Nov. 22, 1960 B. E. NILSSON ET AL 2,960,705

SURFACE TREATING MEMBERS AND MECHANISM FOR DETACHABLY CONNECTING SAME TO ROTATABLE STRUCTURE

Filed March 25, 1957 2 Sheets-Sheet 1

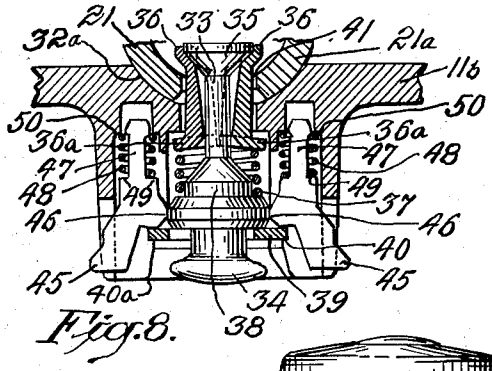

Fig. 8.

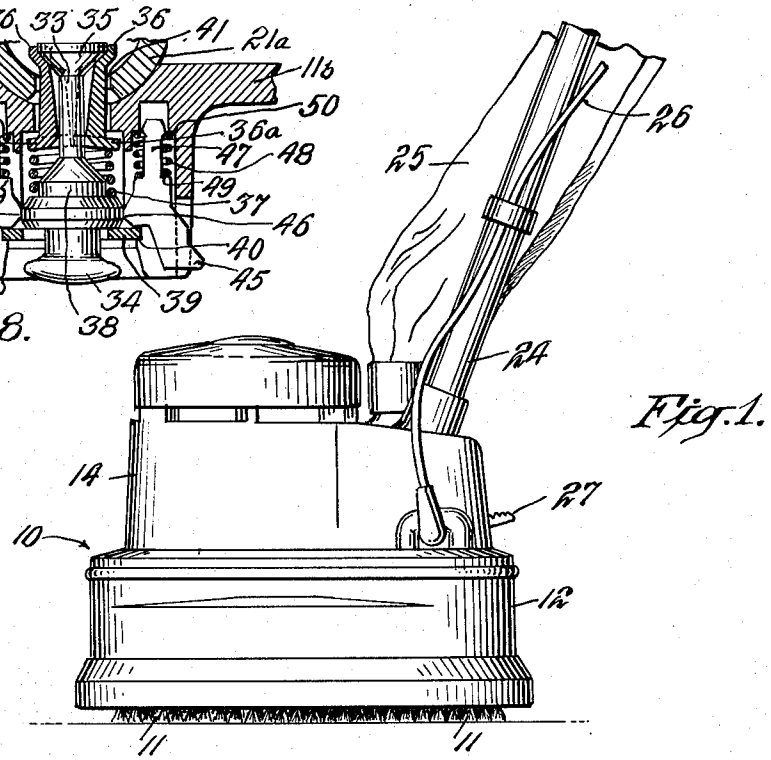

Fig. 1.

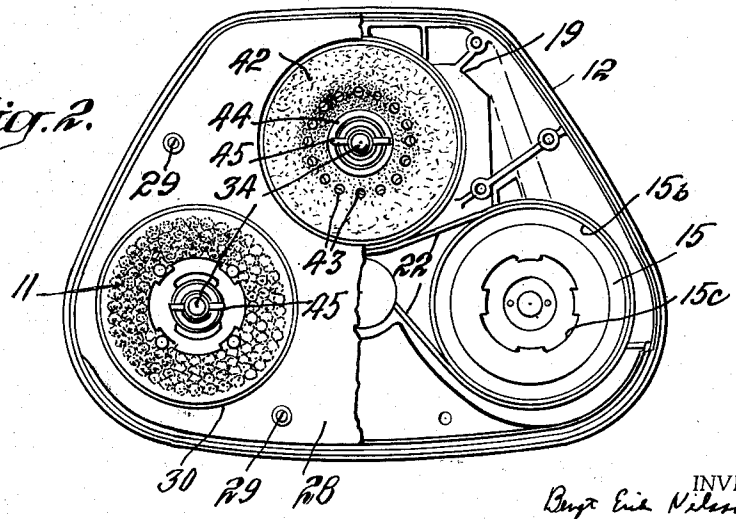

Fig. 2.

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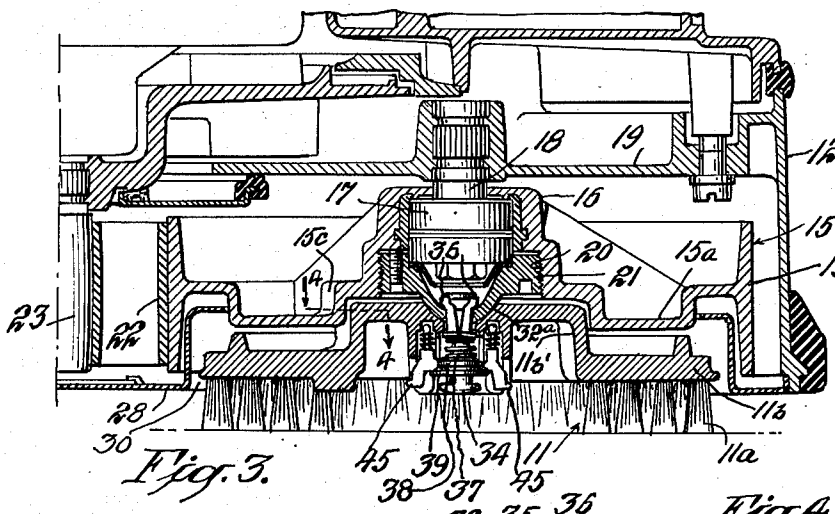

Fig. 3.

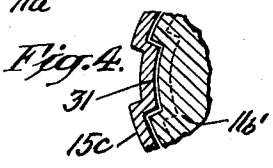

Fig. 4.

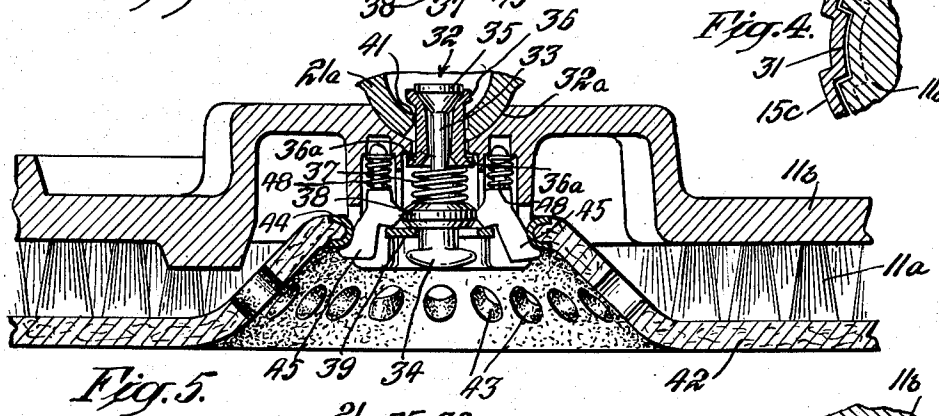

Fig. 5.

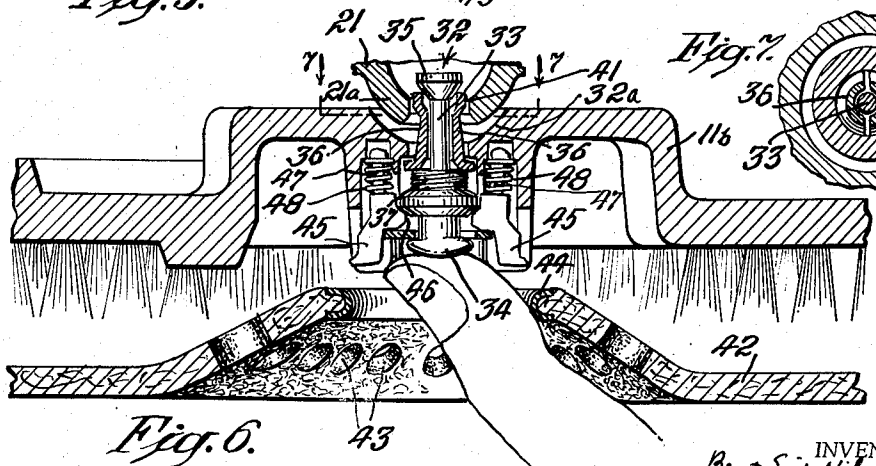

Fig. 6.

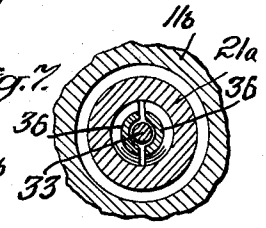

Fig. 7.

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SURFACE TREATING MEMBERS AND MECHANISM FOR DETACHABLY CONNECTING SAME TO ROTATABLE STRUCTURE

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14 Claims. (Cl. 15—4)

This invention relates to surface treating apparatus having rotatable structure adapted to be positioned on a surface and be moved thereover, and more particularly to apparatus of this kind employing a detachably connected surface treating member.

It is an object of this invention to provide on a surface treating member an improved mechanism for detachably connecting the member to rotatable structure of surface treating apparatus.

Another object is to provide on a surface treating member mechanism of this kind which forms a unitary part of the member and is provided with a manually movable operating element which is accessible at the side of the surface treating member adapted to face the surface to be treated.

A further object is to provide on a surface treating member mechanism of this kind which embodies a manually movable element which, when it is moved, enables the member to be moved to and from its position of attachment on the rotatable structure and, when it is released while the member is in its position of attachment, is effective to hold the member on the rotatable structure.

Further objects and advantages of the invention will become apparent as the following description proceeds, and the features of novelty which characterize the invention will be pointed out with particularity in the claims annexed to and forming a part of this specification.

For a better understanding of the invention, reference may be had to the following description taken in connection with the accompanying drawing, in which:

Fig. 1 is a side elevation, partly broken away, of surface treating apparatus embodying the invention;

Fig. 2 is a bottom plan view, partly broken away, of the base of the surface treating apparatus shown in Fig. 1, certain parts being removed to illustrate details more clearly;

Fig. 3 is an enlarged vertical sectional view of one of the rotatable surface treating units shown in Fig. 2;

Fig. 4 is a fragmentary sectional view taken at line 4—4 of Fig. 3;

Figs. 5 and 6 are enlarged fragmentary vertical sectional views of parts shown in Fig. 4 to illustrate the manner in which the surface treating units may be employed to perform different surface treating operations;

Fig. 7 is a sectional view taken at line 7—7 of Fig. 6; and

Fig. 8 is a fragmentary vertical sectional view which illustrates the parts of one of the rotatable surface treating units in reverse position from that shown in Figs. 3, 5 and 6.

Referring to the drawing, the invention is shown in connection with surface treating apparatus **10** having rotatable brushes **11** which project downwardly beneath a hood or base **12** and are arranged to be driven by an electric motor housed in an upright casing **14** positioned over an opening in the base. As will be described hereinafter, the brushes **11** are detachably secured to rotatable pulleys **15** having hubs **16** which may be journaled by ball bearings **17** on pins **18** depending downwardly from and carried by a frame **19** disposed within the hood or base **12**. As best shown in Fig. 3, the hub **16** of each pulley is provided with an internally threaded portion **20** which receives a threaded member **21** that serves as a bottom end cover for the bearing **17**. The rotatable pulleys **15** are driven by an endless belt **22** which may be formed of rubber or other suitable resilient material. The belt **22**, which is under tension, passes over the pulleys **15** and a driving pulley **23** which is fixed to the lower end of the motor shaft.

The surface treating apparatus **10** is adapted to be manipulated by a handle (not shown) connected to the outer free end of an elongated rod **24**, the lower end of which is pivotally mounted in any suitable manner to the base **12**. During operation of the apparatus **10**, air may be drawn into the interior of the base **12** at the underside thereof by a fan unit which is also driven by the electric motor, dust and dirt entrained in the air being separated from the air in a cloth filter bag **25** through which the air is discharged. In order to simplify the drawing, we have not shown the electric motor and the fan driven thereby or the manner in which air is drawn into the interior of the base at the underside thereof and flows through the base to the filter bag **25**, the illustration of these parts not being necessary for an understanding of this invention. The electrical circuit for the motor includes an electrical cord **26** and a switch which is disposed in the casing **14** and adapted to be controlled by a foot-operated member **27** extending rearwardly from the casing.

As best seen in Figs. 3 and 5, the brushes **11** include tufts of bristles **11***a* and a back or disk **11***b* to which the tufts are secured. Each pulley **15** includes the hub **16** and a web **15***a* extending radially therefrom to the flange or rim **15***b* over which the belt **22** passes. The base **12** is provided with a bottom plate **28** which is secured in position at **29** and provided with openings **30** at the regions of the brushes **11**, as shown in Fig. 2.

In accordance with this invention, the brush disks **11***b* rest within the pulleys **15**, the flanges or rims **15***b* of the pulleys being disposed about the disks **11***b* and essentially enclosing the latter. As best shown in Fig. 3, the axially extending portion **15***c* of each pulley, at the immediate vicinity of the hub **16**, forms a pocket or recess which receives a central raised portion **11***b'* of the disk **11***b*. As best shown in Figs. 2 and 4, the axially extending portions **15***c* of the pulleys **15** and the raised portions **11***b'* of the disks are of zig-zag shape and are interlocked, as indicated at **31** in Fig. 4, so that positive driving movement will be imparted to the brush disks **11***b* from the driven pulleys **15**.

In Figs. 3 and 5 it will be seen that the lower part **21***a* of the end member **21**, which serves as a cover for the bearing **17**, is round and essentially spherical in shape. Each brush disk **11***b* is formed with a central opening, the surface **32***a* at the opening being curved and conforming to the lower spherical part **21***a* of the end member **21**, as clearly shown in Fig. 5. With this arrangement, the brushes **11** can assume different angular positions with respect to the axes of rotation of the pulleys **15**, thus enabling the brushes to be in intimate physical contact with surfaces which are not perfectly level.

For detachably connecting the brush to one of the pulleys **15**, each brush **11** is provided with mechanism **32** which forms a unitary part thereof and comprises a spindle **33** having an operating button **34** at one end and a conical-shaped part **35** at its opposite end, the part **35** having its larger end at the extreme end of the spindle

The spindle 33 is enveloped by a pair of elongated elements or catches 36, each of which is semi-circular in transverse section, as shown in Fig. 7. The catches 36, which form a split sleeve, are maintained in a brush-holding position, as illustrated in Figs. 5 and 8, by a helical spring 37 disposed about the spindle between an enlarged portion 38 thereof and the bottom flanged ends 36*a* of the catches 36. In such brush-holding position, the tension of the spring 37 urges the enlarged portion 38 of the spindle 33 downwardly against a resilient ring-shaped member 39 which is held in the recesses 40 of flanges 40*a* extending downwardly from the underside of the hub portion of the brush disk 11*b*, as best seen in Fig. 8. With the enlarged portion 38 of the spindle 33 bearing against the ring-shaped member 39, the opposite conical-shaped part 35 is positioned between the upper ends of the catches 36 and causes them to spread apart, the upper lips of the catches projecting radially outward beyond the edge of the opening 41 in the spherical-shaped bottom 21*a* of the bearing end cover 21.

When it is desired to remove a brush 11 from the pulley 15 to which it is attached, the operating button 34 is pushed upwardly, as indicated in Fig. 6. Upward movement imparted to the spindle 33 causes the conical-shaped upper part 35 to move upwardly beyond the upper ends of the catches 36. With upward movement of the spindle 33, the spring 37, under increased tension, acts against the lower flanged ends 36*a* of the catches 36 and causes the upper ends of the catches to move toward one another and hug the narrow section of the spindle immediately beneath the upper conical-shaped part 35, as illustrated in Fig. 6. Since the upper ends of the catches 36 now do not project radially outward beyond the edge of opening 41 in the spherical-shaped part 21*a*, the brush 11, together with the mechanism 32 which forms a unitary part thereof, can be withdrawn from the pulley 15. After the catches 36 have been moved downwardly through the opening 41 in part 21*a*, the operating button 34 may be released, whereupon the upper ends of the catches 36 will again spread apart.

When the brush 11 is again mounted on a pulley 15, the operating button 34 is pressed in the manner indicated in Fig. 6, and, while being held in such position, the conical-shaped part 35 and the upper ends of the catches 36 are inserted through the opening 41 in the spherical-shaped part 21*a*. After the catches 36 have been inserted through the opening 41, the operating button 34 may be released, whereupon the upper ends of the catches spread apart, due to downward movement of the conical-shaped part 35, and hold the brush 11 on the pulley 15, as illustrated in Figs. 3, 5 and 8.

It is often desirable to attach a pad against a brush to effect a particular surface treatment. For example, it may be desirable to attach pads 42 to the brushes 11 when a buffing treatment must be effected, as illustrated in Fig. 5. The felt pad 42, which is formed with a central opening and is ring-shaped, is provided with a series of small openings 43 about the central opening so that it will be sufficiently flexible at its central part and can be bent in the manner shown in Fig. 5. A suitable lining 44 may be provided at the edge of the central opening of the felt pad so that it will retain its shape and provide a suitable surface-engaging portion for a pair of movable catches 45 adapted to hold the felt pad in place against the brush 11.

The catches 45, at a region intermediate their ends, are formed with inwardly extending projections 46. The underside of the brush disk 11*b* is formed with recesses to receive the narrow upper parts 47 of the catches 45. About the narrow upper parts 47 are disposed helical springs 48 which are under tension between shoulders 49 on the catches 45 and stepped parts or shoulders 50 at the undersides of the disks 11*b*.

In Figs. 5 and 8 it will be observed that the enlarged portion 38 of spindle 33 is formed with a wide middle section and smaller top and bottom sections. As illustrated in Figs. 5 and 8, the projections 46 of the catches 45 engage the top surface of the resilient ring-shaped member 39 and the wide middle section of the enlarged portion 38 of the spindle 33. In this position the catches 45 are spread apart and the extreme bottom ends thereof effectively engage the underside of the lining 44 of the pad 42 and hold the latter in position against the tufts 11*a*.

To release the felt pad 42 from the brush 11, the operating button 34 is moved upwardly, as illustrated in Fig. 6, which causes the wide middle section of the enlarged portion 38 of spindle 33 to move upwardly with respect to the projections 46 on the catches 45. Due to the tension of the springs 48, the projections 46 are moved toward one another against the underside of the bottom narrow section of the enlarged portion 38 of spindle 33. In this manner, the extreme lower ends of the catches 45 move toward one another and become ineffective to hold the pad 42 in position against the brush 11. It will be seen in Figs. 5, 6 and 8 that both the catches 45 and spindle 33 are always held fast on the brush disk 11*b* by the resilient ring-shaped member 39 and hence form a unitary part of the brush structure.

While a particular embodiment of the invention has been shown and described, it will be apparent to those skilled in the art that various modifications and changes may be made without departing from the spirit and scope of the invention, as pointed out in the following claims.

What is claimed is:

1. In a domestic appliance of the class described, structure including rotatable means adapted to be positioned over a surface for rotation about a vertical axis and be moved over the surface, a brush having a back and tufts projecting from a side thereof, said back having a centrally disposed opening therethrough, said rotatable means having a first part at a first zone at the immediate vicinity of its axis of rotation and a second part at a second zone removed from its axis of rotation, mechanism forming a unitary part of said brush for detachably connecting the latter to the first part of said rotatable means, said rotatable means and said back at the opening therein having coacting surfaces so constructed and formed that said back is angularly movable on said rotatable means, said mechanism including a manually movable operating member which is accessible at the tuft side of said brush and an axially disposed member operatively associated with said operating member which extends through the opening in said brush back and is held by the first part of said rotatable means, and said brush back having a part radially removed from said axially disposed member which is in the path of movement of the second part of said rotatable means when said brush is detachably connected thereto, whereby said brush back is turnable with said rotatable means when rotating movement is imparted to the latter.

2. Apparatus as set forth in claim 1 in which said axially disposed member of said mechanism comprises a plurality of elements movable between first holding positions and second positions and actuated to their second positions responsive to movement of said operating member to position said elements whereby said brush can be moved to and from its position of attachment on said rotatable means, and means for moving said elements from the second positions to their first holding positions on the first part of said rotatable means responsive to release of said manually movable operating member while said brush is in its position of attachment.

3. Apparatus as set forth in claim 2 in which said axially disposed member comprises an axially movable spindle and said elements form a plurality of catches disposed lengthwise of and at the immediate vicinity of

said spindle, said manually movable operating member being operatively associated with said spindle.

4. Apparatus as set forth in claim 3 in which said means for moving said elements to their first holding positions includes resilient means for biasing said spindle axially in one direction toward the tuft side of said brush, and means on said spindle for spreading said catches radially outward to their first holding positions when said spindle is biased in said one direction.

5. Apparatus as set forth in claim 2 in which said means for moving said elements to their first holding positions includes means for biasing said manually movable operating member in a direction toward the outer free ends of the tufts, and said mechanism being enabled to be attached to and removed from the first part of said rotatable means responsive to movement of said manually movable operating member in the opposite direction.

6. Apparatus as set forth in claim 1 in which said axially disposed member of said mechanism comprises a spindle and a plurality of radially movable catches disposed lengthwise of said spindle at the immediate vicinity thereof, said spindle having said manually movable operating member at one end thereof and a catch spreading part at the opposite end thereof for spreading said catches when in overlapping axial relation therewith, resilient means for biasing said spindle in one direction toward the outer free ends of the tufts for maintaining said catch spreading part and catches in said overlapping axial relation, and means responsive to movement of said spindle in the opposite direction against the biasing action of said resilient means for displacing the catch spreading part thereof axially with respect to said catches and moving the latter radially inward in close proximity to said spindle.

7. Apparatus as set forth in claim 6 in which said means for displacing the catch spreading part of said spindle axially with respect to said catches and moving the latter radially inward comprises an enlarged part of said spindle intermediate the ends thereof.

8. Apparatus as set forth in claim 7 which includes a ring-shaped element fixed to said brush back at a central region thereof, said spindle extending through said ring-shaped element with said manually movable operating part at one side thereof and said enlarged part at the opposite side thereof, said resilient means including a spring disposed about said spindle between the enlarged part thereof and said catches.

9. Apparatus as set forth in claim 8 in which said catches form a split sleeve disposed about said spindle, each section of said split sleeve having one end portion formed to cause the opposite end portion to move closer to said spindle responsive to movement imparted to said one end portion thereof by said spring.

10. Apparatus as set forth in claim 9 in which said mechanism includes a second set of catches for detachably connecting a pad to the tuft side of said brush, said second catches being rendered operable to hold the pad in position on said brush responsive to movement of said spindle in said one direction toward the outer free ends of the tufts by the biasing action of said spring.

11. Apparatus as set forth in claim 10 in which the enlarged portion of said spindle becomes effective to move the second set of catches radially outward responsive to movement of said spindle in said one direction toward the outer free ends of the tufts by the biasing action of said spring.

12. Apparatus as set forth in claim 11 including resilient means for imparting radially inward movement to the second set of catches to render the latter ineffective to hold the pad on said surface treating member, said last-mentioned resilient means being rendered operable responsive to movement of said spindle in the opposite direction against the biasing action of said spring.

13. Apparatus as set forth in claim 1 in which the first part of said rotatable means comprises a hollow element having a spherical shape at the axis of rotation thereof, said hollow element having an opening through which said axially disposed member projects when said brush is detachably connected to the first part of said rotatable means, the centrally disposed opening in the back of said brush being defined by an edge forming a cavity to receive said hollow spherical-shaped element and with respect to which said brush is angularly moved during movement of said brush over a surface.

14. Apparatus as set forth in claim 1 in which said rotatable means comprises a pulley having a hub and outer flange or rim and interconnecting web means, said pulley and said brush being so constructed and arranged that said back nests within said pulley at one side of said web means when said brush is detachably connected to the first part of said rotatable means, said back having a central dome shape portion, said web means having a central dome shape portion arranged to receive the dome shape portion of said back when the latter nests within said pulley, the second part of said rotatable means and the part of said brush back in its path of movement when said brush is detachably connected to the first part of said rotatable means being disposed at the side walls of the dome shaped portions of said pulley and said brush back, respectively.

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