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(54) **Vacuum cleaner**

(57) A vacuum cleaner 2 has a housing 4 having primary air outlets 20 defined in a bottom surface of the housing 4 to direct air downwardly and rearwardly of the housing. A fan 26 draws dirty air into the inlet 38, through a filter and most of the filtered air passes out of primary outlets 20. As a result, the air is not vented on to the face and hands of the user, and at the same time avoids

disturbing dirt on the surface to be cleaned. A small amount of the air passes between the clamshell halves 10, 12 that make up housing 4, and out of the secondary outlets 28 in the side surfaces of the body portion 6. This air is used to cool the motor, but the rate of air flow out of the secondary outlets is insufficient to cause irritation to the user.

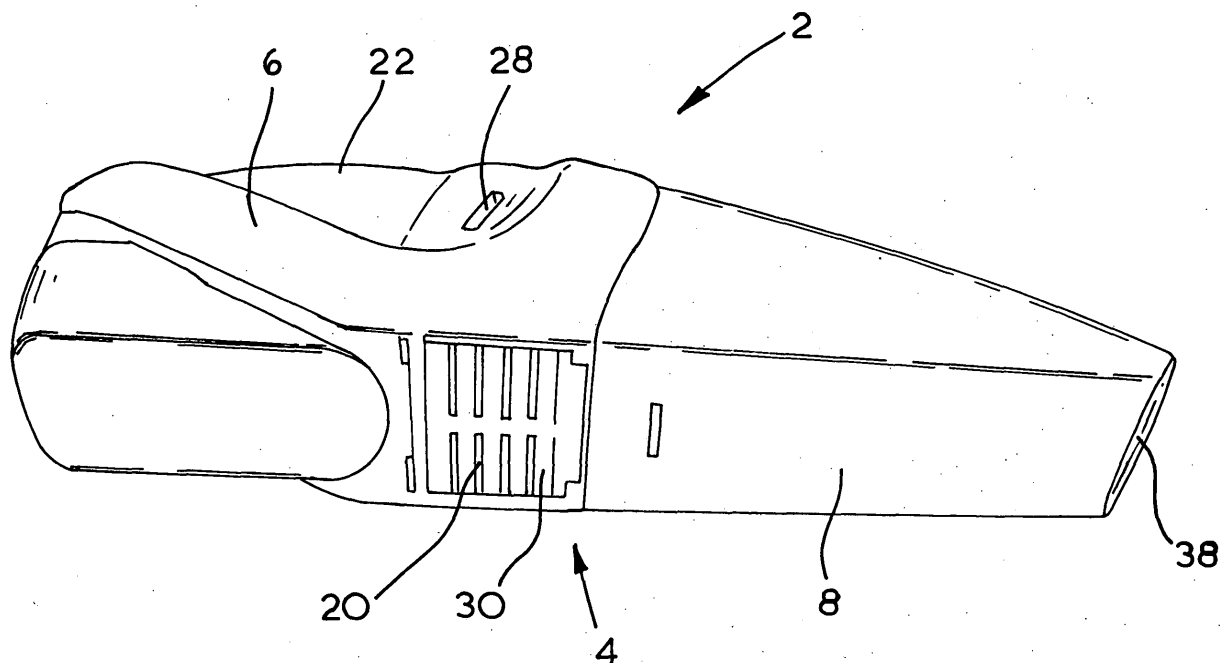


FIG. 2

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Description

[0001] The present invention relates to vacuum cleaners, and relates particularly, but not exclusively to hand-held battery operated vacuum cleaners.

[0002] Hand-held vacuum cleaners are known in which a fan displaces air out of vents in a housing of the vacuum cleaner, as a result of which suction is produced, drawing dirty air into the housing through inlets, and the dirty air is then filtered between the inlets and the fan.

[0003] It is generally the practice to vent the exhausted air through vents located on the sides, at the rear and/or on top of the housing of the vacuum cleaner. In the field of hand-held battery operated vacuum cleaners, it is generally considered necessary to vent the exhausted air through the top, rear or sides of the housing, since it is generally believed that air exhausted through the bottom surface of the housing would disturb dirt particles on the dirty surface being cleaned.

[0004] However, locating exhaust vents at the rear, on the sides or on the top of the vacuum cleaner housing has the disadvantage that when these vents are located near to the handle, which in a compact hand-held vacuum cleaner is generally inevitably the case, the air stream is blown on to the hand of the user. This has proven irritating to users, in particular when the vacuum cleaner is used for long periods of time. Locating the exhaust vents in the top or rear of the housing has the further disadvantage that the exhaust air flow is often directed into the face of the user. This is again irritating and can be dangerous in a dusty environment where dust particles are more likely to be caught in the eye of a user when an increased air flow is blowing across the user's face.

[0005] Preferred embodiments of the present invention seek to overcome the above described disadvantages of the prior art.

[0006] According to the present invention there is provided a vacuum cleaner comprising:-

a housing having at least one inlet adjacent an end portion of said housing for intake of air and at least one first outlet in a bottom surface of said housing for exhaust of air;

suction means for causing air to flow from at least one said inlet to at least one said first outlet; and first filter means for removing particles larger than a first predetermined size from air flowing from at least one said inlet to at least one said first outlet, wherein the or each said first outlet is adapted to direct air from the housing in a direction away from the or each said inlet.

[0007] By providing a vacuum cleaner having at least an outlet on the bottom surface of the housing such that the exhaust air is directed through the outlet away from the or each inlet, this provides the advantage that ex-

haust air from the vacuum cleaner is not blown onto the face and hands of the user, thus minimising discomfort to the user, while also not disturbing dirt particles on the surface which is being cleaned. This result is highly surprising, since it is generally considered impossible by persons skilled in the art to vent exhaust air through a bottom surface of the housing without disturbing dirt on the surface being cleaned.

[0008] The vacuum cleaner may further comprise second filter means for removing particles larger than a second predetermined size, smaller than said first predetermined size, from air flowing through at least one said first outlet.

[0009] The second filter means may be provided in at least one said first outlet.

[0010] By passing the exhaust air through a second filter means located in at least one said first outlet, this provides the advantage that the second filter means acts as a baffle, thereby slowing the speed of the stream of air and further reducing the likelihood of the air disturbing particles on the surface which is being cleaned.

[0011] The vacuum cleaner may further comprise a plurality of slats arranged adjacent at least one said first outlet for directing air passing through said first outlet away from the or each said inlet.

[0012] The vacuum cleaner may further comprise at least one second outlet for enabling air flowing from said suction means to the or each said second outlet to cool a motor of the vacuum cleaner.

[0013] At least one said second outlet may be provided in a side surface of the housing.

[0014] In a preferred embodiment, the housing comprises a plurality of housing parts, and air flows to at least one said second outlet in use via at least one gap between two said housing parts.

[0015] By enabling air to flow to at least one said second outlet via at least one gap between two said housing parts, this provides the advantage of enabling leakage of air flow from the main air flow path to be utilised without the necessity of forming complex pathways. Furthermore, the rate of secondary air flow used to cool the motor is generally sufficiently small that it can be vented out of the top or side surfaces of the housing without causing irritation to the user.

[0016] A preferred embodiment of the present invention will now be described, by way of example only and not in any limitative sense, with reference to the accompanying drawings, in which:-

Figure 1 is a sectional view of a housing of a vacuum cleaner embodying the present invention, with two housing parts thereof separated and a nose portion removed;

Figure 2 is a perspective view of part of the vacuum cleaner of Figure 1 with the nose portion attached; Figure 3 is a detailed perspective view of part of the vacuum cleaner of Figure 2; and

Figure 4 is a schematic view of the vacuum cleaner

of Figures 1 to 3 in use.

[0017] Referring to Figures 1 to 3, a vacuum cleaner 2 has a housing 4 comprising a body portion 6 and a removable nose portion 8. The body portion 6 is formed from co-operating injection moulded clam-shell halves 10, 12 and has a grill 14 defining an air inlet and an aperture 16 for accommodating slats 18 defining primary air outlets 20. The primary air outlets 20 are defined in a bottom surface of the body portion 6 and direct air downwardly and rearwardly of the housing 4. The body portion 6 also defines a handle 22 in an upper part thereof.

[0018] An electric motor 24, powered by a rechargeable battery (not shown) is provided in the body portion 6 and drives a fan 26 such that the fan 26 displaces air radially outwards and out of primary outlets 20 and draws air axially inwards through grill 14. Secondary outlets 28 are also provided in side surfaces of the body portion 6 such that a small proportion of air displaced outwards by the fan 26 is able to pass, via leakage between the two clam-shell halves 10, 12, out of the secondary outlet 28 to cool the motor 24.

[0019] The slats 18 are provided in a hinged door 30 mounted to the body portion 6 to close aperture 16, and a fine filter covers the primary outlets 20, the filter comprising a filter medium 32 which is held in a compressed manner between hinged door 30 and a grill 34 located in the aperture 16. The body portion 6 is also provided with electrical contacts 36 for enabling recharging of the rechargeable battery which drives the motor 24.

[0020] The nose portion 8 defines an inlet 38 for dirty air and contains a filter (not shown) which comprises a coarse filter and a fine filter, for removing dirt from air flowing from the inlet 38 to the grill 14 as a result of suction generated by the fan 26. The construction of the filter located within the nose portion 8 will be familiar to persons skilled in the art and will therefore not be described in further detail.

[0021] The operation of the vacuum cleaner 2 will now be described with reference to Figures 1 to 4.

[0022] Vacuum cleaner 2 is oriented in the manner shown in Figure 4 over a dirty surface 40 to be cleaned. The motor 24 is actuated by means of a suitable switch (not shown) provided adjacent the handle 22 on body portion 6, as a result of which the fan 26 draws dirty air into the inlet 38 of the nose portion 8 and through the filter in the nose portion. The filtered air is drawn through grill 14 and displaced radially outwards by the fan 26, most of the air passing out of the primary outlets 20 in such a manner that the air is displaced generally in the direction of arrow D in Figure 4. As a result, the air is not vented onto the face and hands of the user, and at the same time avoids disturbing dirt on the surface 40 to be cleaned. A small amount of the air displaced radially outwards by the fan 26 passes between the clam-shell halves 10, 12 and out of the secondary outlets 28 in the side surfaces of the body portion 6. As a result,

the motor 24 is cooled, but the rate of air flow out of the secondary outlets 28 is insufficient to cause irritation to the user.

[0023] It will be appreciated by persons skilled in the art that the above embodiment has been described by way of example only and not in any limitative sense, and that various alterations and modifications are possible without departure of the scope of the invention as defined by the appended claims.

Claims

1. A vacuum cleaner comprising:-

a housing having at least one inlet adjacent an end portion of said housing for intake of air and at least one first outlet in a bottom surface of said housing for exhaust of air;

suction means for causing air to flow from at least one said inlet to at least one said first outlet; and

first filter means for removing particles larger than a first predetermined size from air flowing from at least one said inlet to at least one said first outlet, wherein the and each said first outlet is adapted to direct air from the housing in a direction away from the or each said inlet.

2. A vacuum cleaner according to claim 1, further comprising second filter means for removing particles larger than a second predetermined size, smaller than said first predetermined size, from air flowing through at least one said first outlet.

3. A vacuum cleaner according to claim 2, wherein said second filter means is provided adjacent at least one said first outlet.

4. A vacuum cleaner according to any one of the preceding claims, further comprising a plurality of slats arranged in at least one said first outlet for directing air passing through said first outlet away from the or each said inlet.

5. A vacuum cleaner according to any one of the preceding claims, further comprising at least one second outlet for enabling air flowing from said suction means to the or each said second outlet to cool a motor of the vacuum cleaner.

6. A vacuum cleaner according to claim 5, wherein at least one said second outlet is provided in a side surface of said housing.

7. A vacuum cleaner according to claims 5 or 6, wherein said housing comprises a plurality of housing parts, and air flows to at least one said second

outlet in use via at least one gap between two said housing parts.

8. A vacuum cleaner substantially as hereinbefore described with reference to the accompanying drawings. 5

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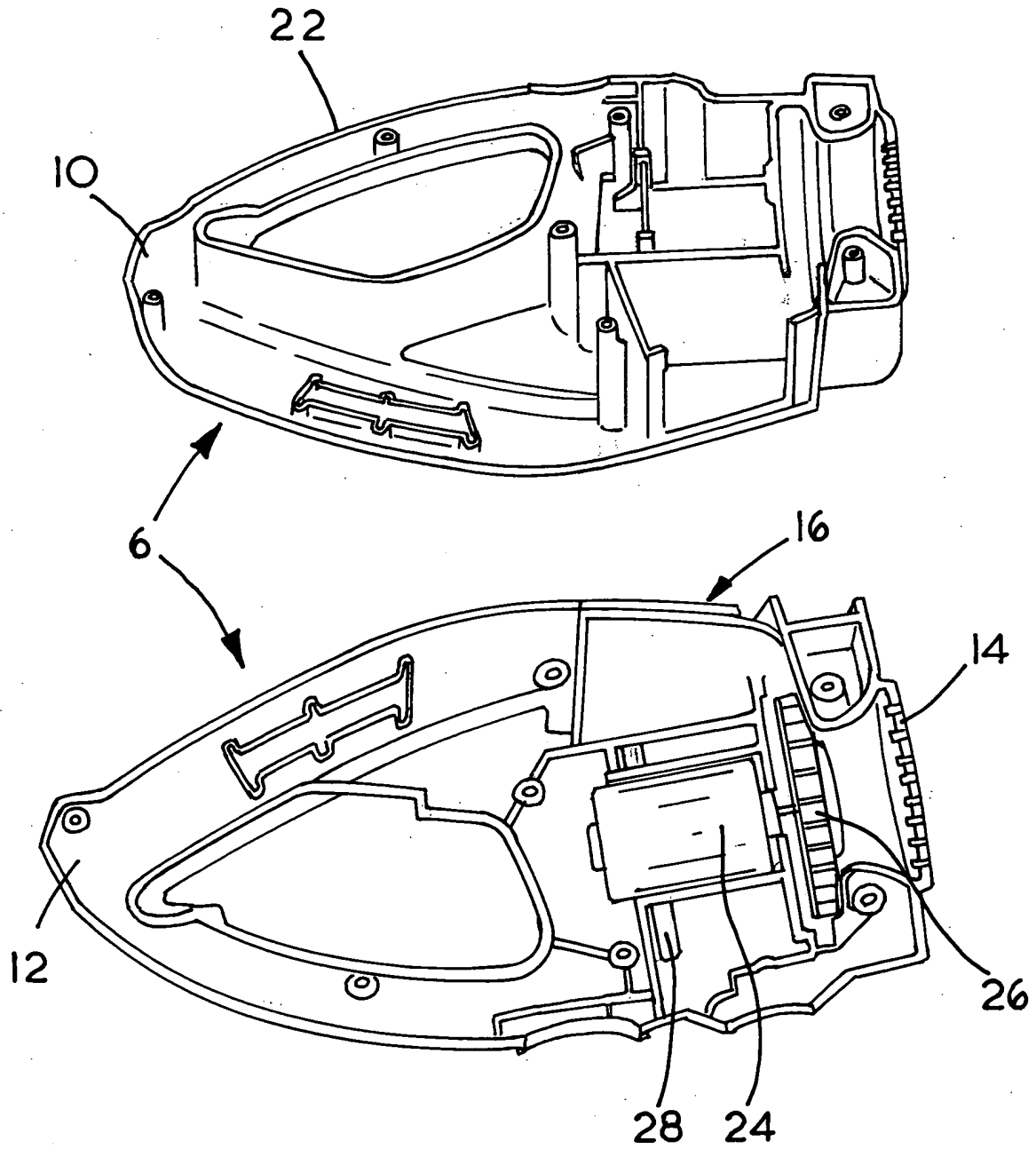


FIG. 1

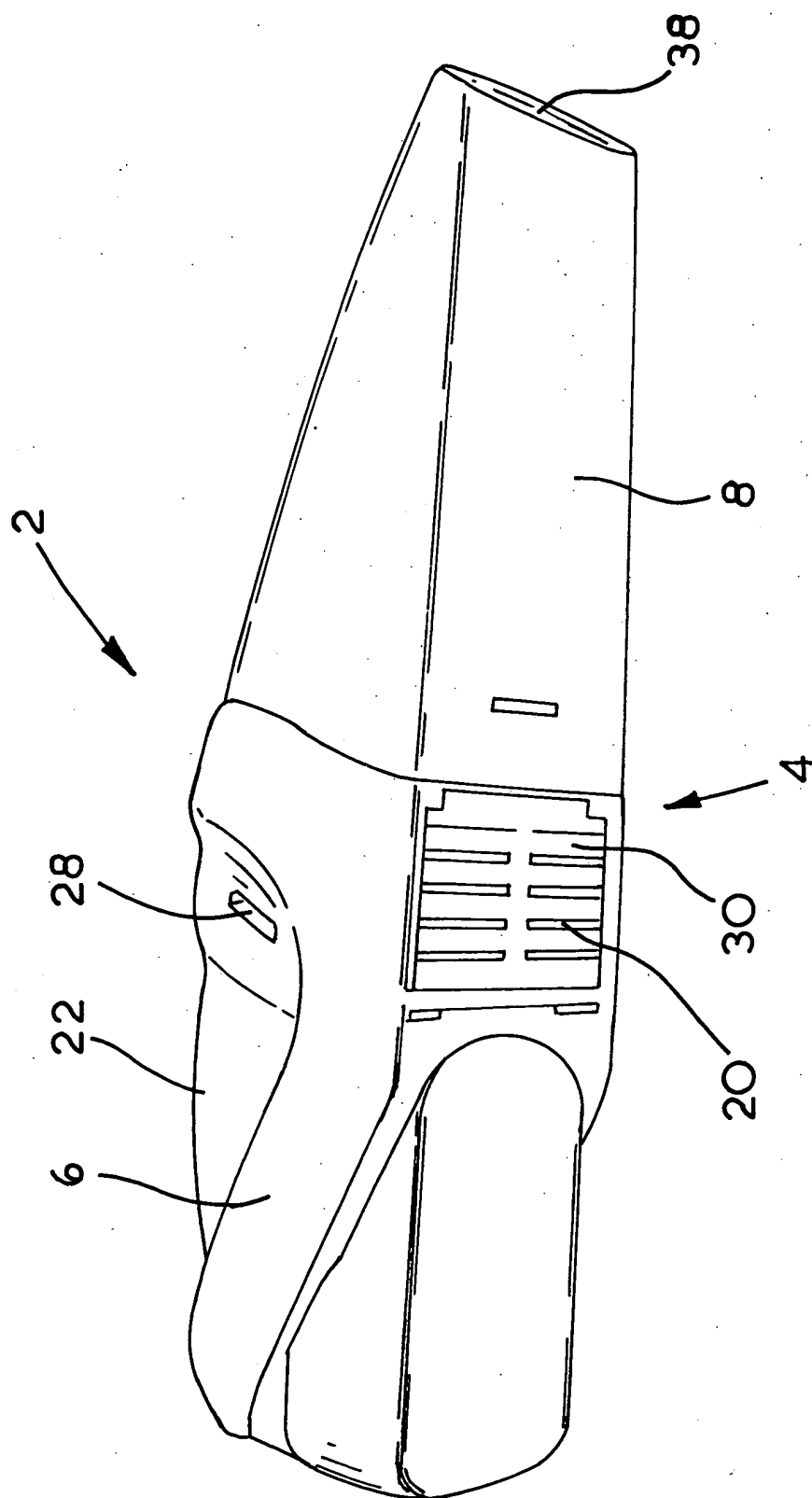


FIG. 2

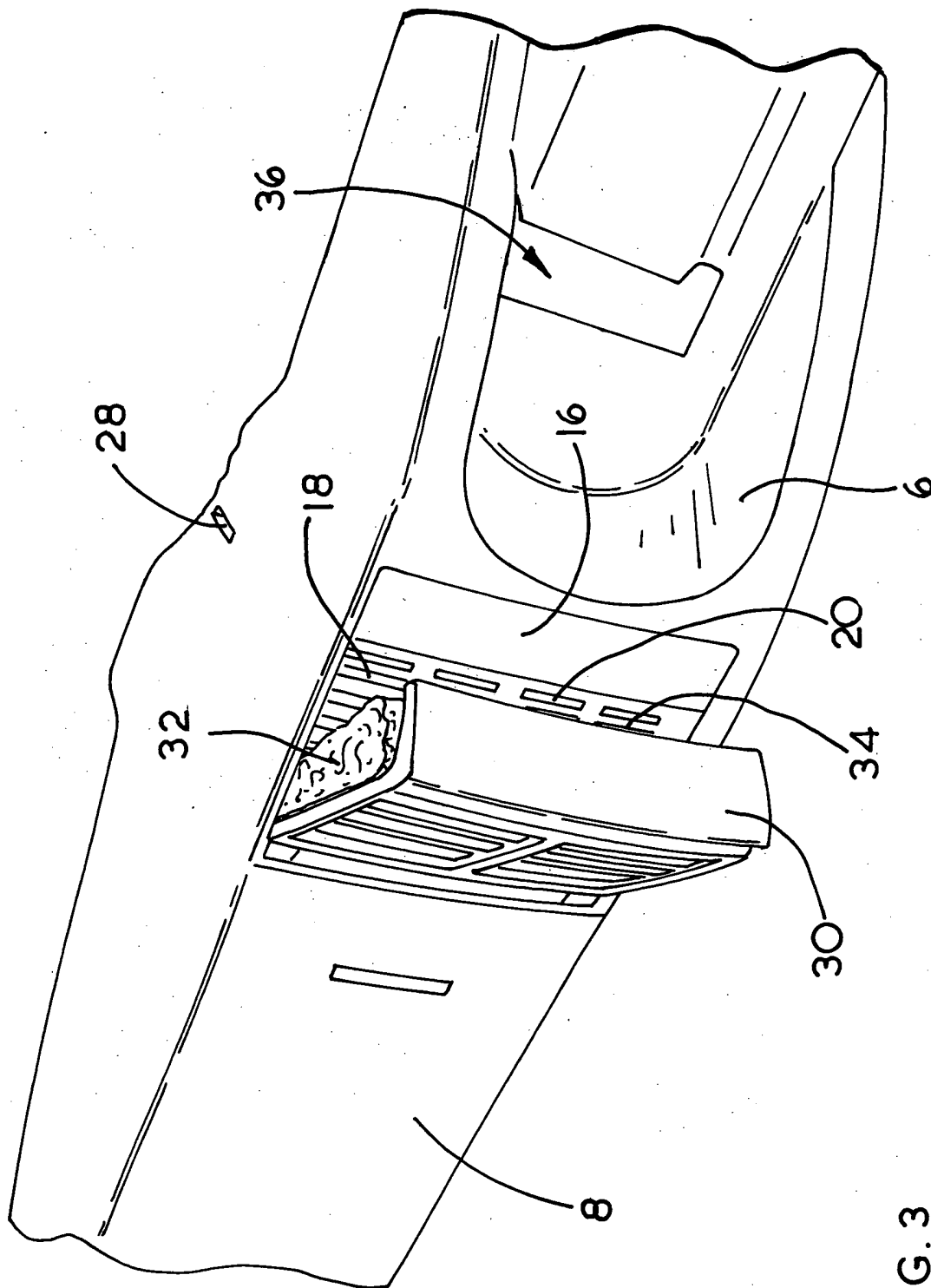


FIG. 3

FIG. 4

