

"CLEANER"

The present invention relates to a cleaner for removing dust or debris from a surface and, although the invention is not so restricted, it relates more particularly, to a table or desk top cleaner for cleaning fine dust from the top of a table or desk.

A cleaner is known in which the dust is caused to adhere to an adhesive layer which is formed on the outer circumference of a roller. The dust is cleaned off the said layer by rotating the roller while pushing it over a surface to be cleaned. The dust is sucked up by using a fan actuated by a motor.

However, such a cleaner for removing the dust by pushing the roller against the surface to be cleaned has the problems that the adhesion of the dust to the adhesive layer of the roller will fail to pick up the dust after it has been used for some time and that it cannot pick up large pieces of dust or debris.

According to the present invention, there is provided a cleaner for removing dust or debris from a surface, comprising housing means having at least one dust-collection area; at least one broom member movably mounted in a part of said housing means and engageable with the said surface so as to sweep the latter; and drive means for effecting sweeping movement of the or each broom member over the said surface so as to move dust or debris from the said surface and into a said dust-collection area, the or each broom member being connected to a crank which is movably mounted in the housing means and which is driven by the said drive means, the or each broom member having a shank provided

with an elongated slot which extends axially of the shank, the crank having at least one crank arm which is movable axially within the respective elongated slot, the or each broom member having a brush which can project below the housing means.

Preferably, the drive means comprises at least one wheel which is carried by a part of the housing means, the or each wheel, or a drive-transmitting member associated therewith, being engageable with the said surface so that, if the cleaner is in contact with the latter and is moved thereover in a predetermined direction, the engagement between the said surface and the or each wheel or drive-transmitting member will produce the said sweeping movement of the or each broom member.

There may be a plurality of broom members which are respectively connected to a corresponding plurality of crank arms which are arranged axially of the crank.

The drive-transmitting member may be a belt running over a plurality of said wheels.

The drive means may comprise clutch means for transmitting rotation of the said wheel in one angular direction only.

The arrangement may be such that the linear distance through which the cleaner travels during one complete rotation of the crank is smaller than the linear distance through which the or each broom member at this time travels in engagement with said surface so as to effect cleaning thereof.

Preferably, the elongated slot of the or each broom member communicates with a cut-away portion of the

broom member through which the respective crank arm may be introduced into the elongated slot, the width of the cut-away portion being less than the diameter of the crank arm.

5 Preferably, as a result of the provision of the cut-away portion, the broom member is provided on one side with a resilient part which is bounded by the cut-away portion and the elongated slot.

10 The resilient part may have a tapered surface adjacent the cut-away portion so as to assist the introduction of the respective crank arm into the respective elongated slot.

15 The or each broom member may be supported by a supporting member which is carried by a part of the housing means, the shank of the or each broom member extending through an opening in the supporting member, the or each said shank having abutment means which are disposed above and abut the supporting member so as to limit the extent to which the respective brush can project below the housing means.

20 Preferably, the housing means comprise frame means in which is mounted a dust case within which the or each dust-collection area is provided.

25 The dust case may be rockably mounted in the frame means, the dust case and frame means having respective portions which are engageable to limit rocking movement of the dust case, biasing means being provided for urging a leading edge into engagement with said surface.

30 The biasing means may be formed integrally with either the dust case or the frame means.

 Alternatively, the said urging is effected by a moment produced by the force of gravity about the rocking centre of the dust case.

 In one arrangement, the or each broom member is

provided with a weight for urging it downwardly.

In another arrangement, the crank has a portion which is engageable with the lower end portion of the broom member so as to push the latter downwardly.

5 In yet another arrangement, either the or each broom member or the crank has a resilient portion for engaging the other member so that the or each broom member is urged resiliently downward.

10 There may be means for regulating the size of the dust or debris which can be swept into the cleaner.

In its preferred form, the cleaner may be made inexpensively with a simple construction.

15 There may be a power transmission mechanism for transmitting a rotational force from a drive source to the crank, the power transmission mechanism having its rotation transmission ratio set such that the distance, by which the frame of the cleaner is moved forward by the angle of rotation of the wheels required for the broom to move from a cleaning start position to clear
20 the cleaning surface and to reach the cleaning start position again, is smaller than the cleaning distance of the broom.

The power transmission mechanism may be interposed between one of the wheels and the crank.

25 If a cleaner constructed as described above is moved forward while being pushed onto the surface to be cleaned, the rotations of the wheel are transmitted to rotate the crank so that the or each broom member is rocked to sweep the dust on the desk top into the dust
30 case.

If the cleaner is moved backwards, the clutch means cuts the rotational transmission from the wheel to the crank so that the or each broom member is not moved and the dust is not swept back onto the surface to be

cleaned.

Since the rotational transmission ratio is set at the above-specified value, the desk top is not left unswept.

5 Since the crank can be inserted from the cut-away portion into the elongated slot of a broom member, the assembly is facilitated, and unnecessary upward motions of the broom member are eliminated.

10 Since the or each broom member is preferably formed with the said abutment means, it does not protrude downwards, if unnecessary, even if the cleaner body is lifted up, whereby to avoid the disadvantages that the broom member cannot be rocked or is damaged.

15 If a belt is made to run on a plurality of wheels, the power generated by the advance of the cleaner is transmitted without fail to the crank.

The invention is illustrated, merely by way of example, in the accompanying drawings, in which:-

20 Figures 1 to 8 show a first embodiment of a cleaner according to the present invention, in which Figure 1 is a sectional top plan view;

Figure 2 is a sectional side elevation of the first embodiment;

25 Figure 3 is a top plan view of the first embodiment;

Figure 4 is a diagram showing the operation of a broom of the first embodiment;

30 Figure 5 shows at (a) to (d) diagrams illustrating the conditions for setting a rotational transmission ratio;

Figure 6 is a side elevation of the said broom;

Figure 7(a) is a sectional side elevation of the first embodiment;

Figure 7(b) is a section taken along line B-B of

Figure 7(a);

Figure 7(c) is a side elevation showing a modification of a brush of the said broom;

5 Figure 8 is a sectional side elevation of the first embodiment;

Figure 9 is a sectional side elevation, and Figure 10 is a front elevation of a second embodiment of a cleaner according to the present invention;

10 Figure 11 is a sectional side elevation, and Figure 12 is a front elevation of a third embodiment of a cleaner according to the present invention;

Figure 13 is a sectional side elevation, and Figure 14 is a front elevation of a fourth embodiment of a cleaner according to the present invention;

15 Figure 15 is a sectional side elevation, and Figure 16 is a front elevation of a fifth embodiment of a cleaner according to the present invention;

20 Figure 17 is a sectional side elevation similar to Figure 9 but illustrating means for regulating the size of dust or debris which can be swept into a dust collection area of the cleaner;

25 Figure 18 is a sectional top plan view; Figure 19 is a sectional side elevation, and Figure 20 is a top plan view of a sixth embodiment of a cleaner according to the present invention;

Figure 21 is a side elevation, and Figure 22 is a sectional top plan view of a seventh embodiment of a cleaner according to the present invention; and

30 Figure 23 is a sectional side elevation and Figure 24 is a sectional top plan view of an eighth embodiment of a cleaner according to the present invention.

Terms such as "upper" and "lower", as used in the description below, are to be understood to refer to directions as seen in the accompanying drawings.

A first embodiment of the present invention will now be described with reference to Figures 1 to 8.

As shown in Figures 1 to 3, a table or desk top cleaner has a supporting plate 1 and a frame 2 which are connected at a predetermined spacing by press-fitting a plurality of pillars or projections 2a of the frame 2 into corresponding tubular portions 1a of the supporting plate 1. The frame 2 is also connected at a predetermined spacing by press-fitting pillars or projections 2a of the frame 2 into corresponding pillars or projecting portions 3a of a frame 3.

The supporting plate 1 and the frame 2 have a space therebetween in which are rotatably mounted a drive gear 4 and a clutch gear 5 which are in meshing engagement with each other. A crank shaft 6 is rotatably mounted in the supporting plate 1 and in the frame 3. The crank shaft 6 is formed integrally with a pinion 6a which is in meshing engagement with the clutch gear 5. The drive gear 4, clutch gear 5 and pinion 6a together constitute a power transmission mechanism A.

The clutch gear 5 is rotatably mounted in a bearing portion 1b of the supporting plate 1 and in a bearing portion 2i of the frame 2, the bearing portions 1b, 2i being formed into long grooves which extend vertically, as shown in Figure 2. The clutch gear 5 constitutes a clutch means for transmitting one-way rotation only of the drive gear 4 to the crank shaft 6, as will be described in detail hereinafter in connection with its operation.

The drive gear 4 has a shaft 4a on which there is press-fitted a wheel 7a which has its outer circumference provided with a tyre 8a made of rubber. The frame 3 has a projection 3b which is aligned with the shaft 4a and on which there is rotatably mounted a

wheel 7b having a rubber tyre 8b. The frames 2, 3 are also respectively provided with projections or wheel shafts 2c, 3b at their front ends on which are rotatably mounted wheels 9. The wheels 7a, 8a and 7b, 8b, together with the wheels 9, are movable over and in contact with a surface 13 to be cleaned.

Each of two brooms 10 or broom members is provided at a lower end portion thereof with a brush 10a which can project below the frames 2, 3. A shank portion 10b of each broom 10 is formed with an elongated slot 10c which extends axially of the shank portion 10b. Each broom 10 is formed at an upper end portion thereof with engagement portions 10d.

Through the elongated slot 10c of each broom 10 there extends a shaft portion or crank arm portion 6b of the crank shaft 6, the shaft portions 6b being arranged axially of the crank shaft 6. Each shaft portion 6b is freely movable within the respective elongated slot 10c and axially of the latter.

Between a pillar or tubular projection 2d of the frame 2 and a pillar or tubular projection 3c of the frame 3, there are press-fitted the opposite ends 11a of a supporting member 11, as shown in Figure 3. The supporting member 11 is formed with openings 11b through which extend the upper end portion of the shanks 10b of the brooms 10.

A dust case 12 is formed at a front end portion thereof with a dust entrance 12a, as shown in Figures 1 and 2, and at a rear end portion thereof with fulcra or pivots 12c and resilient portions 12d. The dust case 12 provides a dust chamber 12b between its front and rear end portions. The dust case 12 is formed at its central portion with engagement portions 12e.

The fulcra or pivots 12c are rotatably mounted in

the frames 2 and 3, and the engagement portions 12e are loosely mounted in recess portions 2f and 3f of the frames 2 and 3 respectively. The resilient portions 12d resiliently abut against projections 2e and 3e of the frames 2 and 3 respectively. As a result, the dust case 12 can be rocked within a predetermined range counter-clockwise as seen in Figure 2 so that the leading edge 12f of the dust entrance 12a is forced by the spring forces into contact with the surface 13 which is to be cleaned.

Pillar 2a of the frame 2 and pillar 3a of the frame 3 are formed at their lower sides with extension portions 2g and 3g respectively, as shown in Figure 2. The extension portions 2g and 3g together constitute selecting members for selecting dust or debris 14 in accordance with its size.

In order to effect a cleaning operation with the cleaner thus constructed, the frames 2 and 3 are grasped to push the cleaner forward while pushing the tyres 8a and 8b and the wheels 9 onto the surface 13. Then the tyre 8a rotates so that the wheel 7a and the drive gear 4 accordingly rotate together counter-clockwise as seen in Figure 2. These rotations are sequentially transmitted to the clutch gear 5 and the pinion 6a so that the crank shaft 6 rotates counter-clockwise as seen in Figure 2.

As a result of the rotations of the crank shaft 6, as shown in Figure 4, the brooms 10 are rocked so as to brush the dust or debris 14 into the dust case 12. At this time, that portion of the dust or debris 14 which is forcibly swept by the brooms 10, is caused to impinge upon walls 2h and 3h which are formed integrally with the frames 2 and 3 respectively until it drops into the dust chamber 12b.

If the table or desk top cleaner is backed along the surface 13, the tyre 8a, the wheel 7a and the drive gear 4 all rotate together clockwise as seen in Figure 2 so that a force is transmitted to lift the clutch gear 5 upward as seen in Figure 2. Thus, the shaft of the clutch gear 5 is moved within the bearing portion 1b and 2i to a position, as shown by phantom lines in Figure 2. As a result of this movement, the clutch gear 5 and the pinion 6a come out of meshing engagement so that no power is transmitted to the crank shaft 6 and to the brooms 10.

The conditions for the cleaner to run forward without the surface 13 being left unswept by the brooms 10 will be described with reference to Figure 5.

Figure 5 shows at (a) a state (i.e. the cleaning starting position) in which a broom 10 is about to sweep the surface 13.

Figure 5 shows at (b) a state in which the tyre 8a rotates through an angle β to advance the cleaner by a distance k . In the meanwhile, the crank shaft 6 rotates through an angle α so that the broom 10 cleans the surface 13 through a distance $(L - k)$.

Figure 5 shows at (c) a state in which the cleaner goes forward from the state (b) so that the crank shaft 6 rotates through an angle $(2\pi - \alpha)$ to return the broom 10 to the cleaning starting position. As shown at (c), the linear distance $L-2k$ through which the cleaner travels during one complete rotation of the crank 6 is smaller than the linear distance L through which the broom 10 at this time travels in engagement with the surface 13 so as to effect cleaning thereof.

Figure 5 shows at (d) a state in which the cleaner advances through the distance k .

In this case:-

γ is the radius of the tyre 8a;

L is the distance through which the broom 10

cleans the surface 13 during one rotation of the crank shaft 6;

α is the angle of rotation of the crank shaft 6

required for the broom 10 to move over the surface 13 and through the distance L;

K is the distance for the cleaner to run forward when the crank shaft 6 is rotated through the angle α ; and

β is the angle for the tyre 8a to rotate when the cleaner runs forward through the distance k.

In order that the cleaner may run forward without the cleaning surface 13 being left unswept by the brooms 10, it is sufficient for the cleaner to advance over the surface 13 to a position in which the distance k is left. This relationship is expressed, as follows:

$$\alpha/k = (2\pi - \alpha)/(L - 2k) \dots \dots \dots (1)$$

Here, $k = \beta \gamma$, and the above equation (1) may therefore be rearranged as follows:

$$\alpha/\beta = \gamma (2\pi + \alpha)/L \dots \dots \dots (2)$$

Hence, if the rotation transmission ratio α/β from the tyre 8a to the crank shaft 6 satisfies the following condition, the cleaner can run forward without the brooms 10 leaving the surface 13 unswept:

$$\alpha/\beta \geq \gamma (2\pi + \alpha)/L \dots \dots \dots (3)$$

As shown in Figure 6, the elongated slot 10c of each broom 10 is formed at its lower end with a cut-away portion 10e which communicates with the respective elongated slot 10c, the width of the opening of the cut-away portion 10e being smaller than the diameter of the shaft portion 6b of the crank shaft 6. The cut-away portion 10e is formed at an end portion thereof with a tapered surface 10f adjacent the cut-away portion 10e. When the shaft portion 6b is inserted along the tapered surface 10f into the cut-away portion 10e, a resilient part 10g of the broom 10 which is separated by the cut-away portion 10e from the remaining part thereof is elastically deformed to allow the shaft portion 6b to be

5 moved forward into the elongated slot 10c. Accordingly, the shaft portion 6b is made freely movable within the elongated slot 10c. As will be appreciated, as a result of the provision of the cut-away portion 10e, the broom is provided on one side with the resilient part 10g which is bounded by the cut-away portion 10e and the elongated slot 10c.

10 As shown at (b) in Figure 7, the engagement portions 10d at the upper end portion of a shank 10b of a broom 10 are in abutment with an opening 11b in the supporting portion 11. As a result, the length of the downward projection of the brush 10a from the cleaner is regulated even if the cleaner is lifted up. Thus the shanks 10b extend through the openings 11b in the
15 supporting member 11, the engagement portions 10d being disposed above and abutting the supporting member 11. The length of the downward projection of the brush 10a from the frames 2 and 3 is arranged to be equal to or smaller than a height or distance h through which the
20 brush 10a can be deformed, as shown at (c) in Figure 7.

25 If the length of the downward projection of the brush 10a from the cleaner were larger than the height h when the cleaner is lifted up, as shown in Figure 8, the brush 10a would project more than necessary past the leading edge 12f of the dust case 12 so that it could not move and the broom 10 would be locked in position.

Figures 9 to 16 show other embodiments which have means for pushing the brushes 10a onto the surface 13 so as to enhance the cleaning ability of the cleaner.

30 In a second embodiment of the present invention which is shown in Figures 9 and 10, the lower end face of each arm portion 6c of the crank shaft 6 can push the lower end portion 10h of the respective broom shank portion 10b downwardly when the broom 10 is in its

lower-most position. As a result of such pushing, the respective brush 10a is forcibly deformed by the surface 13.

5 In a third embodiment shown in Figures 11 and 12, each broom shank portion 10b is provided at its lower end portion 10h with a ring-shaped weight 15. As a result of this weight 15, the respective brush 10a is pushed downwardly and deformed against the surface 13.

10 In a fourth embodiment shown in Figures 13 and 14, the crank shaft 6 is formed integrally with resilient portions 6d each of which is arranged to push the lower end portion 10h of the respective shank portion 10b downwardly when the broom 10 is in its lowermost position. Each brush 10a is thus pushed downwardly and
15 deformed against the surface 13 by resilient force of the respective resilient portion 6d.

In a fifth embodiment shown in Figures 15 and 16, the lower end portion 10h of each broom shank portion 10b is formed integrally with a resilient portion 10i
20 which is arranged to push against the lower end face of the respective arm portion 6c of the crank shaft 6 when the broom 10 is in its lowermost position. The respective brush 10a is thus pushed onto and deformed against the surface 13 by the resilient force of the
25 respective resilient portion 10i.

The function of the extension 2g, 3g in selecting the height of the dust or debris 14 which can be picked up will now be described with reference to Figure 17.

The gap H between the lower ends of the extension portions 2g and 3g and the surface 13 is set at a level
30 no more than the distance h (as indicated at (c) in Figure 7) through which the brush 10a can be deformed, as has been described hereinbefore. If the gap H is larger than the distance h, large pieces of dust 14

could enter the cleaner, and if their height were larger than the distance h , they could prevent movement of the brooms 10.

Figures 18 to 20 show a sixth embodiment in which the dust case is formed integrally with the frames 2 and 3.

As shown in Figures 18 to 20, the shaft 4a of the drive gear 4 is rotatably mounted in the frames 2 and 3. In the space between the supporting plate 1 and the frame 2, there are rotatably mounted not only the clutch gear 5 which meshes with the drive gear 4 but also a multiplying gear 16 which meshes with the clutch gear 5 and an idler wheel 17 which meshes both with the multiplying gear 16 and with the pinion 6a. These components together constitute a power transmission mechanism A.

A dust case 120 is formed integrally with the frames 2 and 3 and is provided with dust entrances 2j-1 and 3j-1 and dust chambers 2j-3 and 3j-3. Since thin portions 2j-2 and 3j-2 (Figure 19) are formed between the dust entrances and the dust chambers, the dust entrances 2j-1 and 3j-1 are made so resilient that their leading edges 2j-0 and 3j-0 can resiliently contact the surface 13.

The frames 2 and 3 are formed integrally with supporting portions 2m and 3m, respectively, which are joined to bear the upper end portion of a single broom 10. On the upper end of the broom 10, there is mounted a movable decoration 18 such as a doll, as shown in Figure 19.

Figures 21 and 22 show a seventh embodiment using belts in place of the tyres.

As shown in Figure 22, two wheels 25 are press-fitted on the shaft 4a of the drive gear 4. The

supporting plate 1 and the frame 2 are formed integrally with wheel shafts 1c and 2c respectively, while the frame 3 is formed with wheel shafts 3b. Wheels 9 are snapped onto the wheel shafts 2c, 3b, while wheels 26 are snapped onto the wheel shafts 1c, 3b. A pair of endless belts 27 are made to run on the individual wheels 9, 25, 26. Each belt 27 is formed with teeth etc. 27a, as shown in Figure 21, the teeth 27a meshing with the teeth (not shown) formed in the individual wheels 9, 25, 26. As a result, the wheels 9, 25, 26 can be rotated together through the belts 27. Since the two belts 27 have a large area in contact with the surface 13, the wheels 9, 25, 26 are rotated without fail to transmit their rotations through the power transmission mechanism A to the crank shaft 6.

Figures 23 and 24 show an eighth embodiment in which the rotational drive of the crank shaft 6 is not a manual drive but is accomplished by using a drive motor.

As shown in Figure 23, the cleaner is provided with a battery 23 and with a drive motor 19 which is energized by the battery 23. A pinion 20 is press-fitted on the output shaft of the drive motor 19. The pinion 20 forms part of a gear train comprising gears 21 and 22, the idler 17 and the pinion 6a, thus constituting together the power transmission mechanism A. The frame 2 is provided at its side portion with a switch 24 for controlling the operation of the drive motor 19. Since, in this case, the wheels 9 and 25 are not connected to the crank shaft 6, the clutch means is dispensed with.

In the embodiments described hereinbefore, the cleaning operation is accomplished by the use of a broom or brooms so that its performance will not deteriorate

even after a long time of use. The or each broom itself has a rhythmical motion for sweeping the dust into the dust case so that the use of the cleaner give the user a pleasant feeling.

5 More rhythmical motions can be produced if a plurality of brooms are mounted in the width direction of the crank shaft.

Even if the cleaner is moved backwards, the clutch means interrupts the transmission of rotation from the wheels to the crank shaft. As a result, the or
10 each broom is not rocked, so that no dust is swept back to the surface which is being cleaned.

Since the rotation transmission ratio is set at the aforementioned value, the cleaner can be carried
15 forward without the desk top being left unswept by the broom.

Since the or each broom and the crank shaft are connected by inserting the latter into the cut portions of the elongated slots of the former, the number of parts
20 is reduced to facilitate the assembly of the cleaner, and unnecessary upward movement of the broom is eliminated.

Since the or each broom is formed with the engagement portions 10d, it is prevented from protruding
25 more than necessary from the lower face of the frames 2, 3 even if the cleaner body is lifted up. Thus, it is possible to prevent the broom from becoming rocked or damaged.

Since the brush at the lower end portion of the or each broom and the dust entrance at the leading edge of
30 the dust case are pushed so as to contact the surface to be cleaned, the dust can be smoothly swept into the dust case by the or each broom.

Since the members 2g, 3g will ensure that only

dust or debris of the right size will be swept into the cleaner, any oversize dust or debris will not stop movement of the broom or brooms, so that the cleaning operation can be accomplished stably and reliably.

5

If belts are used which run on a plurality of wheels, the contact area between the belts and the surface to be cleaned is enlarged to ensure the transmission of the forward force of the cleaner to the crank shaft.



CLAIMS

1. A cleaner for removing dust or debris from a surface, comprising housing means having at least one dust-collection area; at least one broom member movably mounted in a part of said housing means and engageable with the said surface so as to sweep the latter; and drive means for effecting sweeping movement of the or each broom member over the said surface so as to move dust or debris from the said surface and into a said dust-collection area, the or each broom member being connected to a crank which is movably mounted in the housing means and which is driven by the said drive means, the or each broom member having a shank provided with an elongated slot which extends axially of the shank, the crank having at least one crank arm which is movable axially within the respective elongated slot, the or each broom member having a brush which can project below the housing means.
2. A cleaner as claimed in claim 1 in which the drive means comprises at least one wheel which is carried by a part of the housing means, the or each wheel, or a drive-transmitting member associated therewith, being engageable with the said surface so that, if the cleaner is in contact with the latter and is moved thereover in a predetermined direction, the engagement between the said surface and the or each wheel or drive-transmitting member will produce the said sweeping movement of the or each broom member.
3. A cleaner as claimed in claim 1 or 2 in which there are a plurality of broom members which are respectively connected to a corresponding plurality of crank arms which are arranged axially of the crank.
4. A cleaner as claimed in any preceding claim in which the said drive-transmitting member is a belt running over a plurality of said wheels.



5. A cleaner as claimed in any preceding claim in which the drive means comprises clutch means for transmitting rotation of the said wheel in one angular direction only.

6. A cleaner as claimed in any preceding claim in which the linear distance through which the cleaner travels during one complete rotation of the crank is smaller than the linear distance through which the or each broom member at this time travels in engagement with said surface so as to effect cleaning thereof.

7. A cleaner as claimed in any preceding claim in which the elongated slot of the or each broom member communicates with a cut-away portion of the broom member through which the respective crank arm may be introduced into the elongated slot, the width of the cut-away portion being less than the diameter of the crank arm.

8. A cleaner as claimed in claim 7 in which, as a result of the provision of the cut-away portion, the broom member is provided on one side with a resilient part which is bounded by the cut-away portion and the elongated slot.

9. A cleaner as claimed in claim 8 in which the resilient part has a tapered surface adjacent the cut-away portion so as to assist the introduction of the respective crank arm into the respective elongated slot.

10. A cleaner as claimed in any preceding claim in which the or each broom member is supported by a supporting member which is carried by a part of the housing means, the shank of the or each broom member extending through an opening in the supporting member, the or each said shank having abutment means which are disposed above and abut the supporting member so as to limit the extent to which the respective brush can project below the housing means.



11. A cleaner as claimed in any preceding claim in which the housing means comprise frame means in which is mounted a dust case within which the or each dust-collection area is provided.

12. A cleaner as claimed in claim 11 in which the dust case is rockably mounted in the frame means, the dust case and frame means having respective portions which are engageable to limit rocking movement of the dust case, biasing means being provided for urging a leading edge into engagement with said surface.

13. A cleaner as claimed in claim 12 in which the biasing means are formed integrally with either the dust case or the frame means.

14. A cleaner as claimed in claim 12 in which the said urging is effected by a moment produced by the force of gravity about the rocking centre of the dust case.

15. A cleaner as claimed in any preceding claim in which the or each broom member is provided with a weight for urging it downwardly.

16. A cleaner as claimed in any preceding claim in which the crank has a portion which is engageable with the lower end portion of the broom member so as to push the latter downwardly.

17. A cleaner as claimed in any preceding claim in which either the or each broom member or the crank has a resilient portion for engaging the other member so that the or each broom member is urged resiliently downward.

18. A cleaner as claimed in any preceding claim in which there are means for regulating the size of the dust or debris which can be swept into the cleaner.

19. A cleaner substantially as hereinbefore described with reference to and as shown in Figures 1-8; or in Figures 9 and 10; or in Figures 11 and 12; or in Figures 13 and 14; or in Figures 15 and 16; or in Figures 18-20; or in Figures 21 and 22; or in Figures 23 and 24 of the accompanying drawings.
