Dec. 31, 1963 E. M. FRESH ETAL 3,115,653

MECHANICAL DOOR MAT

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Fig. 1.

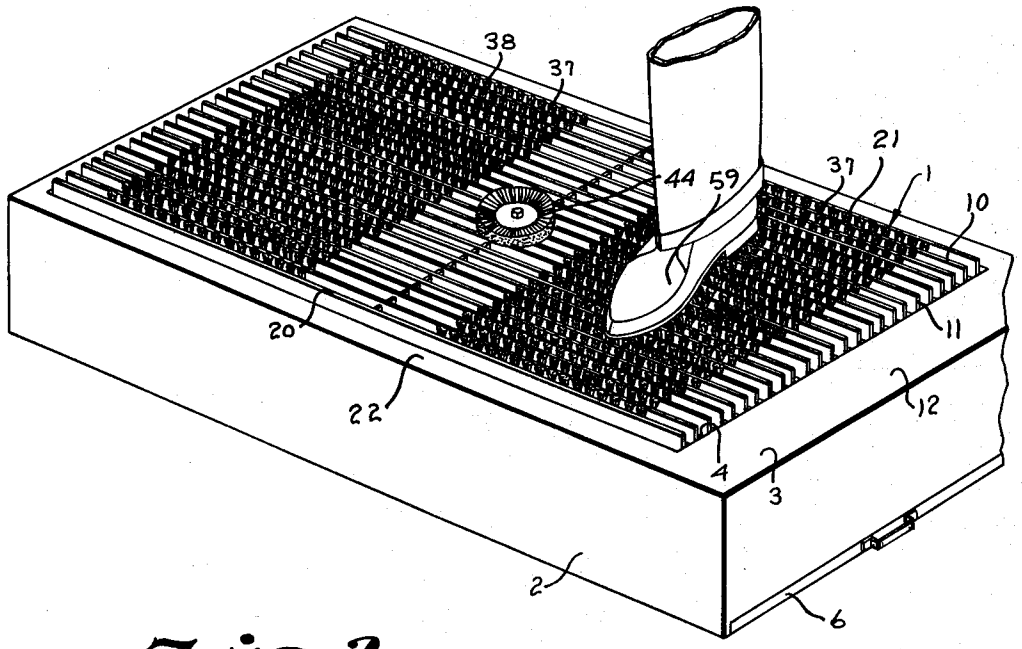
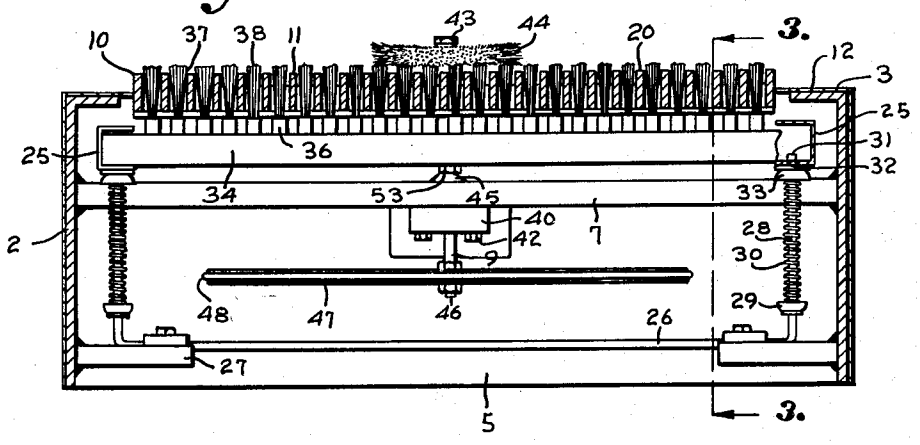


Fig. 2.



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Fig. 3.

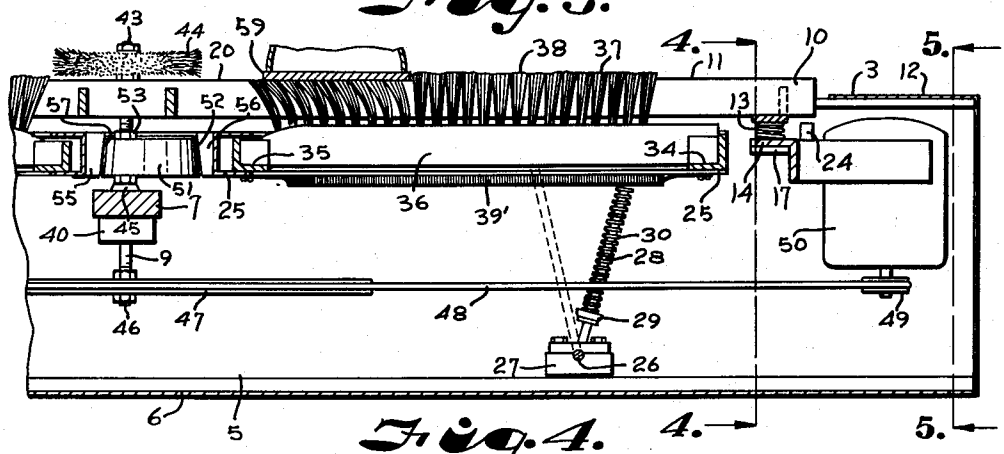


Fig. 4.

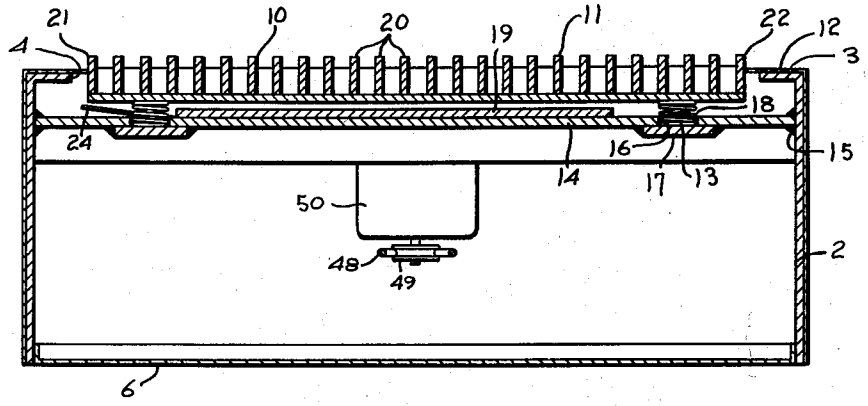
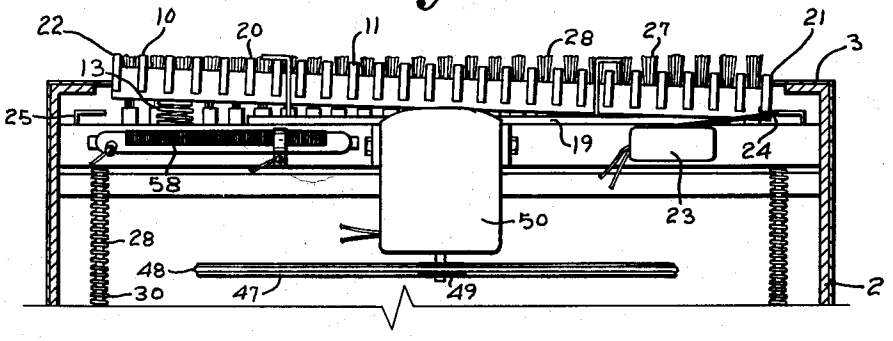


Fig. 5.



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Fig. 6.

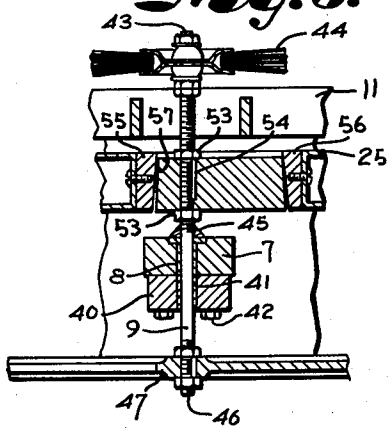


Fig. 7.

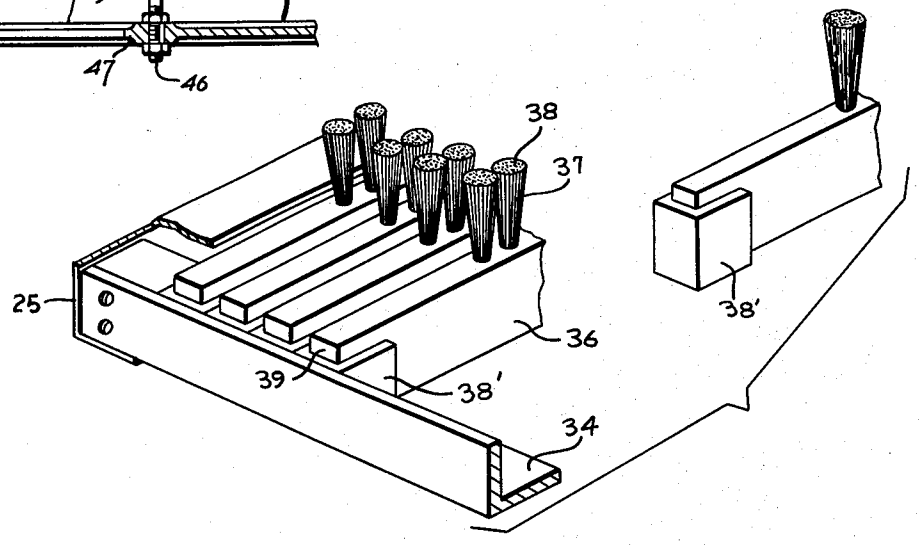
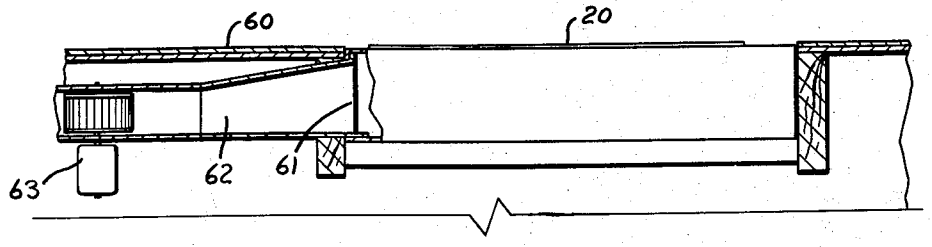


Fig. 8.



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3,115,653
MECHANICAL DOOR MAT

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Filed Jan. 2, 1962, Ser. No. 163,389
2 Claims. (Cl. 15—37)

This invention relates to powered shoe cleaning devices, and more particularly to mechanical door mats adapted for use adjacent outside doors or in entrance halls and which are automatically actuated by the weight of the person stepping thereon for removing mud, dust and other soil matter from shoes, boots or the like.

Automatically-actuated mechanical door mats have been devised in the past. However, such devices begin operation whenever a person steps thereon regardless of whether such person is going in or out of the building. In addition, such prior art devices clean the shoes either with rotating brush rollers or brushes which reciprocate in a straight horizontal path. Such cleaning motions do not result in maximum dirt removal and often a substantial quantity of soil is tracked into the building in spite of the shoe-cleaning device. It is a further characteristic of prior art devices that only the bottom of the shoe soles are cleaned and mud or the like adhering to the sides of the sole or on the upper body of the shoe remains thereon only to fall off inside the building.

The principal objects of the present invention are to provide a powered mechanical door mat which is adapted to be actuated in the event of a person entering a building but remain dormant in response to a person leaving the building; to provide such a device wherein cleaning brushes or bristles operate in an arcuate reciprocatory path for efficient cleaning of the bottom surface of shoe soles and for cleaning the side edges of the soles; to provide a mechanical door mat which includes a horizontally extending radial brush which rotates as the mat is operated for cleaning the upper side surfaces of the soles and the body portions of the shoe; to provide such a device which is adapted to be placed within an entranceway or vestibule and may include a suction device or other apparatus for removing soil and dirt to a place of disposal; to provide such a device having a plurality of brush members which are easily removed and replaced as they become worn; to provide such a shoe-cleaning device having a grille through which cleaning brushes extend, the brushes being resiliently urged upwardly with spring supports to produce the most efficient cleaning pressure against the shoe; and to provide such a device which is simple in construction, easily maintained and reliable in use.

Other objects and advantages of this invention will become apparent from the following description taken in connection with the accompanying drawings wherein are set forth by way of illustration and example certain embodiments of this invention.

FIG. 1 is a perspective view of a mechanical door mat embodying the features of this invention.

FIG. 2 is a sectional end view through the mechanical door mat of FIG. 1, particularly showing the brush-retaining frame mounting.

FIG. 3 is a cross-sectional view on an enlarged scale taken on the line 3—3, FIG. 2, particularly illustrating the driving mechanism for the brush-retaining frame.

FIG. 4 is a cross-sectional view taken on the line 4—4, FIG. 3, particularly showing the resilient grille support.

FIG. 5 is a cross-sectional view taken on the line 5—5, FIG. 3, showing the grille tilted in a direction for actuating the starting switch.

FIG. 6 is a fragmentary sectional view on an enlarged

scale illustrating a radial brush and cam supporting structure.

FIG. 7 is a fragmentary exploded perspective view on an enlarged scale illustrating the placing and removal of brushes in the brush-retaining frame.

FIG. 8 is a cross-sectional view on a reduced scale illustrating the mounting of the mechanical door mat in a vestibule and including suction means for drawing off dirt.

Referring to the drawings in more detail:

The reference numeral 1 indicates a mechanically-operated door mat embodying features of this invention. The door mat 1 comprises a base 2 preferably constructed of suitable structural members enclosed in a sheet material cover forming a box having an upper border or framing portion 3 defining an opening 4. The base 2 is rigid in construction so as to provide adequate support for a heavy person standing thereon. The base 2 is preferaby open at the bottom 5 and a shallow pan 6 may be inserted thereunder for catching dirt or the like removed from shoes in a manner to be described. A cross member 7 adds rigidity to the base 2 and contains a vertical sleeve bearing 8 for rotatably laterally supporting a vertically extending shaft 9 described hereinafter.

A substantially horizontal grille member 10 is comprised of a plurality of laterally spaced parallel weight-supporting bars 11 which substantially fill the opening 4 and extend slightly above the upper surface 12 of the border or frame 3. The grille member 10 rests upon resilient springs 13 located in the vicinity of each corner thereof. Horizontally extending supporting strips 14 are spaced beneath the border 3 and are secured to the base 2, in the illustrated example by welding at 15. The supporting strips 14 contain bores 16 which are covered at the lower termination thereof with plates 17 to form sockets designated 18 to receive and support the springs 13. The supporting strips 14 have bumper strips 19 resting thereon and adapted to restrict the downward movement of the grille member 10 when a weight is placed on the upper surface 20 thereof.

The grille member 10 has a forward edge 21 and a rear edge 22. The rear edge 22 is intended to be placed adjacent the door or entranceway when the mechanically-operated door mat 1 is outside the building. Conversely, when the door mat 1 is to be placed within an entrance hall or the like, the forward edge 21 is to be placed adjacent the doorway. In this manner, a visitor is much more likely to step adjacent the edge 21 when entering the building and adjacent the edge 22 when exiting from the building. Since the grille member 10 is resiliently supported adjacent the four corners thereof, weight placed close to the forward edge 21 will tend to deflect that area of the grille member 10 downwardly to a greater extent than the area adjacent the rear edge 22 and vice versa.

A normally-off spring-actuated switch 23 is mounted on one of the supporting strips 14 and includes an actuating arm 24 which terminates adjacent the grille member 10 in the vicinity of the forward edge 21. The arm 24 is located in a position whereby a depression of the forward edge 21 by a suitable quantity of weight placed on the grille member 10 will actuate the switch 23 and initiate a series of events described hereinafter.

A frame 25 is disposed beneath the grille member 10 and adjacent the opening 4. A pair of spaced rods 26 extend horizontally across the base 2 in a direction transversely of the bars 11. The rods 26 are rotatably supported at each end thereof in pillow blocks 27 respectively secured to opposite inner surfaces of the base 2. The opposite ends of the rods 26 extend upwardly forming oppositely disposed parallel supporting shafts 28 which move together through an arc about the rod 26,

FIG. 3. The shafts 28 each have a spring-receiving washer or cup 29 secured near the lower end thereof and adapted to provide an abutment for supporting the lower end of a helical compression spring 30 mounted coaxially of each of the shafts 28. The upper end 31 of each of the shafts 28 extends respectively into spaced receiving bores 32 in the frame 25. A washer or cup 33 bears on one side thereof against the top of the spring 30 and on the other side thereof against the lower surface of the frame 25 whereby the frame 25 is resiliently supported adjacent the ends 31 of the shafts 28. The above-described structure reciprocally mounts the frame 25 for movement in a directional parallel to the bars 11 and through an arc having a radius spaced beneath the grille member 10.

The frame 25 has spaced ledges 34 and 35 adapted to removably support a plurality of laterally spaced elongated brush members 36 having bristles 37 extending upwardly between the respective bars 11. The bristles 37 terminate in upper ends 38 which extend above the upper surface 20 of the grille member 10 and move with the frame 25. Suitable spacers 38' are engaged with the ends 39 of the brush members 36 for maintaining the desired spacing between the respective brush members. The ledges 34 and 35 are urged together by a spring 39' for firmly retaining the brush members 36.

The vertically extending shaft 9 receives additional lateral support by means of a bearing block 40 containing a bearing sleeve 41 secured to the cross member 7 by means of suitable bolts 42. The upper end 43 of the shaft 9 extends through and above the grille member 10 and a radial brush 44 is secured thereto for rotation in a horizontal plane spaced above the grille member 10. A suitable bearing abutment 45 is secured to the shaft 9 and engages with the bearing 8 for maintaining upward support for the shaft 9. The lower end 46 of the shaft 9 has a pulley 47 secured adjacent thereto and disposed beneath the bearing block 40. The pulley 47 engages with a drive belt 48 which in turn engages with a pulley 49 secured to a suitable prime mover, in the illustrated example an electric motor 50.

An eccentric cam 51 having a downwardly and outwardly tapering cam surface 52 is secured to the shaft 9 between a pair of spaced nuts 53 and is rotatable with the shaft 9 due to a key 54 engaging therebetween.

A pair of spaced substantially parallel extending plates 55 and 56 are secured to the frame 25 and are adapted to receive the cam 51 therebetween for imparting a reciprocatory motion to the frame 25 as the cam 51 is rotated in a horizontal plane. The tapered cam surface 52 cooperates with tapered cam contacting surfaces 57 on the respective plates 55 and 56 to permit ease of assembly while providing only the desired clearance therebetween to prevent jamming as downward pressure is applied against the bristle ends 38.

The electric motor 50 obtains power through a suitable source (not shown) for example 110 volts A.C. through a rheostat 58 which is adjustable to control the speed of the motor 50. It is to be understood that the switch 23 is connected in series with the rheostat 58 and motor 50 whereby the motor 50 will not be actuated until the switch arm 24 is depressed due to the downward deflection of the forward edge 21. When the motor 50 operates, the cam 51 is rotated along with the radial brush 44.

In operation, a person entering the building (not shown) steps adjacent the forward edge 21 of the grille member 10 which actuates the switch 23 causing the motor 50 to rotate the pulley 49. This imparts through the drive belt 48 and pulley 47 a rotary motion of the shaft 9 which results in the simultaneous rotation of the cam 51 and the radial brush 44. The cam 51 imparts a reciprocatory motion to the frame 25 and the shafts 28 translate this motion from a pure linear reciprocation to a reciprocation through an arc having as the center

thereof the spaced rods 26. The bristle ends 38 thus reciprocate arcuately above the grille member 10 whereby a shoe 59 placed thereon is cleaned by the bristle upper ends 38 first on one side thereof and then on the other side thereof while brushing against the bottom of the sole. This motion also permits the bristle ends 38 to be relieved at the end of each brushing cycle so that the brushing direction is not reversed while they are under load which would tend to result in poor brushing efficiency as well as short bristle life. If the shoe has mud or soil adhering thereto at a point spaced out of reach of the bristle ends 38, the shoe may be placed against the radial brush 44 for cleaning at a higher level on the body of the shoe while cleaning is being accomplished at a lower level by the brush members 36. The mud, dirt and soil removed from the shoe tends to drop down between the bars 11 and brush members 36 into the shallow pan 6. It is noted that the pulley 47 is a spoked pulley whereby dirt released thereabove is permitted to pass therethrough into the shallow pan. When exiting from the building, the tendency is for a person to step on or adjacent the rear edge 22 which bottoms the grille member 10 against the bumper strips 19 without actuating the switch 23. Thus, the mechanical door mat 1 will usually not perform the useless act of cleaning the shoes of a guest who is departing from the building.

When placed within the entranceway of a building, it is desirable that the grille upper surface 20 be substantially flush with the floor level 60 as indicated in FIG. 8. With such an inside installation, it is also desirable that the dust and dirt be drawn past the door mat 1 to a suitable place of disposal (not shown). To accomplish this, the sides and bottom of the base 2 are suitably enclosed with the exception of an opening 61 which communicates with a passageway 62 terminating in a motor-driven suction blower 63 which may be actuated with the motor 50.

It is to be understood that while we have illustrated and described one form of our invention, it is not to be limited to the specific form or arrangement of parts herein described and shown except insofar as such limitations are included in the claims.

What we claim and desire to secure by Letters Patent is:

1. A mechanically-operated door mat for cleaning shoes comprising,

(*a*) a base,

(*b*) a substantially horizontal grille member supported by said base and having a plurality of laterally spaced weight-supporting bars,

(*c*) a frame disposed below said grille member, a plurality of downwardly extending arms pivotally mounted at the lower ends thereof to said base and slidably engaged at the upper ends thereof on said frame, resilient means associated with said arms for resiliently supporting said frame on said arms for downward displacement under pressure, said arms mounting said frame for reciprocal movement through an arc having a radius spaced beneath said grille member,

(*d*) a plurality of brush members having bristles extending upwardly between said bars, means on said frame for supporting said brush members, said bristles terminating in upper ends which normally extend above the upper surface of said grille member and move with said frame, and

(*e*) driving means for reciprocating said frame.

2. The door mat as set forth in claim 1 wherein:

(*a*) said resilient means are elongated helical compression springs surrounding said arms and anchored at one end thereof on said arms and operatively bearing at the other end thereof on said frame.

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