

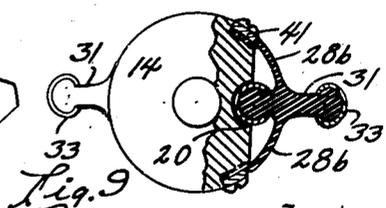
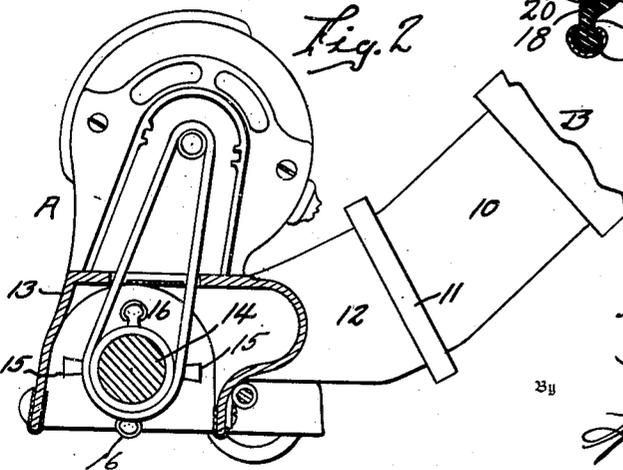
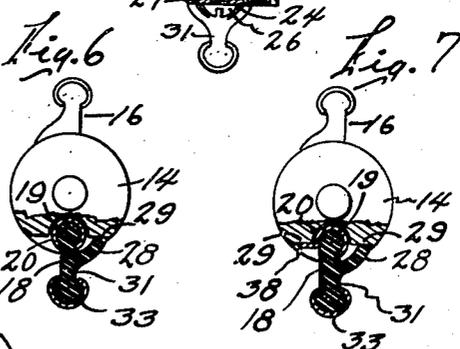
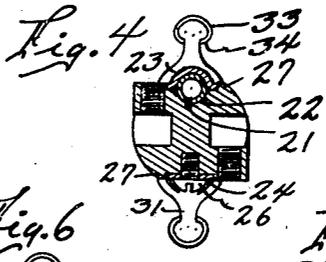
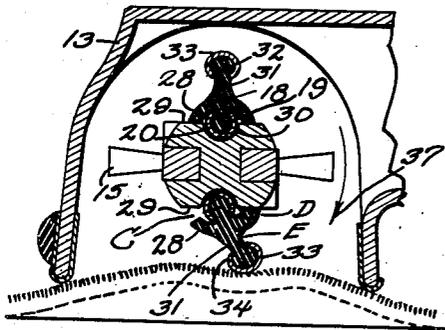
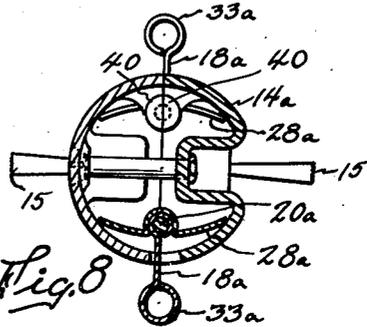
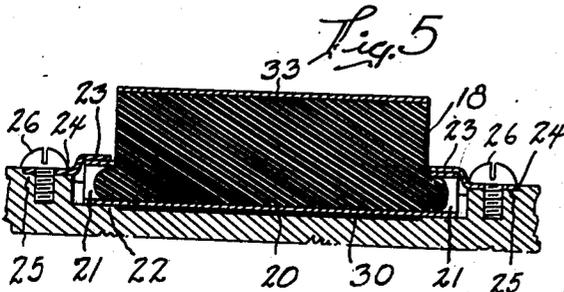
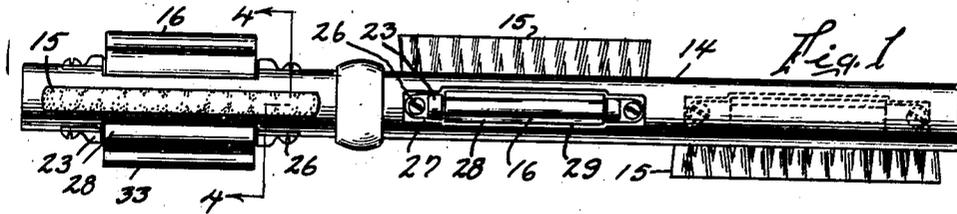
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VACUUM CLEANER

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VACUUM CLEANER

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18 Claims. (Cl. 15—13)

This invention relates to vacuum cleaners of the type shown in pending application Serial No. 752,270 filed November 9, 1934, wherein a rotary agitator with agitating elements mounted for circumferential flexing, is provided for operation upon a carpet against which the agitating elements will flex when striking the same during revolution of the agitator, whereby to cushion and reduce the harshness of the blow.

I have found that it is essential that the radial stretch of the rubber constituting the body of the agitating element of this type of agitator, must be kept below a low limit, in order to secure reasonable uniformity and controllability of action of the agitators. On the other hand, great circumferential flexibility is desirable.

The present invention aims to increase the circumferential flexibility of this type of agitator without increasing the radial distensibility. To this end, it contemplates the provision of an agitating element which is both flexible per se and flexibly mounted.

Another object is to provide in a suction cleaner rotary agitator construction of the type wherein an agitating element is hinged to the rotatable hub on an axis parallel to the axis of rotation, a simple, durable, and efficient means for yieldingly resisting hinging deflection of said element from a normal position. According to the invention, in this respect, the agitating element is provided with a resilient wing, either compressible, flexible, or stretchable, engaging the hub to yieldingly resist hinging deflection.

Another object is to provide in a suction cleaner the combination of a rotatable hub and a beater element hinged thereto on and projecting radially from an axis parallel to that of the hub, and means to normally support said element in a position radial with respect to the agitator axis and to yieldingly resist circumferential deflection of the element away from the said radial position, the beater element terminating in a hard, smooth surfaced carpet engaging portion.

With these and other objects in view the invention consists in the combination and construction and arrangement of the various parts thereof, whereby the objects contemplated are attained, as more fully set forth in the accompanying specifications, pointed out in the claims, and illustrated in the accompanying drawing, in which:

Fig. 1 is a plan view of an agitator embodying the invention.

Fig. 2 is a cross sectional view through a suction cleaner floor tool embodying the invention.

Fig. 3 is a cross sectional view through the suction chamber of the floor tool.

Fig. 4 is a cross sectional view through the agitator, taken on the line 4—4 of Fig. 1.

Fig. 5 is a longitudinal sectional view through a portion of the agitator.

Fig. 6 is a view, partly in cross section, of a modified form of the agitator.

Fig. 7 is a similar view of another modification.

Fig. 8 is a cross sectional view of another modification, and

Fig. 9 is a view similar to Fig. 6, of another modification.

The invention is shown embodied in a floor tool A attached to the fan case B of the cleaner by a short tube 10 and swivel joint 11 joining the same to the neck 12 of the suction chamber 13.

The rotary agitator comprises a hub 14 to which are secured brushing elements 15 and agitating elements 16.

Each agitating element 16 comprises an elongated body of soft rubber of uniform cross section, including a central region 18, and a semi-cylindrical portion 19 molded into and bonded to the inner surface of a metal channel 20. The latter is formed of a cylindrical tube, one side of which is cut away intermediate its ends to receive the rubber, leaving cylindrical end portions 21 projecting beyond each end of the rubber body, to form trunnions. These trunnions are journaled in bearings formed by semi-cylindrical seats 22 in the hub 14, and cooperating bearing caps 23. The latter are provided each with a flat ear 24 which is secured in a recess 25 in the hub by means of a single screw 26, and held against the shoulders 27 defining the sides of the recesses 25.

The central region 18 of the rubber body is extended laterally to form the two resilient butressing wings 28, engaging the flattened faces 29 of the hub so as to normally support the agitating element radially with respect to the agitator axis. When circumferential pressure is imposed against the agitating element, the latter will hinge around the axis of the trunnions 21, one of the wings 28 pulling away from contact

with the hub (as at C, in Fig. 3) while the other is compressed and bent (as at D, in Fig. 3).

The agitating element includes a neck region 31 diametrically opposed to the seating portion 19, and centered between the wings 28. The neck region terminates in a head portion 32 around which is clamped a carpet engaging channel 33.

The channel 33 is generally oval in cross section, with its minor axis disposed along a radius of the hinge axis of the agitating element, i. e., its major axis disposed circumferentially of the agitator. This increases the height of the exposed portion of the rubber body. The portion of the channel 33 remote from the hinge axis is preferably semi-cylindrical, while the extremities thereof are bent sharply into the neck 31 as at 34, inside the developed surface of the said remote portion, thereby attaining greater retention of the rubber head 32.

While the agitating element is hinging around its hinge axis, its neck 31 will simultaneously bend (as at E, in Fig. 3). Thus a double flexing is secured, increasing flexibility.

One advantage of the present invention is the fact that the flexibility of the wings 28, and their resistance to circumferential movement, is entirely independent of the resistance of the rubber body to radial distention. The former depends upon the thickness, shape and arrangement of the wings 28; the latter depends upon the thickness of the neck 31 and of the central body portion 18 where it enters the channel 20. Circumferential flexibility can be increased by thinning the wings 28, without affecting radial stability.

The channel 20 is accommodated in a depression 30 in the hub, which may be slightly deeper than the journal seats 22, so as to avoid contact of the channel 20 with the hub except at its end trunnions.

The resilience of the neck region 31 bears such a relation to that of the wings 28 that as circumferential pressure is applied against the carpet engaging portion 33, both neck region and rear wing will yield.

In using the word "rear", I have reference to the wing which extends rearwardly with respect to the direction of rotation (indicated by arrow 37 in Fig. 3). The forward wing assists in positioning the agitating element radially of the hub axis when it breaks contact with the carpet, but plays no part in resisting deflection under contact with the carpet.

For this reason, the forward wing may be omitted entirely, allowing the agitating element to swing forwardly past its normal position and thence return to normal position under the effect of centrifugal force or the rebound of the central body region 18 against the forward face 29 of the hub. Such a form of the invention is shown in Fig. 6.

Or the forward wing 28 may be replaced by a rigid stop, such as the ear 38 of Fig. 7 struck out from the channel 20, and engageable with the forward hub face 29.

Both of the foregoing forms of the invention are less desirable than the preferred form, both from the standpoint of appearance, and because of functional superiority in the preferred form, which dampens the pendulum swing of the agitating element after carpet contact, more rapidly and effectively than will the device of Fig. 6, and more quietly and smoothly than will the device of Fig. 7. The modified forms are, however, fully operative to attain the general objects of the invention.

Each of the devices of Figs. 6 and 7 embody appropriate means for hinging the agitating element to the hub 84, preferably the type of means described in connection with the preferred form, and each has the resilient neck portion 31, adapted to flex simultaneously with the yielding of the wing 28.

The modification of the invention shown in Fig. 8 embodies the features of an agitating element having a resilient radial portion 18a, hinged at 21a to the hub 14a, and provided with resilient wings 28a engaging the hub to yieldingly resist the hinging movement, while allowing the carpet engaging portion 33a to move circumferentially by the contributing flexing of both neck region 18a and wings 28a. Instead of employing rubber as the resilient material, however, it employs spring metal, and instead of engaging the outer surface of the hub, the wings 28a engage the hollow interior.

In the latter form of the invention the hub 14a may be formed of complementary sections, diametrically divided, and the hinge may be formed by a solid pin 20a around which the metal of neck 18a and wings 28a is formed. The ends of the pin 20a may be received in complementary depressions (not shown) in bosses 40 formed in the hub.

The means to yieldingly resist hinging movement of the agitating element may be either a compression means, as in the preferred form of the invention, or a flexing means, as in Fig. 8, (the preferred form is also to some extent a flexing means) or it may be a tension means, as in Fig. 9. In this case, the wings 28b are quite thin and stretchable, and their edge regions are clamped to the hub by strips 41. The resilient neck 31 is embodied, and the channel 20 is hinged to the hub by means similar to that of the preferred form. The stretchability of the forward wing 28b and the resilience of the neck 31 are correlated so that both neck and wing will yield upon carpet contact, to give the combined hinging and flexing movement characteristic of the invention.

The present invention is an improvement over prior devices wherein there is no resiliency apart from that which carries the load of centrifugal action, in that the centrifugal load in the present device is carried by a hinge which in itself does not oppose circumferential deflection, and the resistance of the resilient wing may accordingly be determined at any figure desired, whereas in that type of device wherein all of the resiliency is subject to the centrifugal load, the resiliency is limited by the requirement for keeping within the proper limit of radial distensibility.

I claim:

1. In a suction cleaner, a rotary agitator comprising a rotatable hub, a beater element, inherently flexible and hingedly attached to said hub, said element including a hard smooth surfaced carpet engaging portion and means to yieldingly resist such hinging movement, whereby the carpet engaging portion of said element is allowed to yield, upon contact with a carpet, by the combined yielding of said element at the hinge, and flexing of said element beyond the hinge, said beater elements projecting sufficiently beyond the periphery of the hub so that said carpet contacting tips can not, during swinging movement of said beaters, contact the hub.

2. In a suction cleaner, a rotary agitator comprising a rotatable hub, a beater element hinged to the hub on an axis parallel to that of the hub,

and means to yieldingly resist hinging deflection of said element by carpet contact, said element including a flexible portion extending radially beyond said means and terminating in a hard, smooth surfaced carpet engaging portion, said flexible portion being capable of flexing simultaneously with the movement of said element around its hinge axis, said beater elements projecting sufficiently beyond the periphery of the hub so that said carpet contacting tips can not, during swinging movement of said beaters, contact the hub.

3. In a suction cleaner, a rotary agitator comprising a rotatable hub, and an agitating element comprising an elongated body of resilient material, hinged to the hub on an axis parallel to the hub axis, said body being formed with an integral resilient wing projecting laterally from the hinge axis and engaging the hub to yieldingly resist hinging deflection of the element.

4. In a suction cleaner, a rotary agitator comprising a rotatable hub, and an agitating element comprising an elongated body of resilient material, hinged to the hub on an axis parallel to the hub axis, said body being formed with integral resilient wings projecting on either side of its hinge axis and engaged normally against the hub.

5. In a suction cleaner, a rotary agitator comprising a rotatable hub, an agitating element hinged thereto on an axis parallel to the axis of rotation, said element having a resilient wing extending laterally from the hinge and engaging the hub to yieldingly resist hinging deflection of said element from a normal position and having a flexible portion extending radially beyond said wing and terminating in a carpet engaging member, said wing and flexible portion both contributing to the total circumferential yieldability of the carpet engaging member.

6. In a suction cleaner, a rotatable hub, an agitating element comprising a channel, a body of soft rubber secured in said channel and projecting radially out of the same, said channel terminating in cylindrical trunnions projecting beyond the rubber body, means journalling said trunnions in the hub, and means to yieldingly resist hinging movement of the element from a normal position.

7. In a suction cleaner, a rotatable hub provided with a depression bordered by two substantially co-planar faces, an agitating element comprising a channel, a body of soft rubber secured in said channel, and projecting radially out of the same, said channel terminating in cylindrical trunnions projecting beyond the rubber body, means journalling said trunnions in the hub, with said channel received in said depression and means on said agitating element engaging said faces to normally support the element in a radial position relative to the hub axis and to yieldingly resist movement from that position, said means including wings forming integral portions of said rubber body, and projecting on either side of said hinge axis.

8. In a suction cleaner, a rotatable hub provided with a depression, an agitating element comprising a channel, a body of soft rubber secured in said channel, and projecting radially out of the same, said channel terminating in cylindrical trunnions projecting beyond the rubber body, said hub having semi-cylindrical bearing seats at the ends of said depression, bordered by shoulder embraced regions, bearing caps securing said trunnions in said seats with said chan-

nel accommodated in said depression, said caps having ears retained in said shoulder embraced regions, and means to yieldingly resist hinging deflection of the element from a normal position.

9. In a suction cleaner, a rotary agitator comprising a hub, rotatably mounted, a beater element hinged to the hub on, and projecting radially from, an axis parallel to that of the hub and terminating in a hard smooth surfaced carpet engaging portion, and means to normally support said element in a position radial with respect to the agitator axis and to yieldingly resist circumferential deflection of the element away from said position, said means being interposed between a lateral region of the beater and an adjacent region of the hub so as to prevent contact between said carpet engaging portion and said hub.

10. In a suction cleaner, a rotary agitator comprising a rotatable hub, an agitating element hinged thereto on an axis parallel to the axis of rotation, said element having a resilient wing extending laterally from the hinge and engaging the hub to yieldingly resist hinging deflection of said element from a normal position.

11. In a suction cleaner, a rotary agitator comprising a rotatable hub, an agitating element hinged thereto on an axis parallel to the axis of rotation, said element having a resilient compressible wing extending laterally from the hinge and engaging the hub to yieldingly resist, under compression, hinging deflection of said element from a normal position.

12. In a suction cleaner, a rotary agitator comprising a rotatable hub, an agitating element hinged thereto on an axis parallel to the axis of rotation, said element having a resilient flexible wing extending laterally from the hinge and engaging the hub to yieldingly resist, under bending flexure, hinging deflection of said element from a normal position.

13. In a suction cleaner, a rotary agitator comprising a rotatable hub, an agitating element hinged thereto on an axis parallel to the axis of rotation, said element having a resilient stretchable wing extending laterally from the hinge and engaging the hub to yieldingly resist, under stretching tension, hinging deflection of said element from a normal position.

14. In a suction cleaner, a rotatable hub, and an agitating element comprising a channel, a body of soft rubber secured in said channel and projecting radially out of the same, said channel terminating in cylindrical trunnions projecting beyond the rubber body, and means journalling said trunnions in the hub.

15. In a suction cleaner, an agitating element comprising a channel, a body of soft rubber secured in said channel and projecting radially out of the same, said channel terminating in cylindrical trunnions projecting beyond the rubber body.

16. In a vacuum cleaner, a rotatable hub, spaced opposed semi-cylindrical bearing seats therein, aligned with each other axially of the hub, an agitating element having at its respective ends, projecting trunnions received in said seats, and bearing caps detachably secured to the hub and cooperating with said seats to form bearings for said trunnions.

17. In a vacuum cleaner, a rotatable hub, spaced opposed semi-cylindrical bearing seats therein, aligned with each other axially of the hub, an agitating element having at its respective ends, projecting trunnions received in said

seats, bearing caps cooperating with said seats to form bearings for said trunnions, each cap having an integral ear projecting in longitudinal alignment with the axis of said bearings, and a cap screw projecting through such ear and threaded into the hub.

18. In a vacuum cleaner, a rotatable hub, spaced opposed semi-cylindrical bearing seats therein, aligned with each other axially of the

hub, an agitating element having at its respective ends, projecting trunnions received in said seats, and bearing caps detachably secured to the hub and cooperating with said seats to form bearings for said trunnions, the region of the hub between said seats being radially depressed below said seats.

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