A cleaning device (1) for spot-cleaning fabrics without causing fiber damage is provided. A hand-held device (1) in the shape of tongs comprises opposing treatment means (2) such as stiff, looped fibres. In use, the stained fabric is moistened with a cleaning composition and grasped by the device (1). The fibers mechanically dislodge the stain. The device (1) is especially useful as a pre-spotter in a dry cleaning operation.
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STAIN REMOVAL DEVICE

FIELD OF THE INVENTION

The present invention relates to devices which can be used to remove stains from fabrics. The devices are especially useful as part of a dry cleaning operation.

CROSS-REFERENCE TO RELATED APPLICATION

This application is a continuation-in-part of co-pending Serial No. 08/514,216 filed August 11, 1995.

BACKGROUND OF THE INVENTION

By classical definition, the term "dry cleaning" has been used to describe processes for cleaning textiles using nonaqueous solvents. Dry cleaning is an old art, with solvent cleaning first being recorded in the United Kingdom in the 1860's. Typically, dry cleaning processes are used with garments such as woolens which are subject to shrinkage in aqueous laundering baths, or which are judged to be too valuable or too delicate to subject to aqueous laundering processes. Various hydrocarbon and halocarbon solvents have traditionally been used in immersion dry cleaning processes, and the need to handle and reclaim such solvents has mainly restricted the practice of conventional dry cleaning to commercial establishments.

While solvent-based dry cleaning processes are quite effective for removing oily soils and stains, they are not optimal for removing particulates such as clay soils, and may require special treatment conditions to remove proteinaceous stains. Ideally, particulates and proteinaceous stains are removed from fabrics using detergents and aqueous washing processes and operating conditions which are more akin to aqueous laundering processes than to conventional dry cleaning.

In addition to the cleaning function, dry cleaning also provides important "refreshment" benefits. For example, dry cleaning removes undesirable odors and extraneous matter such as hair and lint from garments, which are then generally folded or pressed to remove wrinkles and restore their original shape. Of course, such refreshment benefits are also afforded by aqueous laundering processes.

As can be seen from the foregoing, and aside from the effects on certain fabrics such as woolens, there are no special, inherent advantages for solvent-based immersion dry cleaning over aqueous cleaning processes with respect to fabric cleaning or refreshment. Moreover, on a per-garment basis, commercial dry cleaning is much more expensive than aqueous cleaning processes. Accordingly, it would be of considerable benefit to consumers to provide non-immersion dry cleaning processes which can be used in the home.
One type of home dry cleaning system comprises a carrier sheet containing various cleaning agents, and a plastic bag. The garments to be cleaned are placed in the bag together with the sheet, and then tumbled in a conventional clothes dryer. In a commercial embodiment, multiple single-use flat sheets and a single multi-use plastic bag are provided in a package. Unfortunately, such processes may not satisfactorily remove stains from heavily soiled or "spotted" areas of the fabrics being dry cleaned.

As is well known, heavily stained garments may be "pre-spotted" using so-called "spot removal" compositions prior to cleaning. However, it has now been noted that such methods typically involve the vigorous back-and-forth rubbing of the garment with a cleaning composition and a towel, sponge or other implement. It has now further been determined that such rubbing can cause fabric damage and excessive wear.

By the present invention, a device is provided which allows the user to pre-spot fabrics without resort to rubbing. The device herein loosens and removes stains via controlled mechanical action, thereby avoiding fabric damage. As will be seen hereinafter, the device is designed to gently implement Z-axis mechanics only, with respect to the fabric being treated.

BACKGROUND ART

Dry cleaning processes are disclosed in: EP 429,172A1, published 29.05.91, Leigh, et al.; and in U.S. 5,238,587, issued 8/24/93, Smith, et al. Other references relating to dry cleaning compositions and processes, as well as wrinkle treatments for fabrics, include: GB 1,598,911; and U.S. Patents 4,126,563, 3,949,137, 3,593,544, 3,647,354; 3,432,253 and 1,747,324; and German applications 2,021,561 and 2,460,239, 0,208,989 and 4,007,362. Cleaning/pre-spotting compositions and methods are also disclosed, for example, in U.S. Patents 5,102,573; 5,041,230; 4,909,962; 4,115,061; 4,886,615; 4,139,475; 4,849,257; 5,112,358; 4,659,496; 4,806,254; 5,213,624; 4,130,392; and 4,395,261. Sheet substrates for use in a laundry dryer are disclosed in Canadian 1,005,204. U.S. 3,956,556 and 4,007,300 relate to perforated sheets for fabric conditioning in a clothes dryer. U.S. 4,692,277 discloses the use of 1,2-octanediol in liquid cleaners. See also U.S. Patents 3,591,510; 3,737,387; 3,764,544; 3,882,038; 3,907,496; 4,097,397; 4,102,824; 4,336,024; 4,606,842; 4,758,641; 4,797,310; 4,802,997; 4,943,392; 4,966,724; 4,983,317; 5,004,557; 5,062,973; 5,080,822; 5,173,200; EP 0 213 500; EPO 261 718; G.B. 1,397,475; WO 91/09104; WO 91/13145; WO 93/25654 and Hunt, D.G. and N.H. Morris, "PnB and DPnB Glycol Ethers", HAPPI, April 1989, pp. 78-82.
SUMMARY OF THE INVENTION

The present invention encompasses a device for spot cleaning fabrics, comprising:

(a) a first treatment member, especially a member comprising multiple downward-facing (as depicted in the Figures) protrusions or a sponge or absorbent pad;

(b) a second treatment member, especially a member opposing said first member and comprising multiple upward-facing protrusions or a sponge or absorbent pad; and

(c) movable connecting means for movably joining said first member (a) and second member (b) in face-to-face relation. The first member (a) and second member (b) are spatially disposed to provide a gap between said members, such that a stained fabric can be placed in said gap and contact established on opposite sides of said fabric at the area of the stain by the application of compressive force, such as hand pressure, upon the connecting means.

As shown in the Figures, the connecting means comprises a first element affixed to said first treatment member and a second element affixed to said second treatment member, said first element being associated with said second element. Said first element is associated with said second element such that the application of force to either, or both, elements of said connecting means causes said first treatment member and said second treatment member to move toward each other in face-to-face relationship normal to the plane of the fabric being treated.

In a preferred embodiment, the protrusions extending from members (a) and (b) comprise natural or synthetic fibers, e.g., bristles, and, most preferably, looped fibers.

In yet another embodiment, the device can additionally comprise a reservoir for said cleaning composition. In this embodiment, the device also comprises one or more transmission means leading from said reservoir to one or both of members (a) and (b).

In order to assist in its use, the device can, optionally, be modified to additionally comprise retaining means to maintain pressure on said stained fabric when the device is in use.

The invention also encompasses a method for removing stains from a stained area of fabric using a device as described herein, comprising the steps of:

(a) applying a cleaning composition to said stained area;
(b) placing the stained area of said fabrics in the gap between the first and second treatment members of said device;
(c) closing said gap by the application of force to said device such that said members provide contact with opposite sides of the fabric;
(d) removing the fabric from the device; and, optionally,
(e) flushing away loosened stains, preferably by contacting the fabric with a carrier substrate which is moistened with the cleaning composition.

Step (c) of the process preferably employs an up-and-down pumping action, e.g., by intermittently applying and releasing pressure on the device in the Z-direction. This applies mechanical energy to flex the fiber bundles of the fabric being cleaned. This gentle flexing loosens particulate matter trapped within the fiber bundles, thereby allowing it to be removed. A side-to-side "sliding" type action in the X/Y direction is preferably avoided since, as noted above, this can cause fabric damage by snagging, pulling, stretching and abrading loose surface fibers. This undesirably results in permanent, visible fabric damage.

All percentages, ratios and proportions herein are by weight, unless otherwise specified. All documents cited are, in relevant part, incorporated herein by reference.

**BRIEF DESCRIPTION OF THE DRAWINGS**

Figure 1 is a perspective of a device of the present type having bristled first and second treatment members.

Figure 2 is a perspective of the device being used to treat a portion of stained fabric using hand pressure.

Figure 3 is a perspective of the device clamped onto a fabric using a retaining means.

Figure 4 is a perspective of the device having sponge-type first and second treatment members.

Figure 5 is a perspective of the device having a bristled protuberances comprising the first treatment member and a disposable sponge as a second treatment member.

Figure 6 is a perspective of the device with the first and second treatment members comprising looped protuberances.

Figure 7 is a perspective of the device with bristles comprising the first treatment member, a disposable pad comprising the second treatment member, with the first treatment member having a partial section to show a reservoir for the cleaning composition which flows directly into the first treatment member.
Figure 8 is a perspective of a device having a bottle reservoir for the cleaning composition which can be pumped directly into the second treatment member.

Figure 9 is a perspective of a flexible sheet-form device having multiple protuberances as the first and second treatment members and receptacle means to allow grasping of the device by the user's fingers and thumb.

Figure 10 is a perspective of a movable device with a forked base which can be situated at any position on a fabric surface.

**DETAILED DESCRIPTION OF THE INVENTION**

By "protuberances" herein is meant knobs, fibers, bristles or like structures which extend outwardly from the surface of the treatment member. Such elements of the device come into contact with the fabric being spot-cleaned ("pre-spotted") to provide the mechanical cleaning action.

By "first treatment member" herein is meant that part of the device which, during operation of the device, provides contact with stained areas on one side of the fabric.

By "second treatment member" herein is meant that part of the device which, during operation of the device, provides contact with stained areas on the side of the fabric opposite to the first treatment member. In a preferred mode, the second member is, essentially, a mirror image of the first member.

By "contact with stained areas" is meant contact which is afforded by impingement of the protuberances, pads, sponges, etc., with the stained area. As noted above, it is highly desirable that this contact be the result of motion limited to the Z-direction substantially perpendicular to the surface of the stain, rather than side-to-side in the X- and Y-directions. Preferably, the contact is associated with a pumping or intermittent squeezing stroke on the device.

By "connecting means" or "connectors" herein is meant that part of the device which joins the first member and the second member and which, by virtue of its movability, allows the members (more specifically, the pads, sponges or protuberances extending outwardly therefrom) to be brought into contact with the stained areas on opposite sides of the fabric and normal to the plane of the fabric. The connecting means is associated with the treatment members. "Associated" includes both an integral (one piece) article such as shown in Figure 1, or an article comprising two connecting arms, or the like, joined at a pivot point, as shown in Figure 4.

By "gap" herein is meant the spacing between the opposing first and second treatment members which allows for the insertion of fabric therebetween.
By "compressive force" herein is meant sufficient force which closes the gap in the device, thereby bringing the pads, sponges or protuberances which comprise the first treatment member and the second treatment member into contact with opposite sites of the fabric at the stained site.

By "retaining means" herein is meant any mechanism or means which maintains the opposing first and second treatment members in contact with opposite sides of the fabric without the need for additional compressive force.

**DETAILED DESCRIPTION OF THE DRAWINGS**

Figure 1 shows a hand-operated device (1) comprising a first treatment member (2) and an identical second treatment member (2) which are connected by movable, compressible connecting means (3). The first and second treatment members comprise multiple protuberances (4) in the form of bristles.

Figure 2 shows the operation of device (1) by the application of hand pressure (5) to connecting means (3). This pressure causes the movement of the first and second treatment members (2) such that their protuberances (4) come into contact with opposite sides of the stained fabric (6) which is being treated.

Figure 3 shows the device (1) with protuberances (4) on both treatment members (2) held in contact with the opposite sides of fabric (6) using retaining means (7) around connecting means (3).

Figure 4 shows a device (8) whose connecting means (9) and (10) are, themselves, connected by a pivot device (11). In device (8), the first treatment member (12) and second treatment member (13) are each absorbent sponges (14). In-use, the gap between the sponges is closed by applying pressure to connecting means (9) and (10), as indicated by the arrow, thereby causing the sponges to come into contact with opposite sides of the stained fabric.

Figure 5 shows a device (15) wherein the first treatment member (16) comprises multiple protuberances (4) in the form of bristles. The protuberances (4) are permanently joined to the first treatment member (16) using base plate (18). The second treatment member (17) comprises a receptacle (19) for a disposable sponge (20) or disposable pad. The first and second treatment members are joined by flexible connecting means (21).

Figure 6 shows a device (22) wherein first treatment member (23) comprises a base material (24) and second treatment member (25) comprises a base material (26). In this preferred embodiment, the protuberances from the respective bases of the first and second treatment members are in the form of looped fibers (27). As with the earlier described devices, treatment members (23) and (25) are joined by connecting means (28), which can be compressed by hand pressure.
Figure 7 shows device (28) which comprises second treatment member (33) comprising a receptacle (29) which contains a disposable pad (30). In this embodiment, the first treatment member (31) is hollow and provides a reservoir for a liquid cleaning composition. The reservoir (60) communicates through port (32) to deliver cleaning compositions to the protuberances (4). The reservoir is provided with a flexible membrane (34) which serves to pump cleaning composition from the reservoir cavity to the protuberances. Said first and second treatment members are joined by the compressible connecting means (35).

Figure 8 shows a device (36) which can be used for table-top operation, rather than being hand-held. The lower assembly (45) comprises a reservoir for a liquid cleaning composition which is provided by a bottle (37). Dip tube (38) communicates through the flexible bellows pump (39) into the second treatment member (40) via orifice (41). The cleaning composition can thereby be introduced into a pad or sponge (42). In use, the fabric is placed in the gap between treatment head (43) and the pad or sponge (42), and using pressure on connecting means (44), the protuberances (4) are pressed onto the stained fabric, whose opposite side is in contact with the sponge or pad (42). The bellows (39) can then be activated to force additional cleaning solution into the fabric via sponge or pad (42).

Figure 9 shows a device (46) which is prepared from a backing sheet of flexible polymer (47) having first treatment member (48) and second treatment member (49), each of which comprises opposing protuberances (50) in the Z-direction. The illustrated embodiment also has receptacles (51) for receiving the user's fingers and thumb, thereby providing gripping means. This embodiment is illustrated with an absorbent sheet (52) overlaying backing sheet (47) to assist in controlling drippage of liquid cleaning composition.

Figure 10 is an alternate embodiment of the present device, comprising a base member (54), connecting means (55), treatment member (56) and bristles (4). In this embodiment, the stain (57) on fabric (58) is treated between bristles (4) and an underlying second treatment member, which can comprise, for example, a folded, disposable paper towel (59). In this embodiment, which falls within the ambit of the invention, connecting means (55) causes the association of the first and second treatment members during operation of the device.

**Cleaning Compositions** - The chemical compositions which are used to provide the cleaning function in the present device and process comprise ingredients which are safe and effective for their intended use. Since the dry cleaning process herein does not involve an aqueous rinse step, the cleaning compositions employ ingredients which do not leave undesirable residues on fabrics when employed in the
manner disclosed herein. While conventional laundry detergents are typically formulated to provide good cleaning on cotton and cotton/polyester blend fabrics, the cleaning compositions herein must be formulated to also safely and effectively clean and refresh fabrics such as wool, silk, rayon, rayon acetate, and the like.

In addition, the cleaning compositions herein comprise ingredients which are specially selected and formulated to minimize dye removal from the fabrics being cleaned. In this regard, it is recognized that the solvents typically used in immersion dry cleaning processes can remove some portion of certain types of dyes from certain types of fabrics. However, such removal is tolerable in immersion processes since the dye is removed relatively uniformly across the surface of the fabric. In contrast, it has now been determined that high concentrations of certain types of cleaning ingredients at specific sites on fabric surfaces can result in unacceptable localized dye removal. The preferred cleaning compositions herein are formulated to minimize or avoid this problem.

The dye removal attributes of the present cleaning compositions can be compared with art-disclosed cleaners using photographic or photometric measurements, or by means of a simple, but effective, visual grading test. Numerical score units can be assigned to assist in visual grading and to allow for statistical treatment of the data, if desired. Thus, in one such test, a colored garment (typically, silk, which tends to be more susceptible to dye loss than most woolen or rayon fabrics) is treated by padding-on cleaner using an absorbent, white paper hand towel. Hand pressure is applied, and the amount of dye which is transferred onto the white towel is assessed visually. Numerical units ranging from: (1) "I think I see a little dye on the towel"; (2) "I know I see some dye on the towel"; (3) I see a lot of dye on the towel"; through (4) "I know I see quite a lot of dye on the towel" are assigned by panelists.

In addition to the foregoing considerations, the cleaning composition used herein is preferably formulated such that it is not so adhesive in nature that it renders the device unhandy or difficult to use. However, and while not intending to be limiting of the present invention, the preferred cleaning compositions disclosed herein afford a spot-cleaning process which is both effective and aesthetically pleasing when used with a device according to this invention.

Having due regard to the foregoing considerations, the following illustrates the ingredients used in the cleaning compositions herein, but is not intended to be limiting thereof.

(a) Solvent - The compositions will preferably comprise at least about 4%, typically from about 5% to about 25%, by weight, of solvent.
The objective is to provide at least about 0.4 g, preferably from about 0.5 g to about 2.5 g, of solvent per kg of fabrics being cleaned.

(b) Emulsifier - The compositions will comprise sufficient emulsifier to provide a stable, homogeneous composition comprising components (a), (b) and (d). For the preferred emulsifiers disclosed hereinafter, levels as low as 0.05%, preferably 0.07% to about 0.20%, by weight, are quite satisfactory. If less efficient emulsifiers are used, levels up to about 2%, by weight, can be used, but may leave some noticeable residues on the fabrics.

(c) Water - The compositions will comprise at least about 60%, typically from about 80% to about 95%, by weight, of water. Stated otherwise, the objective is to provide at least about 6 g of water per kg of fabrics being cleaned.

(d) Optionals - The compositions herein may comprise various optional ingredients, including perfumes, conventional surfactants, and the like. If used, such optional ingredients will typically comprise from about 0.1% to about 10%, by weight, of the compositions, having due regard for residues on the cleaned fabrics.

It has now been determined that 1,2-octanediol ("OD") affords special advantages in the formulation of the cleaning compositions herein. From the standpoint of aesthetics, OD is a relatively innocuous and low odor material. Moreover, OD appears to volatilize from fabric surfaces without leaving visible residues. This is especially important in a dry cleaning process of the present type which is conducted without a rinse step. From the performance standpoint, OD appears to function both as a solvent for greasy/oily stains and as what might be termed a "pseudo-surfactant" for particulate soils and water-soluble stains. Whatever the physical-chemical reason, OD has now been found to be a superior wetting agent with respect to both cleaning and ease-of-use in the present context of home-use cleaning compositions and processes. If used, OD will comprise at least about 0.05%, typically from about 0.1% to about 1.5%, by weight of the cleaning compositions herein.

A preferred solvent herein is butoxy propoxy propanol (BPP) which is available in commercial quantities as a mixture of isomers in about equal amounts. The isomers, and mixtures thereof, are useful herein. The isomer structures are as follows:
BPP is outstanding for cleaning, and is so effective that it allows the amount of the relatively expensive 1,2-octanediol to be minimized. Moreover, it allows for the formulation of effective cleaning compositions herein without the use of conventional surfactants. Importantly, the odor of BPP is of a degree and character that it can be relatively easily masked by conventional perfume ingredients. While BPP is not completely miscible with water and, hence, could negatively impact processing of the cleaning compositions herein, that potential problem has been successfully overcome by means of the PEMULEN-type polyacrylate emulsifiers, as disclosed hereinafter.

The BPP solvent used herein is preferably a mixture of the aforesaid isomers. In a preferred mode, the cleaning compositions comprise a mixture of the 1,2-octanediol and BPP, at a weight ratio of OD:BPP in the range of from about 1:250 to about 2:1, preferably from about 1:200 to about 1:5.

A highly preferred emulsifier herein is commercially available under the trademark PEMULEN, The B. F. Goodrich Company, and is described in U.S. Patents 4,758,641 and 5,004,557, incorporated herein by reference. PEMULEN polymeric emulsifiers are high molecular weight polyacrylic acid polymers. The structure of PEMULEN includes a small portion that is oil-loving (lipophilic) and a large water-loving (hydrophilic) portion. The structure allows PEMULEN to function as a primary oil-in-water emulsifier. The lipophilic portion adsorbs at the oil-water interface, and the hydrophilic portion swells in the water forming a network around the oil droplets to provide emulsion stability. An important advantage for the use of such polyacrylate emulsifiers herein is that cleaning compositions can be prepared which contain solvents or levels of solvents that are otherwise not soluble or readily miscible with water. A further advantage is that effective emulsification can be accomplished using PEMULEN-type emulsifier at extremely low usage levels (0.05-0.2%), thereby minimizing the level of any residue left on fabrics following product usage. For comparison, typically about 3-7% of conventional anionic or nonionic surfactants are required to stabilize oil-in-water
emulsions, which increases the likelihood that a residue will be left on the fabrics. Another advantage is that emulsification (processing) can be accomplished effectively at room temperature.

While the cleaning compositions herein function quite well with only the 1,2-octanediol, BPP, PEMULEN and water, they may also optionally contain detersive surfactants to further enhance their cleaning performance. While a wide variety of detersive surfactants such as the C_{12}-C_{16} alkyl sulfates and alkylbenzene sulfonates, the C_{12}-C_{16} ethoxylated (EO 0.5-10 avg.) alcohols, the C_{12}-C_{14} N-methyl glucamides, and the like can be used herein, it is highly preferred to use surfactants which provide high grease/oil removal. Included among such preferred surfactants are the C_{12}-C_{16} alkyl ethoxy sulfates (AES), especially in their magnesium salt form, and the C_{12}-C_{16} dimethyl amine oxides. Especially preferred mixtures comprise MgAE_{1S}/MgAE_{6.5S}/C_{12} dimethyl amine oxide, at a weight ratio of about 1:1:1, and MgAE_{1S}/C_{12} dimethyl amine oxide at a 2:1 weight ratio. If used, such surfactants will typically comprise from about 0.05% to about 2.5%, by weight, of the cleaning compositions herein.

In addition to the preferred solvents and emulsifiers disclosed above, the cleaning compositions herein may comprise various optional ingredients, such as perfumes, preservatives, co-solvents, brighteners, salts for viscosity control, pH adjusters or buffers, anti-static agents such as VERSAFLEX 157 or VERSAFLEX 2004 from National Starch and Chemical Company, softeners, colorants, mothproofing agents, insect repellents, and the like. Enzymes such as proteases, amylases, lipases and mixtures thereof can also be used at levels from about 0.0001% to about 1% of the compositions. The following illustrates preferred ranges for cleaning compositions for use herein, but is not intended to be limiting thereof.

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<th>Ingredient</th>
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<td>1,2-Octanediol</td>
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<tr>
<td>PEMULEN**</td>
<td>0.05-0.20%</td>
</tr>
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<td>Neodol 23-6.5***</td>
<td>0.1-2.5%</td>
</tr>
<tr>
<td>Perfume</td>
<td>0.01-1.5%</td>
</tr>
<tr>
<td>Water</td>
<td>Balance</td>
</tr>
</tbody>
</table>

pH range from about 6 to about 8.

*Other solvents or co-solvents which can be used herein include various glycol ethers, including materials marketed under trademarks such as Carbitol, methyl Carbitol, butyl Carbitol, propyl Carbitol, and hexyl Cellosolve, and especially
methoxy propoxy propanol (MPP), ethoxy propoxy propanol (EPP), propoxy propoxy propanol (PPP), and all isomers and mixtures, respectively, of MPP, EPP, and PPP, and the like, and mixtures thereof. Indeed, although somewhat less preferred, the MPP, EPP and PPP, respectively, can replace the BPP solvent in the foregoing cleaning compositions. The levels of these solvents, and their ratios with 1,2-octanediol, are the same as with the preferred BPP solvent. If desired, and having due regard for safety and odor for in-home use, various conventional chlorinated and hydrocarbon dry cleaning solvents may also be used. Included among these are 1,2-dichloroethane, trichloroethylene, isoparaffins, and mixtures thereof.

As disclosed in U.S. Patents 4,758,641 and 5,004,557, such polyacrylates include homopolymers which may be crosslinked to varying degrees, as well as non-crosslinked. Preferred herein are homopolymers having a molecular weight in the range of from about 100,000 to about 10,000,000, preferably 200,000 to 5,000,000.

C\textsubscript{12}-C\textsubscript{13} alcohol average ethoxylate (EO) 6.5; trademark Shell.

**Carrier** - When used in a dry cleaning operation of the present type, the foregoing cleaning compositions are preferably used in combination with a carrier, such that the cleaning composition performs its function as the surfaces of the fabrics being cleaned come in contact with the surface of the carrier. The carrier releasably contains the cleaning composition. By "releasably contains" means that the cleaning composition is effectively released from the carrier onto the soiled fabrics as part of the dry cleaning process herein.

The carrier can be in any desired form, such as powders, flakes, shreds, and the like. However, it will be appreciated that such comminuted carriers would have to be separated from the fabrics at the end of the cleaning process. Accordingly, it is highly preferred that the carrier be in the form of an integral pad or sheet which substantially maintains its structural integrity throughout the cleaning process. Such pads or sheets can be prepared, for example, using well-known methods for manufacturing non-woven sheets, paper towels, fibrous batts, cores for bandages, diapers and catamenials, and the like, using materials such as wood pulp, cotton, rayon, polyester fibers, and mixtures thereof. Woven cloth pads may also be used, but are not preferred over non-woven pads due to cost considerations. Integral carrier pads or sheets may also be prepared from natural or synthetic sponges, foams, and the like.

The carriers are designed to be safe and effective under the intended operating conditions of the present process. The carriers must not be flammable during the process, nor should they deleteriously interact with the cleaning
composition or with the fabrics being cleaned. In general, non-woven polyester-based pads or sheets are quite suitable for use as the carrier herein.

The carrier used herein is most preferably non-linting. By "non-linting" herein is meant a carrier which resists the shedding of visible fibers or microfibers onto the fabrics being cleaned, i.e., the deposition of what is known in common parlance as "lint". A carrier can easily and adequately be judged for its acceptability with respect to its non-linting qualities by rubbing it on a piece of dark blue woolen cloth and visually inspecting the cloth for lint residues.

The non-linting qualities of sheet or pad carriers used herein can be achieved by several means, including but not limited to: preparing the carrier from a single strand of fiber, employing known bonding techniques commonly used with nonwoven materials, e.g., point bonding, print bonding, adhesive/resin saturation bonding, adhesive/resin spray bonding, stitch bonding and bonding with binder fibers. In an alternate mode, a carrier can be prepared using an absorbent core, said core being made from a material which, itself, sheds lint. The core is then enveloped within a sheet of porous, non-linting material having a pore size which allows passage of the cleaning compositions, but through which lint from the core cannot pass. An example of such a carrier comprises a cellulose or polyester fiber core enveloped in a non-woven polyester scrim.

The carrier should be of a size which provides sufficient surface area that effective contact between the surface of the carrier and the surface of the fabrics being cleaned is achieved. Of course, the size of the carrier should not be so large as to be unhandy for the user. Typically, the dimensions of the carrier will be sufficient to provide a macroscopic surface area (both sides of the carrier) of at least about 360 cm$^2$, preferably in the range from about 360 cm$^2$ to about 3000 cm$^2$. For example, a rectangular carrier may have the dimensions (X-direction) of from about 20 cm to about 35 cm, and (Y-direction) of from about 18 cm to about 45 cm.

The carrier is intended to contain a sufficient amount of the cleaning composition to be effective for its intended purpose. The capacity of the carrier for the cleaning composition will vary according to the intended usage. For example, carrier/cleaning composition pads or sheets which are intended for a single use will require less capacity than such pads or sheets which are intended for multiple uses. For a given type of carrier the capacity for the cleaning composition will vary mainly with the thickness or "caliper" (Z-direction; dry basis) of the sheet or pad. For purposes of illustration, typical single-use polyester sheets used herein will have a thickness in the range from about 0.1 mm to about 0.7 mm and a basis weight in the range from about 30 g/m$^2$ to about 100 g/m$^2$. Typical multi-use polyester pads
herein will have a thickness in the range from about 0.2 mm to about 1.0 mm and a basis weight in the range from about 40 g/m² to about 150 g/m². Open-cell sponge sheets will range in thickness from about 0.1 mm to about 1.0 mm. Of course, the foregoing dimensions may vary, as long as the desired quantity of the cleaning composition is effectively provided by means of the carrier.

The preferred carrier herein comprises a binderless (or optional low binder), hydroentangled absorbent material, especially a material which is formulated from a blend of cellulosic, rayon, polyester and optional bicomponent fibers. Such materials are available from Dexter, Non-Wovens Division, The Dexter Corporation as HYDRASPUN®, especially Grade 10244. The manufacture of such materials forms no part of this invention and is already disclosed in the literature. See, for example, U.S. Patents 5,009,747, Viazmensky, et al., April 23, 1991 and 5,292,581, Viazmensky, et al., March 8, 1994, incorporated herein by reference. Preferred materials for use herein have the following physical properties.

<table>
<thead>
<tr>
<th>Grade</th>
<th>Optional</th>
</tr>
</thead>
<tbody>
<tr>
<td>10244</td>
<td>Targets</td>
</tr>
<tr>
<td>Basis Weight</td>
<td>gm/m²</td>
</tr>
<tr>
<td>Thickness</td>
<td>microns</td>
</tr>
<tr>
<td>Density</td>
<td>gm/cc</td>
</tr>
<tr>
<td>Dry Tensile</td>
<td>gm/25 mm</td>
</tr>
<tr>
<td>MD</td>
<td>1700</td>
</tr>
<tr>
<td>CD</td>
<td>650</td>
</tr>
<tr>
<td>Wet Tensile</td>
<td>gm/25 mm</td>
</tr>
<tr>
<td>MD*</td>
<td>700</td>
</tr>
<tr>
<td>CD*</td>
<td>300</td>
</tr>
<tr>
<td>Brightness</td>
<td>%</td>
</tr>
<tr>
<td>Absorption Capacity</td>
<td>%</td>
</tr>
<tr>
<td>Dry Mullen</td>
<td>gm/cm²</td>
</tr>
</tbody>
</table>

*MD - machine direction; CD - cross direction

As disclosed in U.S. 5,009,747 and 5,292,281, the hydroentangling process provides a nonwoven material which comprises cellulosic fibers, and preferably at least about 5% by weight of synthetic fibers, and requires less than 2% wet strength agent to achieve improved wet strength and wet toughness.

Surprisingly, this hydroentangled carrier is not merely a passive absorbent for the cleaning compositions herein, but actually optimizes cleaning performance. While not intending to be limited by theory, it may be speculated that this carrier is more effective in delivering the cleaning composition to soiled fabrics. Or, this
particular carrier might be better for removing soils by contact with the soiled fabrics, due to its mixture of fibers. Whatever the reason, improved dry cleaning performance is secured.

In addition to the improved cleaning performance, it has now been discovered that this hydroentangled carrier material provides an additional, unexpected benefit due to its resiliency. In-use, the dry cleaning sheets herein are designed to function in a substantially open configuration. However, the sheets are packaged and sold to the consumer in a folded configuration. It has been discovered that carrier sheets made from conventional materials tend to undesirably revert to their folded configuration in-use. This undesirable attribute can be overcome by perforating such sheet, but this requires an additional processing step. It has now been discovered that the hydroentangled materials used to form the carrier sheet herein do not tend to re-fold during use, and thus do not require such perforations (although, of course, perforations may be used, if desired). Accordingly, this newly-discovered and unexpected attribute of the carrier materials herein makes them optimal for use in the manner of the present invention.

**Stain Removal and Dry Cleaning Process** - While the devices provided by the present invention can be employed under any circumstances where stain removal from a fabric is desired, such as in a conventional aqueous laundering process, they are especially useful in a home dry cleaning process, as described hereinafter.

A fabric to be dry cleaned is inspected for areas having high stain levels, or persistent stains. A portion of a suitable cleaning composition, especially those disclosed hereinabove, is applied in an amount sufficient to at least dampen the stained area, typically from about 0.1 to 4 mls per cm², depending on the type, weight and absorbency of the fabric and the degree of staining. The application can be achieved by any of several methods. For example, the cleaning composition can be poured, sprayed or padded directly onto the stain. In an alternate mode, the cleaning composition can be applied to the treatment member of the present device and transferred to the stain during operation of the device, i.e., steps (a) and (b) of the claimed process herein are done concurrently. The consecutive or concurrent performance of steps (a) and (b) is deemed to be equivalent. In yet another mode, the cleaning composition can be dispensed from a reservoir in a device as shown in Figures 7 and 8. Again, in this mode steps (a) and (b) are concurrent.

The device and cleaning composition are brought into close contact with the stain, e.g., by squeezing the fabric between the treatment members using hand pressure, as shown in Figure 2. Contact is maintained for a period of 1-10 seconds for lighter stains and 1-5 minutes, or longer, for heavier or more persistent stains.
For such longer contact times, the user may elect to employ a device fitted with a retaining means, as shown in Figure 3. In a preferred mode, the user will employ an up-and-down pumping action by alternately squeezing and releasing the device. This exerts a pumping action which gently loosens and removes the stain. Ten to twenty "pumps" of the device are usually sufficient to loosen most stains. As noted above, a side-to-side action is preferably avoided due to potential damage to fibers.

After the stains are loosened by use of the device in the described manner, the loosened stain matter is preferably removed by gentle padding with a towel or tissue, or, most preferably, with an article releasably containing additional cleaning composition, such as described in Example IV, hereinafter.

In an alternate use during a fabric laundering operation, the stained area of the fabric can be moistened with a paste made from water and a conventional granular detergent, or with a liquid laundry detergent. A conventional pre-spotting composition designed for use in laundering processes can also be used. The device is then employed as described herein to loosen the stains prior to a conventional, aqueous laundering process.

Materials

The devices herein can be manufactured by injection molding using polymers such as low- and high-density polyethylene, polypropylene, nylon-6, nylon-6,6, acrylics, acetals, polystyrene, polyvinyl chloride, and the like. The connecting means on the devices are designed to be flexible so that they can be compressed by hand pressure. In a preferred mode, the flex modulus of the polymers is preferably in the range of about 145,000-250,000 psi (10,194-17,575 kg/cm²). High density polyethylene and polypropylene are within this range and are preferred for use herein.

While the tong-type devices of Figures 1 through 7 employ polymers whose minimum flex modulus is about 35,000 psi (2461 kg/cm²), the sheet-type devices of Figure 9 can be prepared using flexible films whose flex modulus can be substantially lower, e.g., as low as about 200 psi (14 kg/cm²). Such films can be, for example, 0.0025 to 0.0125 mm thick polyethylene, polypropylene, and the like.

The first and second treatment members on the devices herein can comprise natural or synthetic bristles, natural or synthetic sponges, absorbent pads such as cotton, rayon, regenerated cellulose, and the like, as well as the HYDRASPUN® fabric described hereinabove. Such materials are all well-known in the cleaning arts for use in conventional brushes and toothbrushes (see U.S. Patent 4,637,660) and in various cleaning utensils. Sponges, pads, and the like will typically have a thickness of from about 1 mm to about 1.25 cm and can be glued to the device. The sponges,
pads, bristled pads, etc., are typically co-extensive with substantially the entire face of the treatment member.

The protuberances herein can be in the form of blunt or rounded bristles, which may be provided uniformly across the face of the treatment member or in clusters. The protuberances can be in the form of monofilament loops, which can be circular, ovoid or elongated, or can be cut loops. The protuberances can comprise twisted fiber bundles, extruded nubs, molded finger-like appendages, animal hair, reticulated foams, rugosities molded into the face of the member, and the like. Protuberances made from monofilament fibers may be straight, twisted or kinked.

In one embodiment, the treatment member can comprise multiple components. In particular, the treatment member can comprise an absorbent base material which can be, for example, a natural or synthetic sponge, an absorbent cellulosic sheet or pad, or the like. In contact with and extending outward from this base material are multiple protrusions as disclosed above. A specific example of this embodiment is a treatment member comprising multiple looped protuberances made from monofilament fibers which protrude from a sponge base layer. In this embodiment, the absorbent base layer acts as a reservoir which feeds cleaning composition to the protuberances as the device is "pumped".

The protuberances herein are typically provided as a bed or mat which comprises multiple strands or loops which extend therefrom in the Z-direction. Convenient and familiar sources include pile carpet-type materials, paint pad-type materials, and the like. In such embodiments, the treatment member will comprise several thousand protuberances per cm². With the preferred looped protuberances herein, there will typically be 10-500, preferably about 60-150, loops per cm². The choice of the source, style and number of protuberances are matters for the manufacturer's discretion, and the foregoing illustrations are not intended to be limiting of the invention.

The protuberances should preferably extend outwardly from the face of the treatment member for a distance of at least about 1 mm. While there is no upper limit to their length, there is essentially no functional reason for the protuberances to extend more than about 1.25 cm.

The protuberances can be made from plastic, rubber or any other convenient, resilient material which is stable in the presence of the cleaning composition. Fibrous protrusions can be made from natural or synthetic fibers. Fiber diameters can typically range from 0.1 mil (0.00025 mm) to 20 mil (0.05 mm). Again, this is a matter of selection and is not intended to be limiting.
While the surface area of the treatment members can be adjusted according to the desires of the manufacturer, it is convenient for a hand-held, home-use device to have first and second treatment members whose surface areas are each in the range from about 0.75 in$^2$ (4.8 cm$^2$) to about 10 in$^2$ (64 cm$^2$).

In one highly preferred embodiment, the protuberances are in the form of a multiplicity of stiffened, ovoid looped fibers which extend outwardly from the face of the treatment members as shown in Figure 6. Such looped fibers can comprise, for example, 7 mil (0.018 mm) monofilament loops of polypropylene extending at least about 0.03 inch (0.76 mm), typically from about 2.0 mm to about 1.5 cm, outwardly from the face of a backing material. The diameter of the loops at their widest point is about 1.3 mm. A convenient material for said looped protrusions is available commercially from APLIX Inc., Number 200, Unshaved Loop, Part No. DM32M000-QY. This material comprises a nylon backing with about 420 loops per square inch (65 loops per cm$^2$) extending from its surface.

The following further describes the construction of preferred hand-operated devices of the present type, as shown in the Figures. The devices are constructed using otherwise conventional materials, bristles, sponges, pads and the like, according to the desires of the formulator. The following illustrates such construction, but is not intended to be limiting thereof.

**EXAMPLE 1**

A hand-held "pre-spotting" (i.e., spot removal) device as shown in Figure 6 is prepared using conventional plastic injection molding techniques and apparatus. The arms which comprise the connecting means (28) are fashioned from polypropylene, about 3/16 in. (0.48 cm) in thickness. The connecting means may each have a uniform width of about 0.75 in. (1.9 cm), or can be shaped to provide a more aesthetically pleasing aspect by gently narrowing the connecting means to a width of about 0.5 in. (1.27 cm) at the bend shown in the Figure. The overall length of the device is about 5 1/4 in. (13.34 cm).

The diameter of the base of each treatment member is about 1 5/16 in. (3.33 cm) and the diameter of the region of the looped protrusions extending outwardly from each treatment member is about 1 1/8 in. (2.86 cm).

Due to the angle of the bend between the arms of the connecting means and the resiliency of the polypropylene, the gap between the first and second treatment members is about 5/8 in. (1.59 cm) when the device is at rest. When squeezed by hand pressure, the gap is easily closed such that the protrusions which extend from each treatment member are brought into contact with opposite sides of the stains on the fabrics being treated.
With respect to the multiple protrusions which comprise the first and second treatment member, in this embodiment of the device the protrusions comprise stiff, looped monofilament fibers which extend from the face of each treatment member for a distance of about 2.0 mm. In a convenient mode, a source multiplicity of such looped fibers can be a sheet of the uncut, looped fibers used to prepare Velcro®-type fasteners. Sheets containing such looped fibers are available from Aplix Inc., and can simply be glued to the device.

EXAMPLE II

In another simple embodiment, a device of this invention designed for operation by simple hand pressure as shown in Figure 4 is prepared having plastic connecting means (9) and (10) pivotally connected at a hinged connection device (11) such that the device can easily be squeezed together in the manner of tongs, or the like. As shown in Figure 3, such devices can optionally comprise retaining means (7). An elastic band is convenient for this purpose. In use, the device is closed on the stained area of the fabric and the retaining means is engaged. This allows for sufficient time to pass such that the stain is loosened and removed, without need for continuous hand pressure.

EXAMPLE III

The device of Figure 9 is assembled using a piece of flexible 2 mil (0.005 mm) polyethylene. The polyethylene is folded over at each end and sealed on the outer surface of the device along the side edges to form "pockets" (51) into which the fingers and thumb of the user can be inserted to provide gripping means. A strip of absorbent substrate (52), available from the Dexter Corporation as HYDRASPUN® Grade 10244 is laid down on the inner surface of the device. Treatment members (48) and (49) are then glued onto the device as shown in the Figure, with multiple protuberances extending outwardly therefrom. The protuberances are conveniently provided by using APLIX 200 Uncut Loop or APLIX 960, both available from Aplix Inc., Charlotte, North Carolina.

While also useful as a pre-spotting step in a conventional aqueous laundering process, the overall process herein will be illustrated in its preferred aspect, which relates to dry cleaning, especially in a conventional, home, hot-air lauder dryer. This is not intended to limit the scope of the invention.

EXAMPLE IV

The first step of the overall process herein comprises pre-spotting stained areas of the fabric using a device of the present type. The second step of the overall process is conducted in a tumbling apparatus in the presence of heat. In a convenient mode a nylon container bag with the carrier/cleaning composition and
enveloping the pre-spotted fabric to be dry cleaned is sealed and placed in the drum of an automatic hot air clothes dryer at temperatures of 40°C-150°C. The drum is allowed to revolve, which imparts a tumbling action to the bag and agitation of its contents concurrently with the tumbling. By virtue of this agitation, the fabrics come in contact with the carrier containing the cleaning composition. The tumbling and heating are carried out for a period of at least about 10 minutes, typically from about 20 minutes to about 30 minutes. This step can be conducted for longer or shorter periods, depending on such factors as the degree and type of soiling of the fabrics, the nature of the soils, the nature of the fabrics, the fabric load, the amount of heat applied, and the like, according to the needs of the user.

More specifically, a dry cleaning article in sheet form is assembled using a sheet substrate and a cleaning composition prepared by admixing the following ingredients.

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>% (wt.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BPP*</td>
<td>7.0</td>
</tr>
<tr>
<td>1,2-octanediol</td>
<td>0.5</td>
</tr>
<tr>
<td>PEMULEN TR-1**</td>
<td>0.125</td>
</tr>
<tr>
<td>KOH</td>
<td>0.08</td>
</tr>
<tr>
<td>C_{12}-C_{13} EO (6.5)</td>
<td>1.0</td>
</tr>
<tr>
<td>Perfume</td>
<td>0.75</td>
</tr>
<tr>
<td>Water and minors***</td>
<td>Balance</td>
</tr>
</tbody>
</table>

*Isomer mixture, available from Dow Chemical Co.

**PEMULEN TR-2, B. F. Goodrich, may be substituted.

***Includes preservatives such as KATHON®.

A non-linting carrier sheet is prepared using stock HYDRASPUN® Grade 10244 fabric, described above. The fabric is cut into square carrier sheets, approximately 9 in (22.9 cm) x 10 in (25.4 cm), i.e., 580.6 cm² sheets.

23 Grams of the above-noted cleaning composition are evenly applied to the sheet by spreading onto the sheet with a roller or spatula using hand pressure. In an alternate mode, the cleaning composition can be applied by dipping or spraying the composition onto the substrate, followed by squeezing with a roller or pair of nip rollers, i.e., by "dip-squeezing" or "spray squeezing". The external surfaces of the sheet are damp but not tacky to the touch. The finished sheet can be folded for packaging, and when unfolded and used in the manner disclosed herein, the sheet remains in the desired unfolded configuration.

The fabric to be cleaned is visually inspected for areas with high stain levels. Such areas are moistened with cleaning composition by gently dabbing them with a
sheet article of the foregoing type. Once moist, a device of the type shown in Figure 6 is placed at the stained area, with the treatment members on either side of the fabric at the area of staining. The device is squeezed 10-30 times, slowly, to bring the illustrated looped protuberances into close contact with the fabric, thereby loosening the stain without damaging the fabric surface. The area is then again padded with the sheet article.

The pre-spotted fabric and sheet article are then placed in a flexible bag (preferably, heat and vapor resistant, most preferably prepared from nylon film). The bag is closed and sealed using a Velcro®-type fastener. Other fasteners such as nylon zipper and Zip-Lok®-type fasteners may also be used. In a typical mode, the bag will have a volume of about 25,000 cm³, which will accommodate up to about 2 kg of dry fabrics. When the fabrics and the dry cleaning sheet are placed in the bag, the air is preferably not squeezed out of the bag before closing and sealing. This allows the bag to billow, thereby providing sufficient space for the fabrics and cleaning sheet to tumble freely together. The bag is then closed, sealed and placed in a conventional hot-air clothes dryer. The dryer is started and the bag is tumbled for a period of 20-30 minutes at a dryer air temperature in the range from about 40°C to about 150°C. During this time, the sheet comes into close contact with the fabrics. After the machine cycle is complete, the bag and its contents are removed from the dryer, and the spent dry cleaning sheet is discarded. The nylon bag is retained for reuse. The fabrics are cleaned and refreshed. The water present in the cleaning composition serves to minimize wrinkles in the fabrics. Excellent overall cleaning is secured when from about 3 g to about 50 g of the preferred cleaning compositions herein are used per kilogram of fabric being cleaned.

Thus, an overall pre-spotting and dry cleaning process is provided which comprises a pre-spotting operation employing a device of the present type on stained areas of the fabric, said overall process comprising the steps of:

(a) applying a cleaning composition to said stained area;
(b) placing the stained area of said fabric in the gap between the first and second treatment members of said device;
(c) closing said gap by the application of force (preferably, intermittent force, e.g., a pumping action in the Z-direction) to said device such that said members come in contact with opposite sides of the fabric and normal to the plane of the fabric;
(d) removing the fabric from the device;
optionally, contacting (preferably by gentle padding) the fabric from step (d) with a carrier which releasably contains the cleaning composition;

(f) placing the fabric together with the carrier containing the cleaning composition in a bag;

(g) sealing the bag;

(h) placing the bag in a hot air clothes dryer and operating the dryer with heat and tumbling; and

(e) removing the fabric from the bag.

It is to be understood that Step (a) and (b) can be accomplished simultaneously or consecutively.

EXAMPLE V

The following illustrates a typical dry cleaning kit herein, but is not intended to be limiting thereof.

A dry cleaning kit is assembled packaging a re-usable pre-spotting device as disclosed herein, multiple (typically; 5-10) single use dry cleaning sheets of the type described herein, together with a sealable, reusable heat-resistant container bag, in a package comprising a conventional cardboard box suitable for retail sales. In an alternate mode, the articles may be in the form of spheres or polyhedra.

EXAMPLE VI

A dry cleaning composition with reduced tendency to cause dye "bleeding" or removal from fabrics as disclosed above is as follows.

<table>
<thead>
<tr>
<th>INGREDIENT</th>
<th>PERCENT (wt.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(RANGE)</td>
<td></td>
</tr>
<tr>
<td>Butoxypropoxy propanol (BPP)</td>
<td>7.000</td>
</tr>
<tr>
<td>NEODOL 23 - 6.5*</td>
<td>0.750</td>
</tr>
<tr>
<td>1,2-Octanediol</td>
<td>0.500</td>
</tr>
<tr>
<td>Perfume</td>
<td>0.750</td>
</tr>
<tr>
<td>Pemulen TR-1</td>
<td>0.125</td>
</tr>
<tr>
<td>Potassium Hydroxide (KOH)</td>
<td>0.060</td>
</tr>
<tr>
<td>Potassium Chloride</td>
<td>0.075</td>
</tr>
<tr>
<td>Water (distilled or deionized)</td>
<td>90.740</td>
</tr>
</tbody>
</table>

Target pH = 7.0

*Shell; C_{12}-C_{13} alcohol, ethoxylated with average EO of 6.5.

The composition of Example VI is employed in the manner disclosed above to pre-spot, clean and refresh soiled fabrics. Nylon VELCRO®-type, ZIP-LOK®-type and/or zipper-type closures can be used to seal the bag, in-use.
Besides the optional nonionic surfactants in the cleaning compositions herein, which are preferably C₈-C₁₈ ethoxylated (E01-15) alcohols or the corresponding ethoxylated alkyl phenols, the compositions can contain enzymes to further enhance cleaning performance. Lipases, amylases and protease enzymes, or mixtures thereof, can be used. If used, such enzymes will typically comprise from about 0.001% to about 5%, preferably from about 0.01% to about 1%, by weight, of the composition. Commercial detergents such as LIPOLASE, ESPERASE, ALCALASE, SAVINASE and TERMAMYL (all ex. NOVO) and MAXATASE and RAPIDASE (ex. International Bio-Synthesis, Inc.) can be used.

If an antistatic benefit is desired, the compositions used herein can contain an anti-static agent. If used, such anti-static agents will typically comprise at least about 0.5%, typically from about 2% to about 8%, by weight, of the compositions. Preferred anti-stats include the series of sulfonated polymers available as VERSAFLEX 157, 207, 1001, 2004 and 7000, from National Starch and Chemical Company.

The compositions herein can optionally be stabilized for storage using conventional preservatives such as KATHON® at a level of 0.001%-1%, by weight.

It is to be understood that the devices of the present invention can be manufactured using various materials which inexpensively, yet effectively, provide the desired function. Thus, the connectors ("connecting means") used herein can be manufactured from elongated pieces of plastic which form the "arms" of the device. The plastic can be sufficiently resilient that the jaws of the device resume their original shape after the lateral, compressive forces which are applied during operation of the device have been released. The connector arms are preferably sufficiently rigid that there is substantially no movement in the XY plane of the fabric when the device is being used in the present process. Likewise, the first and second treatment members can be manufactured separately and affixed to the connectors, or can be molded as an integral part of the connectors using conventional molding techniques. The treatment members can comprise a multi-layer composite comprising a sponge-like, resilient backing material for a fibrous layer having multiple fibrous elements extending outwardly therefrom. Such composites can be permanently or semi-permanently affixed to the treatment members using glue or other conventional means, and, typically, are substantially co-extensive with the face of the treatment member. Such composites can be made from conventional materials, e.g., using a sponge, foam or other absorbent base pad material from about 0.5-20 mm thickness and a layer of fibers such as a conventional painter's pad with fibers having a length of from about 0.05 mm to about 20 mm.
As can be seen from the foregoing, the devices of the present invention can be assembled using otherwise conventional materials and manufacturing techniques. Other means for assembling and using the devices herein may be employed within the scope of the invention.
1. A device for spot cleaning fabrics, comprising:
   (a) a first treatment member;
   (b) a second treatment member; and
   (c) movable connector for movably joining said first member (a) and
       second member (b) in face-to-face relation.

2. A device according to Claim 1 wherein the connector comprises a first
   element affixed to said first member and a second element affixed to said second
   member, said first element being associated with said second element, such that the
   application of force to said connector causes said first member and said second
   member to move toward each other in face-to-face relationship.

3. A device according to Claim 1 wherein said first member comprises
   multiple downward-facing protrusions.

4. A device according to Claim 3 wherein said second member comprises
   multiple upward-facing protrusions.

5. A device according to Claim 4 wherein the protrusions on member (a)
   comprise natural or synthetic fibers, and wherein the protrusions on member (b)
   comprise natural or synthetic fibers.

6. A device according to Claim 1 wherein said first and second members
   comprise multiple protrusions in the form of looped fibers.

7. A device according to Claim 1 which additionally comprises a
   reservoir for a cleaning composition.

8. A method for removing stains from a stained area of fabrics using a
   device according to Claim 1, comprising the steps of:
   (a) applying a cleaning composition to said stained area;
   (b) placing the stained area of said fabrics in the gap between the first and
       second treatment members of said device;
   (c) closing said gap by the application of force to said device such that
       said members come in contact with opposite sides of the fabric; and
   (d) removing the fabric from the device.
9. A process according to Claim 8 wherein step (c) involves the intermittent application of force on the device.

10. An overall dry cleaning process for treating a stained area of fabric, which comprises a pre-spotting operation employing a device according to Claim 1 comprising the steps of:

(a) applying a cleaning composition to said stained area;
(b) placing the stained area of said fabric in the gap between the first and second treatment members of said device;
(c) closing said gap by the application of force to said device such that said members provide contact with opposite sides of the fabric; and
(d) removing the fabric from the device;
(e) optionally, contacting the fabric from step (d) with a carrier which releasably contains the cleaning composition;
(f) placing the fabric together with the carrier containing the cleaning composition in a bag;
(g) sealing the bag;
(h) placing the bag in a hot air clothes dryer and operating the dryer with heat and tumbling; and
(e) removing the fabric from the bag.
INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 A47L25/08 D06F43/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED
Minimum documentation searched (classification system followed by classification symbols)
IPC 6 A47L D06F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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<th>Relevant to claim No.</th>
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<td>CH,A,309 153 (A. DUTTO) 1 November 1955 see page 1, lines 1 - 3, 36 - 67 see page 2, line 34 - line 68 see figures 3,4</td>
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  'O' document referring to an oral disclosure, use, exhibition or other means
  'P' document published prior to the international filing date but later than the priority date claimed

'Date of the actual completion of the international search
14 November 1996

Date of mailing of the international search report
29.11.96

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