March 19, 1946. E. T. LINDEROTH 2,396,861

BRUSHING AND CLEANING APPARATUS FOR CARPETS AND THE LIKE

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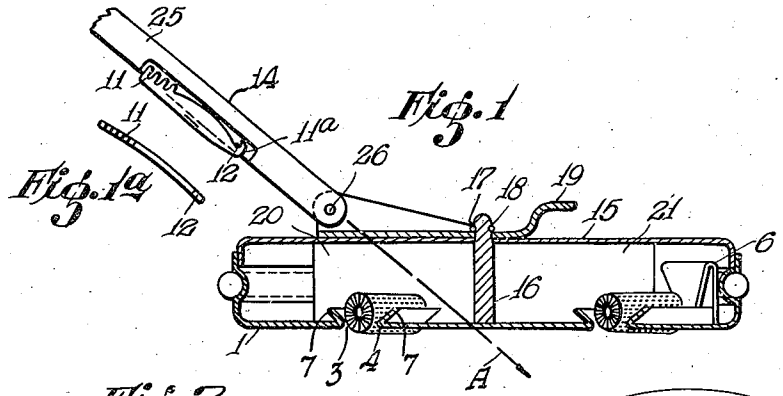

Fig. 1

Fig. 1a

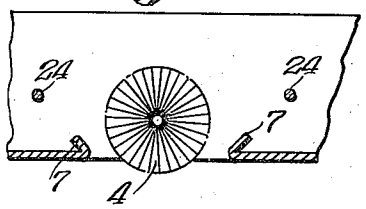

Fig. 7.

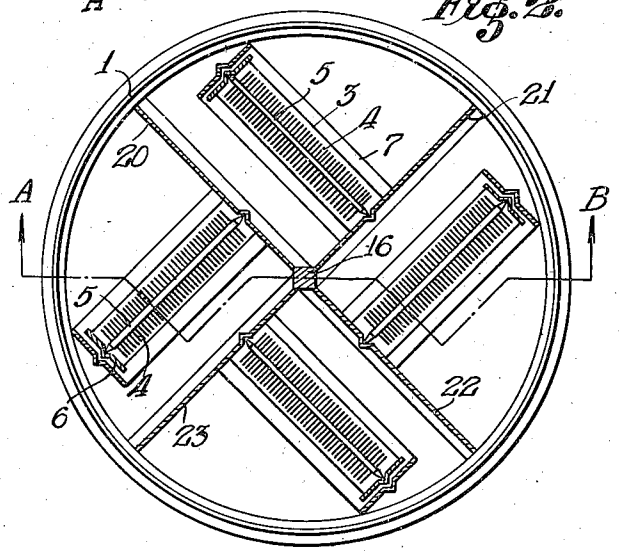

Fig. 2.

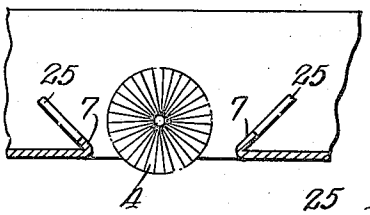

Fig. 9.

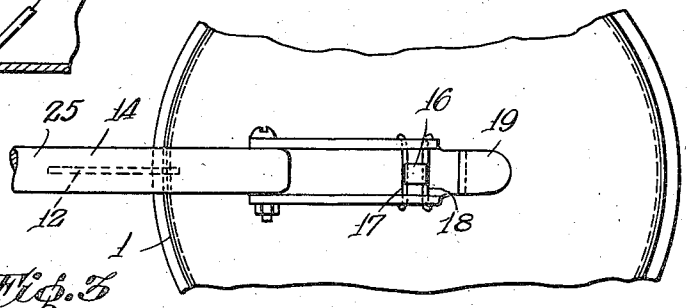

Fig. 3

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Fig. 8.

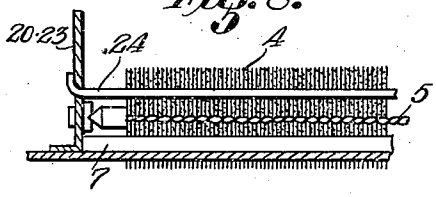


Fig. 4.

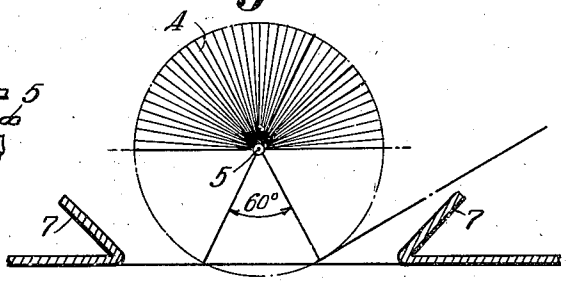


Fig. 5.

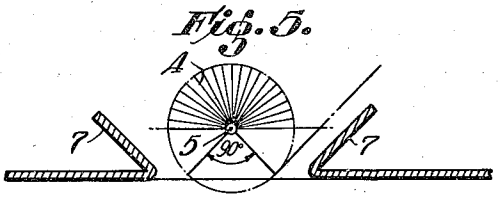


Fig. 10.

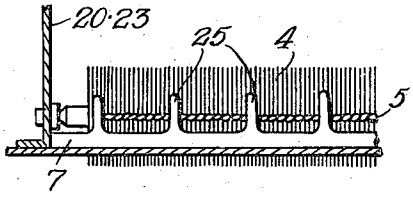
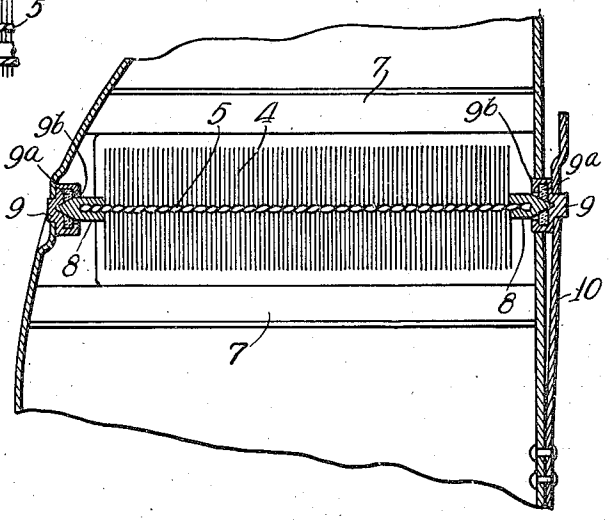


Fig. 6.



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BRUSHING AND CLEANING APPARATUS FOR CARPETS AND THE LIKE

Erik Torvald Linderoth, Enkoping, Sweden

Application February 18, 1943, Serial No. 476,298
In Sweden November 28, 1941

4 Claims. (Cl. 15—41)

The present invention relates to an improved brushing apparatus mainly intended for use in brushing dust and other solid impurities from soft carpets.

It has always been a problem to keep such carpets clean, as the impurities penetrate deeply into the carpet and therefore may be removed only with difficulty.

The invention has for its object to overcome this difficulty and to develop a highly efficient brushing apparatus of a simple construction that is easily operated. For this purpose the invention has improved the known type of brushing apparatus consisting of a dust collecting receptacle that is movable back and forth by means of a handle, the bottom of which receptacle is provided with one or more slots or openings out of each of which one or several cylindrical brushes partly protrude below the bottom of the receptacle, said brushes being freely rotatably journalled in the receptacle and provided with resilient bristles.

An object of the invention is not only to loosen and remove impurities from the surface of the carpet, but also remove dust particles from the deeper regions of the same.

According to the invention this is accomplished by so arranging the brushes that they support the receptacle in such a manner that they will roll like wheels on the carpet when the receptacle is pushed along the carpet, and that the shafts of one or more or all of the brushes are disposed obliquely in relation to the direction of movement of the apparatus as determined by the position of the handle.

Due to the oblique position of a brush axis in relation to the direction of movement of the apparatus, the bristles of the brush, when in engagement with the carpet, will be bent also sidewards.

When disengaged from the carpet, the bristles are suddenly snapped back to their position of rest in a direction sidewards-backwards-upwards due to their inherent resiliency. The extent and direction of this returning resilient motion of the bristles depends on the degree of the oblique position of the brush and the angle through which the brush revolves while the bristles remain in contact with the carpet. This angle depends on the relation between the diameter of the brush and the extent of the radial projection of the brush below the bottom of the receptacle.

When the angle of motion of the bristles while in engagement with the carpet amounts to 45°, it corresponds to a relation between the diameter of the brush and the radial extent of the projection of the brush below the bottom of the receptacle of 20:1.

This relation between the diameter of the brush and the projection below the bottom of the receptacle amounts to 15:1 when the angle of engagement is 60°. However, if this relation is reduced to 5:1 instead of 15:1, the angle of engagement will become 90°.

Due to this peculiar motion of the bristles not only a certain brushing of the carpet is carried out but the bristles will also work in such a direction that they loosen the impurities from the carpet and throw them with a considerable force up into the receptacle. Such a brushing apparatus does not only extract sand, bread crumbs, pieces of hair, carpet fluff and the like, but also fine dust, for example cigarette ashes pressed down into the carpet.

The principal idea of the invention embodied in the oblique positioning of the axes of freely rotatable cylindrical brushes may also be used with great advantage in vacuum cleaners.

A number of embodiments of the invention are illustrated on the accompanying drawings, in which

Fig. 1 shows a sectional view taken along the line A—B in Fig. 2 of an embodiment of a brushing apparatus according to the invention. Fig. 1*a* is detail edge view of a brush cleaning comb. Fig. 2 is a horizontal section, and Fig. 3 a fragmentary plan view of the invention.

Figs. 4 and 5 show cross-sectional detail views in full size of two embodiments of the brush arrangement.

Fig. 6 shows a fragmentary horizontal section showing a modified embodiment of the brush arrangement.

Figs. 7 and 8 show a fragmentary cross-section and a longitudinal section respectively of a brush arrangement with further modified details.

Figs. 9 and 10 show similar detail views of another modified brush arrangement.

The brushing apparatus according to Figs. 1–3 includes a cylindrical flat receptacle 1 with a removable cover 15.

The receptacle 1 has a plane bottom. In the bottom of the receptacle four rectangular openings 3 are provided. In each of these openings a brush roller 4 is arranged being rotatably journalled in the receptacle with its axis 5 extending in the longitudinal direction of the opening. The openings 3 are, inside the receptacle, surrounded by screens 6 and 7 projecting upwards from the

bottom of the receptacle, the longitudinal screens 7 being inclined upwards as shown.

In order that the brushes will throw the particles of dirt from the carpet up into the receptacle, it is of advantage to use brushes with a small diameter.

The angle of throw (with relation to the plane of the carpet) is increased when the diameter of the brushes is reduced. As the diameter is reduced, the angle through which the brush revolves while the bristles remain in contact with the carpet, increases if the bristles protrude below the bottom of the receptacle sufficiently to penetrate into the carpet. A suitable distance of projection is 3–4 mm.

Fig. 4 shows in full size a cross-section through a brush roller designed to remain in contact with the carpet while rotating through an angle of 60°. With a brush of small diameter the angle of contact may be increased to 90°.

Fig. 5 shows in full size such an embodiment. This size of the brush gives a good angle of throw so that dust may be thrown up above rather high side screens 7. An angle of engagement above 120° would hardly be practical, since the brush diameter would be so small that the length of the bristles would be insufficient to maintain engagement with the carpet, considering that the brushes are to have an efficient oblique position of between 25° and 65° with respect to the direction of motion of the apparatus.

The brushes must have a small hub diameter, if the bristles in spite of the small brush diameter are to obtain a sufficient flexibility sidewards, which is of the greatest importance in order that the desired effect should be reached by the oblique position of the brushes. The dust delivery of the brush increases with the angle of inclination and reaches a maximum at a certain angle whereupon it begins to decrease at continued increase of said angle.

The angle, at which the maximum delivery occurs, is somewhat different for different kinds of dust. For such dusts that are difficult to loosen and throw up, the maximum efficiency is obtained at an angle of inclination of about 45°.

For sand and coarser particles the maximum efficiency is obtained at a smaller angle of inclination.

Fig. 6 shows an arrangement for journalling of the brush which satisfies both the requirement of an easy rolling and protection against admission of dirt and pieces of thread and hair to the bearing.

The shaft 5 of the brush roller is at both ends provided with pointed pivots 8 running in conical bearings 9. The open end of each of the bearings contains a ring of felt or other soft material 9a secured directly in the bowl of the bearing by contraction of a cylindrical collar 9b projecting from the bearing bowl. The journalling on pointed pivots makes the running of the brush roller easy, and the felt ring protects against admission of dirt. The bearings 9 are removably secured to the receptacle 1. One of said bearings is not, however, secured directly to the receptacle but to a flat spring 10 attached to the receptacle. By this arrangement it will be possible in a simple manual operation to loosen a brush roller in order to remove the pieces of threads and hair that may have been twisted about the shaft. The conical shape of the pivots and bearings makes it easy to correctly remount and center the brush roller.

It is known that pieces of threads and hair that penetrate into the brush may be wound about the shaft of the brush In order to readily remove such pieces of hair one may use a special tool by means of which the hair pieces about the shaft may be readily cut off and removed without damaging the brush. The tool may consist of a comb 11 with a handle 12 punched out from a steel plate (Figs. 1 and 1a). The handle is shaped with a hook 11a in its end. The inside of this hook is sharpened. If the hook is pulled along the shaft of the brush, the threads about it are cut off without damaging the bristles.

In order that the tool is always at hand, it is suitable to keep it on the brushing apparatus, for example detachably secured to the same. This is carried out most simply by putting the tool in a slot 13 in the handle 14 of the brushing apparatus. In order that the tool 11, 12 will not fall out of the slot, the tool is slightly curved as shown in Fig. 1a so that it is held in place when pressed into the slot.

The handle 25 of the brushing apparatus is attached as shown in Fig. 1 and the best result is obtained by fastening the handle so far back that an imagined axial extension of the handle intersects the bottom of the receptacle approximately at its center, centrally between the brushes, as shown by the dotted line A. The handle (Fig. 1) is pivotally secured to the cover of the apparatus as indicated at 26.

To make the apparatus convenient to use, the cover of the receptacle is removable by a single manual operation and is readily remounted in a correct position in relation to the brushes.

For this purpose a vertical pin 16 is attached to the bottom of the receptacle and is passed freely through a hole in the cover 15. The cover 15 is secured to the pin by the resilient wires 17 and 18 which engage a recess in the upper part of the pin 16. To loosen the cover 15 a hook 19 secured to the cover is lifted while the pin 16 is pressed down. The correct position of the cover and the handle in relation to the receptacle and the brushes may be secured by making the pin 16 and the hole in the cover square.

Within the receptacle partition walls 20—23 are arranged in a way to prevent the brushes from throwing dust on each other. In the shown embodiment the walls divide the receptacle into four chambers, one for each brush.

It is of course desirable to obtain the greatest possible accumulating capacity of the receptacle but increasing the height of the screens 7 to produce this result is unsatisfactory because the particles thrown sidewards-backwards-upwards by the bristles are prevented from freely entering the receptacle. However, it has been found that the major part of the volume of the stuff removed from the carpet has a fibrous structure. Such stuff deposits itself uppermost in the receptacle where it is felted together to a mass, while the heavier grainy stuff sinks to the bottom. This layering and felting is a consequence of the reciprocating motion of the receptacle during operation.

Due to these facts a solution of the problem of screening off the openings 3 without preventing the stuff from being thrown up into the receptacle is effected by using low screens in combination with grate-like members projecting upwards from or arranged above the screen and consisting of teeth, wires or the like. For example, a wire 24, Figs. 7 and 8, is stretched along the long sides of the openings. In a further embodiment teeth or points 25 projecting upwards from the bottom of the receptacle or from the screens 7 are provided as shown in Figs. 9 and 10.

Having now particularly described the nature of my invention and the manner of its operation what I claim is:

1. A brushing and cleaning apparatus for carpets and the like, comprising a dust collecting receptacle adapted to be moved back and forth along the surface of an object to be cleaned, a handle attached to said receptacle, at least one cylindrical brush roller with flexible bristles freely rotatably journalled about a substantially horizontal axis in said receptacle, an oblong opening for each brush roller in the bottom side of said receptacle the lower portion of each brush roller protruding through said opening below the bottom side of the receptacle to support the latter like a freely rolling wheel and to penetrate with its bristles into the object to be cleaned when the receptacle is moved along the latter, the axis of at least one of said brush rollers being directed obliquely in relation to the direction of movement of the apparatus as determined by the position of said handle to force each rotating bristle of such brush roller to be bent sidewards and strained while penetrating into the interior of said object and then, when released, to snap back to normal position on the brush roller, thereby loosening impurities in the interior of the object and throwing them mechanically through said opening into the receptacle.

2. A brushing and cleaning apparatus for carpets and the like, comprising a dust collecting receptacle adapted to be moved back and forth along the surface of an object to be cleaned, a handle attached to said receptacle, at least one cylindrical brush roller with flexible bristles freely rotatably journalled about a substantially horizontal axis in said receptacle, an oblong opening for each brush roller in the bottom side of said receptacle, the lower portion of each brush roller protruding through said opening below the bottom side of the receptacle to support the latter like a freely rolling wheel and to penetrate with its bristles into the object to be cleaned when the receptacle is moved along the latter, said bristles being the only means provided for supporting the moving receptacle, the axis of at least one of said brush rollers being directed obliquely in relation to the direction of movement of the apparatus as determined by the position of said handle to force each rotating bristle of such brush roller to be bent sidewards and strained while penetrating into the interior of said object and then, when released, to snap back to normal position on the brush roller, thereby loosening impurities in the interior of the object and throwing them mechanically through said opening into the receptacle.

3. A brushing and cleaning apparatus for carpets and the like, comprising a dust collecting receptacle adapted to be moved back and forth along the surface of an object to be cleaned, a handle attached to said receptacle, at least one cylindrical brush roller with flexible bristles freely rotatably journalled about a substantially horizontal axis in said receptacle, an oblong opening for each brush roller in the bottom side of said receptacle, the lower portion of each brush roller protruding through said opening below the bottom side of the receptacle to support the latter like a freely rolling wheel and to penetrate with its bristles into the object to be cleaned when the receptacle is moved along the latter, the axis of at least one of said brush rollers being directed obliquely in relation to the direction of movement of the apparatus as determined by the position of said handle to force each rotating bristle of such brush roller to be bent sidewards and strained while penetrating into the interior of said object and then, when released, to snap back to normal position on the brush roller, thereby loosening impurities in the interior of the object and throwing them mechanically through said opening into the receptacle, in which upwardly directed screens are provided out of touch with the brush roller along the sides of each of said openings in the bottom of the dust collecting receptacle, which screens are combined with a fencing arrangement of bars out of touch with the brush roller for retaining removed impurities in said receptacle.

4. A brushing and cleaning apparatus for carpets and the like, comprising a dust collecting receptacle adapted as a brush carrier and to be moved back and forth along an object to be cleaned, a handle attached to said receptacle, a plurality of cylindrical brush rollers with flexible bristles, each being freely rotatably journalled about a substantially horizontal axis in said receptacle, a separate chamber for each brush roller in said receptacle, said chambers being separated from one another by means of partition walls, an oblong opening for each brush roller in the bottom side of said receptacle, the lower portion of each brush roller protruding through said opening below the bottom side of the receptacle to support the latter like a freely rolling wheel and to penetrate with its bristles into the object to be cleaned when the receptacle is moved along the latter, said bristles being the only means provided for supporting the moving receptacle, the axis of at least one of said brush rollers being directed obliquely in relation to the direction of movement of the apparatus as determined by the position of said handle to force each rotating bristle of such brush roller to be bent sidewards and strained while penetrating into the interior of said object and then, when released, to snap back to normal position on the brush roller, thereby loosening impurities in the interior of the object and throwing them mechanically through said opening into the receptacle.

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