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(54) **Vacuum cleaner head**

(57) A vacuum cleaner head 10 for cleaning carpet comprises a head portion 15 which is tiltably attached to a body portion 12, the head portion 15 having a transversely extending suction mouth 18 on its underside 17. An elongate depending blade 21 extends longitudinally of the suction mouth 18 at a position between front and rear working edges 27, 28 thereof. The suction mouth 18 comprises front and rear working edges 27, 28. An arm 14 tilts the head portion 15 such that the suction mouth 18 faces rearwardly when the head 10 is moved forwardly

across a floor surface to lower the front edge 27 of the mouth 18 into engagement with the carpet C. The front edge 27 distorts and parts the carpet fibres F to allow trapped dust to be extracted. Dust is also dislodged as the carpet fibres suddenly recover their shape. This process is repeated by the action of the blade 21 and dust extraction from the carpet is greatly improved and a comparatively low power motor can be used to induce the airflow through the cleaner.

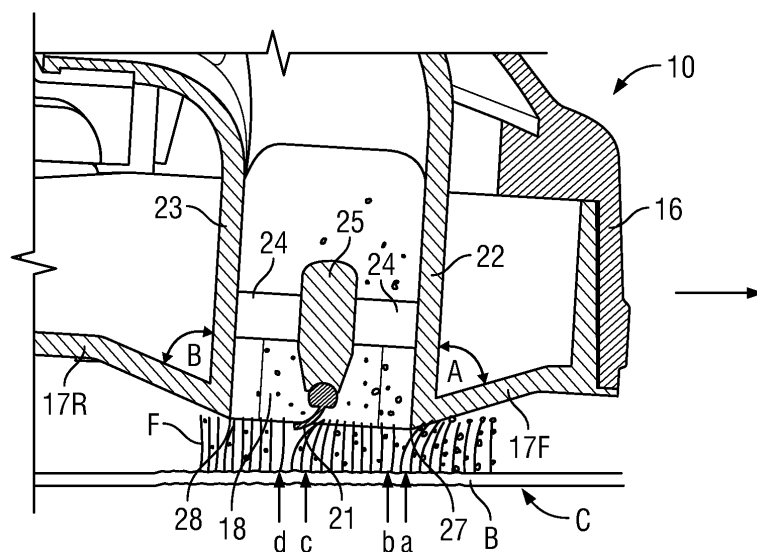


FIG. 4

Description

[0001] This invention relates to a vacuum cleaner head and more particularly to a vacuum cleaner head for cleaning carpets.

[0002] Vacuum cleaners always comprise some form of head which can engage the floor to pick up dirt and dust. In a so-called upright cleaner the head is pivoted to an upright body which contains means for separating and collecting the dirt and dust that is drawn into the cleaner by the induced airflow. In a so-called canister cleaner, the head is provided at the end of a tubular wand that is connected to the body of the cleaner via an elongate flexible duct. The body of the cleaner contains means for separating collecting the dirt and dust that is drawn into the cleaner by a motor and fan unit and disposed in the body. Sometimes the head of the canister cleaner may be detachable, so that the user can fit other kinds of cleaning tools to the wand.

[0003] Floor surfaces formed of carpet can be difficult to clean because the dirt and dust becomes trapped in the carpet pile. Typically, the only way of removing such dirt and dust is by using a vacuum cleaner which has a relatively high-powered motor to increase the airflow and hence the degree of suction applied to the carpet. A disadvantage of such high powered motors is that they are noisy and consume a substantial amount of electricity. For these reasons, legislation is being introduced which limits the power that vacuum cleaners can consume in use. Clearly, this restriction in power will restrict the overall cleaning efficiency of the vacuum cleaner to the extent that its ability to clean carpets is detrimented.

[0004] We have now devised a vacuum cleaner head which aims to provide enhanced cleaning of carpets even when a relatively low-powered motor is used.

[0005] In accordance with the present invention there is provided a vacuum cleaner head having a head portion which is tiltably attached to a body portion, the head portion comprising a transversely extending suction mouth on the underside thereof, the suction having front and rear working edges, the head further comprising means for tilting the head portion such that the suction mouth faces rearwardly when the head is moved forwardly across a floor surface and vice-versa to respectively lower front and rear working edges of the suction mouth into engagement with the floor surface, wherein an elongate depending blade extends longitudinally of the suction mouth at a position between the front and rear working edges thereof, the blade comprising a lower edge which lies below the front and rear working edges.

[0006] In use, when the head is moved forwardly the head portion tilts such that the front edge of the suction mouth forms a working edge which sinks slightly into the carpet pile to a greater extent than the rear working edge.. This action causes three effects. Firstly it impedes the air flow into the suction mouth from the front of the head and stops any surface dust being pulled deeper into the carpet pile. Secondly, it spreads and parts adjacent rows

of fibres of the carpet pile, thereby allowing airflow from the bottom of the carpet where dirt and dust may have collected. Thirdly, it causes the resiliently flexible fibres to bend as they pass under the working edge: the fibres then quickly recover their shape and this action dislodges any dust and propels it into the suction airflow. The strength of propulsion upon the individual carpet fibres is the main mechanism that causes the release of dust from the carpet pile. Airflow within the suction mouth carries the propelled dust into the cleaner. If no airflow were present, a significant amount of dust would still be propelled and released from the carpet pile as the head moves across the carpet but would eventually fall back into the pile.

[0007] The presence of the protruding blade behind the front edge similarly causes the second and third of above-mentioned effects to be repeated a second time and therefore provides an additional mechanism to agitate and propel dust from the pile of the carpet, thereby maximising the cleaning efficiency by enabling dirt and dust which had not been picked up the first time by the action of the front edge to be picked up.

[0008] In this manner, dust extraction from the carpet is greatly improved and a comparatively low power motor can be used to induce the airflow through the cleaner.

[0009] The above-mentioned effects also occur when the head is moved rearwardly because the head portion tilts such that the rear edge of the suction mouth forms a working edge which sinks slightly into the carpet pile.

[0010] The forwards and rearwards tilting of the head portion plays a vital role in allowing the head to function correctly. The tilting arrangement allows the bottom surface of the head portion to rotate forwards and backwards to engage and compress the carpet pile adequately on each stroke. At the same time it must also force a greater amount of airflow under the non working edge of the suction mouth to cause entrainment and carry the propelled air-borne dust into the cleaner.

[0011] Preferably the underside of the head portion comprises a bottom surface which defines said transversely extending suction mouth, the bottom surface having front and rear surface portions which respectively extend upwardly and away from the front and rear working edges of the mouth respectively, the lower edge of the blade lying below the bottom surface of the head portion.

[0012] Preferably the blade is formed of a resiliently flexible material bends and which helps to improve the separation of the carpet fibres, preferably to a greater extent than the separation caused by the action of the front edge.

[0013] In order to help to ensure that airflow under the bottom surface of the head portion is as laminar and direct as possible, the front and rear portions of the bottom surface are preferably smooth and preferably planar.

[0014] Preferably the suction mouth comprises front and rear side walls, the angle between the front and rear side walls and the respective portions of the bottom surface is acute and preferably in the range of 65-75 degrees

and most preferably 70 degrees.

[0015] Preferably the front and rear edges of the suction mouth are sharp and preferably comprise a radius of less than 0.5mm.

[0016] The blade may extend the full length of the suction mouth or a part or parts thereof.

[0017] Preferably the head portion is arranged to tilt in the appropriate direction by frictional engagement between the underside of the head portion and the floor surface being cleaned as the head is moved forwardly and rearwardly.

[0018] Also in accordance with the present invention there is provided a vacuum cleaner comprising a vacuum cleaner head as hereinbefore described.

[0019] An embodiment of the present invention will now be described by way of example only and with reference with the accompanying drawings, in which:

Figure 1 is a perspective bottom view of a vacuum cleaner head in accordance with the present invention;

Figure 2 is a left side view of the vacuum cleaner head of Figure 1 when moving forwards, with some parts being shown in outline;

Figure 3 is a left side view of the vacuum cleaner head of Figure 1 when moving rearwards, with some parts being shown in outline;

Figure 4 is a fragmentary sectional view of a head portion of a vacuum cleaner head of Figure 1 when moving forwardly; and

Figure 5 is a fragmentary sectional view of a head portion of a vacuum cleaner head of Figure 1 when moving rearwardly.

[0020] Referring to Figures 1 to 3 of the drawings, there is shown a vacuum cleaner head 10 in accordance with the present invention for fitting to a canister vacuum cleaner, the rear of the head 10 comprising a rearwardly-extending tubular suction outlet 11 for releasably coupling to the distal end of a tubular wand of the cleaner. In use, a motor and fan unit in the body of the cleaner (not shown) draws air through the head 10 via the wand.

[0021] The head 10 comprises a rear body portion 12, from which the outlet 11 extends. A central roller 13 is mounted to the underside of the body portion 12. An arm 14 extends forwardly from the body portion 12 and is pivotally connected thereto for rotation about a first axis X1, which extends transverse the head 10 and which also forms the rotational axis for the roller 13.

[0022] A head portion 15 comprises a hollow housing 16 which is substantially T-shaped in plan. A housing 16 comprises a bottom wall 17, which defines an elongate suction mouth 18 which extends transversely of the head 10. The suction mouth 18 is connected to the suction

outlet 11 via an L-shaped duct 19 and a flexible duct (not shown) which extends inside the housing 16.

[0023] The head portion 15 comprises a pair of wheels 20 disposed at the rear of the head 10 and outwardly of the roller 13. The head portion 15 is pivotally connected to the front end of the arm 14 for rotation about a second axis X2, the arm 14 providing the sole support between the body portion 12 and the head portion 15.

[0024] Also referring to Figures 4 and 5 of the drawings, in accordance with the present invention an elongate resiliently flexible wiper blade 21 extends longitudinally of the suction mouth 18.

[0025] The blade 21 is disposed in the centre of the suction mouth 18 and extends parallel to front and rear side walls 22, 23 of the suction mouth 18. The lower edge of the blade 21 lies below the front and rear edges 27, 28 of the suction mouth 18. The blade 21 is supported by an elongate carrier 25 which is connected to the front and rear side walls 22, 23 by a plurality of spaced apart formations 24 which do not substantially obstruct the flow of air into the suction mouth 18.

[0026] The bottom wall 17 of the head portion 15 comprises front and rear portions 17F, 17R which respectively extend upwardly and outwardly from the front and rear edges 27, 28 of the suction mouth 18 respectively. The angle A between the front sidewall 22 and the front portion 17F of the bottom wall 17 is 70 degrees. The angle B between the rear sidewall 23 and the rear portion 17R of the bottom wall 17 is also 70 degrees. The front and rear portions 17F, 17R of the bottom wall 17 are substantially flat and are substantially free of protrusions or indentations. The front and rear edges 27, 28 of the suction mouth 18 are sharp and comprise a radius of less than 0.5mm.

[0027] Referring to Figures 2 and 4 of the drawings, when the wand (not shown) is used to push the head 10 forwardly across a carpet C, the friction between the carpet C and the bottom wall 17 of the head portion 15 causes a compressive force between the head and body portions 15, 12. This compressive force causes the front end of the arm 14 to pivot upwards and lift the rear of the head portion 15, such that the suction mouth 18 faces rearwardly with the front edge 27 of the suction mouth 18 forming a working edge which sinks slightly into the pile of the carpet C formed by fibres F. This action causes three effects:

1. it impedes the air flow into the suction mouth 18 from the front of the head 10 and stops any surface dust being pulled deeper into the carpet fibres F;

2. the front edge 27 of the suction mouth spreads and parts adjacent rows of fibres F (between points a and b), thereby allowing airflow from the bottom of the carpet where dirt and dust may have collected; and

3. it causes the resiliently flexible fibres F to bend as

they pass under the working edge: the fibres then quickly recover their shape and this action dislodges any dust and propels it into the suction airflow.

[0028] The blade 21 bends rearwardly and similarly causes the effects 2. and 3. to be repeated a second time (between points c and d) and the blade 21 therefore provides an additional means to agitate and propel dust from the fibres F of the carpet, thereby maximising the cleaning efficiency by enabling dirt and dust which had not been picked up by the action of the front edge 27 to be picked up.

[0029] This above-mentioned processes also occur when the head is moved rearwardly because the head portion tilts such that the rear edge of the suction mouth forms a working edge which sinks slightly into the carpet pile.

[0030] Referring to Figures 3 and 5 of the drawings, when the wand (not shown) is used to pull the head 10 rearwardly across a carpet C, the friction between the carpet C and the bottom wall 17 of the head portion 15 causes a tensile force between the head and body portions 15,12. This tensile force causes the front end of the arm 14 to pivot downwards and lower the rear of the head portion 15, such that the suction mouth 18 faces forwardly with the rear edge 28 of the suction mouth 18 forming a working edge which sinks slightly into the pile of the carpet C. Again, this action causes three effects:

4. it impedes the air flow into the suction mouth 18 from the rear of the head 10 and stops any surface dust being pulled deeper into the carpet fibres F;

5. the rear edge 28 of the suction mouth spreads and parts adjacent rows of fibres F (between points a and b), thereby allowing airflow from the bottom of the carpet where dirt and dust may have collected; and

6. it causes the resiliently flexible fibres F to bend as they pass under the working edge: the fibres then quickly recover their shape and this action dislodges any dust and propels it into the suction airflow.

[0031] The blade 21 bends forwardly and similarly causes the effects 4. and 5. to be repeated a second time (between points c and d) and the blade 21 therefore provides an additional means to agitate and propel dust from the fibres F of the carpet, thereby maximising the cleaning efficiency by enabling dirt and dust which had not been picked up by the action of the front edge 27 to be picked up.

[0032] The invention thus provides a vacuum cleaner head 10 for cleaning carpet, in which the comprises a head portion 15 tiltably attached to a body portion 12, the head portion 15 having a transversely extending suction mouth 18 on its underside 17. An elongate depending blade 21 extends longitudinally of the suction mouth 18 at a position between front and rear working edges 27,

28 thereof. The suction mouth 18 comprises front and rear working edges 27, 28. An arm 14 tilts the head portion 15 such that the suction mouth 18 faces rearwardly when the head 10 is moved forwardly across a floor surface to lower the front edge 27 of the mouth 18 into engagement with the carpet C. The front edge 27 distorts and parts the carpet fibres F to allow trapped dust to be extracted. Dust is also dislodged as the carpet fibres suddenly recover their shape. This process is repeated by the action of the blade 21 and dust extraction from the carpet is greatly improved and a comparatively low power motor can be used to induce the airflow through the cleaner.

[0033] Tests have shown that the provision of the blade 21 to provide an additional means for separating the carpet fibres F substantially improves dust removal at lower flow rates. Hence, dust removal is not compromised by using a comparatively low power motor in the motor and fan unit.

Claims

1. A vacuum cleaner head having a head portion which is tiltably attached to a body portion, the head portion comprising a transversely extending suction mouth on the underside thereof, the suction having front and rear working edges, the head further comprising means for tilting the head portion such that the suction mouth faces rearwardly when the head is moved forwardly across a floor surface and vice-versa to respectively lower front and rear working edges of the suction mouth into engagement with the floor surface, wherein an elongate depending blade extends longitudinally of the suction mouth at a position between the front and rear working edges thereof, the blade comprising a lower edge which lies below the front and rear working edges.
2. A vacuum cleaner head as claimed in claim 1, in which the underside of the head portion comprises a bottom surface which defines said transversely extending suction mouth, the bottom surface having front and rear surface portions which respectively extend upwardly and away from the front and rear working edges of the mouth respectively, the lower edge of the blade lying below the bottom surface of the head portion.
3. A vacuum cleaner head as claimed in claim 2, in which the front and rear portions of the bottom surface are substantially smooth.
4. A vacuum cleaner head as claimed in claims 2 or 3, in which the front and rear portions of the bottom surface are substantially planar.
5. A vacuum cleaner head as claimed in any of claims

2 to 4, in which the suction mouth comprises front and rear side walls, the angle between the front and rear side walls and the respective portions of the bottom surface is acute.

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6. A vacuum cleaner head as claimed in claim 5, in which said angle is in the range of 65-75 degrees.

7. A vacuum cleaner head as claimed in claim 6, in which said angle is substantially 70 degrees.

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8. A vacuum cleaner head as claimed in any preceding claim, in which the front and rear edges of the suction mouth are sharp.

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9. A vacuum cleaner head as claimed in claim 8, in which the front and rear edges of the suction mouth comprise a radius of less than 0.5mm.

10. A vacuum cleaner head as claimed in any preceding claim, in which the blade is formed of a resiliently flexible material.

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11. A vacuum cleaner head as claimed in any preceding claim, in which the blade extends the full length of the suction mouth.

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12. A vacuum cleaner head as claimed in any of claims 1 to 10, in which the blade extends along a part or parts of the suction mouth.

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13. A vacuum cleaner head as claimed in any preceding claim, in which the head portion is arranged to tilt in the appropriate direction by frictional engagement between the underside of the head portion and the floor surface being cleaned as the head is moved forwardly and rearwardly.

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14. A vacuum cleaner comprising a vacuum cleaner head as claimed in any preceding claim.

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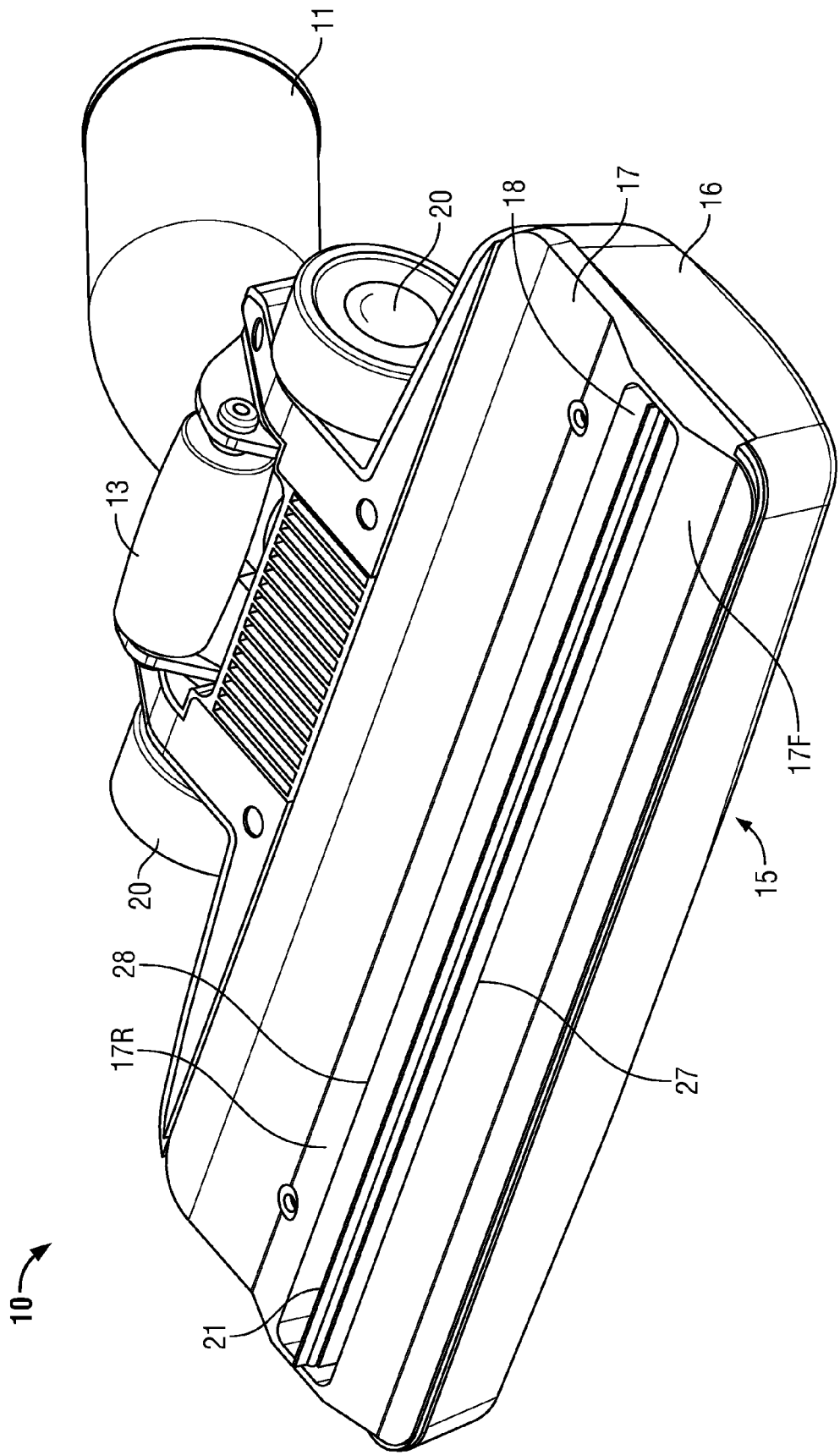


FIG. 1

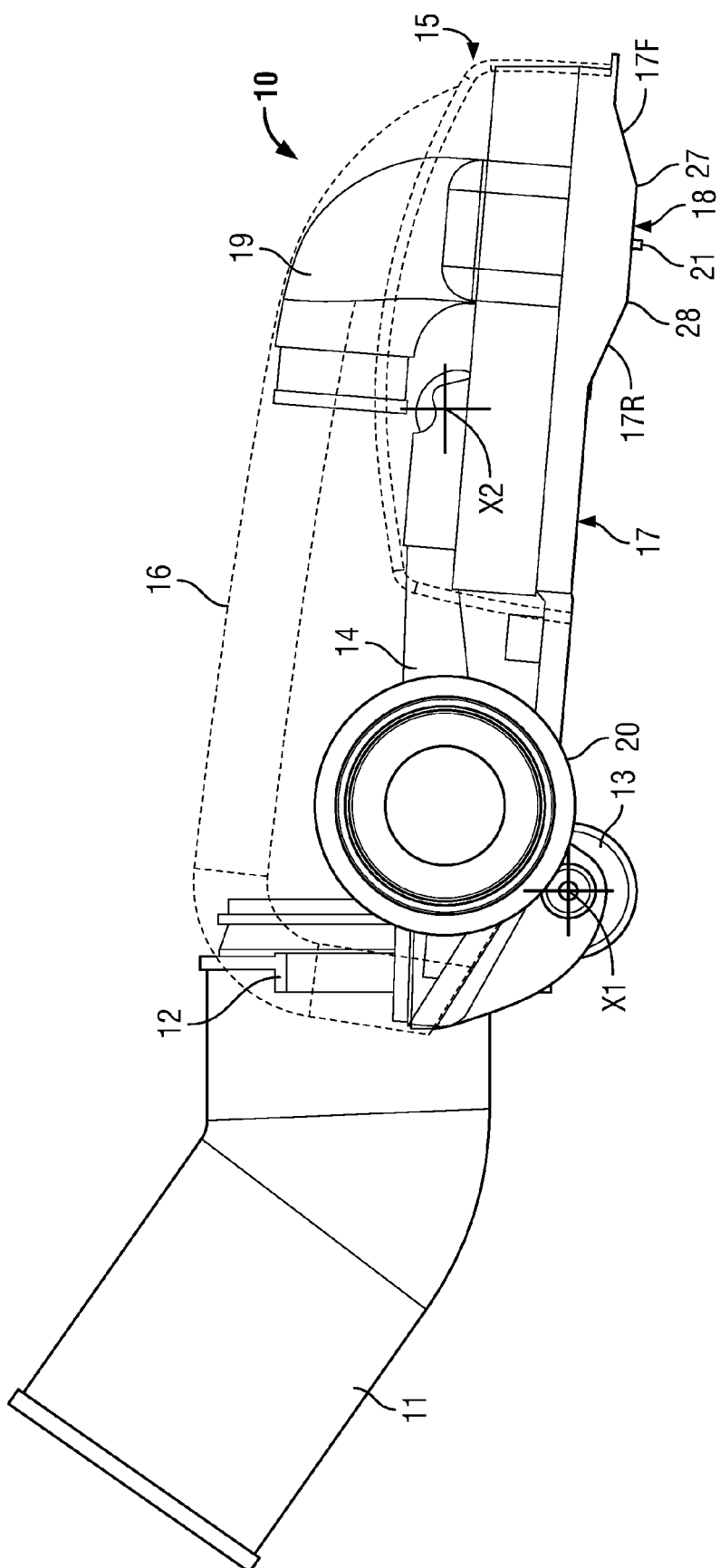


FIG. 2

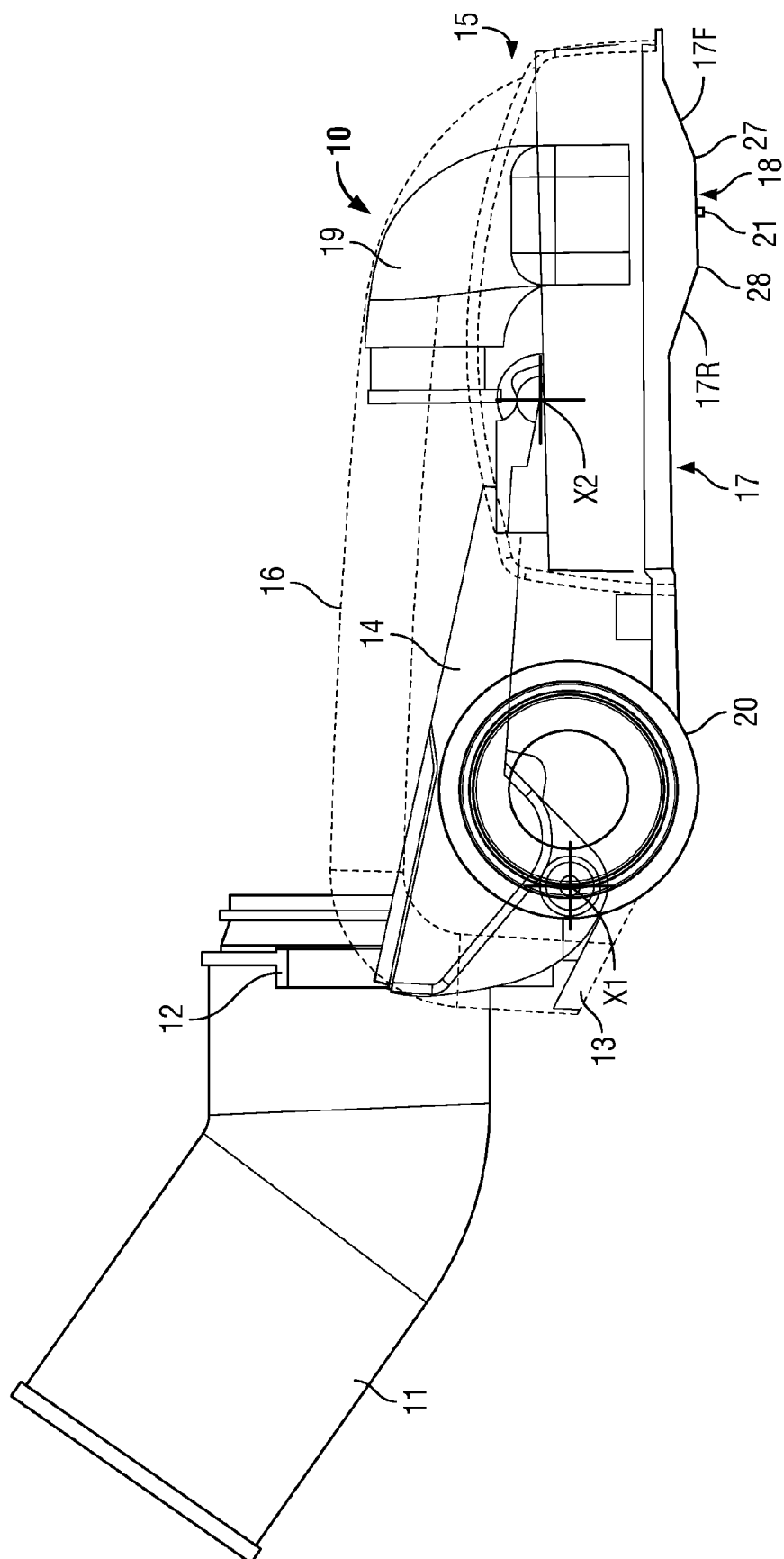


FIG. 3

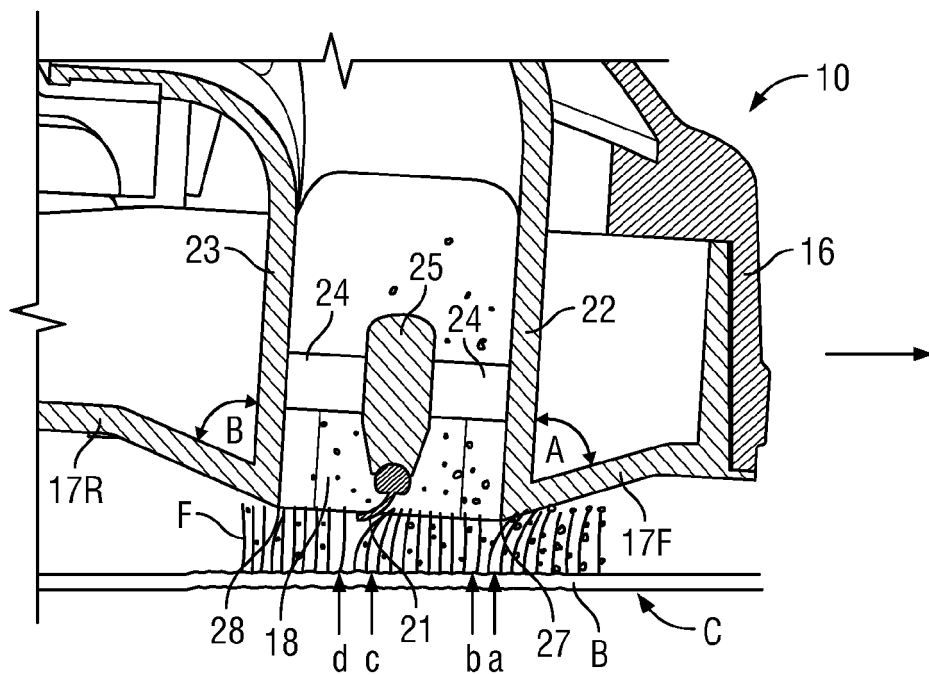


FIG. 4

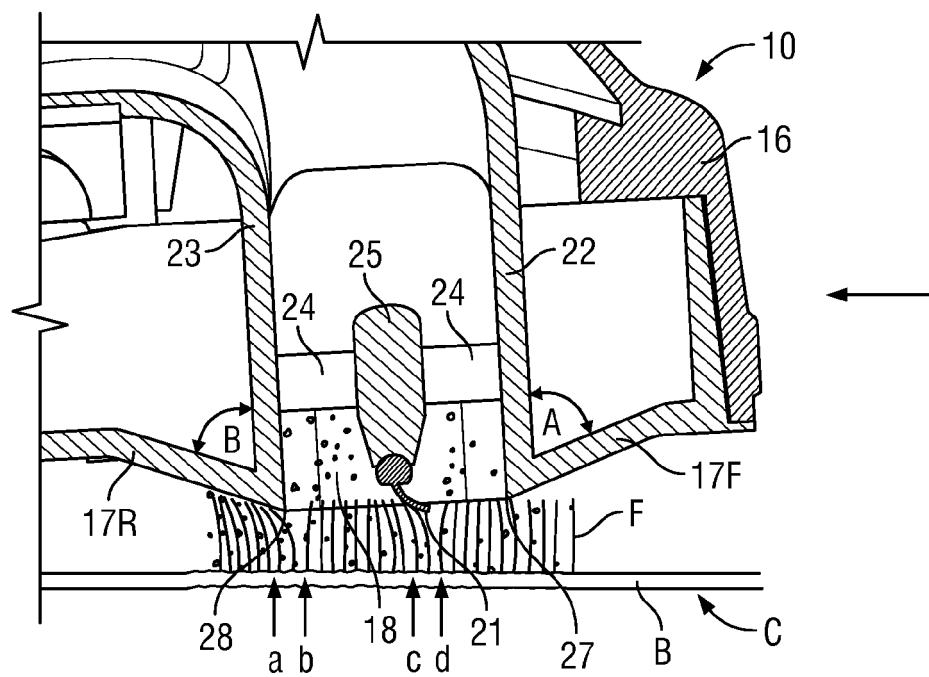


FIG. 5



EUROPEAN SEARCH REPORT

 Application Number
EP 15 15 4167

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Place of search Munich		Date of completion of the search 11 June 2015	Examiner Eckenschwiller, A
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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