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(54) **BRUSH FOR SURFACES**

BÜRSTE FÜR FLÄCHEN

BROSSE POUR SURFACES

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(56) References cited:

WO-A1-2004/009338 US-A1- 2009 282 633
US-A1- 2011 107 530 US-A1- 2013 276 827
US-B1- 6 536 067

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Description

[0001] The present invention relates to a brush suitable to be mounted on a self-powered vehicle for brushing or conditioning large surfaces. The invention relates more particularly to a brush of 'static' type, namely wherein its bristles, in use, are not moved by an own motion (as occurs, for example, for brushes called 'rotative'), other than the movement derived from the movement of the vehicle on the surface. Static brushes have low purchasing and maintenance costs and they advantageously lift a low amount of dust.

[0002] Typically, static brushes comprise a frame provided with a mounting portion for mounting the brush to the self-powered vehicle, typically to the two forks of a vehicle for goods movement commonly called 'forklift'. A plurality of tufts of bristles are rigidly fixed to the frame, so protruding from it orthogonally.

[0003] In use the bristles lean on the surface to be brushed, with their free end opposite to the frame, typically in this way sustaining partially or fully the weight of the brush. Following the movement of the self-powered vehicle, the bristles slide with their free end on the surface exerting a brushing action of the existing dirt.

[0004] The patent document US 5,621,940B1 discloses a static brush, comprising a plurality of removable strips of bristles mutually parallel, the bristles being made from extruded plastic, preferably polypropylene.

[0005] The patent document EP 2269484 B1 discloses a static brush, wherein some rows of bristles are disposed in V-shape or in curvilinear shape, for the purpose of improving the dirt retaining capability before it exits laterally.

[0006] US 2011/107530 A1 discloses a brush for a machine for the cleaning of surfaces provided with at least one set of first hairs for cleaning or polishing the parts of the surface which extend between grooves, joints, unevennesses and/or pores, and at least one set of second hairs for cleaning the grooves, joints, unevennesses and/or pores.

[0007] US 6536067 B1 discloses a vehicle mounted broom.

[0008] WO 2004/009338 A1 discloses a method for manufacturing a cassette brush adapted for making a brush consisting of a plurality of consistent cassette brushes.

[0009] US 2013/276827 A1 discloses a brush for removing chewing gum remains and weeds from a surface, consisting of a baseplate provided with first hairs and one or more detachable brush parts provided with second hairs, in which one or more first or second hairs are steel strips or wires having a serrated or toothed edge and/or tip.

[0010] US 2009/282633 A1 discloses a brush for cleaning swimming pools according to the preamble of claim 1.

[0011] The Applicant realized that known brushes are not devoid of disadvantages and/or can be improved in

some aspects.

[0012] The Applicant realized that known brushes are usually optimized for brushing alternatively light dirt or heavy dirt, but they are not able to brush efficiently mixed dirt, i.e. light and heavy.

[0013] For example, the brush described in EP 2269484 B1 has rows of bristles of different diameter, so as, notwithstanding they are made from the same material, the thicker bristles can repel the debris or objects of significant size and/or heavy, while the thinner bristles can repel the smaller dirt.

[0014] The Applicant discovered that also this solution has some drawbacks, inasmuch the use of the same material for the bristles does not allow to differentiate sufficiently the brushing capability of the bristles for brushing efficiently light and heavy debris.

[0015] So, the Applicant has faced the problem of designing a brush for large surfaces which overcomes the inconveniences of the prior art, for example which has a high capability and/or efficiency of brushing in presence of small and light dirt, as well as heavy debris, such as metal object or iron filings, and which at the same time has a structure simple and/or affordable, and/or its production is simple and/or inexpensive.

[0016] The Applicant considers that one or more of the previous problems, and possible further problems better explained in the following, are solved by a brush for surfaces according to the present invention, according to one or more of the following claims and/or one or more of the following preferred embodiments.

[0017] The invention concerns a static brush for surfaces as defined in the claims, comprising a frame provided with a mounting portion for mounting the brush to a self-powered vehicle and a plurality of bristles (rigidly) attached to the frame so that the bristles protrude from the frame on an opposite side to said mounting portion.

[0018] Said plurality of bristles comprises a first group of bristles made from a plastic material and a second group of bristles made from an iron alloy.

[0019] The Applicant considers that the aforementioned features, particularly the feature that the brush comprises both bristles made from plastic material and bristles made from iron alloy, allows to brush efficiently surfaces which presents debris made from material both with high specific weight and with low specific weight. Particularly, the bristles made from iron alloy are particularly suited, due to their toughness and relative rigidity, to collect heavy and/or high specific weight objects (such as metal objects or iron filings) and to drag for a long distance, even in presence of a considerable heap of these materials against the metal bristles. On the contrary, the bristles made from plastic material, by their nature more flexible, are particularly suitable to collect and drag thinner and lighter dirt (such as for example common dust or shredded paper), even because during the drag on the surface they tend to flex all in the same way, so constituting a barrier for that kind of dirt.

[0020] On the other way, the bristles made from iron

alloy are, as such, not typically able to collect and drag along themselves the lighter and thinner dirt, whereas the bristles made from plastic are, as such, not able to collect and drag along themselves the dirt constituted of heavy objects or, anyway, made of material of high specific weight, as for example small objects made from metal or metal filings, especially when that kind of dirt accumulates progressively against the plastic bristles.

[0021] Furthermore, the Applicant noticed a synergic effect between the plastic bristles and the iron alloy bristles, insofar the latter are able to 'scrabble' the surface, so removing also the dirt attached to the surface, while the plastic bristles are able to collect that dirt removed from the surface, which otherwise (in case of iron alloy bristles alone) would mostly scatter again. On the contrary, the bristles made of plastic are not typically able to remove the dirt attached to the surface.

[0022] Preferably said plastic material is selected in the group consisting of: polypropylene, aliphatic polyamides (nylon), aromatic polyamides (e.g. Kevlar, Nomex, etc.).

[0023] Preferably said alloy iron is steel (i.e. alloy of iron and carbon, in addition of possible other elements, preferably containing less than 2% of carbon), more preferably hardened steel (i.e. containing 0.4% or more of carbon and, preferably containing 1.2% or less of carbon), for example harmonic steel.

[0024] In a preferred embodiment, the plastic material is polypropylene and the iron alloy is hardened steel.

[0025] The materials cited in the previous three paragraphs are found particularly suitable to the purpose in terms of physical characteristics, including the wear resistance, even though they are cheap (especially the polypropylene). To this regard, the Applicant, after extensive tests of the aforementioned brush, found with great surprise that the wear that suffered the bristles made of the aforementioned steel and the bristles made of the aforementioned plastic resulted comparable. This aspect, according the Applicant makes it possible to realize the brush of the present invention not only technically but also economically and commercially, because the substitution of the bristles due to wear and/or damage becomes necessary after a usage comparable to that of bristles made of a single material. On the contrary, different timing for substitution of the two materials because of use would be more expensive and/or cause a complication of the maintenance of the brush.

[0026] 'Brushing direction' or 'longitudinal direction' is defined as the direction along which the brush is designed to be dragged by the self-powered vehicle on the surface, and 'transversal direction' is defined as the direction orthogonal to the brushing direction.

[0027] 'Length' is defined as the dimension along the brushing direction and 'width' the dimension along the transversal direction.

[0028] Said first group of bristles forms at least a first bristle barrier, which extends (substantially) continuously (substantially) over an entire width of the brush, more

preferably over an entire width of the frame.

[0029] Said second group of bristles forms at least a second bristle barrier, which extends (substantially) continuously (substantially) over an entire width of the brush, more preferably over an entire width of the frame.

[0030] In this way, the brush brushes uniformly along its entire width and the bristle barriers collect the dirt of the respective size, avoiding its exit from the brush.

[0031] The first bristle barrier comprises at least a first row of bristles and the second bristle barrier comprises at least a second row of bristles. Advantageously the rows distribution of the bristles, in addition to simplifying the construction of the brush and/or the substitution of the worn/damaged bristles, allows a high efficiency and/or effectiveness of brushing of the surface.

[0032] 'Bristles row' means a substantially aligned succession of close-up bristles or of close-up tufts of bristles, considering the bristles in at least a point of their main development. For example, the point considered can be the point in which the bristles protrude from the frame in their free tract, independently form the fact that the free ends of the bristles maintain or not their initial alignment. In particular, the free ends of the bristles made of iron alloy can intentionally 'scatter', even in a casual way, even though at their point of anchor to the frame the bristles are organized in tufts aligned along rows. Furthermore, the neighboring bristles or tufts of bristles can be reciprocally in contact or slightly distant. Preferably the first group of bristles (more preferably the first bristle barrier) comprises a plurality of first rows of bristles and/or the second group of bristles (more preferably the second bristle barrier) comprises a plurality of second rows of bristles. More preferably the plurality of first rows of bristles comprises a number of first rows of bristles between two and eight, preferably between two and six. In this way, advantageously the efficiency and/or the effectiveness of brushing is improved.

[0033] Preferably said first group of bristles comprises a pair of third rows of bristles respectively arranged at opposite transverse end portions (more preferably at opposite transverse ends), with respect to the transverse direction, of said first bristle barrier. Preferably said third rows of bristles are respectively arranged at opposite transverse end portions (more preferably at opposite transverse ends), with respect to said first row of bristles or to at least one of said first rows of bristles or to all the first rows of bristles. Preferably said third rows of bristles have an extension (substantially) parallel to the brushing direction. In this way, advantageously the third rows of bristles stop laterally the thinner dirt collected and dragged by the plastic bristles which fulfil the actual brushing function. In fact, in general the collected dirt would tend to progressively accumulate against the first bristle barrier and to migrate from the centre towards the edge of the row, up to beginning to exit laterally, littering again the surface.

[0034] Preferably said first and said third rows of bristles define at least one closed polygon, more preferably

a convex quadrilateral, even more preferably a parallelogram, even more preferably a rectangle having the larger side (substantially) orthogonal to said brushing direction. In this way, the thinner dirt is spatially confined inside the closed polygon. It is observed that the solution in which the first rows of bristles are arranged in an open V, which is comprised in the present invention in its more general form, however it does not avoid the lateral exit of the collected dirt, once the dirt fills completely the dirt containment space up to reaching the ends of the V. Furthermore, the open V shape requires (in contrast to the shape with rectilinear sides) more encumbrance of each single row of bristles along the brushing direction, which in turn tends to worsen the optimal use of the available surface of the brush, in that the complex distribution of the bristles creates spaces without bristles, with consequent diminished capability of brushing.

[0035] Preferably adjacent bristles of the first row(s) of bristles and/or of the third rows of bristles (and/or the respective adjacent tufts of bristles) are mutually in contact, more preferably along at least a substantial tract of the bristle extension (e.g. of the free tract). Preferably said first row(s) of bristles and/or said third rows of bristles have a number of bristles per main extension linear unit between 5 bristles/cm and 40 bristles/cm, more preferably between 10 bristles/cm and 20 bristles/cm. In this way, the bristles made of plastic creates a proper physical barrier to their crossing by the thinner dirt.

[0036] Preferably adjacent bristles of the second row(s) of bristles (or the respective adjacent tufts of bristles) are slightly distant. In this way, the bristles made of iron alloy are able to cover effectively the useful surface of the brush dedicated to them, while keeping simple their mounting on the frame.

[0037] Preferably each of said first rows of bristles, and/or each of said second rows of bristles, extend(s) (substantially) continuously along an entire width of the brush, more preferably along an entire width of said frame. Advantageously in this way the dirt collected by the bristles is dragged by the brush along a long tract of brushing, avoiding its exit from the brush.

[0038] Preferably said first row of bristles or at least one of, or each of, said first rows of bristles, and/or said second row of bristles or at least one of, or each of, said second rows of bristles, and/or said third rows of bristles has/have extension along a line (substantially) rectilinear. In such way, advantageously the use of the available surface of the brush is optimized, because the encumbrance of each row of bristles along the direction orthogonal to itself is reduced to a minimum and it is possible to distribute the rows of bristles in a rational and optimal way.

[0039] Preferably said first row of bristles or at least one of, or each of, said first rows of bristles, and/or said second row of bristles or at least one of, or each of, said second rows of bristles has/have extension along a line substantially orthogonal to the brushing direction, more preferably orthogonal to the brushing direction.

[0040] 'Substantially orthogonal' to a given direction means that it forms with that direction an angle comprised between $90^{\circ}+15^{\circ}$ and $90^{\circ}-15^{\circ}$. 'Substantially parallel' to a given direction means that it forms with that direction an angle comprised between $0^{\circ}+15^{\circ}$ and $0^{\circ}-15^{\circ}$. Preferably said first rows of bristles are all mutually parallel.

[0041] Preferably said second rows of bristles are all mutually parallel.

[0042] Preferably said third rows of bristles are mutually parallel.

[0043] Preferably said first and second rows of bristles are all mutually parallel.

[0044] Preferably said second bristle barrier (which can also consist in said second group) of said second group of bristles is arranged at a front longitudinal end portion of said brush with respect to said brushing direction, more preferably in proximity of a front longitudinal end of the brush. More preferably said second bristle barrier comprises (or consists in) a plurality (more preferably a number between two and twelve) of said second rows of bristles. In this way, advantageously when, in use, the brush is dragged on the surface with the bristle barrier made of iron alloy in front position, the iron alloy bristles, due to their frontal position, perform the function of collecting and dragging the bigger or heavier or with higher specific weight objects, performing this function even in presence of a considerable heap of this material on the front of the brush. Furthermore, the front bristles made of iron alloy can 'scratch' the surface to clean. The bristles made of plastic of the first group (more particularly the bristles of the first barrier), which are located on the rear of the front bristles made of iron alloy with respect to the brushing direction, complete the cleaning by collecting and dragging the dirt which sneaks through the front bristles and/or which is detached or moved by the front bristles.

[0045] Preferably said second group of bristles forms a third bristle barrier which extends (substantially) continuously (substantially) over an entire width of the brush, more preferably over an entire width of the frame. Preferably said third bristle barrier is arranged at a rear longitudinal end portion of said brush, longitudinally opposite to the front longitudinal end portion with respect to said brushing direction, more preferably in proximity of a rear longitudinal end of the brush. More preferably said third bristle barrier comprises (or consists in) at least one of said second rows of bristles or a plurality (more preferably a number between two and twelve) of said second rows of bristles. Preferably said first group of bristles (or said first bristle barrier) is arranged, with respect to the brushing direction, at a position interposed between said second and said third bristle barrier, more preferably at a central portion of the brush with respect to the brushing direction. In this way, advantageously, in addition to the technical effects described in the previous paragraph, it is possible to use the brush in both orientations along the brushing direction.

[0046] In an embodiment said second group of bristles

consists in said second and third bristle barrier.

[0047] In an embodiment said first group of bristles consists in said first barrier of bristles and in said third rows of bristles.

[0048] It is observed that the terms 'front' and 'rear' are used conventionally with respect to an arbitrary orientation of dragging of the brush, and so they are interchangeable.

[0049] Preferably said bristles of said plurality of bristles are symmetrically distributed with respect to a median plane orthogonal to said brushing direction, more preferably the entire brush is symmetric with respect to said median plane. In this way the brush, in addition to be perfectly reversible with respect to the orientation of use (as explained before), is structurally simple and rational and/or is simple and rational to be manufactured.

[0050] The features of the present invention, and the purposes they fulfil, will be further explained by the following detailed description of some exemplar embodiments, given as example and not limiting the more general concepts claimed.

[0051] The following detailed description refers to the attached figures, in which:

- figure 1 is a schematic and partial perspective view of a brush according to the present invention;
- figure 2 is an exploded schematic perspective view of the brush of figure 1;
- figure 3 is a further exploded schematic perspective view of the brush of figure 1 with some parts removed;
- figure 4 is a lateral exploded schematic view of the brush of figure 3 with some parts removed;
- figure 5 is a plan view from the bottom of the brush of figure 1;
- figure 6 is a schematic perspective view, partial and exploded, of an enlarged element of the brush of figure 1;
- figure 7 is a schematic perspective view, purely illustrative, of a tuft of bristles made of metal of the brush of figure 1 in a scattered configuration.

[0052] With reference to the attached figures, the reference number 1 indicates a brush for large surfaces according to the present invention.

[0053] The brush comprises a frame 2, preferably comprising a plate-like single body 3, typically with rectangular plan, shaped (e.g. by appropriate foldings) such as to present a shallow opening 4 on the bottom and delimited by a perimetral wall 3A of the body 3. For example, the plate-like body has appropriate toughening ribs 5 obtained by folding.

[0054] The frame 2 is provided with a mounting portion 6 of the brush to a self-powered vehicle for dragging along the brushing direction 30. In figure 1 the transversal direction 39 is also shown. For example, the mounting portion 6 comprises two openings 7 for inserting the ribs of a goods movement vehicle, like a 'forklift'.

[0055] For the purpose of description, in figure 1 an orientation of the longitudinal brushing direction has been arbitrarily chosen, as indicated by the arrow 31 (with respect to which the terms 'front' and 'rear' are used). However, due to the brush being symmetric with respect to a median plane 32 orthogonal to the brushing direction, it can be operated in a reversible way, in both orientations of brushing along the direction 30. However, the present invention includes also brushes (not shown) designed to be used in only one orientation, for example not symmetric.

[0056] The brush comprises a plurality of bristles 8 rigidly attached to the frame 2 such as to protrude from the frame opposite to the mounting portion 6.

[0057] The plurality of bristles comprises a first group 20 of bristles made of a plastic material, for example polypropylene, and a second group 21 of bristles made of iron alloy, for example harmonic steel.

[0058] The first group of bristles 20 forms at least a first bristle barrier 22 which extends with continuity along the whole width of the frame and the second group of bristles 21 forms a second bristle barrier 23 which extends with continuity along the whole width of the frame. Preferably the second bristle barrier 23 is arranged at a front longitudinal end portion 24 of said brush with respect to said brushing direction, in proximity of a front longitudinal end 25 of the brush.

[0059] Preferably the second group of bristles 21 forms a third bristle barrier 26 which extends with continuity along the whole width of the frame. Preferably the third bristle barrier is arranged at a rear longitudinal end portion 27 of said brush, longitudinally opposite to the front longitudinal end portion with respect to said brushing direction, in proximity of a rear longitudinal end portion 28 of the brush (fig. 5).

[0060] Preferably the first group of bristles 20 (e.g. the first bristle barrier 22, but also the possible third rows of bristles 44, see below) is, with respect to the brushing direction, in an interposed position between the second 23 and the third 26 bristle barrier, at a central portion 43 of the brush.

[0061] In an embodiment not shown of the present invention, the second group of bristles can consist in, and only in, the second bristle barrier (e.g. a brush not symmetric devoid of the third bristle barrier), and the first bristle barrier (with the possible third rows of bristles) can be at a rear longitudinal end portion 27.

[0062] For example, all the bristles 8 of the brush shown, or the respective tufts of bristles, are arranged in a plan (see figure 5) such as to be aligned along straight rows. However, the present invention includes also solutions in which some or all of the bristles, or their respective tufts of bristles, are distributed in all kind of shapes, for example uniformly on the effective plan surface of the brush, or along not rectilinear rows (e.g. V-shaped or curvilinear).

[0063] In the example shown the first barrier of bristles 22 comprises exemplarily four first rows of bristles 40,

shown only schematically in the figures, which extends with continuity along the whole width of the brush. The first rows of bristles are mutually parallel and extend along the transversal direction 39. In the figures the rows of bristles 40 (and 44) are schematically shown as a single and continue body, and the single bristles constituting them are not shown. Exemplarily each row of bristles 40 can be composed by a plurality, for example four, of single bristles contactingly adjacent along the transversal direction and mutually fixed at an end thereof integrally with a support bar 41, also made of polypropylene (in other terms each row 40 is formed, along the transversal direction, by a row of adjacent tufts of bristles, each tuft comprising four single bristles longitudinally aligned). Exemplarily each first row of bristles 40 has a number of bristles per linear transversal development unit equal to 12 bristles/cm. Preferably the adjacent bristles (along the transversal direction) of each first row of bristles are mutually in contact along a substantial tract of the free extension of the bristles, at least in a rest position. It is intended that in use the free ends of the adjacent bristles can randomly scatter one from the other, however the density of the plastic bristles makes it possible that each row of bristles constitutes a continue barrier for the dirt which it is designed for. Exemplarily each single bristle made of plastic (not shown) has an orthogonal section oval-shaped, for example with dimensions of about 2.5mm x 3.5mm.

[0064] In the example shown, each second 23 and third 26 barrier of bristles comprises eight second rows of bristles 42, shown only schematically in the figures, which extend continuously along the entire width of the brush. The second rows of bristles are rectilinear, mutually parallel and parallel to the transversal direction 39. The second rows of bristles 42 are exemplarily arranged in two groups 47 having four second rows each. Preferably, the brush 1 comprises a fixing bar 9 (which can be a single piece or composed by a plurality of pieces, as in the example shown wherein it is composed by two pieces) for each group 47 of second rows of bristles 42, the fixing bar 9 being rigidly fixed to the frame at an opposite side with respect to the mounting portion 6.

[0065] Exemplarily each fixing bar 9 is plate-like and has a transversal section profile U-shaped (as exemplarily shown in figure), with the convexity facing the frame. The U-shaped profile is typically obtained by folding along two folding lines 10 mutually parallel.

[0066] Preferably each fixing bar is fixed to the single body 3 of the frame 2 by screws or bolts 11 which engage respective through holes 12 of the fixing bar (the nuts fixing the bolts are not shown in the figures).

[0067] So, the fixing bars are housed in the aforementioned opening 4 of the single plate-like body 3.

[0068] Each fixing bar is equipped with a plurality of pairs of through holes 13. In figure 6 the pairs of holes are all shown mutually parallel and aligned, however the present invention includes any mutual orientation of the pairs of holes. 'Pair of holes' means each pair of holes

13 which is engaged by a respective bundle of elongated elements, as described in the following.

[0069] Preferably, the brush comprises a plurality of bundles 14 of elongated elements 15, the latter (and the respective bundles) having a main development line substantially U-shaped (at least in the undeformed condition as shown in the figure 6) and comprising along said line a first 17 and a second 18 folding.

[0070] Preferably, each elongated element 15 is formed therefore by a first tract 60 between the first folding 17 and a first longitudinal end of the elongated element, a second tract 62 comprised between the second folding 18 and a second longitudinal end of the elongated element and an intermediate tract 64 comprised between the two foldings.

[0071] Preferably each bundle 14 of elongated elements is inserted in a respective pair of holes 13 such as, for each elongated element, the intermediate tract 64 is interposed between the respective fixing bar 9 and the frame 2 (typically the single body 3 of the frame), and the first and second tract 60, 62 pass through a respective hole 13 of the pair of holes and project from the fixing bar on the opposite side with respect to the intermediate tract 64, and in such a way that the bristles 8 are constituted of the first and second tracts 60, 62 of the elongated elements.

[0072] It is observed that in this way the bristles 8 are arranged in tufts corresponding to the bundles of first or second tracts 60, 62 of elongated elements 15.

[0073] It is observed that in all the figures 1-6 the bundles 14 of elongated elements are shown in an undeformed configuration, wherein all the elongated elements 15 are identically shaped and configured and are parallel and close in mutual contact along the entire longitudinal development of the bundle, 'free' tracts 60 and 62 included.

[0074] Actually, the bundles 14 of elongated elements have not such undeformed configuration, but rather they are in a 'open' or 'scattered' configuration wherein the bristles 8 of the same tuft (namely of the same bundle of first and second tracts 60, 62) are kept together at the through section of the respective hole 13 and from here, going towards the free ends, they tend to scatter in the space in a substantially random way inside a cone having vertex at the hole 13.

[0075] Figure 7 is a purely illustrative view of said 'open' configuration, even though in such view, only for technical reasons, the scattering of the bristles follows a regular and ordered pattern (for example the bundle 14 appears generally symmetric with respect to at least two orthogonal planes), contrary to the actual case in which the scattering is substantially random, without planes of symmetry, and in which the bristles of the same tuft are oriented in the space in a substantially random way, nevertheless inside the aforementioned cone. For example, typically, even though not shown, the free ends of the bundles of first and second tracts belonging to the same bundle 14 mutually compenetrates. In this context, pref-

erably the adjacent pairs of holes 13 are positioned in such a way that the free ends of the bundles of first and second tracts belonging to adjacent bundles 14 mutually compenetrates (not shown), when the tufts are in 'open' configuration. In this way, for each group of rows 47, a single compact barrier of bristles 8 is created, which mutually compenetrates continuously along the entire width of the brush.

[0076] In the example shown, each single elongated element is a band or foil having total longitudinal length exemplarily equal to about 540 mm and transversal section (constant along the entire main development line) rectangular with dimensions exemplarily equal to about 3 mm x 0.5 mm. Exemplarily the diameter of each hole 13 is equal to 9 mm. Exemplarily the total length of each first and second tract (namely of each bristle 8) is equal to about 260mm.

[0077] In the example shown, each bundle 14 of elongated elements 15 comprises thirteen elongated elements arranged along two adjacent piles of six elements each, and the thirteenth element is disposed at the top of the two piles bridging them. The present invention envisages however any number of elongated elements, even a single elongated element for each 'bundle'.

[0078] It becomes clear therefore that even though the free ends of the bristles made of metal can 'scatter' on purpose, at their point of attachment to the frame the bristles are organized in tufts aligned along straight lines, the tufts being mutually slightly apart. Preferably the first group of bristles 20 comprises a pair of third rows of bristles 44 respectively arranged at opposed transversal end portions, with respect to the transversal direction, of the first barrier of bristles 22. Exemplarily the third rows of bristles are arranged at opposed transversal end 45 of all the first rows of bristles 40. Preferably the third rows of bristles have development parallel to the brushing direction 30. In this way, the first and the third rows of bristles define at least a rectangle 46 with substantially continuous perimeter and having the longer sides (rows 40) orthogonal to the brushing direction and shorter sides (rows 44) parallel to the brushing direction. The present invention however also envisages solutions in which the third rows of bristles are arranged at only some first rows of bristles, or in which the closed central polygon has a shape different from rectangular (even though the latter is the preferred shape for efficiency of brushing and/or reversibility of the brushing direction orientation). Exemplarily the third rows of bristles 44 are structurally identical to the first rows of bristles 40.

[0079] For the mounting of the first rows of bristles 40 and the third rows of bristles 44 to the frame 2, the brush comprises preferably a mounting structure 50 consisting of a number of retaining guides 51 equal to the number of first and third rows of bristles, fixed (e.g. welded) to joining plates 52 equipped with through holes for their bolting to the frame. Each support bar 41 of the first and third rows of bristles engages a respective retaining guide 51.

[0080] The mounting structure 50 and the support bars 41 are therefore housed in the aforementioned opening 4 of the single plate-like body 3.

[0081] Exemplarily the frame and/or the fixing bars and/or the mounting structure 50 are made of iron alloy (e.g. mild steel) or anodized aluminium.

[0082] A possible production process for the brush for surfaces 1, comprises, for the first group of bristles, insert by sliding, beginning from a respective end, each support bar 41 in a respective retaining guide 51 and fixing the mounting structure 50 to the frame (e.g. by bolts). The support bars 41 are kept in the guides 51 by the lateral wall 3A or (for the third rows of bristles 44) by the adjacent mounting bars 9.

[0083] Regarding the second group of bristles, it is possible to perform: forming a plurality of bundles 14 of the aforementioned U-shaped elongated elements 15; inserting each bundle 14 of elongated elements in a respective pair of holes 13 of the fixing bar in such a way that, for each elongated element, the intermediate tract 64 is located in proximity of the top surface 35 of the fixing bar, and the first and the second tract 60, 62 pass through a respective hole 13 of the pair of holes and project from the fixing bar at opposite side to the intermediate tract 64, and rigidly fixing the fixing bar 9 at the (single body 3 of the) frame 2 at the side opposite to the mounting portion 6 (namely in the opening 4), in such a way that the intermediate tract 64 is interposed between the fixing bar 9 and the frame 2 and in such a way that the bristles 8 are realized by the first and second tracts 60, 62 of the elongated elements 15.

[0084] The bundle of intermediate tracts, once the fixing bar is pulled against the frame 2 (for example closing the nuts in the bolts 11), is therefore pressure-clamped between the bottom surface of the single body 3 of the frame and the top surface of the fixing bar.

[0085] In use, the two prongs of a goods lifting fork of a 'fork lift' are inserted in the openings 7 and lifted such as to lift the entire brush from the ground. Once the surface to be cleaned is reached, the prongs are lowered until the weight of the brush is entirely or partially sustained by the bristles 8. Therefore, the brush is thrust by the fork lift on the surface along the brushing direction 30 (the brush 1, being symmetric, can be mounted in any orientation of the brushing direction 30).

Claims

1. A brush (1) for surfaces, the brush being of static type and comprising a frame (2) provided with a mounting portion (6) for mounting the brush to a self-powered vehicle and a plurality of bristles (8) attached to the frame (2) so that the bristles (8) protrude from the frame (2) on an opposite side to said mounting portion (6), wherein said plurality of bristles (8) comprises a first group of bristles (20) made from a plastic material and a second group of bristles (21)

made from an iron alloy, wherein said first group of bristles (20) forms at least a first bristle barrier (22) and said second group of bristles (21) forms at least a second bristle barrier (23),

characterized in that said first bristle barrier (22) comprises at least a first row of bristles (40) which extends continuously over an entire width of the brush (1) and **in that** said second bristle barrier (23) comprises at least a second row of bristles (42) which extends continuously over the entire width of the brush (1).

2. A brush according to claim 1, wherein said plastic material is selected in the group consisting of: polypropylene, aliphatic polyamides, aromatic polyamides, and/or said iron alloy is steel.
3. A brush according to claim 1 or 2, wherein said second bristle barrier (23) is arranged at a front longitudinal end portion (24) of said brush (1) with respect to a brushing direction (30).
4. A brush according to claim 3, wherein said second group of bristles (21) forms a third bristle barrier (26), which extends continuously over the entire width of the brush (1) and is arranged at a rear longitudinal end portion (27) of said brush (1), longitudinally opposite to the front longitudinal end portion (24) with respect to said brushing direction (30), and wherein said first bristle barrier (22) is arranged at a position interposed between said second (23) and said third bristle barrier (26), with respect to the brushing direction (30).
5. A brush according to any one of the preceding claims, wherein the first bristle barrier (22) comprises a plurality of first rows of bristles (40) and/or the second bristle barrier (23) comprises a plurality of second rows of bristles (42), wherein each of said first rows of bristles (40), and/or each of said second rows of bristles (42), extends continuously throughout the width of the brush (1).
6. A brush according to any one of claims 1 to 5, wherein said first group of bristles (20) comprises a pair of third rows of bristles (44) respectively arranged at opposite transverse end portions, with respect to the transverse direction, of said first bristle barrier (22), said third row of bristles (44) having an extension substantially parallel to a brushing direction (30).
7. A brush according to claims 5 and 6, wherein said third rows of bristles (44) are respectively arranged at opposite transverse ends (45) of at least one of said first rows of bristles (40) or of all of said first rows of bristles (40).
8. A brush according to claim 6 or claim 7, wherein said

first (40) and said third rows of bristles (44) define at least one closed polygon.

9. A brush according to claim 8, wherein said first (40) and said third rows of bristles (44) define a rectangle (46) having the larger side substantially orthogonal to the brushing direction (30).
10. A brush according to any one of claims 1 to 9, wherein adjacent bristles of the first row of bristles (40) are mutually in contact.
11. A brush according to any one of claims 6 to 9, wherein adjacent bristles of each of the first rows of bristles (40) and/or of the third rows of bristles (44) are in mutual contact, and wherein said first rows of bristles (40) and/or said third rows of bristles (44) have a number of bristles (8) per main extension linear unit between 5 bristles/cm and 40 bristles/cm.
12. A brush according to any one of claims 5 to 11, wherein at least one of, or each of, said first rows of bristles (40), and/or at least one of, or each of, said second rows of bristles (42), and/or said third rows of bristles (44), extends along a substantially straight line, and wherein at least one of, or each of, said first rows of bristles (40), and/or at least one of, or each of, said second rows of bristles (42), extends along a line substantially orthogonal to the brushing direction (30).
13. A brush according to any one of the preceding claims, wherein said plastic material is propylene, and/or said alloy iron is hardened steel.
14. A brush according to any one of the preceding claims, wherein said alloy iron is harmonic steel.

Patentansprüche

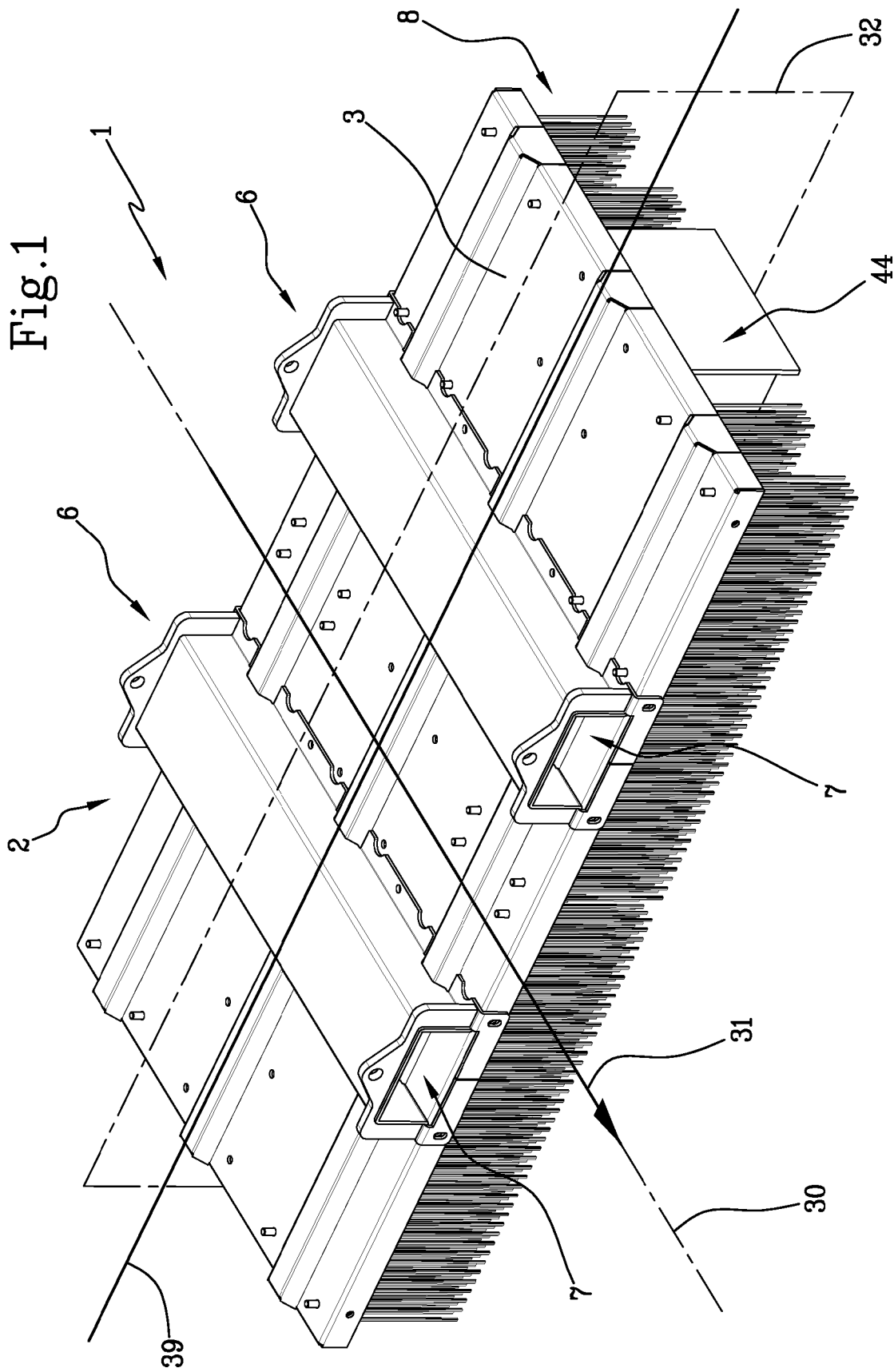
1. Bürste (1) für Oberflächen, wobei die Bürste vom statischen Typ ist und einen Rahmen (2) umfasst, der mit einem Montageabschnitt (6) zum Montieren der Bürste an einem selbstangetriebenen Fahrzeug und einer Vielzahl von Borsten (8) versehen ist, die am Rahmen (2) angebracht sind, so dass die Borsten (8) vom Rahmen (2) auf einer dem Montageabschnitt (6) gegenüberliegenden Seite vorstehen, wobei die Vielzahl von Borsten (8) eine erste Gruppe von Borsten (20), die aus einem Kunststoffmaterial bestehen und eine zweite Gruppe von Borsten (21), die aus einer Eisenlegierung bestehen, umfasst, wobei die erste Gruppe von Borsten (20) mindestens eine erste Borstenbarriere (22) bildet und die zweite Gruppe von Borsten (21) mindestens eine zweite Borstenbarriere (23) bildet, **dadurch gekennzeichnet, dass** die erste Borsten-

- barriere (22) mindestens eine erste Reihe von Borsten (40) umfasst, die sich durchgehend über eine gesamte Breite der Bürste (1) erstreckt und dass die zweite Borstenbarriere (23) mindestens eine zweite Reihe von Borsten (42) umfasst, die sich durchgehend über die gesamte Breite der Bürste (1) erstreckt.
2. Bürste nach Anspruch 1, wobei das Kunststoffmaterial ausgewählt ist aus der Gruppe bestehend aus: Polypropylen, aliphatischen Polyamide, aromatischen Polyamiden und/oder die Eisenlegierung Stahl ist.
 3. Bürste nach Anspruch 1 oder 2, wobei die zweite Borstenbarriere (23) in Bezug auf eine Bürstenrichtung (30) an einem vorderen Längsendabschnitt (24) der Bürste (1) angeordnet ist.
 4. Bürste nach Anspruch 3, wobei die zweite Gruppe von Borsten (21) eine dritte Borstenbarriere (26) bildet, die sich durchgehend über die gesamte Breite der Bürste (1) erstreckt und an einem hinteren Längsendabschnitt (27) der Bürste (1), in Längsrichtung entgegengesetzt zum vorderen Längsendabschnitt (24) in Bezug auf die Bürstenrichtung (30) angeordnet ist, und wobei die erste Borstenbarriere (22) an einer Position angeordnet ist, die in Bezug auf die Bürstenrichtung (30) zwischen der zweiten (23) und der dritten Borstenbarriere (26) liegt.
 5. Bürste nach einem der vorhergehenden Ansprüche, wobei die erste Borstenbarriere (22) eine Vielzahl an ersten Reihen von Borsten (40) umfasst und/oder die zweite Borstenbarriere (23) eine Vielzahl an zweiten Reihen von Borsten (42) umfasst, wobei sich eine jede der ersten Reihen von Borsten (40) und/oder eine jede der zweiten Reihen von Borsten (42) durchgehend über die Breite der Bürste (1) erstreckt.
 6. Bürste nach einem der Ansprüche 1 bis 5, wobei die erste Gruppe von Borsten (20) ein Paar dritter Reihen von Borsten (44) umfasst, die jeweils an gegenüberliegenden quer verlaufenden Endabschnitten in Bezug auf die Querrichtung der ersten Borstenbarriere (22) angeordnet sind, wobei die dritte Reihe von Borsten (44) eine Erstreckung im Wesentlichen parallel zu einer Bürstenrichtung (30) aufweist.
 7. Bürste nach den Ansprüchen 5 und 6, wobei die dritten Reihen von Borsten (44) jeweils an gegenüberliegenden Querenden (45) von mindestens einer der ersten Reihen von Borsten (40) oder aller ersten Reihen von Borsten (40) angeordnet sind.
 8. Bürste nach Anspruch 6 oder Anspruch 7, wobei die erste (40) und die dritte Reihe von Borsten (44) mindestens ein geschlossenes Polygon definieren.
 9. Bürste nach Anspruch 8, wobei die erste (40) und die dritte Reihe von Borsten (44) ein Rechteck (46) definieren, dessen größere Seite im Wesentlichen orthogonal zur Bürstenrichtung (30) verläuft.
 10. Bürste nach einem der Ansprüche 1 bis 9, wobei benachbarte Borsten der ersten Reihe von Borsten (40) sich gegenseitig berühren.
 11. Bürste nach einem der Ansprüche 6 bis 9, wobei benachbarte Borsten einer jeden der ersten Reihen von Borsten (40) und/oder der dritten Reihen von Borsten (44) in gegenseitigem Kontakt stehen und wobei die ersten Reihen von Borsten (40) und/oder die dritten Reihen von Borsten (44) eine Anzahl von Borsten (8) pro Haupterstreckungslinienereinheit zwischen 5 Borsten/cm und 40 Borsten/cm aufweisen.
 12. Bürste nach einem der Ansprüche 5 bis 11, wobei mindestens eine oder eine jede der ersten Reihen von Borsten (40) und/oder mindestens eine oder eine jede der zweiten Reihen von Borsten (42) und/oder der dritten Reihen von Borsten (44) sich entlang einer im Wesentlichen geraden Linie erstreckt, und wobei mindestens eine oder eine jede der ersten Reihen von Borsten (40) und/oder mindestens eine oder eine jede der zweiten Reihen von Borsten (42) sich entlang einer Linie erstreckt, die im Wesentlichen orthogonal zur Bürstenrichtung (30) verläuft.
 13. Bürste nach einem der vorhergehenden Ansprüche, wobei das Kunststoffmaterial Propylen ist und/oder das Legierungseisen gehärteter Stahl ist.
 14. Bürste nach einem der vorhergehenden Ansprüche, wobei das Legierungseisen harmonischer Stahl ist.

Revendications

1. Brosse (1) pour surfaces, la brosse étant de type statique et comprenant un cadre (2) pourvu d'une partie de montage (6) servant à monter la brosse sur un véhicule automoteur et une pluralité de poils (8) attachés au cadre (2) de sorte que les poils (8) dépassent du cadre (2) sur un côté opposé à ladite partie de montage (6), dans laquelle ladite pluralité de poils (8) comprend un premier groupe de poils (20) en matière plastique et un second groupe de poils (21) en alliage de fer, dans lequel ledit premier groupe de poils (20) forme au moins une première barrière de poils (22) et ledit second groupe de poils (21) forme au moins une seconde barrière de poils (23),
caractérisée en ce que ladite première barrière de

- poils (22) comprend au moins une première rangée de poils (40) qui s'étend de manière continue sur toute la largeur de la brosse (1) et **en ce que** ladite seconde barrière de poils (23) comprend au moins une seconde rangée de poils (42) qui s'étend de manière continue sur toute la largeur de la brosse (1).
2. Brosse selon la revendication 1, dans laquelle ladite matière plastique est choisie dans le groupe constitué de : polypropylène, polyamides aliphatiques, polyamides aromatiques, et/ou ledit alliage de fer est de l'acier.
 3. Brosse selon la revendication 1 ou 2, dans laquelle ladite seconde barrière de poils (23) est disposée en correspondance d'une partie d'extrémité longitudinale avant (24) de ladite brosse (1) par rapport à une direction de brossage (30).
 4. Brosse selon la revendication 3, dans laquelle ledit second groupe de poils (21) forme une troisième barrière de poils (26), qui s'étend de manière continue sur toute la largeur de la brosse (1) et est disposée en correspondance d'une partie d'extrémité longitudinale arrière (27) de ladite brosse (1), longitudinalement opposée à la partie d'extrémité longitudinale avant (24) par rapport à ladite direction de brossage (30), et dans laquelle ladite première barrière de poils (22) est disposée en correspondance d'une position interposée entre ladite deuxième (23) et ladite troisième barrière de poils (26), par rapport à la direction de brossage (30).
 5. Brosse selon l'une quelconque des revendications précédentes, dans laquelle la première barrière de poils (22) comprend une pluralité de premières rangées de poils (40) et/ou la seconde barrière de poils (23) comprend une pluralité de secondes rangées de poils (42), dans laquelle chacune desdites premières rangées de poils (40), et/ou chacune desdites secondes rangées de poils (42), s'étend de manière continue sur toute la largeur de la brosse (1).
 6. Brosse selon l'une quelconque des revendications 1 à 5, dans laquelle ledit premier groupe de poils (20) comprend une paire de troisièmes rangées de poils (44) respectivement disposées en correspondance de parties d'extrémité transversales opposées, par rapport à la direction transversale, de ladite première barrière de poils (22), ladite troisième rangée de poils (44) ayant une extension substantiellement parallèle à une direction de brossage (30).
 7. Brosse selon les revendications 5 et 6, dans laquelle lesdites troisièmes rangées de poils (44) sont respectivement disposées aux extrémités transversales opposées (45) d'au moins une desdites premières rangées de poils (40) ou de toutes lesdites premières rangées de poils (40).
 8. Brosse selon la revendication 6 ou la revendication 7, dans laquelle ladite première (40) et ladite troisième rangée de poils (44) définissent au moins un polygone fermé.
 9. Brosse selon la revendication 8, dans laquelle lesdites première (40) et troisième rangées de poils (44) définissent un rectangle (46) dont le plus grand côté est substantiellement orthogonal à la direction de brossage (30).
 10. Brosse selon l'une quelconque des revendications 1 à 9, dans laquelle les poils adjacents de la première rangée de poils (40) sont mutuellement en contact.
 11. Brosse selon l'une quelconque des revendications 6 à 9, dans laquelle les poils adjacents de chacune des premières rangées de poils (40) et/ou des troisièmes rangées de poils (44) sont en contact mutuel, et dans laquelle lesdites premières rangées de poils (40) et/ou lesdites troisièmes rangées de poils (44) ont un nombre de poils (8) par unité linéaire d'extension principale compris entre 5 poils/cm et 40 poils/cm.
 12. Brosse selon l'une quelconque des revendications 5 à 11, dans laquelle au moins une ou chacune desdites premières rangées de poils (40), et/ou au moins une ou chacune desdites deuxièmes rangées de poils (42), et/ou lesdites troisièmes rangées de poils (44), s'étendent le long d'une ligne substantiellement droite, et dans laquelle au moins une desdites, ou chacune desdites, premières rangées de poils (40), et/ou au moins une desdites, ou chacune desdites, deuxièmes rangées de poils (42), s'étendent le long d'une ligne substantiellement orthogonale à la direction de brossage (30).
 13. Brosse selon l'une quelconque des revendications précédentes, dans laquelle ladite matière plastique est du propylène, et/ou ledit fer allié est de l'acier trempé.
 14. Brosse selon l'une quelconque des revendications précédentes, dans laquelle ledit fer allié est un acier harmonique.



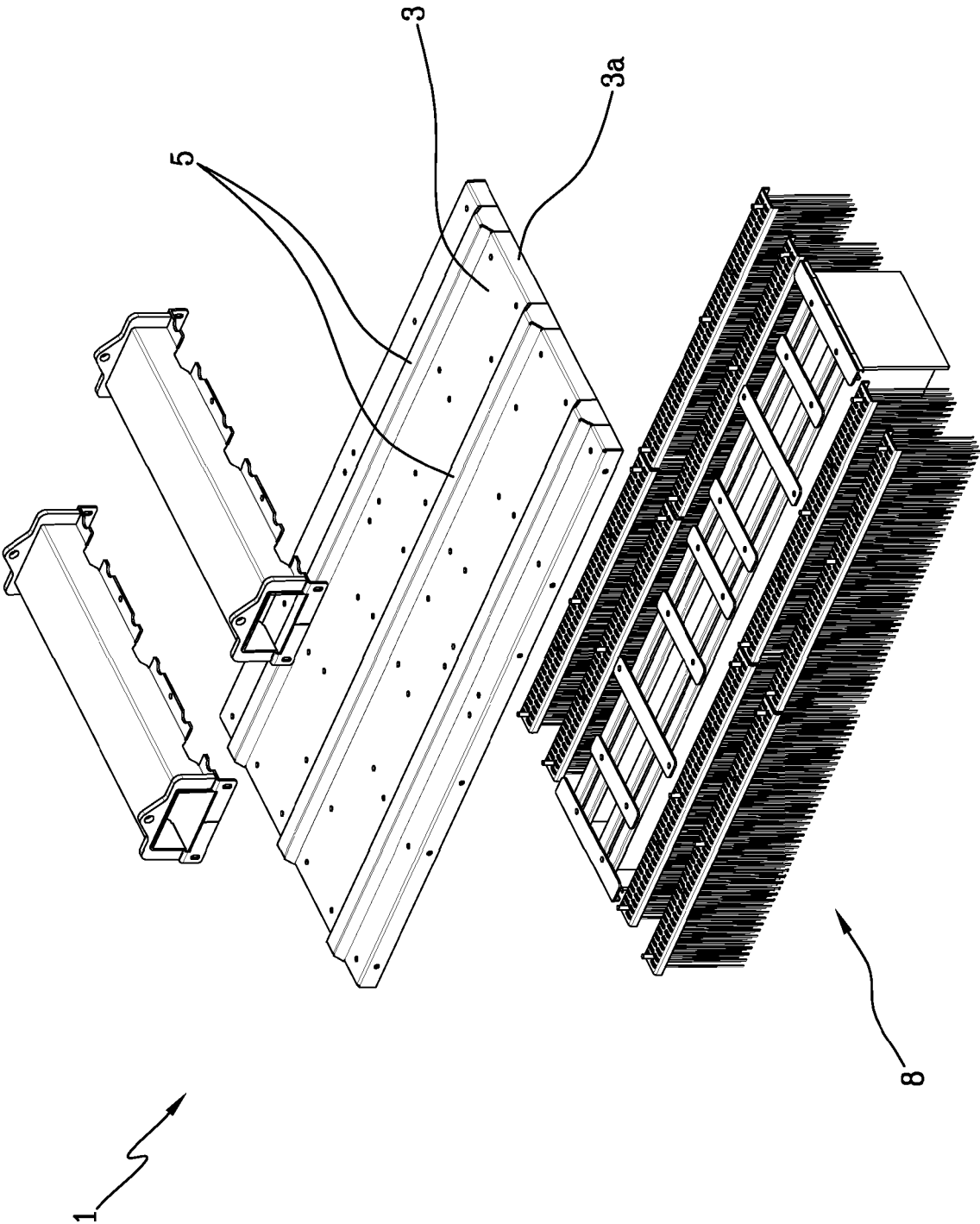


Fig.2

Fig.3

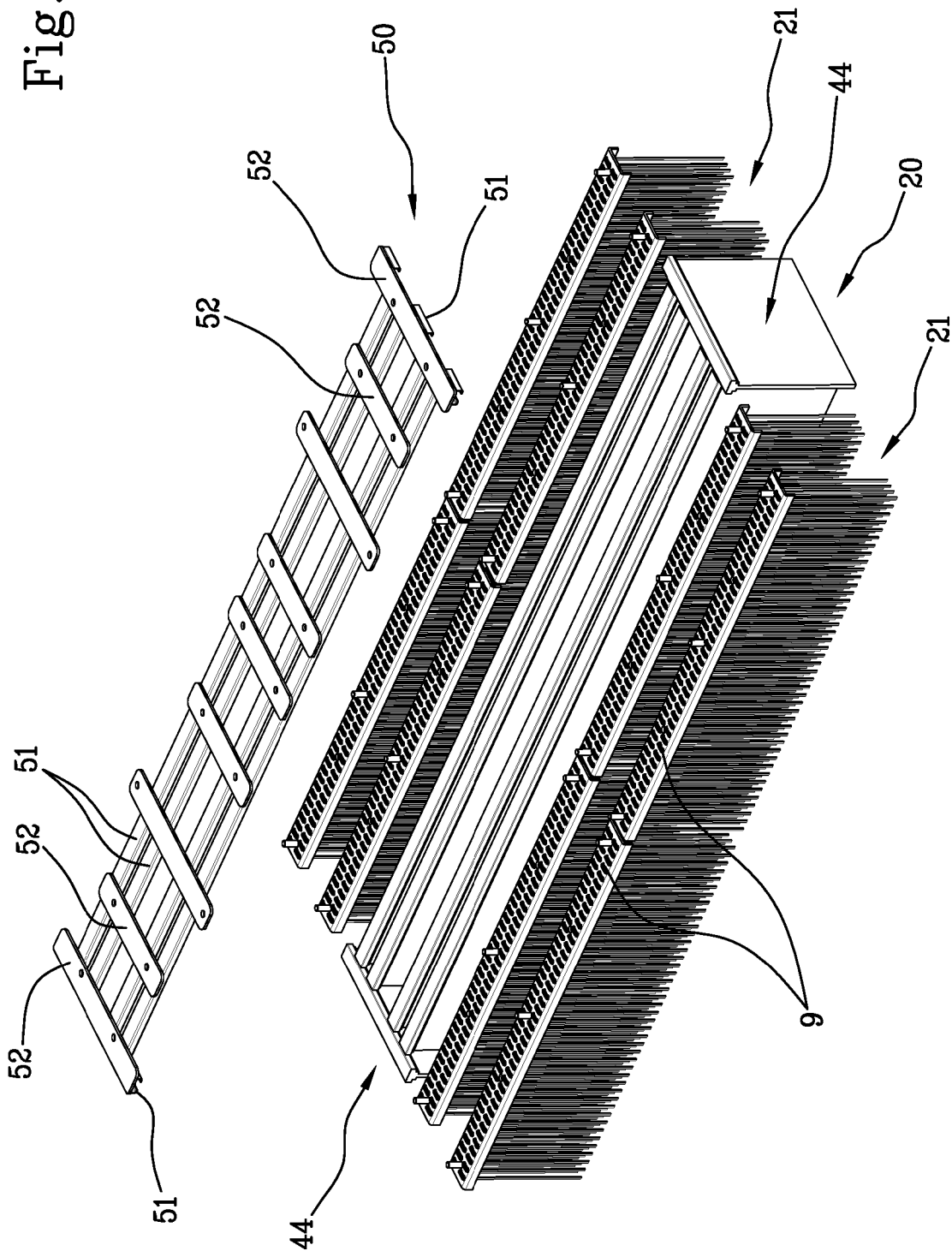
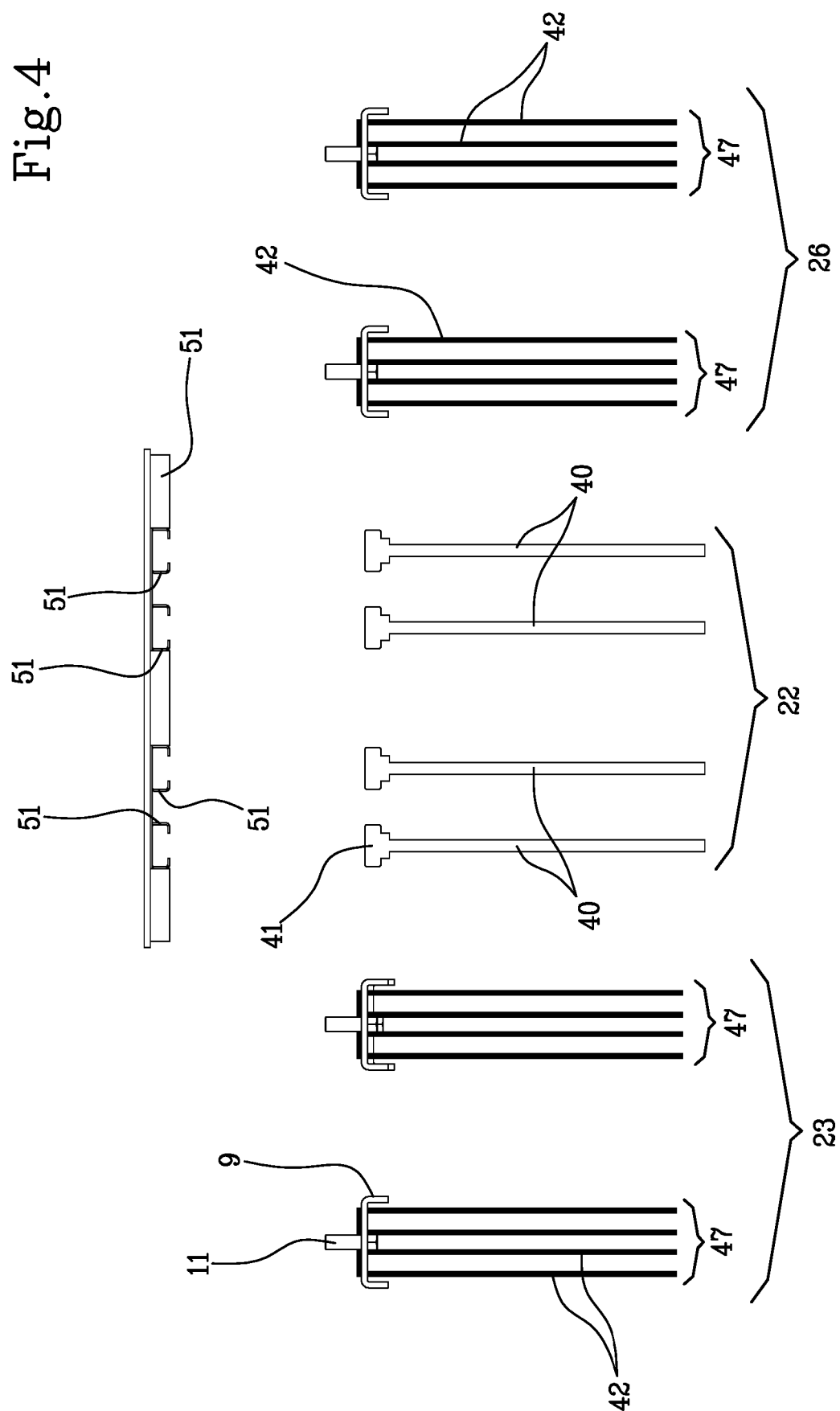


Fig. 4



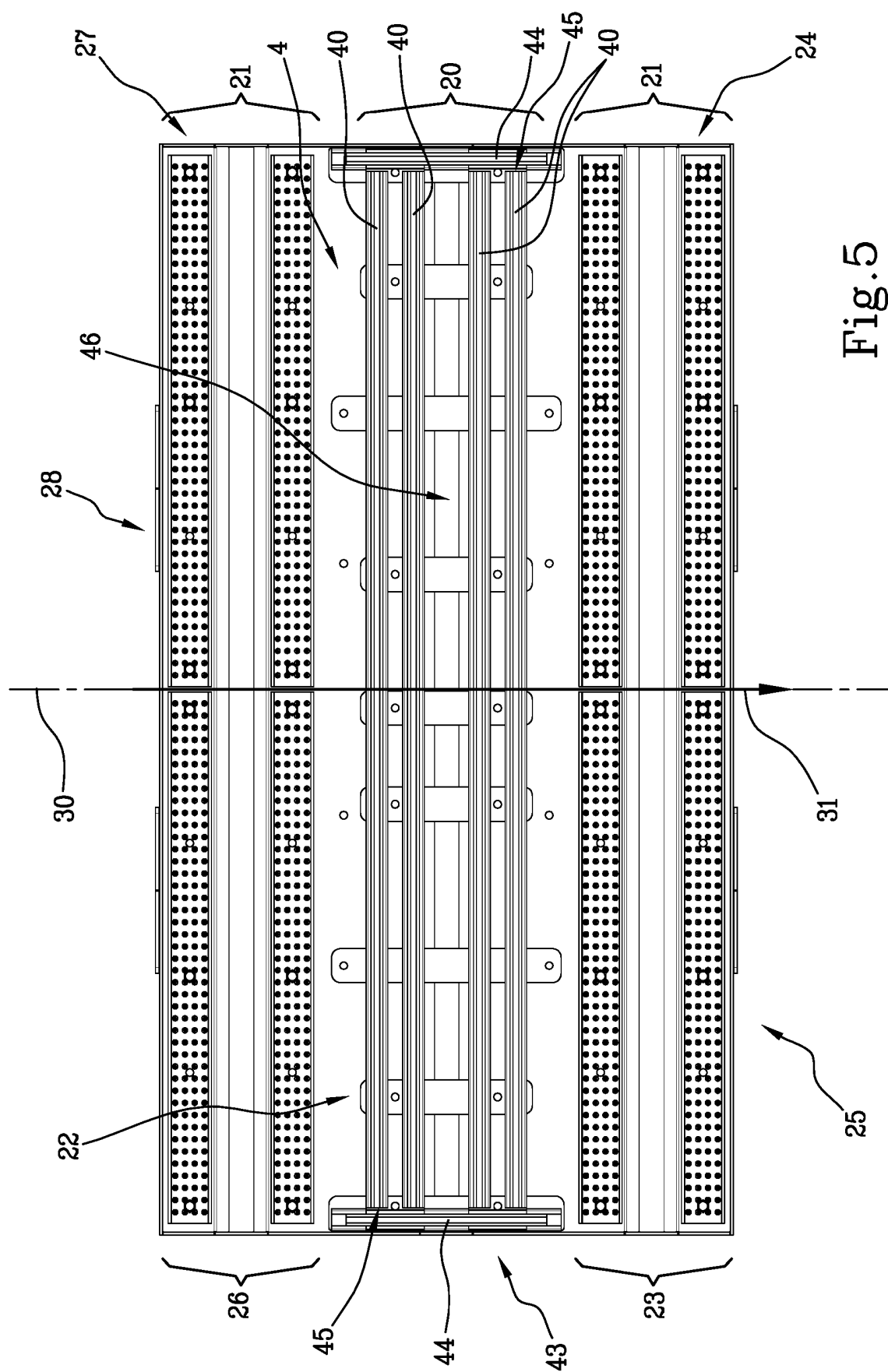
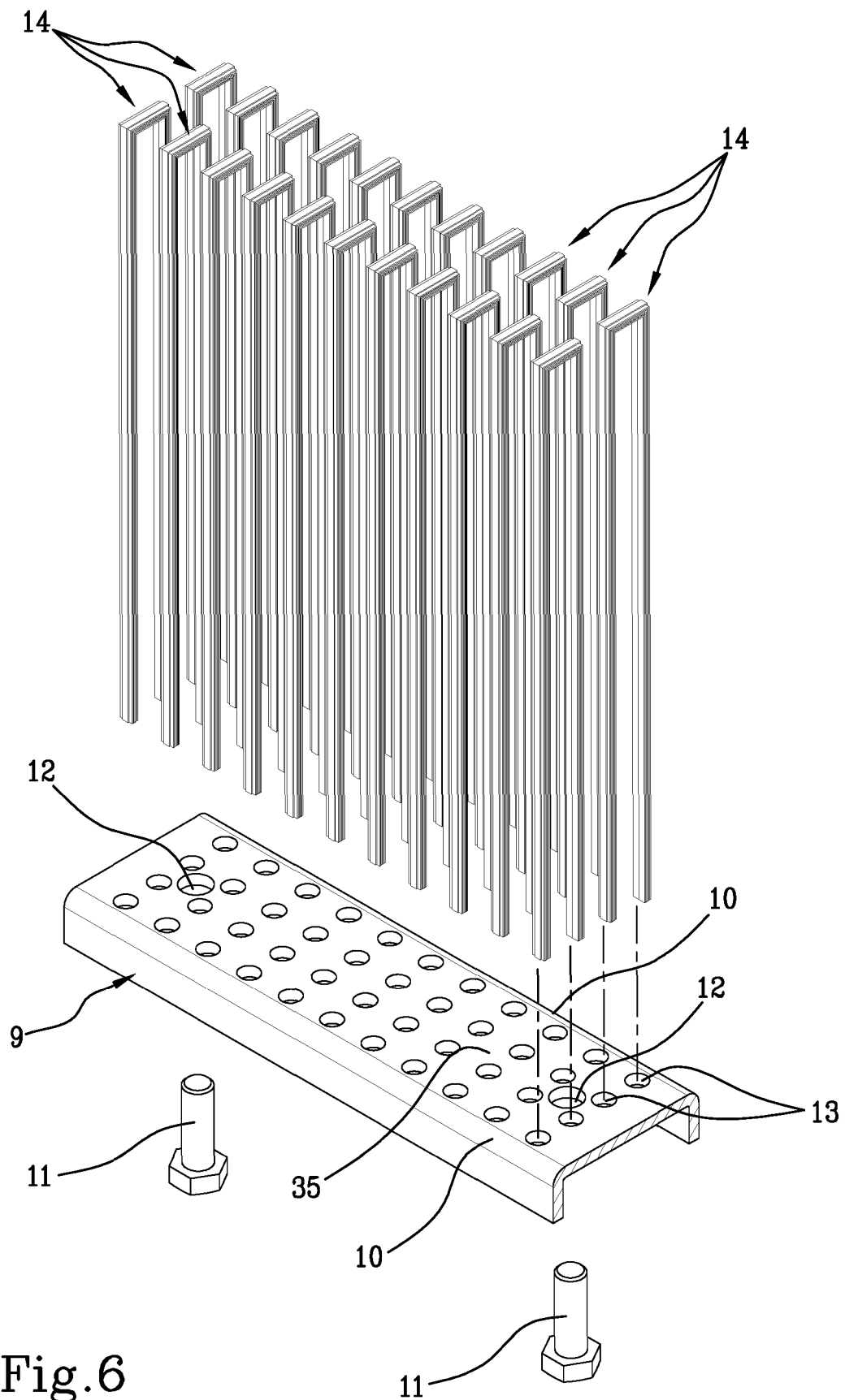
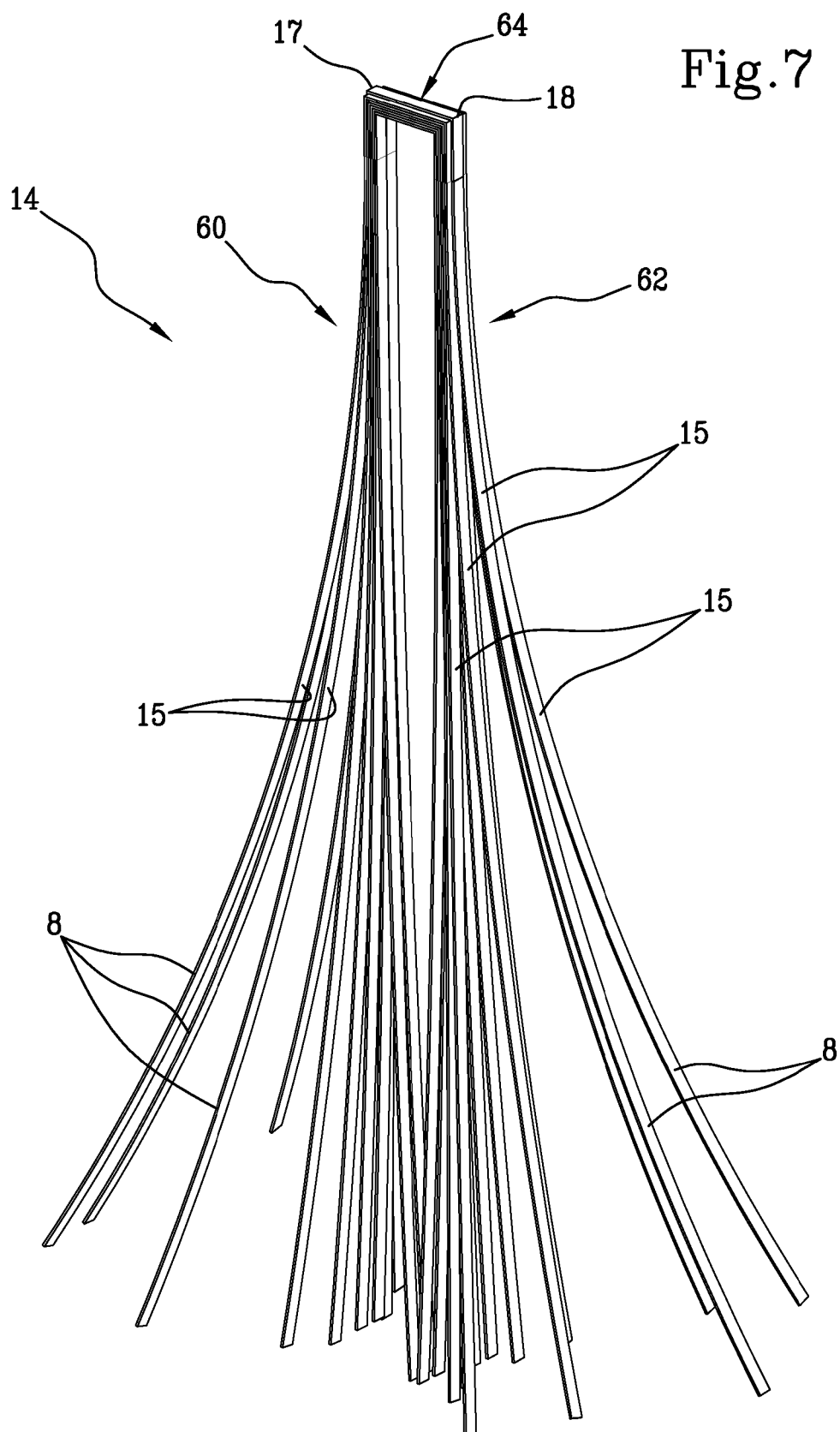


Fig. 5





REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- US 5621940 B1 [0004]
- EP 2269484 B1 [0005] [0013]
- US 2011107530 A1 [0006]
- US 6536067 B1 [0007]
- WO 2004009338 A1 [0008]
- US 2013276827 A1 [0009]
- US 2009282633 A1 [0010]