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2,947,016

CLEANING AND POLISHING CLOTH

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No Drawing. Filed Apr. 8, 1957, Ser. No. 651,175

6 Claims. (Cl. 15—209)

This application relates to a cleaning and polishing cloth for cleaning and polishing surfaces and, more particularly, relates to a cleaning cloth especially adapted for cleaning and polishing glass surfaces including windshields, windows and the like.

A satisfactory cleaning and polishing agent or cleaning and polishing cloth for surfaces must be characterized by maximum cleansing ability and freedom from scratching of the surface upon which it is employed. Moreover, where a cleaning cloth is to be employed to clean a wet surface the cloth must also be highly absorbent in order to both clean and dry the surface. Ideally, such a cloth will also be characterized by the ability to rid itself of substantial quantities of moisture by evaporation between periods of use. These necessary characteristics are of paramount importance if the surface to be cleaned and/or polished is a glass or other transparent surface, scratching or smearing of which adversely affects either its appearance or function.

The prior art suggests various types of glass cleaning agents, including cloth and paper impregnated with materials which will assist in the removal of dirt and other incrustations from the surfaces to be cleaned. Particularly with respect to the cleaning of windshields, which especially during the summer months become incrustated with maimed and/or deceased insects as well as the usual dirt, road film and debris, the art has faced a difficult problem in developing a highly absorbent cleaning or wiping cloth which rapidly will remove dirt and moisture from the surface without damaging the surface of the windshield or leaving vision-impairing films and streaks.

Specifically, the prior art has suggested the use of fabric and paper impregnated with silica as a cleaner for both metals and glass. This art has taught that the silica employed need not have a particle size of less than about 300–400 mesh in order to prevent scratching of glass surfaces, and, moreover, that the use of silica of a particle size less than 300–400 mesh dusts out of the cloth or paper and is, therefore, undesirable. In addition, the prior art has taught that a humective material such as glycerine or other polyhydric alcohol should be employed in conjunction with the silica either to prevent dusting or to promote the gathering of moisture by the cloth or paper, thus making it unnecessary to moisten the glass or other surface prior to the cleaning operation.

Silica impregnated cloth and paper, as taught by the prior art, has never been successfully employed. The silica has not been satisfactorily retained by the cloth or paper and the humective materials have been highly undesirable in that they have caused streaking and blurring of the glass or other surface. Moreover, the presence of the humective has adversely reduced the absorbing capacity of the cloth and thus adversely limited the amount of surface which could be cleaned and suitably dried with a cloth of given size. Additionally, the humective considered essential by the prior art has pre-

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vented rapid evaporation of water from the cloth between periods of use, which fact has also curtailed repeated use in glass cleaning operations.

For a commercial cleaning or wiping cloth to be practical, it must also possess sufficient strength to permit not only repeated use but must be able to endure repeated laundering and treating processes. No prior art cleaning cloth has possessed in commercially acceptable degree most or all of the desired characteristics above enumerated.

In view of these and other deficiencies of prior art cloths for cleaning glass or other surfaces, a primary object of the present invention is a cloth which will efficiently clean surfaces, particularly glass surfaces, without scratching or marring such surfaces.

A further object of the invention is a cloth which will efficiently clean glass and other surfaces and which is highly absorbent.

An additional object of the invention is a cloth for cleaning glass and similar surfaces which is highly absorbent but which also permits rapid evaporation of moisture between periods of use.

A further object of the invention is a cloth for cleaning glass and other surfaces which is not dust-producing and which does not deposit dust or lint on the surface to be cleaned.

Another object of the invention is a cleaning cloth combining the desired cleaning and absorbency characteristics together with sufficient strength and wearability to endure many cycles of use, laundering and retreatment.

In accordance with the present invention, it has been discovered that one or more of the foregoing objects may be achieved by impregnating a particular type of cloth with silica of colloidal dimensions.

Generally described, one embodiment of the present invention consists of a highly moisture absorbent cloth for cleaning surfaces, and particularly glass surfaces, which comprises a fabric of cellulosic material having a ratio of filling to warp of between 77 to 23 and 50 to 50, woven from yarn characterized by a range of twist multiplier of from about 2.25 to about 5.00 and impregnated with colloidal silica. It is preferred to employ a range of twist multiplier for the filling of from about 2.25 to about 3.90 and for the warp, a range of from about 3.90 to about 5.00.

In accordance with the present invention, it has been determined that in order to obtain a cloth having the necessary strength to endure repeated washing and treatment, the essential absorbency characteristics, and the ability satisfactorily to retain silica of colloidal dimensions without dusting, the ratio of filling to warp in the cloth should fall between 77 to 23 and 50 to 50. Moreover, it has been found that to accomplish these results the yarn employed in weaving the cloth should be characterized by a range of twist multiplier of from about 2.25 to about 5.00¹. In the preferred embodiment of the invention, the preferred ratios of filling to warp and the preferred ranges of twist multiplier for filling and warp will be employed.

To be operable in the present invention, the silica employed must be characterized by colloidal dimensions. In general, silica operable in the invention will be characterized by a particle size of less than about 275 to about 300 millimicrons. In the preferred embodiment of the invention the silica will be characterized by a particle size of between about 10 and about 250 millimicrons. The amount of silica employed to impregnate the cloth will depend largely upon the amount of mild

¹ Twist multiplier is a constant which when multiplied by the square root of the yarn number will give the number of turns per inch desired in the yarn.

abrasiveness desired. In general, however, the cloth of the invention will contain from about 1 to about 15% by weight of colloidal silica. If less than 1% silica is employed, insufficient cleaning action is obtained while if more than about 15% of colloidal silica is employed, there is a progressively increasing tendency toward dusting. Preferably from about 4 to about 7% of colloidal silica will be employed for the windshield cleaning cloths which constitute the preferred embodiment of the present invention.

The impregnated fabrics of the present invention may be produced in a number of ways known to the art for impregnating cloth with particulate material. For example, the colloidal silica, usually produced and sold in the form of a silica sol, may be added in sufficient quantity to a bath and the cloth to be treated or impregnated immersed in the bath and then dried by suitable means to deposit the desired amount of silica. For example, sufficient silica sol may be added to a water bath to provide the amount of silica desired in the cloth. The cloth may be immersed to saturate the material with the treating liquid and then passed through padding or squeeze rolls set for complete or substantially complete pickup. The partially dehydrated fabric may then be dried by any conventional drying means or apparatus at any temperature below that which will damage the cloth employed.

In the most economical and the preferred treatment, however, it is desired to exhaust the colloidal silica on the fabric from a suitable treating bath. In the known exhaustion process an exhausting agent such as a water soluble inorganic salt, for example, aluminum sulfate, aluminum chloride, and the like, is added to the bath and the temperature of the bath is then raised to accelerate the action of the exhausting agent. Preferably an exhausting agent is employed of a type and in an amount sufficient to maintain a pH in the treating solution between about 3.5 and about 7.5. In this manner the silica, through the activity of the exhausting agent, is completely exhausted from the solution onto the fabric. When the exhaustion of silica on the fabric has been substantially complete, the bath is dropped, and the towels are centrifuged and then dried at elevated temperature. Temperatures above the boiling point of water are not required if sufficient time is taken in the drying procedures. However, it is desired to use a temperature above 212° F. in order to expedite the drying process. Obviously, temperatures which will have a deleterious effect on the fabric being treated will not be employed.

Having generally described the invention, the following examples are given for purposes of specific illustration:

Example I

Thirty seven hundred and fifty cotton towels, weighing 340 pounds were placed in a Miller wash wheel measuring 54 inches by 60 inches. The towels employed were characterized by a ratio of filling to warp of 70 to 30 woven from a yarn wherein the twist multiplier of the warp was 4.50 and of the filling was 3.50. One hundred and thirteen gallons of water were run into the wheel to produce a saturated cold water level of about 12 inches. With the wheel running, 6.82 pounds of aluminum sulfate in 3 gallons of cold water was added. After ten minutes, seven gallons of a 30% solution of colloidal silica having a particle size averaging about 17 millimicrons was added over a period of five minutes. The running of the wheel was continued for five minutes, after which steam was introduced into the wheel until the temperature of the bath reached 130° F. After an additional eight minutes, the wheel was stopped, the bath was dropped and the treated towels were centrifuged for six minutes. The towels were then tumble dried in a conventional drier at a temperature of about 220° F. The resulting towels were impregnated with about 6% by weight of silica and exhibited no dusting whatsoever.

Example II

Towels processed in accordance with the procedure of Example I were tested at a busy metropolitan filling station to determine their utility as a windshield cleaning cloth. The windshields were initially moistened with water sprayed from an atomizer squeeze bottle and were then rubbed briskly with the treated towel. It was found that the windshields were cleaned efficiently without any scratching, smearing or streaking whatsoever and that the towel was highly absorbent. It was found that each towel could be employed by a single attendant in the normal course of filling station operations for an average of from 16 to 20 windshields before the towels became too dirty for further use. No film, dust or lint was left on the windshields cleaned with the towels of the invention. Under similar conditions the conventional paper towel employed by filling stations was found to become water saturated and useless after use in cleaning a single windshield.

Example III

The process of Example I was repeated in laboratory scale equipment of a size permitting treatment of 10 towels. However, a treating bath having the same relative concentrations was employed. In this instance, the silica employed had a particle size of about 2 millimicrons. A test similar to that of Example II indicated that identical results were obtained with silica of this particle size.

Example IV

The procedure of Example I was repeated in laboratory scale equipment of a size permitting treatment of 10 towels. However, a treating bath having the same relative concentrations was employed. In this instance colloidal silica having a particle size averaging between 80 and 240 millimicrons was employed. Again, substantially identical results were obtained when these towels were employed for cleaning windshields under conditions similar to those set forth in Example II.

Example V

The process of Example I was repeated in laboratory scale equipment of a size permitting treatment of 10 towels. However, a treating bath having the same relative concentrations was employed. In this instance towels in accordance with the invention containing 75% cotton and 25% rayon were treated. It was found that these towels were equal to the cotton towels in their cleaning ability and freedom from dust. A mixed cotton and rayon fabric exhibits materially increased absorbency as compared to a straight cotton towel and thus is desirable to permit cleaning of an increased surface area with a single towel.

Example VI

The procedure of Example V was repeated employing colloidal silica having a particle size of about 2 millimicrons and the towels were again tested for their ability to clean automobile windshields. Results substantially identical to those of Example V were obtained.

Example VII

The procedure of Example V was again repeated, this time employing silica having a particle size ranging between 80 and 240 millimicrons. When employed in cleaning windshields as in Example II, the treated towels again produced the same results as in Example V.

The enhanced absorbency exhibited by the treated cloth of the invention is due to the nature of the cloth itself as previously described and also to the increased adsorbency due to the colloidal size of the silica employed. In other words, the higher specific surface of the smaller particles greatly increases the amount of moisture which can be absorbed by the treated cloth. The ability to use colloidal particle sizes without dusting previously experienced by the art appears to be due to the

nature of the construction essential to the fabric operable in the invention. The improved cleaning action of the treated cloth of the invention is due, therefore, to the mild abrasive action of the colloidal silica, the increased surface area due to the particle size of the silica, and the increased absorbency of the cloth resulting from the nature of the cloth itself and the high specific surface of the colloidal silica.

Wetting agents and similar materials employed by the prior art to increase the rate of depositing of particulate materials from solution or suspension may be employed in treating fabric in accordance with the invention but are not preferred since most of such wetting agents cause streaking of the glass surface as do the humective materials deemed essential by the prior art.

Since modifications of the invention will doubtless occur to those skilled in the art, it is intended that this invention shall be limited only by the scope of the appended claims.

What is claimed is:

1. A highly moisture absorbent cloth for cleaning surfaces which comprises a fabric of cellulosic material having a ratio of filling to warp of between 77 to 23 and 50 to 50, woven from yarn characterized by a range of twist multiplier of from about 2.25 to about 5.00, and impregnated with colloidal silica.

2. A highly moisture absorbent cloth for cleaning surfaces which comprises a cotton cloth having a ratio of filling to warp of between 77 to 23 and 50 to 50, woven from yarn characterized by a range of twist multiplier of from about 2.25 to about 5.00, and impregnated with from about 1 to about 15% by weight of colloidal silica.

3. A highly moisture absorbent cloth for cleaning surfaces which comprises a cloth composed of a blend of cotton and rayon and having a ratio of filling to warp of between 77 to 23 and 50 to 50, woven from yarn characterized by a range of twist multiplier of from about

2.25 to about 5.00, and impregnated with from about 1 to about 15% by weight of colloidal silica.

4. A highly moisture absorbent cloth for cleaning surfaces which comprises a fabric of cellulosic material having a ratio of filling to warp of between 77 to 23 and 50 to 50, woven from yarn characterized by a range of twist multiplier of from about 2.25 to about 5.00, and impregnated with from about 1 to about 15% by weight of colloidal silica having a particle size of from about 10 to about 250 millimicrons.

5. A highly moisture absorbent cloth for cleaning surfaces which comprises a cotton cloth having a ratio of filling to warp of between 77 to 23 and 50 to 50, woven from yarn characterized by a range of twist multiplier of from about 2.25 to about 5.00, and impregnated with from about 1 to about 15% by weight of colloidal silica having a particle size of from about 10 to about 250 millimicrons.

6. A highly moisture absorbent cloth for cleaning surfaces which comprises a cloth composed of a blend of cotton and rayon and having a ratio of filling to warp of between 77 to 23 and 50 to 50, woven from yarn characterized by a range of twist multiplier of from about 2.25 to about 5.00, and impregnated with from about 1 to about 15% by weight of colloidal silica having a particle size of from about 10 to about 250 millimicrons.

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