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(54) **A rectilinear combing machine with an improved system for the fitting and removal of the cylindrical brush**

Flachkämmaschine mit einem verbesserten Ein- und Ausbausystem der Zylinderbürste

Machine de peignage rectiligne avec un système amélioré pour mettre en place et enlever la brosse cylindrique

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Description

[0001] The present invention relates to a rectilinear combing machine of the type comprising:

- a circular comb for cleaning the head portions of tufts of fibres held by a nipper,
- a cylindrical brush fitted removably on a support shaft contrarotating relative to the circular comb, the brush being covered with bristles which, in use, penetrate between the bars of the circular comb and remove fibres and waste which collect on the circular comb, and
- a doffer for removing the fibres carried by the brush.

[0002] In rectilinear combing machines of modern design, the short waste fibres are separated from the long fibres by means of a circular comb and a straight comb.

[0003] The short and very short fibres together form the noil which is transported by the circular comb onto the cylindrical brush, from which the noil is removed in turn by the doffer. The noil is then detached from the doffer and recovered by a system provided for that purpose.

[0004] The cylindrical brush has a faster speed of rotation than the circular comb so as to be able to clean the comb effectively. In operation, the bristles covering the brush penetrate between the bars of the circular comb and are pushed rearwardly relative to the sense of rotation of the brush. After a certain period of operation, the bristles consequently remain deformed rearwardly and the efficiency of the brush is reduced to zero since the tips of the bristles of the covering no longer penetrate the circular comb and can no longer remove the noil from the needles of the bars.

[0005] The efficiency of the circular comb thus decreases considerably because of the accumulation of noil which is no longer removed by the circular brush. To prevent this problem, it is necessary to turn the brush through 180° periodically so as to make the bristles of the covering work in the opposite direction. This operation has to be carried out on average after every twenty-four hours of operation, or every forty-eight hours at the most.

[0006] In known rectilinear combing machines, the brush is fitted on a shaft which has supports at both of its ends. The brush cannot be removed from the shaft and is composed of two half-shells which are joined together to form a cylindrical body. In order to turn the brush round, it is therefore necessary to stop the machine, slacken the device clamping the brush, remove the two half-shells which make up the cylindrical brush, turn both of the half-shells round and fit them back on the shaft and, finally, clamp the brush on the shaft. To be able to carry out these operations, it is also necessary to open all of the doors of the machine and to dismantle the front suction device situated in the region of the cylindrical brush. After the brush has been turned round, in order to start the machine again, it is necessary to refit the suction device, possibly to adjust the position of the brush relative to the circular comb, and to close the doors.

[0007] These operations take a long time, involving a loss of productivity of the machine, particularly if it is borne in mind that combing machines are always in batteries of six, eight, twelve or more machines which have to be stopped simultaneously in order to turn the brushes round.

[0008] The object of the present invention is to provide a rectilinear combing machine of the type specified above which is not affected by the aforementioned problems and which achieves a reduction in the unproductive periods of the plant during the turning of the brushes.

[0009] According to the present invention, this object is achieved by a rectilinear combing machine having the characteristics forming the subject of the main claim.

[0010] In the novel system proposed, the support shaft of the brush is cantilevered on the structure of the machine and, instead of being constituted by two half-shells, the brush comprises a monolithic, tubular support body which can be fitted on the shaft from its distal end and can be removed from the shaft by a simple axial movement. The brush is connected for rotation with the shaft by bayonet-type quick-coupling means. The shaft also has centring means which centre the brush automatically simultaneously with its fitting on the shaft.

[0011] Further characteristics and advantages of the present invention will become clear in the course of the following detailed description, given purely by way of non-limiting example, with reference to the appended drawings, in which:

Figure 1 is a schematic side view of a rectilinear combing machine according to the invention,

Figure 2 is a schematic, perspective view of the part indicated by the arrow II in Figure 1, and

Figure 3 is a section taken on the line III-III of Figure 2.

[0012] With reference initially to Figure 1, a rectilinear combing machine, indicated 10, comprises, in generally known manner, a base 12 carrying two or three feed rollers 14 which supply a sliver of fibres to be combed in the direction indicated by the arrow 16. The sliver to be combed passes through an array of needles or gill 18 downstream of which there is a nipper 20 comprising a lower jaw 22 and an upper jaw 24. A straight comb 26 is disposed downstream of the nipper 20, with reference to the direction of advance of the sliver, and is movable to and fro between a raised position and a lowered position.

[0013] In front of the nipper 20 is a detaching carriage 28 which oscillates in the directions indicated by the double arrow 30 and comprises a pair of detaching rollers 32 which detach tufts of fibre causing them to pass through the straight comb 26. The detaching carriage 28 comprises a tubular belt 34 on which the sliver of combed fibres is formed by partial superposition of the detached tufts of fibres.

[0014] A circular comb 36 is disposed beneath the nipper 20 and is mounted on a shaft 38 rotated in the sense indicated by the arrow 40. The circular comb 36 is shaped as a circular sector and has a plurality of bars which, in use, carry out the combing in the head portions of the tufts held by the nipper 20. The short and very short fibres which together collect between the bars of the circular comb 36 constitute the so-called noil. A cylindrical brush 44 has a covering of bristles which, in use, penetrate to the base of the bars of the circular comb 36. The cylindrical brush 44 contrarotates relative to the circular comb 36 and rotates at a much faster speed than the latter.

[0015] The cylindrical brush 44 extracts the noil from the circular comb and transports it, carding it briefly, onto a doffer 46. The doffer 46 is rotated continuously and the noil is detached therefrom by means of an oscillating rake-like comb 48. The noil is produced on the rake-like comb 48 in the form of a continuous film which is recovered by a suction system, not shown.

[0016] With reference now to Figures 2 and 3, the cylindrical brush 44 is composed substantially of a monolithic tubular body 50 to which the bristles 52 of the covering are anchored, in known manner. The tubular body 50 is mounted on a shaft 54 cantilevered for rotation about its own longitudinal axis 56 on a fixed support 58. The fixed support 58 is carried by the base of the machine and its position relative to the circular comb can be adjusted manually or automatically to compensate for the wear of the covering 52 of the cylindrical brush 44. The shaft 54 is rotated by a driven shaft of the machine, by means of a chain of transmission elements. Alternatively, the shaft 54 may have its own motor operable at a fixed speed or a variable speed. With autonomous drive of the shaft 54, a non-return device is also provided.

[0017] The shaft 54 projects in the manner of a cantilever from the fixed support 58 so that the brush 44 can be fitted or removed by a simple movement in an axial direction. To facilitate the fitting of the brush on the shaft, the distal end of the shaft 54 has a tapered portion 60.

[0018] The shaft 54 has a diameter slightly smaller than the inside diameter of the body 50 and has means for automatically centring the brush 44 relative to the axis of rotation 56. These centring means include a frustoconical portion 62 formed integrally on the proximal end of the shaft 54. As can be seen in Figure 3, the tubular body 50 of the brush 44 has a corresponding frustoconical portion 64 which bears axially against the portion 62, ensuring that the brush is centred at the proximal end of the shaft 54. At the opposite end, centring is ensured by a plurality of centring members 68 carried by the distal end of the shaft 54 and urged resiliently outwardly by respective springs 70 (Figure 3).

[0019] The brush 44 and the shaft 54 are connected for rotation by quick-coupling means which operate in accordance with the general principle of a bayonet connection. This bayonet connection comprises a coupling portion 72 formed integrally on the shaft 54 at its proximal end. A plurality of open-ended helical grooves 74 is formed on the coupling portion 72. Each end of the brush 44 has a plurality of radial pins 76 and 76' for engaging respective grooves 74.

[0020] The brush 44 is formed symmetrically with respect to a median plane perpendicular to its longitudinal axis so that it can be engaged on the shaft in two positions disposed at 180° to one another. The helical grooves 74 are inclined in the opposite sense to the sense of rotation of the shaft, relative to a line parallel to the longitudinal axis of the shaft and oriented from the distal end to the proximal end of the shaft. In other words, as the pins 76 travel along the grooves 74 in the direction of insertion, they perform a rotation relative to the longitudinal axis 56 in the opposite sense to the sense of rotation of the shaft, indicated by the arrow 78 in Figure 2. During the rotation of the shaft 54, the contact between the walls of the grooves 74 and the radial pins 76 thus generates an axial force which tends to urge the brush 74 in the direction indicated by the arrow 80 in Figure 3. This force is sufficient to keep the brush 44 firmly in rotational contact with the shaft 54 without the need for further clamping means.

[0021] It is clear from the foregoing that the engagement and centring of the brush 44 on the shaft 54 take place by means of a simple movement of the brush relative to the shaft in an axial direction. The removal of the brush is also very simple and is carried out by a slight rotation of the brush in the sense of rotation of the shaft in order to release the pins 76 from the grooves 74, the brush then being removed from the shaft axially.

Claims

1. A rectilinear combing machine comprising:

- a circular comb (36) for cleaning the head portions of tufts of fibres held by a nipper (20),
- a cylindrical brush (44) fitted removably on a support shaft (54) contrarotating relative to the circular comb (36), the brush (44) being covered with bristles (52) which, in use, penetrate between the bars of the circular comb (36) and remove fibres and waste which collect on the circular comb (36), and
- a doffer (46) for removing the fibres carried by

the brush,

characterized in that the shaft (54) for supporting the brush (44) is cantilevered on the structure of the machine, and **in that** the brush (44) comprises a monolithic tubular body (50) which is intended to be fitted on the shaft (54) or to be removed from the shaft (54) by movement in an axial direction.

2. A rectilinear combing machine according to Claim 1, **characterized in that** the body (50) of the brush (44) is connected to the shaft (54) by bayonet connection means (74, 76, 76').

3. A rectilinear combing machine according to Claim 2, **characterized in that** both ends of the body (50) of the brush (44) have radial pins (76, 76') for engaging helical grooves (74) formed in the shaft (54) at the proximal end thereof.

4. A rectilinear combing machine according to Claim 3, **characterized in that** the grooves (74) are inclined in the opposite sense to the sense of rotation of the shaft, relative to a line parallel to the longitudinal axis of the shaft and oriented from the distal end to the proximal end of the shaft.

5. A rectilinear combing machine according to Claim 1, **characterized in that** the proximal end of the shaft (54) for supporting the brush (44) has a frustoconical centring portion (62) against which the body (50) of the brush (44) bears axially.

6. A rectilinear combing machine according to Claim 1, **characterized in that** the distal end of the shaft (54) for supporting the brush (44) has a plurality of centring members (68) projecting radially from the shaft and urged resiliently outwardly.

Patentansprüche

1. Flachkämmmaschine, die enthält:

- einen Rundkamm (36), um die Kopfbereiche von Faserbüscheln zu reinigen, die von einer Zange (20) gehalten werden,
- eine Zylinderbürste (44), die auf einer Tragwelle (54) abnehmbar befestigt ist, die sich relativ zum Rundkamm (36) in die entgegengesetzte Richtung dreht, wobei die Bürste (44) mit Borsten (52) überzogen ist, die im Betrieb zwischen die Stäbe des Rundkamms (36) eindringen und Fasern sowie Verunreinigungen entfernen, die sich auf dem Rundkamm (36) angesammelt haben, und
- einen Abzieher (46), um die von der Bürste gehaltenen Fasern zu entfernen,

dadurch gekennzeichnet, dass die Welle (54), die die Bürste (44) trägt, im Chassis der Maschine freitragend gelagert ist, und dass die Bürste (44) einen monolithischen, rohrförmigen Körper (50) enthält, der so aufgebaut ist, dass er durch eine Bewegung in axialer Richtung auf die Welle (54) aufgesetzt oder von der Welle (54) entfernt werden kann.

2. Flachkämmmaschine gemäß Anspruch 1, **dadurch gekennzeichnet, dass** der Körper (50) der Bürste (44) mit der Welle (54) über eine Bajonettverbindung (74, 76, 76') verbunden ist.

3. Flachkämmmaschine gemäß Anspruch 2, **dadurch gekennzeichnet, dass** beide Enden des Körpers (50) der Bürste (44) mit radialen Zapfen (76, 76') versehen sind, um in schraubenförmige Rillen (74) einzugreifen, die in der Welle (54) am inneren Ende der Welle (54) ausgebildet sind.

4. Flachkämmmaschine gemäß Anspruch 3, **dadurch gekennzeichnet, dass** die Rillen (74) entgegengesetzt zur Drehrichtung der Welle relativ zu einer Achse parallel zur Längsachse der Welle geneigt und vom freien Ende zum inneren Ende der Welle ausgerichtet sind.

5. Flachkämmmaschine gemäß Anspruch 1, **dadurch gekennzeichnet, dass** das innere Ende der Welle (54), die die Bürste (44) trägt, einen kegelstumpfförmigen Teil (62) besitzt, an dem der Körper (50) der Bürste (44) axial aufliegt.

6. Flachkämmmaschine gemäß Anspruch 1, **dadurch gekennzeichnet, dass** das freie Ende der Welle (54), die die Bürste (44) trägt, eine Vielzahl von Zentrierelementen (68) besitzt, die radial von der Welle vorspringen und federnd nach außen gedrückt werden.

Revendications

1. Une machine de peignage rectiligne, comprenant:

- un peigne circulaire (36) pour nettoyer les parties de tête de touffes de fibres maintenues par un accrocheur (20),
- une brosse cylindrique (44) montée de façon amovible sur un arbre support (54) tournant en sens inverse par rapport au peigne circulaire (36), la brosse (44) étant couverte de soies (52) qui en utilisation pénètrent entre les tiges du peigne circulaire (36) et éliminent fibres et déchets qui se collectent sur le peigne circulaire

(36), et

- un cylindre peigneur (46) pour éliminer les fibres portées par la brosse,
- **caractérisée en ce que** l'arbre (54) devant supporter la brosse (44) est monté en porte-à-faux sur la structure de la machine, et **en ce que** la brosse (44) comprend un corps tubulaire (50) monolithique prévu pour être monté sur l'arbre (54) ou être enlevé de l'arbre (54) par un déplacement en direction axiale.

2. Une machine de peignage rectiligne selon la revendication 1, **caractérisée en ce que** le corps (50) de la brosse (44) est relié à l'arbre (54) par des moyens de liaison à baïonnette (74, 76, 76').

3. Machine de peignage rectiligne selon la revendication 2, **caractérisée en ce que** les deux extrémités du corps (50) de la brosse (44) ont des tétons radiaux (76, 76') pour venir en prise avec des gorges (74) hélicoïdales formées dans l'arbre (54), à son extrémité proximale.

4. Machine de peignage rectiligne selon la revendication 3, **caractérisée en ce que** les gorges (74) sont inclinées dans le sens opposé au sens de rotation de l'arbre, par rapport à une ligne parallèle à l'axe longitudinal de l'arbre et orientées depuis l'extrémité distale vers l'extrémité proximale de l'arbre.

5. Une machine de peignage rectiligne selon la revendication 1, **caractérisée en ce que** l'extrémité proximale de l'arbre (54) devant supporter la brosse (44) a une partie de centrage (62) tronconique, contre laquelle le corps (50) de la brosse (44) porte axialement.

6. Une machine de peignage rectiligne selon la revendication 1, **caractérisée en ce que** l'extrémité distale de l'arbre (54) devant supporter la brosse (44) a une pluralité d'éléments de centrage (68) faisant saillie radialement depuis l'arbre et sollicité axialement vers l'extérieur.

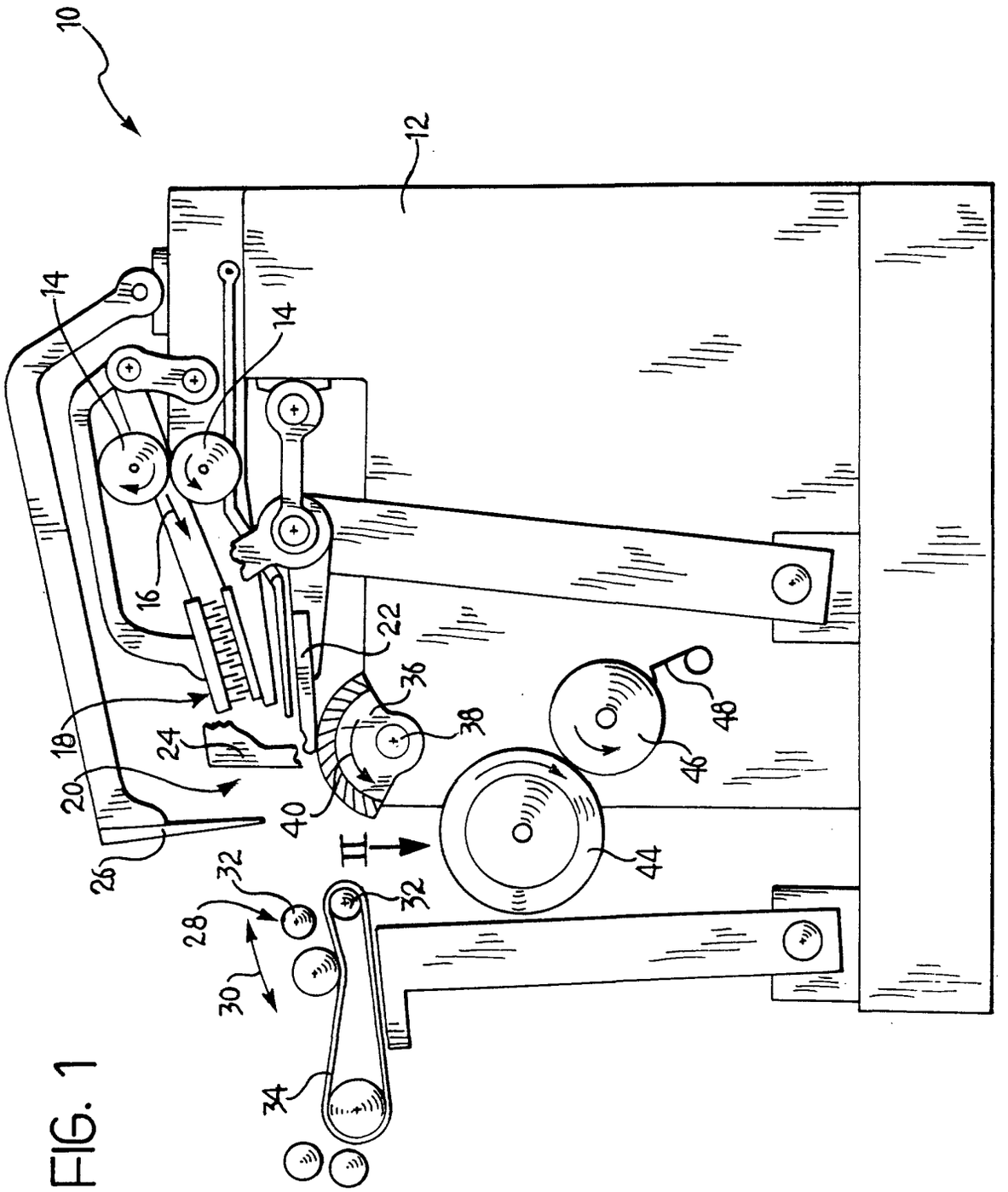

FIG. 1

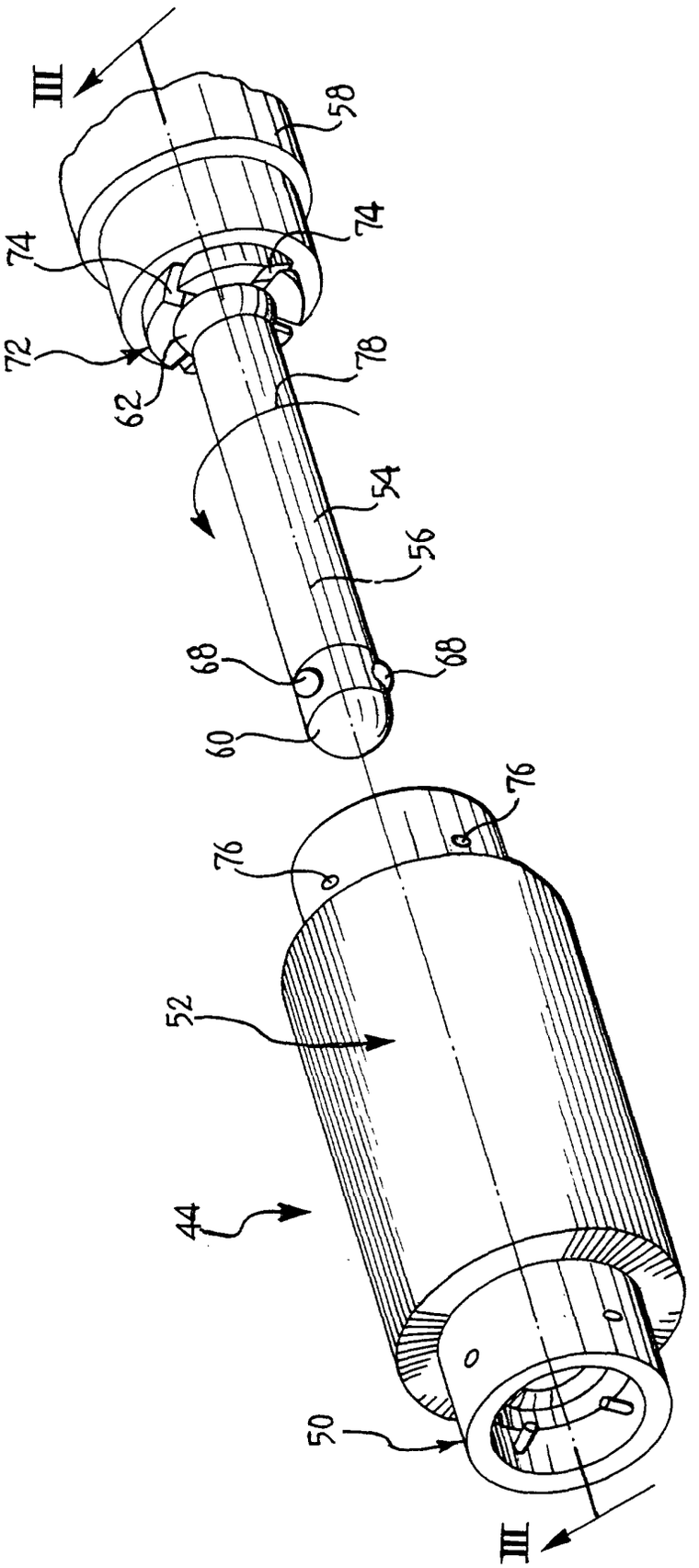

FIG. 2

FIG. 3