FIG. 1

FIG. 2

FIG. 3

FIG. 4

INVENTOR.
J. J. NAPPI ETAL
SHOE SOLE CLEANER
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J. J. NAPPI ETAL
3,400,421

INVENTOR.
JOHN J. NAPPI
CHARLES E. PFUND

Russell, Chittick, Pfund
ABSTRACT OF THE DISCLOSURE

A floor mat of the "tacky mat" type which provides a tread surface of pressure sensitive adhesive to accumulate dirt from the bottom of shoes with the tread surface renewable by peeling the top pressure sensitive sheet in a stack to dispose of the accumulated contaminating material is adapted to provide increased contact area with shoe soles, vehicle wheels and the like as they pass over the mat by using a stack of pressure sensitive sheets such as cloth backed adhesive that is pliable in all directions transverse to the sheets and a compressible, resilient pad such as foam or sponge rubber under the stack which conforms the top surface of the stack to the curvature of the shoe or wheel.

This invention relates to improved shoe sole cleaners sometimes referred to as tacky mats in which a pressure sensitive adhesive surface is walked upon to clean the under surface of the shoes. Devices of this general type are shown in the patent to Nappi 3,083,393. As in this previous patent one of the primary uses of the device is to clean the shoe soles and heels of persons entering into contamination controlled areas. The device is also useful for cleaning the tread of wheeled vehicles which are brought into the controlled area by wheeling through the controlled access door. Accordingly throughout this specification and in the claims where shoe soles are mentioned it is to be understood that the language includes the heels of shoes and the tread of wheeled vehicles which pass over the device.

These devices of the Nappi type have enjoyed considerable success and widespread use in clean rooms for the industrial field where delicate and critical manufacturing operations are under way and environmental control of dust particles is essential. In addition they have found widespread use in hospitals particularly at the entrance to operating rooms where a large volume of walking and wheeled vehicle traffic enters from the corridors and patients rooms in connection with the operating procedures performed. In each field of use the tacky mat type shoe cleaner of the Nappi patent has shown marked improvement in the control of contamination by the ability of such devices for capture and disposal of residual contaminants upon the under surface of shoes which cannot be effectively removed by brushing or using an ordinary rug or mat.

One feature which the prior devices do not provide is the ability to clean the entire ground contact surface of the shoe or the entire rounded cross-section tread contour of a tire on a wheeled vehicle which passes over the device due to the inability of the pressure sensitive adhesive sheets to conform to complex curvatures and recesses when resting on the firm support herebefore provided. The shoe sole cleaner of the present invention extends the cleaning adhesive contact to such areas and also can reach slightly up the rounded edge outline of gum sole shoes depending upon the compressibility factor employed as hereinafter explained. The action of the device has improved effectiveness in extending into recesses such as pits and indentations or recessed tread patterns on the under surface of shoes including areas that are recessed due to excessive wear such as a worn down heel. The adhesive contact can also be made to extend a short distance up the side wall of a vehicle tire by using a relatively high compressibility factor.

Accordingly, the principal object of the present invention to provide an improved cleaning device for shoe soles or the like which is capable of conforming the adhesive cleaning surface to the contour of an object which is passing therethrough due to the weight of the object compressing the subjacent supporting member for the pressure sensitive sheets and the employment of pressure sensitive sheets which are pliable in all directions thereby to provide improved and extended cleaning contact with the under surface of the shoe or tire tread.

This and other objects of the invention will become evident from the following detailed description and the accompanying drawings wherein:

FIG. 1 is a vertical sectional view through an improved shoe sole cleaner made in accordance with the present invention;

FIG. 2 is an enlarged fragmentary view of a portion of a device like FIG. 1 showing the operation with a representation of a shoe in front elevation view bearing on the top surface of the device;

FIG. 3 is a vertical sectional view of a modified form of the invention; and

FIG. 4 is a fragmentary vertical section view through the hub of a wheel and shows the use of the invention to clean the tire tread of a wheeled vehicle.

In this specification and in the claims the description will be presented in terms of the drawings which show the device disposed and normal to the surface area of the floor, i.e. the top sheet is exposed to the tread of the user and the bottom surface is the surface normally supported on the walking area where the device is placed. Although the sectional views are considered to be clearly understood, for the sake of reference it will be stated that the figures in the drawings correspond generally with the FIG. 2 sectional view of Nappi Patent No. 3,083,393.

The thickness dimensions in the drawings have generally been exaggerated relative to the other dimensions for clarity of illustration, particularly the thickness shown for the adhesive sheets.

Tacky mat shoe sole cleaners generally comprise a rectangular stack of pressure sensitive adhesive sheets which are held in place on the floor with the adhesive side up to form an adhesive traffic or tread surface upon which the persons walk and which can be renewed by peeling the top sheet. Various arrangements for holding the stack of sheets in place can be used, the accepted practice being to place a stack of sheets in an aluminum frame having beveled edges to permit the users to walk over the slight thickness of the tacky mat without stumbling at the edges. Such a frame is not essential however and any suitable base or direct support on the floor can be employed. The stack can be anchored to its underlying support by any suitable means, the general practice being to use strips or a sheet of double face adhesive.

One arrangement of the present invention is shown in FIG. 1 wherein a stack of pressure sensitive sheets 11 is shown attached to a resilient compressible flexible foam pad 12 by means of an intermediate adhesive such as a sheet 13 of double face adhesive. Sheets 11 are preferably single face pressure sensitive adhesive coated cloth sheets with the thread size and weave of the cloth such as to make a relatively limp sheet that is pliable in all directions when subject to forces normal to the surface of the sheet. When five to fifteen such sheets are assembled in a stack 11, such as shown in FIG. 1, the stack so formed is still relatively pliable in all directions and will readily conform to the supporting surface therebeneath.
The supporting surface for the stack 11 in accordance with the present invention is the pad 12 which may be sponge rubber or flexible plastic foam such as flexible polyurethane foam. Other materials can be used, the primary requirement being that the material exhibit a good compressibility factor to deform in accordance with the contour of a shoe with sufficient resilience to conform the overlying stack 11 to the contour of a shoe sole while weight is applied thereto and to return the depression in the stack 11 caused by the weight of the shoe to a substantially flat uniform top surface 14 after the weight is removed. While sponge rubber and synthetic flexible foams are preferred for the material of pad 12, other materials having the desired compressibility and resilience can be used if otherwise satisfactory.

The device of FIG. 1 is used by placing the assembled elements 11, 12 and 13 on the floor with the exposed pressure sensitive adhesive surface 14 upwardly facing and when so placed can be used without any further structure, if desired. As previously mentioned, however, it is usually preferable to attach the assembled elements 11, 12 and 13 to some form of base or in a frame. As shown in FIG. 1 the base comprises a flat rigid plate 15 which may be aluminum, masonite or other suitable material to which the under surface of foam pad 12 is attached by a double face adhesive 13. As assembled to the base 15 the device may be placed directly on the floor and either secured thereto or held there by its own weight. The assembled device as shown in FIG. 1 may also be used as an insert with the flat rigid plate 15 being adapted to fit into the frames of the type disclosed in the aforementioned Nappi patent.

The operation of the invention is illustrated in FIG. 2 where a representation of a shoe 16 in place and bearing weight on the top surface 14 is indicated. The foam pad 12 is preferably thicker than the assembled height of the stack 11 with a compressibility factor which permits adequate deflection for curving the stack 11 an amount sufficient to conform the top surface 14 across the entire under curved surface 17 of the shoe 16. This conformance to the curved under surface 17 also occurs in the longitudinal direction of the shoe so that as the normal step is taken in contact with the top surface 14 the adhesive acts to clean the shoe sole from edge to edge out to the tip of the toe and well back into the instep. In general it will not be practical to use a resilient layer 12 of adequate thickness and compressibility to permit the adhesive contact to extend into the entire area of the instep but the contact can be made to extend back into the instep far enough to clean those portions of the instep which generally carry dirt accumulated from contact with the floor.

It will be noted in the drawing FIG. 2 that the thickness of the foam layer 12 is represented as greater than the thickness of the stack of sheets 11. This arrangement is preferred and the thickness of the foam 12 may exceed the thickness of stack by any desired amount depending upon the amount of compression desired when the product is in use. For example, the layer 12 of ordinary sponge rubber 1/4" thick will exhibit approximately the same thickness as fifteen sheets of woven cloth single faced tape used to make up the stack 11 of pressure sensitive sheets. These proportions give a minimum sensation to the user that he is walking on a resilient and compressible surface but nevertheless have been found to be adequate for producing a distinct contour line of the edge 18 of the shoe sole. Fifteen cloth single face sheets are normally used in the stack 11 and the preferred thickness for the pad 12 should be somewhat thicker than 1/4" and anywhere from 3/8" to 1/2" provides a practical commercial arrangement. The preferred woven cloth of which the sheets 11 are constructed provides pliability in all directions due to the general characteristics of woven cloth which has no appreciable bending strength transverse to the surface area and yet is strong enough in tension to prevent tearing or puncturing the adhesive surface in use and to permit peeling the shoe sole face between other materials which have these characteristics when produced in the form of thin sheets are equally satisfactory.

The foam pad 12 can be selected as previously stated from a wide range of materials and will generally be chosen with a weight or density factor which permits the desired amount of compression while still exerting the resilient forces necessary to conform the top layer 14 to the under surface 17 and to restore the entire stack 11 to a substantially flat surface when the weight of the shoe is removed therefrom. The surface strength of the pad 12 must be adequate to withstand the peeling pull exerted thereon when the sheets 11 are peeled from the stack. As previously indicated, the amount of actual compression present does not need to be great and in fact with a 1/4" sponge rubber layer 12 is so small as to be barely discernable by the user while still producing improved results. For cases where the contact of the shoes is severe, more compressible material than sponge rubber or lower densities (i.e. more or larger air cells or bubbles in the material) can be employed. An extreme example of a compressible resilient material is reticulated urethane flexible foam which is characterized by an interconnected network of struts without membranes between the struts so that the foam is actually porous to fluids and hence produces no pneumatic resistance to deflection due to entrapped air in the foam cells. These open cells provide extreme compressibility with adequate although reduced (due to the absence of pneumatic struts) adhesiveness to force the conformance of the top layer 14 into the desired areas of the shoe and restore the walking surface when the weight is removed. With such foams the structural linkage is such as to permit horizontal movement as the area subjacent to shoe compresses thereby accommodating the weight while maintaining adequate resilience and restoration forces. Thus the layer 14 using highly compressible materials such as reticulated urethane foam can be even thicker than 3/8" to provide an extreme amount of compression for conformance with difficult contours. Unless however an extensible sheet material is used for the stack of pressure sensitive sheets 11 even this amount of compression will not extend into the extreme recesses of the instep where the heel of the shoe meets the sole since the woven cloth sheets normally used for the stack 11 are strong in tension and will not extend the full thickness of the heel into the bottom of the instep.

Referring now to FIG. 3 a modified form of the invention is shown which can be used either by itself as a shoe sole cleaner by placing the object on the floor or by using it as an insert or the like on a base member 15 or by insertion in a frame, not shown. The device shown in FIG. 3 comprises a foam layer 12 to which a stack 11 of single face pressure sensitive sheets is attached by means of an intervening double face pressure sensitive sheet 13. This arrangement can be precisely as described for FIG. 1. On the bottom of the foam layer 12 an exactly similar arrangement is placed consisting of stack 11' of single faced pressure sensitive sheets with the adhesive surfaces thereof facing downward secured to the under surface of foam 12 by means of a double face pressure sensitive sheet 13'.

In use the device of FIG. 3 can be secured directly to a clean flat surface such as a base 15 or the bare floor by adhering the exposed adhesive surface of the lower sheet in the stack 11' directly to the supporting surface on which the device is to be placed. The stack of sheets 11 on the top of the device of FIG. 3 is then used in a normal manner until the final sheet is peeled to expose the top adhesive surface of the double face adhesive sheet 13. At this time the entire remaining device of FIG. 3 is peeled intact from the floor or support base 15 to which it has been attached by separating the adhesive contact from the lower surface of the lower sheet in the stack 11'.
from contact with such supporting surface. Once the device is peeled intact it is inverted and the exposed pressure sensitive adhesive surface of the sheet 13 is used to secure the device to the floor or other support. At this point the stack of sheets 11' is on top and the adhesive surfaces of the sheets in the stack 11' are upwardly facing. These sheets 11' can then be walked upon and peeled in succession to consume the remaining sheets in the stack 11'. The primary advantage of the arrangement of FIG. 3 is the distribution of the stacks 11 and 11' or opposite sides of the foam 12 so that the buildup in stiffness in the stacks is reduced for any given total number of single face sheets in the two stacks 11 and 11'. For example, instead of the single stack 11 in FIG. 1 having fifteen single face sheets therein, the device of FIG. 3 can have two stacks 11 and 11' of eight sheets each and thereby have only approximately half the thickness of a fifteen sheet stack 11, as disclosed in FIG. 1.

Referring now to FIG. 4, the operation of the invention with respect to tire treads of vehicle wheels and other rounded contours is further illustrated. A wheel 21 having a circular cross section rubber tire 22 thereon is shown in contact with the top adhesive tread surface 14. As indicated, the compression of the pad 13 conforms the top surface 14 to the bottom and rounded side walls of the tire 22. Thus if the pad 13 compresses under the weight borne by the wheel 21 more than the compression of the tire 22, the adhesive surface 14 extends its cleaning contact beyond the contact area which the tire 22 normally makes with a flat floor. This is the usual case since the tires of hospital beds and the like ordinarily compress the considerations of materials like sponge rubber in the pad 13.

Modifications of the invention will become apparent from the present disclosure and the patent is accordingly limited only by the scope of the appended claims. For example, a stack of single face pressure sensitive adhesive foam sheets secured for shoe sole cleaning could be used in place of a separate stack of cloth sheets on a foam pad.

In the claims the words upward and downward facing and similar terms are used to refer to the normal orientation of the device as used and as indicated in the drawings, although it is realized that the directions upward and downward only assume the intended physical significance when the device is placed in use.

We claim:

1. A device for cleaning the soles of shoes as the user walks across the device while the shoes are being worn comprising

(a) a stack of pliable peelable pressure sensitive adhesive sheets of size suitable for walking thereon, said sheets stacked with the pressure sensitive adhesive surface of each sheet upward to provide a tread surface which, except for the top sheet in said stack, is adhered to the under surface of the next higher sheet in said stack;

(b) a relatively thick, flat, porous, resilient and compressible pad substantially coextensive with the area of said stack; and

(c) means for securing the top surface of said pad to the under surface of the bottom sheet in said stack with said pressure sensitive adhesive surfaces of said sheets facing upward;

the bottom surface of said pad being adapted to be supported on a walking surface and retained thereon against the upward pull of a shoe adhered to said top sheet, said pad adapted to compress under the normal weight of a shoe when a user walks on the tread surface of the top sheet in said stack, the compression and resilience of said pad and the pliability of said stack of sheets adapted to operate to increase substantially the area of adhesive contact of said tread surface of said top sheet with the under surface of said shoe.

2. The device of claim 1 in which the means for securing said pad to said stack comprises a sheet of double face pressure sensitive adhesive between the top surface of said pad and the under surface of the bottom sheet in said stack.

3. The device according to claim 1 in which said bottom surface of said pad is secured to a flat base member.

4. The device according to claim 3 in which said base member is a rigid flat plate and said bottom surface of said pad is secured to said base member by a sheet of double face pressure sensitive adhesive therebetween.

5. A device according to claim 1 and including a second stack of pressure sensitive adhesive sheets secured to said bottom surface of said pad with the pressure sensitive tread surface of the sheets of said second stack facing downward and adapted to be brought into operative upward facing position for shoe sole cleaning by inverting said device.

6. An article of manufacture for the adhesive cleaning of shoe soles or the like as the user proceeds to move across the article in contact with the adhesive cleaning surface comprising a contour deformable stack of a plurality of single face pressure sensitive sheets, the pressure sensitive surface of each sheet except the top sheet in said stack adhered to the under surface of the next higher sheet in the stack to hold the higher sheets in place adhesive side up to form a traffic surface renewable by peeling the sheets one at a time to expose a new top sheet; and a flat, resilient, compressible foam pad adhered to the under surface of the bottom sheet in said stack, said pad being thicker than said stack and compressible under the weight of a person walking on the top sheet in said stack sufficient to conform the portion of said top sheet subjacent the shoe of such person to substantially the entire under surface of said shoe, the resilience of said pad restoring said stack to a substantially flat condition upon removal of said stack from the shoe.

7. The article according to claim 6 in which said sheets are made of woven cloth.

8. An adhesive cleaner for shoe soles or the like operable as the user walks across the device comprising a plurality of single face pressure sensitive sheets stacked one upon another adhesive side up, the adhesive surface of each sheet being large enough to be walked upon and supported by a pliable web having sufficient strength in tension to permit peeling said sheets one at a time, and resilient compressible means supporting and adhesively retaining substantially the entire adhesive area of said sheets and operative to conform the adhesive areas of the top sheet of said stack to the contour of a shoe sole bearing thereon under the normal weight of the wearer of the shoe.

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CHARLES A. WILLMUTH, Primary Examiner.
LEON C. MACHLIN, Assistant Examiner.