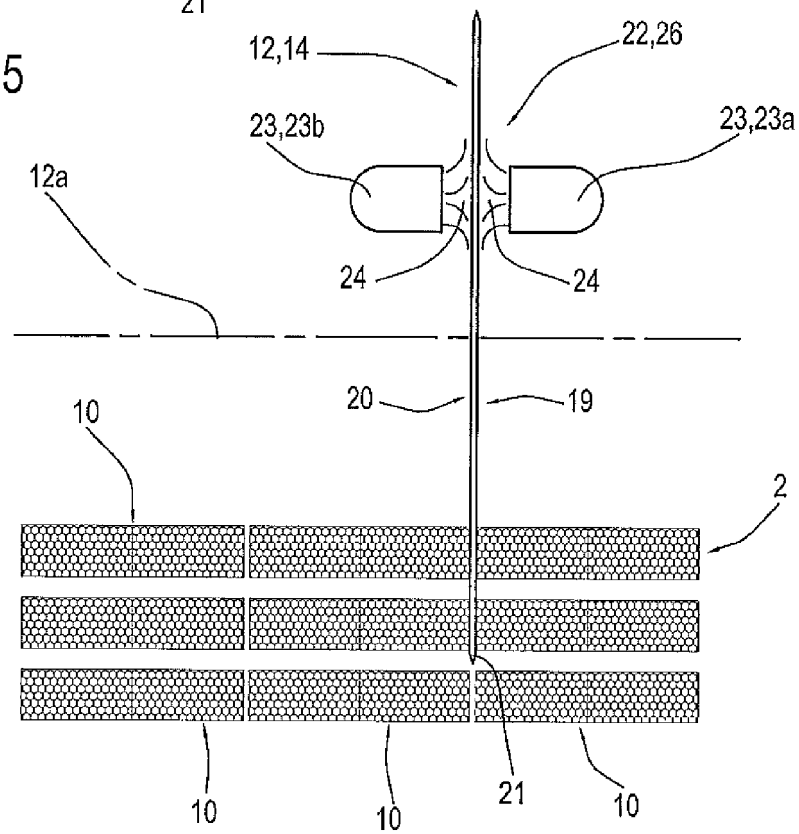

12,13
22,26
23,23a
12a
23,23b
24
24
19
20
2b
2a
2
2
10
21

FIG.5


12,14
22,26
23,23b
23,23a
12a
24
24
20
19
10
2
10
10
21
10

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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