Aug. 18, 1970 M. SPIVACK 3,524,213

VACUUM HEAD

Filed June 17, 1968 3 Sheets-Sheet 1

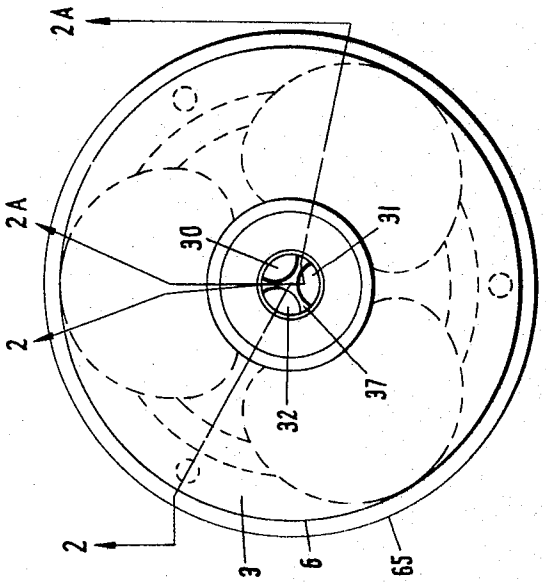

FIG. 1

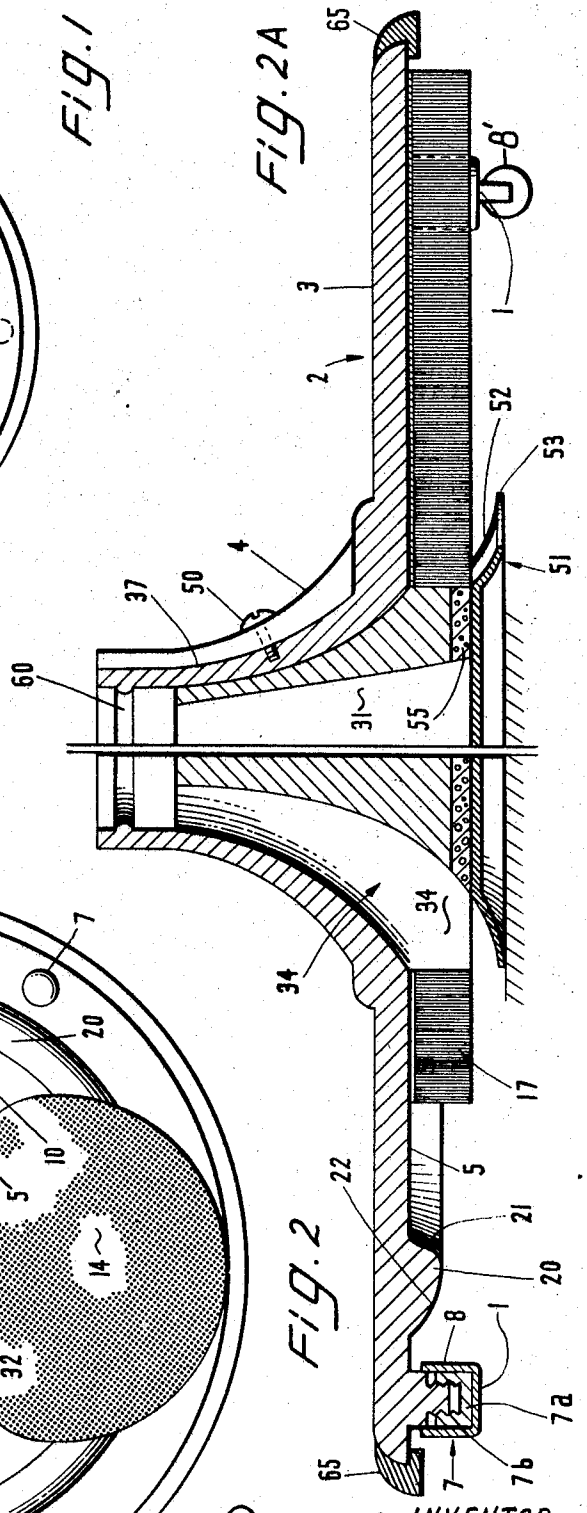

FIG. 2A

FIG. 2

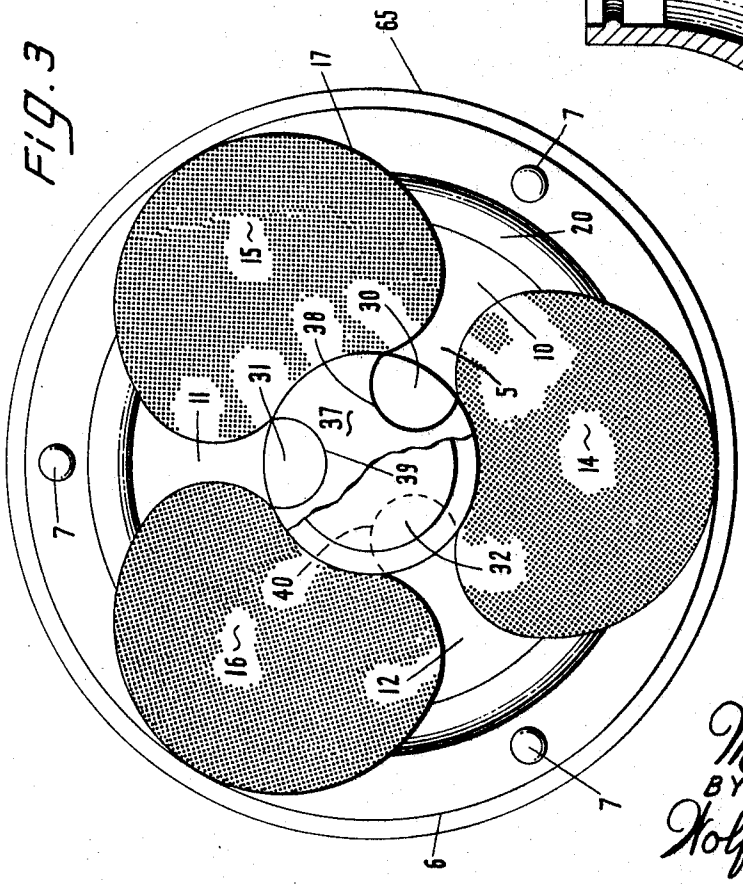

FIG. 3

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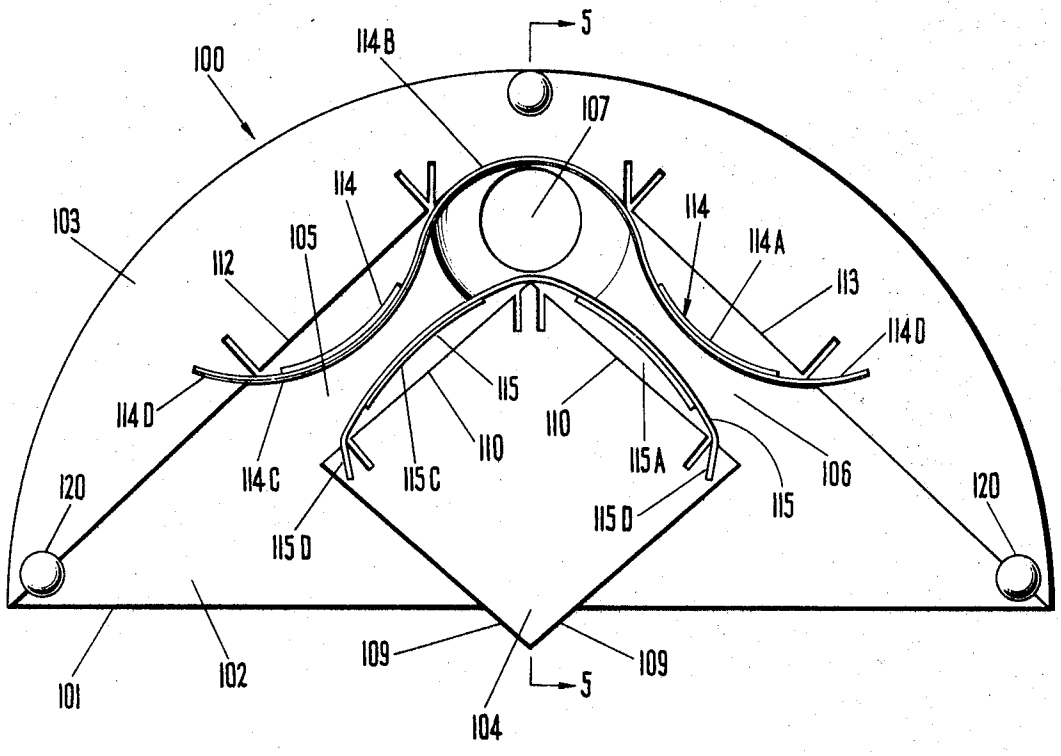

Fig. 4

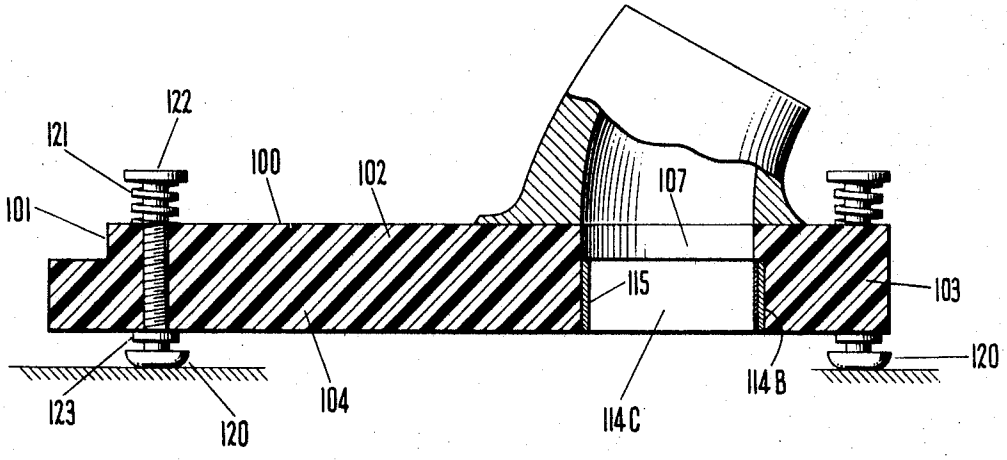

Fig. 5

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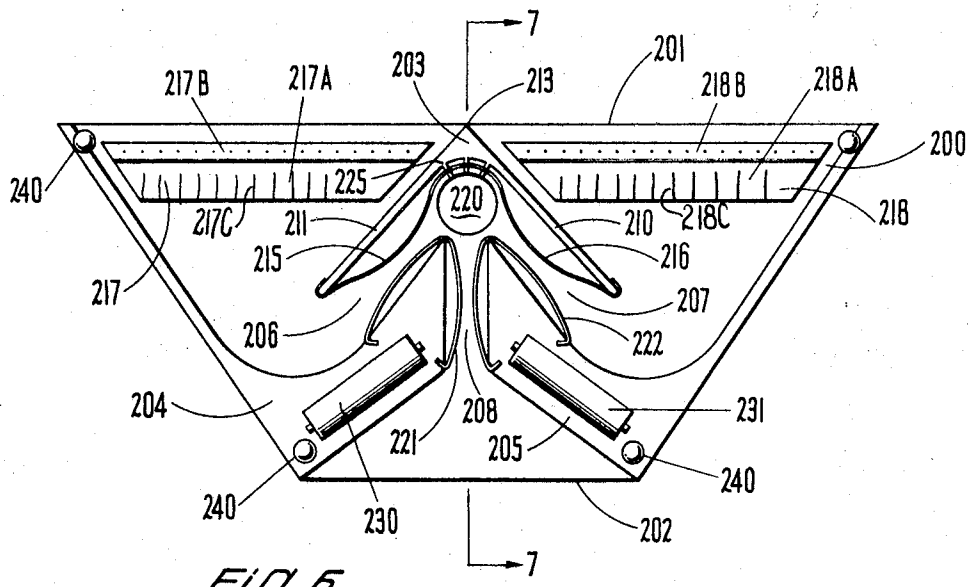

Fig. 6

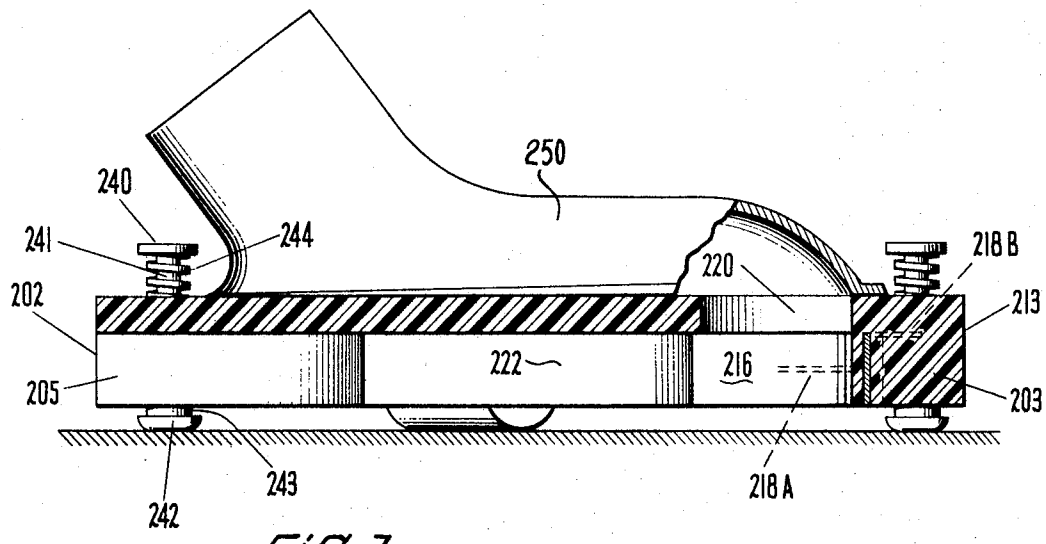

Fig. 7

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3,524,213

VACUUM HEAD

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Continuation-in-part of application Ser. No. 542,281, Apr. 13, 1966. This application June 17, 1968, Ser. No. 747,058

Int. Cl. A47l 5/34, 9/06

U.S. Cl. 15—354 21 Claims

ABSTRACT OF THE DISCLOSURE

A vacuum cleaner head having a hood with a skirt defining a lower surface maintained in spaced relation to the floor. Passages are formed from the periphery of the hood to an aperture in the hood. Venturi constrictions are provided in the passage in the form of flexible resilient walls which are adapted to open wider from a preset position to permit passage of large objects. The flexible walls are formed preferably of a thin flexible strip of metal or the like that lies partially in two passages and is shaped and arranged in such a manner as to constrict one passage when the other passage is being widened.

CROSS REFERENCE TO RELATED APPLICATIONS

This is a continuation-in-part of application Ser. No. 542,281, filed Apr. 13, 1966 and now abandoned.

SUBJECT MATTER OF THE INVENTION

The present invention relates to a vacuum cleaner head especially designed to pick up small particles of relatively high density.

BACKGROUND OF THE INVENTION

Commercially available vacuum cleaner heads frequently are incapable of picking up relatively small particles such as nails, metal shavings, stones, gravel, sand, glass and the like. Furthermore, such vacuum cleaner heads often are not especially designed for use on hard surfaces, such as floors. Consequently such vacuum cleaner heads are not particularly designed for industrial use. Presently available vacuum cleaner heads, moreover, do not make maximum use of their power and dissipate a large amount of the lifting force provided in the vacuum cleaner in poorly designed vacuum cleaner heads.

Further insofar as is known no commercially available vacuum cleaner head used either on floors or on rugs or the like provides a head having apertures that dynamically vary in size and provide dynamic venturi openings or passages that are directly related to particles that are being picked up.

BRIEF DESCRIPTION OF THE INVENTION

The present invention is designed to provide a vacuum cleaner head which overcomes these and other disadvantages of presently available vacuum cleaner heads.

The present invention provides a vacuum cleaner head which is capable of maximizing the efficiency of a vacuum source by first accelerating particles to be swept up in a horizontal direction and then subsequently in a vertical direction through the ducts or tubes connected to the vacuum source. These particles are accelerated to the maximum velocity of the system in their initial horizontal direction of movement by use of a venturi effect. The present invention also provides a construction which is particularly adapted for use on hard surfaces but which may also be used on other surfaces such as rugs with a high degree of efficiency.

The present invention also provides a vacuum cleaner head which is self cleaning, simple to manufacture, maintain, and repair. A further object of this invention is to provide a lightweight vacuum cleaner head which is relatively low in height and, therefore, capable of moving under low objects.

The present invention also provides a vacuum cleaner head having passages which extend radially from the aperture in the hood of the vacuum cleaner head with venturi constrictions in the passages. In this invention the venturi constrictions are preferably dynamically formed so as to vary the dimensions of the passages in conformity with the particles being sucked through the head.

In the present invention the vacuum cleaner head comprises primarily a hood having a skirt with a lower surface having depending means defining one or more passages extending in a plane parallel to the lower surface of the hood. These passages extend radially from an aperture in the hood and are provided with venturi constrictions in the passage. In a preferred form the venturi constrictions are formed of flexible wall members adapted to be moved dynamically while air is passing through the passage with the flexible wall members adapted to widen one passage and constrict another passage from a preset position simultaneously during operation of the cleaner.

BRIEF DESCRIPTION OF THE DRAWINGS

The foregoing objects and advantages of the present invention will be more clearly understood when considered in conjunction with the accompanying drawings in which:

FIG. 1 is a top plan view of a vacuum cleaner head embodying the invention;

FIG. 2 is a cross-sectional view taken along the line 2—2 of FIG. 1;

FIG. 2A is a cross-sectional view taken along the line 2A—2A of FIG. 1 and forming a substantial continuation of the cross-sectional view taken along the line 2—2 of FIG. 1;

FIG. 3 is a bottom, partially fragmented view;

FIG. 4 is a bottom plan view of a modification of the invention;

FIG. 5 is a cross-sectional view taken substantially along the line 5—5 of FIG. 4;

FIG. 6 is a bottom plan view of a preferred embodiment of the invention; and

FIG. 7 is a cross-sectional view taken substantially along the line 7—7 of FIG. 6.

DESCRIPTION OF PREFERRED EMBODIMENTS

The vacuum cleaner head illustrated is designed primarily for use in removing particles or dust from a flat surface and is particularly designed for removing relatively heavy particles from a floor or like flat surface. The location of such a surface relative to the vacuum cleaner head when used is illustrated at 1 in FIGS. 2 and 2A. The vacuum cleaner head has a hood 2. This hood comprises a skirt 3 and an annular conic wall 4 with the annular conic wall 4 and skirt 3 preferably integrally formed and continuous with one another. The conic wall 4 is preferably centrally located with respect to the skirt 3. If desired, the wall 4 and skirt 3 may be formed of a single piece of injection-molded plastic. If desired, the hood 2 may be formed of a transparent plastic to permit viewing of the surface to be cleaned and of the particles as they accelerate in a horizontal plane under the skirt. The skirt 3 is formed with a lower surface 5 and outer periphery 6. The lower surface 5 is maintained in spaced relation to the flat surface or floor 1 by spacing means which may, for example, comprise at least three adjustable dependent posts 7 intermittently spaced about the lower surface 5. These posts may be adjusted to variable lengths

by suitable adjusting means. For example, each post may have an outer portion 7*a* and an inner portion 7*b* having complementary threaded portions adapted to permit elongation of the post 7 by adjusting the outer portion relative to the inner portion. If desired, these posts may be provided with friction engaging outer coverings or sleeves 8 formed of a material having a relatively low coefficient of friction, such as Teflon or the like. The inner surface of sleeve 8 may be longitudinally serrated to engage complementary serrations on the outer surface of posts 8 to restrain rotation of portion 7*a* relative to portion 7*b*. If desired, such spacing means may also comprise wheels instead of the fixed spacing means 7 which are also suitably adjustable to different heights so as to maximize the efficiency of the vacuum head for different purposes. If desired, the posts 8 may carry wheels as illustrated at 8'.

If desired, a bumper 65 of a flexible strip of magnetic material may be suitably secured about the periphery of the skirt 3. This strip functions both as a non-abrasive bumper and as a means for picking up metal particles.

A plurality of means extend downwardly from the lower surface 5 and define a plurality of passages 10, 11 and 12, with these passages 10, 11 and 12, having their upper and lower surfaces formed respectively by the lower surface 5 and the flat surface of the floor 1. The plurality of means which extend from the lower surface 5 to form the sidewalls of these passages 10, 11 and 12 may comprise either a solid member or a brush. Thus, for example, these means may comprise brushes 14, 15 and 16. The brushes are suitably secured at their upper end to the lower surface 5 and extend downwardly towards the flat surface 1 and are spaced close to the floor 1, as for example, one sixteenth of an inch away from or flush with the floor, being maintained a distance away from the floor by the height of the spacing means 7. The sidewalls 17 of these brushes are generally flared outwardly from their inner or one end to the other or outer end of the passages 10, 11 and 12. Preferably this flaring is substantial and may be formed by arranging the sidewalls 17 in an arcuate configuration as illustrated in FIG. 3. If the members 14, 15 and 16 are formed as brushes, the brushes should be relatively dense and stiff so as to effectively form a relatively tight packed barrier to the passage of air, dust particles or other foreign material therethrough.

Means forming a venturi constriction extend across each of the passages 10, 11 and 12 near the outer end. Each means may comprise, for example, the downwardly extending projection 20 integrally formed on the lower surface 5. These downwardly extending projections 20 preferably extend in a longitudinal arc with the ends of the arc terminating at the sidewalls 17 of adjacent, downwardly extending projections. Preferably, the inner edge of these projections 20 extend to the surface 5 at a sharp angle, as illustrated at 21, while the outer surface may be tapered as illustrated at 22.

The inner ends of the passages 10, 11 and 12 are each connected respectively to one of the conduit portions 30, 31 and 32 and form continuous connections therewith. These conduit portions each extend parallelly upward through an aperture 34 in the skirt 3 which aperture is defined by the wall 4. These conduit portions 30, 31 and 32 are formed by a septum 37. The septum 37 has a plurality of channels 38, 39 and 40 in its outer surface longitudinally extending from the lower to the upper ends of this septum 37. The channels 38, 39 and 40 are preferably semi-circular in cross section, with a diameter at the lower ends continuous with the inner ends of the passages 10, 11 and 12, with which they are aligned, so that the passages and conduits converge smoothly into one another and with the conduits extending angularly upwardly through the aperture 34 from the horizontally planar passages 10, 11 and 12. The septum 37 may be suitably secured with its outer walls fixed to the inner surface of the angular wall 4 by suitable means such as a plurality of screws 50 which extend through the wall 4 into the septum 37. The lower end of the septum 37 has secured to it a scoop 51. This scoop 51 is formed with a circular lip 52 having a circular peripheral edge 53 adapted to press against the flat surface of a floor. This scoop 51 is preferably formed of resilient material so that the edge 53 will closely engage the floor. The surface 52 of the scoop is arcuately curved upwardly to direct particles moving inwardly through the passages upwardly through the conduit portions 30, 31 and 32. Preferably, this scoop 51 is secured to the septum 37 with an intermediate resilient foam or compressible section 55 which is adapted to take up any irregularities that may occur in the floor or surface over which the vacuum cleaner is moving while maintaining the edge 53 in close adjacency to the flat surface.

The upper edge of the annular wall 4 is formed with means suitable for engaging the vacuum cleaner head with a tube or nozzle of a vacuum cleaner. If desired, this may comprise an inwardly extending bead 60 adapted to engage a recess or other suitable engaging element on a vacuum cleaner tube nozzle.

Although this embodiment illustrates a vacuum cleaner head having a circular configuration other configurations are contemplated. For example, triangular, rectangular, eliptical or square heads more adapted to fit into corners may embody this invention.

Turning now to FIGS. 4 and 5 there is illustrated an embodiment of the invention utilizing a passage having a dynamic venturi constriction. In this arrangement the hood 100 which is preferably made of a transparent material has a forward or mouth end 101. Depending from the lower surface 102 of the hood 100 are a plurality of downwardly projecting members 103 and 104 which cooperate to define a plurality of passages 105 and 106. These passages 105 and 106 extend radially from an aperture 107 to the forward or mouth end 101. The aperture 107 extends upwardly through the hood 100 and is provided with means suitable for attachment to a vacuum hose or other suction element. The downwardly projecting element 104 in the embodiment described, is preferably in the shape of an island having a uniform thickness and flat walls 109 and 110 angularly arranged. Walls 109 project forwardly and function to divert particles rearwardly to the passages 105 and 106. Walls 110 converge and form respectively one-half each of the passages 105 and 106. The downwardly projecting member 103 is formed with forward walls 112 and 113 which converge rearwardly of the aperture 107 and cooperate respectively with the walls 110 to form the passages 105 and 106.

The passages 105 and 106 are each provided with venturi constrictions. These venturi constrictions are formed by flexible walls 114 and 115. The flexible walls 114 project from the walls 112 and 113, while the flexible walls 115 project from the walls 110. Preferably the flexible walls 114 and 115 are formed of an elongated metal member or strip which is suitably and preferably solidly anchored at their ends respectively in the downward projecting members 103 and 104. Thus slots are formed in members 103 and 104 to receive the ends of flexible walls 113 and 114 in securing relation. The wall 114 which extends in the passage 105 and 106 is formed with curved sections 114A, 114B and 114C connected integrally and in series with the bowed portion 114B arcuately curved rearwardly around the aperture 107 and the bowed portions 114A and 114C both bowed forwardly or in a direction opposite to the direction of bow of section 114B. Flexible wall 115 extends from passage 105 to passage 106 and is anchored at its ends in the downwardly projecting member 104 in a manner similar to the means for securing the flexible wall 114 at its ends in downwardly projecting member 103. Preferably the flexible wall 115 is arcuately curved around the intersection of walls 110 forwardly of the aperture 107. Bowed portion 115A is positioned opposite bowed portion 114A while bowed portion 115C is positioned opposite bowed portion 114C.

The walls **114** and **115** may be secured respectively at their ends in slots **114D** and **115D** in turn extending upwardly in members **103** and **104**. If desired, legs **120** may be provided at the corners of the hood **100** to raise the unit to a selected height over a floor. Each leg may be adjusted to different heights against the tension of spring **121**, bearing between the hood **100** and head **122** of the threaded leg **120**, by adjusting the locknut **123** which is threaded on the leg **121**.

In the operation of the embodiment of the invention illustrated in FIGS. 4 and 5, a vacuum connection is suitably connected to the aperture **107** and the unit is moved over a floor that is to be cleaned. Particles are drawn through the passages **105** and **106** upwardly through the aperture **107**. If a large particle is drawn through one of the passages, for example passage **105**, and its dimension is greater than the preset distance between the opposed surfaces of the walls **114C** and **115C**, these walls will be forced apart by the increased air pressure around the particles between them, or by mechanical forces resulting from contact with the obstruction itself. At the same time the opposite ends of the walls **114** and **115** in the area of sections **114A** and **115A** will close. This closure in the passage **106** will cause increased force in the flow of air through passage **105** thus accelerating the forces on the particle as it moves towards aperture **107**.

The walls **114** and **115** may be damped or undamped, depending upon the specific application for which the unit is intended. If the walls are undamped, they are formed of a spring metal of uniform thickness. If the springs are damped they may be formed of a lamination of spring metal and damping material such as cloth, rubber, plastic or leather, as illustrated.

Turning now to FIGS. 6 and 7, there is illustrated a preferred embodiment of the present invention. In this arrangement, the hood **200** is provided with a forward or leading edge **201** and a trailing edge **202**. Depending from the hood is a plurality of downwardly projecting members **203**, **204** and **205** which cooperate to form forward passages **206** and **207** and rearwardly extending passage **208**. The downwardly extending member **203** is provided with two legs **210** and **211** which extend from a forward vertex **213** rearwardly. The inner surface of these legs **210** and **211** are substantially parallel to walls of the depending or downwardly projecting members **204** and **205** and cooperate therewith to form the passages **206** and **207**. The lower surfaces of downwardly extending members **204** and **205** are flat and adapted to lie parallel to the surface of the floor on which they move. Preferably positioned within these downwardly extending members and projecting downwardly therefrom are the brushes **230** and **231**. These brushes may be conventionally formed and may, if desired, be freely rotatable or, alternately, driven for purposes of picking up or driving dust towards one or the other of the passages.

Positioned within passages **206** and **207** are the flexible wall members **215** and **216**. Also positioned in passages **206** and **207** are the flexible wall members **221** and **222**. The flexible wall members **221** and **222** are arcuately curved over the forward edges of the downwardly extending members **204** and **205** and from thence extend rearwardly through the passage **208**. The wall members **215** and **216** are preferably formed of a single elongated piece of flexible resilient metal which may be damped or undamped as previously described in connection with the embodiment of FIG. 4. This elongated metal member has two rearwardly bowed portions which lie adjacent the walls **210** and **211** and are secured at their ends at the ends of these walls **210** and **211**. The intermediate portion of the flexible wall members **215** and **216** extends forwardly in between the aperture **202** and the rear surface of the downwardly projecting member **203**. If desired it may be supported against movement in this area by the pins of projections **225** which project on either side of the flexible wall. The flexible walls **221** and **222** extend into passage **208** and are anchored at the outer end of passage **208** respectively in the depending members **204** and **205**. The other ends of these flexible wall members **221** and **222** are also anchored respectively in the downwardly extending members **204** and **205** but on the other side of these members opposite the walls **211** and **210** respectively. The venturi effect formed by the opposed portions of walls **215** and **221** in passage **206** and by walls **216** and **222** in passage **207** is similar to that as effected in the flexible walls of FIG. 4. Similarly the flexible walls **221** and **222** in passage **208** form a venturi effect for material picked up by the head on rearward movement of it. In that arrangement the movement of the walls **221** and **222** will simultaneously close both of the passages **206** and **208**. Thus, in other words, the passage of an article through any one of the venturi constrictions formed by the flexible walls will effectively close or narrow the venturi constrictions in the other passages.

The forward edge or wall of the hood is also provided with a pair of venturi members **217** and **218** which may be damped or undamped similar to walls **114** and **115**. These venturi members **217** and **218** comprise primarily flexible wall members having offset sections **217A** and **217B** in flexible wall member **217** and flexible wall sections **218A** and **218B** in flexible wall member **218**. The offset sections **217B** and **218B** are respectively secured to the undersurface of the hood. The other portions **217A** and **218A** which may be slotted from the free edge as indicated at **217C** and **218C**, project downwardly and are spaced from the lower surface of the hood and provide venturi effects which may be deflected upon passage of articles between the hood and the surface over which the hood is being moved.

If desired, the hood may be provided with legs generally indicated at **240**. These legs should preferably be adjustable and in this connection are provided with shanks **241** which project preferably through the hood. The lower end of the legs is formed with a rolling or sliding tip **242**. The nut **243** is threaded on the shank **241** and prevents upward movement of the leg through the hood. A spring **244** coaxial with the shank has one end bearing against the upper surface of the hood and the other end bearing against a knob or handle **245**. Thus the leg is tensioned upwardly against the stop nut **243** and may be adjusted by rotating the stop nut **243** against the tension of the spring **244**.

The hood **200** may be formed with a fixed shroud **250** as illustrated in FIG. 7 adapted to be connected to a vacuum source. Alternately, this shroud may be provided with a universal tubular joint designed to permit the free end of the shroud to pivot with respect to the portion immediately above hood **200**. Suitable detents may be provided to normally limit universal movement to movement in forward and rear directions unless an overriding force is applied.

Having now described my invention, I claim:

1. A vacuum cleaner head for use in removing particles from a flat surface comprising, a hood having a skirt with a lower surface, means for maintaining said lower surface in spaced relation to said flat surface, means extending from said lower surface defining a passage with one end of said passage adjacent an aperture in said lower surface and the other end intermediate said aperture and the peripheral edge of said lower surface, said passage defining means comprising a plurality of downwardly extending elements having lower surfaces extending close and parallel to said flat surface and sidewall members flared apart toward to said other end of said passage whereby the cross-sectional area of said passage is greater in portions closer to the other end of said passage than in portions remote therefrom, means forming a venturi constriction in said passage at said other end of said passage, means forming a conduit extending angularly from said aperture with one end connected to

said aperture of said head and the other end of said conduit means adapted to receive a suction hose, whereby said passage and conduit form a continuous passageway with the portion thereof formed by said passage parallel to said flat surface and angular to said conduit, means projecting downwardly from said one end adjacent said conduit and having a surface forming a scoop with the lower edge extending across said passage at said one end close to said flat surface.

2. A vacuum cleaner as set forth in claim 1 having a septum with walls forming portions of said conduits.

3. A vacuum cleaner as set forth in claim 2 having a plurality of said passages.

4. A vacuum cleaner as set forth in claim 3 wherein said spacing means are adjustable for adjusting the area of said passage at said venturi-forming means.

5. A vacuum cleaner head for use in removing particles from a flat surface comprising, a hood having a skirt with a lower surface, means for maintaining said lower surface in spaced relation to said flat surface, means extending from said lower surface defining a passage with one end of said passage adjacent an aperture in said lower surface and the other end intermediate said aperture and the peripheral edge of said lower surface, said means defining a passage comprising a plurality of downwardly extending elements having sidewall members flared outwardly from said one end toward said other end whereby the cross-sectional area of said passage is greater in portions closer to said other end than in portions remote therefrom and with each of said passages continuous with one of a plurality of separate parallel conduits, means forming a venturi constriction in said passage at said other end of said passage, said venturi-forming means extending across each of said passages with each comprising a projection extending downwardly from said lower surface with the end of said projection terminating adjacent one of said downwardly extending elements, means forming a conduit extending angularly from said aperture with one end connected to said aperture of said head and the other end of said conduit means adapted to receive a suction hose, whereby said passage and conduit form a continuous pasasgeway with a portion thereof formed by said passage parallel to said flat surface and angular to said conduit, said means forming a conduit formed of an annular wall with its lower edge continuous with said skirt, a septum positioned within said annular wall said septum having an outer wall with a plurality of spaced downwardly extending channels formed therein and defining with the inner surface of said conduit said plurality of separate parallel conduits.

6. A vacuum cleaner as set forth in claim 5 wherein said skirt is transparent and said spacing means includes a plurality of wheels.

7. A vacuum cleaner head for use in removing particles from a flat surface comprising, a hood having a skirt with a lower surface, means for maintaining said lower surface in spaced relation to said flat surface, means extending from said lower surface defining a passage with one end of said passage adjacent an aperture in said lower surface and the other end intermediate said aperture and the peripheral edge of said lower surface, means forming a venturi constriction in said passage at the other end of said passage, means forming a conduit extending angularly from said aperture with one end connected to said aperture of said head, and the other end of said conduit means adapted to receive a suction hose, whereby said passage and conduit form a continuous passageway with a portion thereof formed by said passage parallel to the flat surface and angular to said conduit, and having a septum with walls forming portions of said conduit and with said septum terminating at its lower end in a scoop at said one end of said passage.

8. A vacuum cleaner head as set forth in claim 7 wherein said septum is formed with a transverse section of resilient compressible material.

9. A vacuum cleaner head as set forth in claim 5 having a flexible magnetic strip encircling said skirt, and said strip comprising a bumper means.

10. A vacuum cleaner head for use in removing particles from a flat surface comprising, a hood having a skirt with a lower surface, means for maintaining said lower surface in spaced relation to said flat surface, means extending from said lower surface defining a passage with one end of said passage adjacent an aperture in said lower surface and the other end intermediate said aperture and the peripheral edge of said lower surface, said passage defining means comprising a plurality of downwardly extending elements having sidewall members flared apart toward said other end of said passage whereby the cross-sectional area of said passage is greater in portions closer to the other end of said passage than in portions remote therefrom, means forming a venturi constriction in said passage at said other end of said passage wherein said venturi constriction extends downwardly from said lower surface and comprises a ridge extending from one sidewall member to the other, means forming a conduit extending angularly from said aperture with one end connected to said aperture of said head and the other end of said conduit means adapted to receive a suction hose, whereby said passage and conduit form a continuous passageway with a portion thereof formed by said passage parallel to said flat surface and angular to said conduit.

11. A vacuum cleaner head in accordance with claim 10 wherein a plurality of means extend from the lower surface to define a plurality of passages with one end of each passage adjacent said aperture and the other end of each passage intermediate said aperture and the peripheral edge of said lower surface, and a plurality of means forming a plurality of conduits extending angularly from said aperture.

12. A vacuum cleaner head for use in removing particles from a flat surface comprising, a hood having a skirt with a lower surface, means projecting from said lower surface defining at least one passage positioned inwardly from the edge of said skirt, means forming an aperture in said skirt remote from the edge thereof in fluid communication with said passage, said means projecting from said lower surface including walls extending generally radially from said aperture and having intermediate their length means forming a venturi constriction.

13. A vacuum cleaner head as set forth in claim 12 wherein said walls include at least in part a flexible wall adapted to be moved dynamically while air is passing through said passage to vary the dimensions of said passage.

14. A vacuum cleaner head as set forth in claim 13 including a pair of flexible walls on opposite sides of said passage.

15. A vacuum cleaner head as set forth in claim 14 including a plurality of passages with each passage having said flexible walls therein.

16. A vacuum cleaner head as set forth in claim 15 including said flexible walls formed of elongated, flexible members, and means securing said flexible members at their ends to said downwardly projecting member.

17. A vacuum cleaner head as set forth in claim 16 wherein said hood has a forward end and a rear end and two of said passages extend forwardly of said hood and one of said passages extends rearwardly of said hood.

18. A vacuum cleaner head as set forth in claim 12 including, a plurality of said passages, means positioned in said passages for simultaneously opening one passage while a second passage is being closed.

19. A vacuum cleaner head as set forth in claim 18 wherein said means positioned in said passage includes an elongated, flexible strip extending from one passage

to a second passage and forming a flexible wall adapted to simultaneously expand the cross-sectional area of one passage and constrict the cross-sectional area of a second passage.

20. A vacuum cleaner head as set forth in claim **19** wherein said elongated, flexible strip has arcuate portions in said passages with the ends of said strips extending in generally angular directions with respect to one another.

21. A vacuum cleaner head as set forth in claim **20** wherein said flexible strip is resilient.

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ROBERT W. MICHELL, Primary Examiner

U.S. Cl. X.R.

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