This invention relates to an improved vacuum cleaner assembly and attachment therefor which may be combined in a novel manner to produce results heretofore obtainable only by employing two or more different mechanisms.

The present teachings make it possible to use a vacuum cleaner as a motive force to achieve results other than cleaning by suction. Therefore, primarily a scrubbing, polishing and/or buffing apparatus in the form of an attachment to a vacuum cleaner is furnished, by means of which floors may be quickly brought to a clean and desirable condition.

A further object is that of furnishing a structure which may be employed by an unskilled person and which—upon the completion of the desired operation—will involve a ready disconnecting of the cleaner and attachment, so that the cleaner may be employed for its primary purpose of cleaning by vacuum.

Another object is that of designing a simple mechanism which will involve only relatively few and rugged parts capable of ready manufacture; those parts being susceptible to ready association with each other to furnish a unitary and light-weight apparatus capable of being used for long periods of time with freedom from all difficulties.

Reference is had to the attached sheets of drawings, illustrating practical embodiments of the invention, and in which:

Fig. 1 is a partly sectional side view of a vacuum cleaner assembly associated with the attachment and having its structures modified so that it will drive the latter;

Fig. 2 is a sectional plan view taken along the line 2—2 in the direction of the arrows as indicated in Fig. 1;

Fig. 3 is a fragmentary plan view taken along the line 3—3 in the direction of the arrows as also indicated in Fig. 1;

Fig. 4 is a side elevation of the attachment with the vacuum cleaner mounted thereon;

Fig. 5 is a view similar to Fig. 2, but showing an alternative form of mechanism;

Fig. 6 is a transverse sectional view taken along the line 6—6 in the direction of the arrows as indicated in Fig. 5;

Fig. 7 is a fragmentary sectional side view of a further form of the assembly;

Fig. 8 shows in plan a refined design of the attachment;

Fig. 9 is a fragmentary section taken along line 9—9 in the direction of the arrows of Fig. 8.

Referring primarily to Fig. 1, the numeral 10 indicates the upper casing or portion of a tub-shaped vacuum cleaner which has a lower casing portion 11 of preferably reduced area. Journalled to the side faces of this latter portion are wheels 12, the lower peripheral portions of which extend below the base surface of the casing, and the diameter of which is preferably such that they extend to have their upper portions at least half the overall height of the casing. These wheels normally support the assembly for rolling contact over a floor. A skid 13 may be provided at a point intermediate the wheels and extends from the lower or base surface of the casing while a contact element 14 may similarly extend from that surface at a point adjacent the rear face thereof. The center of gravity of the assembly is preferably such that skid portion 13 will be out of contact with the floor while part 14 rides in contact with that surface. Of course, the base of the casing might directly contact the floor adjacent the zone of location of element 14 if it were desired not to employ the latter.

For a fuller disclosure of the detailed structure of a vacuum cleaner of this type, reference is had to my prior Patent No. 2,716,465 dated August 30, 1955 for "Vacuum Cleaner Assembly." As also shown in that patent, a casing cover 15 is provided at the upper part of the assembly by being, for example, hingedly connected as at 16 thereto. A catch 17, which may be released by an actuator, is preferably disposed at a point opposite hinge 16. An inlet opening is defined conveniently by a collar 18 in the forward face of the casing, and a motor blower unit 19 is included in the assembly and mainly within the lower casing section 11 in order to induce the flow of air through the opening defined by fitting 18, thence through the filtering media which are employed and so, out through discharge openings (not shown) which are preferably located in the front and rear faces of the casing.

Contrary to the disclosure in my earlier patent the shaft 20 of the motor blower unit extends materially below that unit and terminates above the base of the casing. The exposed end portion of the shaft may be formed with serrations or ridges 21 to constitute one part of a self-centering clutch assembly. Preferably connected to the inner face of the casing base is a closure which normally overlies an opening formed in that base in line with shaft 20.

While the closure might take one of several different forms, it is preferred to employ a pair of flaps or gates 22 which are formed with notches or recesses 23 in their inner edges and are hingedly affixed to the base as at 24. Springs 25 are associated with these hinges to normally maintain the flaps in closed positions. Additionally, when the cleaner assembly is in operation, the pressure of air seats these gates to close the base opening. Accordingly, as shown in Fig. 3 the flaps or gates normally overlap each other so as to present an effective closure for the opening in the base. This has been indicated in dot-and-dash lines in Fig. 3. When swung upwardly or inwardly, access to the interior of the vacuum cleaner assembly may be had through the opening in its face. In order not to unduly confuse the present illustration, a detailed showing of sealing surfaces and structures has not been resorted to. It will, however, be apparent that any desired expedients might be employed to assure the provision of a seal of greater or lesser effectiveness at the base opening and in order to minimize or completely obstruct any flow of air from the casing interior through this opening.

The attachment will involve a supporting portion preferably in the nature of a pan 26, having a forward dimension barely in excess of the diameter of casing section 11. The forward face of the pan may be sloped, as indicated at 27, and throughout desirable portions of its periphery a bumper 28, preferably of rubber, may be mounted in any suitable manner to minimize damaging contact between walls and furniture with the assembly. A partition 29 preferably extends across the body of the pan and upon the upper face of this partition a support or pedestal 30 may be provided to engage with contact element 14 or its equivalent to maintain the axis of the cleaner in a vertical position. The side
edge portions of this pan are preferably extended, as indicated at 31, to furnish spaces such that the lower peripheral pan or pans 12 may be accommodated therein. The length of these extensions and the depth of the pan should be proportioned to the wheel diameter so that the vacuum cleaner assembly may be placed upon the latter and will, in effect, be thereupon incapable of lateral movement with respect to the same. Also, the deep end of the pan should be such that the switch actuator 32 of that assembly is exposed above the lip of the pan body.

There will conveniently be affixed to the rear face of the pan a coupling, by means of which the entire assembly may be shifted and guided. That coupling may take the form of a socket 33, which extends upwardly and rearwardly. The socket has a diameter such that it may receive the section 34 of the usual wand which is customarily included as part of a vacuum cleaner assembly of this type. A clamp 35 is pivotally mounted by socket 33 and engages against wand section 34 in order to lock the latter against detachment. A pair of wheels 36 may extend downwardly from the rear edge of the pan, one to each side of socket 33 with their peripheries well below the lower face of the unit 26. In this manner, by bringing pressure against the upper end of the wand, these wheels may be tilted upwardly and rearwardly so as to be properly supported upon the wheels 36 for movement over the floor. Of course, if a solid handle were preferred rather than the wand section 34, such an element might be readily employed.

A second clutch element, in the form of a socket member 37, extends upwardly from the partition or deck 29 and has a shaft portion rotatably supported thereby. The lower shaft end of element 37 extends through the deck 29 and mounts below the same a pinion 38. This has been shown in both Figs. 1 and 2. That pinion meshes with the teeth of a relatively large gear 39, which is secured to a shaft also mounting a pinion 40. The teeth of the latter mesh with the teeth of a gear 41. That gear is secured against movement with respect to a shaft 42, mounted by a bearing 43 preferably affixed to the base surface of pan 26. For example, a brush 44 may have a coupling suitable 45, by means of which that brush or other floor-contacting element may be attached to the shaft with minimum effort. The diameter of the brush should be such that it will be accommodated in a space defined within the area of the pan, including the bumper portions and the wheels 36. Also, it should not extend materially beyond the projecting portions of the bumper. The gear train provided by elements 38 to 41 serves to drive the brush afforded by the relatively high speed shaft 20 to a sufficiently low number of revolutions per minute that the brush 44, buffer or any equivalent element will move at a properly low speed. That brush or element should preferably have a height such that it will extend (without the weight of the vacuum cleaner thereon) below the plane into which the lower peripheries of wheels 36 project. Accordingly, a major portion of the weight of the vacuum cleaner assembly, or else all of it, will be carried by the brush or its equivalent.

In the event that a reduction train, such as has been shown and described in Figs. 1 and 2, is not employed, then a reduction drive involving a worm and worm-gear may be used. This has been shown particularly in Figs. 5 and 6. In those views, the numeral 11 again indicates the lower casing section, to which wheels 12 are journalled. These rest upon the surface of the deck or partition 29, one in each of the extended portions 31 of the pan or support 26. The motor blower unit has its shaft 20 driving the clutch or driven part 37. Connected with this part and carried by the unit 26 is the coupling element 37. The latter serves to drive a pinion 46, the teeth of which mesh with a gear 47. This is coupled to a bevel gear 48, which drives a similar gear 49 attached to shaft 40. That shaft is conveniently supported upon brackets and mounts a worm 51 of preferably low pitch. The worm meshes with the worm wheel 52 attached to a shaft to which is connected the worm wheel 53. The teeth of the latter mesh with a gear 54. That gear corresponds to gear 41 of the earlier views. It will be apparent that a reduction drive of high value is thus provided.

In many instances, the weight of the vacuum cleaner assembly embracing the casing, wheels and associated mechanism will be adequately retained that assembly against displacement with respect to the support or pan upon which it rests. However, in certain cases, it may be desired to further assure against any accidental movement of the attachment with respect to the assembly. With this thought in mind, and as especially shown in Figs. 4 and 5, a coupling locking the vacuum cleaner against movement with respect to the attachment may be provided. This may take one of numerous different forms. Conveniently, and as shown in these figures, straps 55 may be attached, one to each of the opposite side faces of pan 26 substantially in line with the ends of wheel 12. To the upper ends of these straps, and by means of pivots 56, actuating levers 57 may be connected. These levers conveniently have finger-engaging portions 58 at their outer ends. At a point intermediate those ends and pivots 56, the lower ends of straps 50 are attached by means of pivots 59. The upper ends of these straps conveniently terminate in hooked or retaining portions 61. The latter have dimensions such that they may overlap the peripheries of wheels 12 adjacent the upper zones of the latter. When actuating levers 57 are swung to the position shown in Fig. 4 and the left-hand side of Fig. 6, then these couplings act as clamps or securing elements to prevent movement of the vacuum cleaner with respect to the pan.

It will be assumed that the attachment is to be employed. The couplings encompassing assemblies 55 to 61 will be in open position, as in the right-hand side of Fig. 6, and assuming that such couplings are employed. The vacuum cleaner will be placed within the pan to have its wheels 12 rest within the extended portions 31 of the latter. With such positioning of the parts, the clutch element or socketed member 37 will pass through the opening in the base of lower casing section 11 and receive the lower end portion of the pins or or the quite accurately positioned and aligned with respect to each other as a consequence of the disposition of the vacuum cleaner within the pan and the restricted zone of the latter. Any misalignment will be compensated for by the clutch parts functioning as a self-centering assembly. Therefore, these clutch parts will be coupled, as in Figs. 1 and 6. If a connecting structure is employed to lock the cleaner against displacement from the pan, then that structure will be rendered operative, as in Fig. 4, in which the actuating lever 57 has been shifted to its full downward position and past dead center in the manner illustrated in the left-hand side of Fig. 6. In any event, either due to that coupling or because of the weight of the assembly, one may be assured that no accidental displacement will occur.

As a consequence of the wheels 36 or their equivalents which are preferably provided, an operator, by bearing down on either end of the handle such as the wand 34, will be able to support the weight of the entire assembly on these wheels. Therefore, by pushing or pulling action, the entire unit may be shifted to any desired location. Thereafter, by releasing the pressure on the handle, the brush 44 or other operating element will bear directly upon the floor and substantially support the entire assembly; the wheels 36 being, at best, under these circumstances, only in light contact or engagement with the floor.
Now, with the flexible conductor (not shown) coupled to a suitable electrical outlet, an operator may cause the switch actuator 32 to function. This will energize the motor blower unit 19. With no hose connected to coupling 18 and, if desired, the filtering elements within the assembly being removed, only minimum resistance to movement will be encountered on the part of this unit and insofar as its operation is concerned. However, its driving force will be transmitted by shaft 20 to the parts of the attachment.

In the form of drive shown in Figs. 1 and 2, the relatively high R. P. M. of shaft 20 will be translated into a relatively slow rotation of the brush 44 or any substitute element. The tendency of the entire mechanism to move in an undesired manner over a floor and especially if only a single brush or buffer is employed, may be counteracted by the operator exerting force on the handle 34. Also, by the manipulation of the handle, a rocking force with consequential greater or lesser weight is imposed upon the brush or other element. Therefore, the engagement between the latter and the surface being cleaned or polished may be desirably varied.

When the operation has been completed, then, by a further operation of actuator 32, the unit 19 may be de-energized. Thereupon, the cleaner may be lifted clear of the pan or support. Of course, if a coupling such as 55 to 61 inclusive is employed, that will have been previously loosened. With the lifting of the cleaner, clutch part 37, which was served—in camming contact with the flags 22—to open the closure in the base of the cleaner, will be withdrawn. Accordingly, this closure will automatically seal. Such sealing will be enhanced in subsequent operations of the cleaner by the plenum chamber effect of pressure acting on the inner face of the closure.

The apparatus, as illustrated in Figs. 7, 8 and 9, will function in the same manner as that heretofore described. Referring to Fig. 7, the lower area of the vacuum cleaner has been illustrated which, in this instance, will not be formed in a manner such that it supports automatically clamping closure elements of the type shown in Fig. 3. Rather, a relatively large opening will be provided in both the base of the main casing 11 and the adjacent surface of the inner casing housing the motor-blower unit. A flange 62 may conveniently define this opening in the base surface of the inner casing wall. A closure member 63, indicated in dot and dash lines preferably of the headed type, and conveniently formed of rubber, plastic or other suitable material, has a plug length such that when its head is resting against flange 62, its plug will seal against the opening defined by flange 63. Thus, all air will have to be discharged in the usual manner from the inner casing section, when this closure is in position. A clutch element 64 of the dog type is affixed to the operating shaft of the driving unit 15. That element will be accommodated within the casing when closure 63 is in position. Obviously, by the use of the fingers or else any simple tool, the closure may be displaced from mounted position in order to afford access to the end of operating shaft 20.

In lieu of the pan structure heretofore generally indicated by the reference numeral 26, a multiple pan or mountings, as in Figs. 7, 8 and 9, is employed. This includes an upper receiving part, as hereafter described, below which a receptacle 65 is disposed. The latter embraces side walls and a base having a configuration generally corresponding to the lower area of casing section 11. It is continued in the form of outer side walls 66 through a substantial area of its base. It is mounted upon a similar pan unit 67, also including a deck or base portion, and presenting side walls 68, which are preferably flared downwardly and outwardly, to be contiguous with walls 66 when the assembly is completed. Below the pan unit 67, the brush 44 may normally be disposed. That brush is preferably provided with a hub portion 69 which extends upwardly from its backing plate. The side interlocks, as shown in Fig. 7, may be employed to maintain the casing sections of the attachment in properly related positions. In addition, fastening elements of any desired character, and which have not been shown, may be utilized in this connection. A facing and bumper structure is conveniently formed by a strip or sheet 70 of rubber or similar material which overlies the outer surfaces of walls 68 and may be suitably secured against detachment therefrom. This sheet or strip conveniently includes a flange portion 71, which is interposed between adjacent units 66 and 68. So disposed, it will function somewhat on the order of a gasket, as well as a retaining member, to minimize the transmission of noise and vibration.

Disposed above pan unit 65 is a further supporting member 72. The inner face of the latter may be contoured to correspond substantially precisely to the outer surfaces of casing 11 adjacent the base of the latter. A gasket 73, or bead member of rubber (thermoplastic or natural) is applied to the edge of unit 72. This gasket lies in contact with the upper edges of the wall assemblies 65 and 66, as well as continuations thereof. It may be furnished with a trough portion capable of accommodating the skid 13 or its equivalent extending from the lower face of casing 11. Thus, with that casing resting in contact with the surfaces of member 72, it will be securely retained. If, in addition, it is desired to employ strap or securing means as has been generally indicated here tofore under the numerals 55 to 61 inclusive, such structure may be resorted to. As in Figs. 8 and 9, the walls 65--66 will extend into the spaces intervening those wheels and casing 11 so as to provide—especially in conjunction with gasket 73—a wedge and friction fit.

A shaft 75 is rotatably supported by the base of pan 65 and carries at its upper end a clutch element 76. The latter is contoured to cooperate with clutch element 64. It is preferred that these elements have their driving faces slightly inclined. In this manner, a self-centering clutch structure is furnished, which assures a coupling of the elements as the cleaner is positioned upon the attachment. Of course, if, in addition to having bearing in the base of pan 65, it was desired to provide a further support for shaft 75, this result might be achieved in a number of obvious manners.

A pinion 77 is attached to shaft 75. This pinion has teeth meshing with the teeth of a relatively large-diameter gear 78, secured to a shaft 79. The latter may have rotatable bearing in the base of pan 65, as well as the base of pan 67. It mounts a pinion 80 of relatively reduced diameter, the teeth of which mesh with gear 81, having a large diameter. The latter gear is secured to shaft 82. It follows that if shaft 20 has a relatively great speed, this reduction train or drive will assure that shaft 82 rotates at a relatively low speed. Conveniently, a detent structure 83 is provided in association with the lower end of shaft 82 and the hub 69 of the brush 44. Therefore, the latter may be shifted axially of the shaft for coupling and uncoupling purposes. It will also be understood that at least the lower end portion of shaft 82 is preferably operation-in-circular contour, so that relative rotation between the same and the brush or other appliance may not occur.

An apparatus such as has been shown in Figs. 7 to 9 may be used by simply exposing the base face of the lower casing section 11. So exposed, no difficulty will be experienced in removing closure 63. The cleaner may now be lifted by its handle to occupy the space defined by the upper pan unit 72, with the wheels extending as...
in Fig. 9 in contact with the ledge portions which may be flat or recessed. So mounted, the weight of the apparatus will rest upon ledges 74 and the base of pan 72. Adjacent the side faces of the cleaner, walls 65 and 66, as well as the ring 73 and the adjacent edge of the upper pan unit, will extend into the spaces between the inner faces of the wheels and the casing 11. Thus, the parts will be held against accidental displacement with respect to each other to avoid undue movements such as would result in noisy operation. As the vacuum cleaner has been lowered into position, clutch elements 64 and 76 will have interengaged to assure a positive drive from shaft 20 to shaft 75.

The reduction train afforded by the series of gears 77, 78, 80 and 81 assures that shaft 82 will be driven at a properly slow speed. The weight of the entire assembly will be supported by the pair of casters 84 and the brush 44 or its equivalent. As shown especially in Fig. 7, the lower peripheral portions of the casters may extend slightly below the lower ends of the tufts providing the brush body. In this manner, and despite rotation of the brush, there will be no apparent tendency on the part of the apparatus to shift in a circle. At the same time, the forward area of the brush will adequately polish or scrub the floor.

Thus, among others, the several objects of the invention as especially aforesaid are achieved. Obviously, numerous changes in construction and rearrangement of the parts might be resorted to without departing from the spirit of the invention as defined by the claims.

I claim:

1. An attachment for use in connection with wheel-supported vacuum cleaners of the tub type for the purpose of cleaning and polishing floors, said attachment including in combination a horizontally disposed pan, a partition carried by said pan and upon which the vacuum cleaner is to be mounted, a floor-contacting element below said pan, a vertically extending shaft rotatably mounted mounted by and projecting below said pan, means for coupling the lower shaft end with said element whereby the latter may be rotated in a horizontal plane and serve as a support for said pan, a reduction drive assembly connected to the upper end of said shaft and disposed below said partition, a further rotatably mounted driving shaft forming a part of said assembly and projecting above said partition, extensions forming parts of said pan to both sides of said further shaft and providing areas for receiving the wheels of the vacuum cleaner, means forming parts of said attachment to retain a vacuum cleaner when mounted on said partition against displacement therefrom and in a predetermined position with respect to said driving shaft, a wand-receiving socket connected to said pan and extending upwardly therefrom, and a wand-coupling element mounted by said socket.

2. In combination, a wheel-supported vacuum cleaner of the tub type and an attachment therefor, the latter comprising a horizontally disposed pan, a partition carried by said pan and upon which the vacuum cleaner is detachably mounted, a floor-contacting element below said pan, a vertically extending shaft rotatably mounted by and projecting below said pan, means for coupling the lower shaft end with said element whereby the latter may be rotated in a horizontal plane and serve as a support for said pan, a reduction drive assembly connected to the upper end of said shaft and disposed below said partition, a further rotatably mounted driving shaft forming a part of said assembly and projecting above said partition, extensions forming parts of said pan to both sides of said further shaft and providing areas receiving the wheels of the vacuum cleaner, means forming parts of said attachment to retain said vacuum cleaner mounted on said partition against displacement therefrom and in a predetermined position with respect to said driving shaft, said vacuum cleaner including a casing defining a plenum chamber, a base portion forming a part of said casing and having an opening, a motor within said casing, a power shaft forming a part of said motor and extending within such chamber in line with the base opening thereof, and means for detachably coupling said power shaft to the driving shaft of said attachment as said vacuum cleaner is mounted upon said partition.

3. In the combination as defined in claim 2, a flap movably carried by the base portion of said casing and obstructing said opening to normally maintain the plenum chamber effect within said casing, said flap being shiftable by the driving shaft of said attachment as the latter enters such opening, and means for normally urging said flap to a position at which it obstructs such opening.

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