

UNITED STATES PATENT OFFICE.

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PURIFYING DRY-CLEANING SOLVENT.

No Drawing. Application filed September 30, 1926, Serial No. 138,809, and in Great Britain December 31, 1925.

This invention relates to improvements in dry cleaning, by which term I include wool scouring by means of solvents, and has for its object to provide an improved process for clarifying and dehydrating the soiled solvent in the washing machines.

Hitherto the solvent used for this purpose has been clarified and dehydrated by various means such as processes of filtration, the use of centrifugal separators, or dissociation, or precipitation by various chemical reagents. Tests have shown, however, that in no cases is the effluent perfectly free of moisture and foreign matter. For example, experiments carried out with centrifugal separators have shown that not all of the suspended impurities and moisture are removed but that a gelatinous residue remains formed by the moisture in the goods being cleaned emulsifying with a percentage of the soaps and oils liberated and in many cases with the soap used in dry cleaning. This residue holds finely divided solid matter in the colloidal state and it is impossible to remove it by mechanical means.

It has been proposed in a process of removing oily ink from material containing the same by means of a solvent, such as benzine, to pass the soiled solvent into a tank in which it is treated with a substance such as clay, infusorial earth, carbon, and the like. The solvent is then passed to a filter press and the filtrate is run into a still where it is evaporated, the heavy oil in the solvent being recovered while the solvent itself is condensed and passed to a storage tank.

I have now found that if, in the process of dry cleaning, the soiled solvent is treated with a finely divided porous cellular silica (hereinafter referred to as filter aid) of a sufficiently low specific gravity and the solvent containing the particles of the said filter aid in suspension is passed to a filter, the filtrate is substantially free of moisture and foreign matter and can be passed back to the washing machine in a continuous cyclic process.

Further, the rate at which the solvent is passed through the washing machine can be increased to such an extent that once in every five minutes or less the bath is changed, by which I mean, a volume of sol-

vent equal to the volume of the bath is run into and removed from the washing machine while the working level of the solvent in the washing machine is always maintained. It is essential, that the filter aid in addition to being of low specific gravity, should be sufficiently porous to maintain the emulsions and suspended dirt in a porous state when held against the filter. The specific gravity of the filter aid should not be substantially more than about 12 pounds per cubic foot (that is to say not more than 3 or 4 pounds in excess of 12 pounds per cubic foot), calculated on the wet process, i. e., from the volume occupied by the material after mixing it with water and allowing it to stand for 12 hours, or alternatively when the filter aid is gently sifted through air into a box of known capacity and the excess scraped off without tamping. Distillation, or other equivalent processes are not required until the solvent becomes overladen with oils, soaps and other fatty matters in solution. The process may be carried out in the following manner.

The soiled articles of clothing, or the like, to be dry cleaned are placed in a washing machine to which is added the solvent and soap necessary for the cleaning of such goods. The machine is set in motion by any ordinary means and the soiled solvent is withdrawn from the washing machine and delivered to an agitating tank in which suitable filter aid in accordance with this invention is placed. As hereinbefore mentioned a preferred type of filter aid is described in British Patents Nos. 229,021 and 234,735. This is agitated with the dirty solvent which is then pumped to a filter press where the filter aid together with the dirt and emulsions are retained. Such filter aid as has been mentioned has also the property of absorbing moisture from the dry cleaning solvents and dehydrating the same. It may be used in conjunction or admixed with finely divided decolorizing carbons or vegetable charcoals which assist in removing minute traces of colouring matters in solution. The decolorizing medium may be such as to absorb the coloring material or to cause it to flocculate. The solvent after it has been passed through the filter press is

then ready to be returned to the washing machine. The washing machine, agitator or mixing vessel, pump and filter press are in continuous connection so that the dirty solvent passes out of the washing machine, is mixed with the filter aid, pumped to the press and returned to the washing machine in such a manner that the washing machine during the washing process is kept continuously flushed with clear solvent at such a rate that the bath in the washing machine is changed say six times within a washing cycle which will usually take from 10 to 20 minutes. In order to assist in maintaining a porous mass in the filter press the salts or hydroxides of the alkaline metals including such reagents as caustic potash, caustic soda or ammonia, the carbonates of potash, soda or ammonia or other chemicals such as aluminate of soda, or silicate of soda may be continuously agitated or mixed with the solvent before or after the addition of the filter aid and are subsequently neutralized by inorganic acids such as sulphuric acid. Alternatively the dirty solvent (before or after the addition of the filter aid) may be treated with sulphonated oils such as those referred to in British patent specification No. 176,540. These reagents have the action of suspending materials and causing the immediate flocculation of the foreign bodies contained in the solvent, and maintaining them in a more porous state.

Instead of the use of an agitating tank the filter aid may be run or pumped continuously during the process into a pipe line along which the solvent passes from the washing machine to the filter press and such pipe line may be suitably designed to assist in the thorough mixing of the filter aid and any reagents that may be employed with the solvent.

The solvent on re-entering the washing machine is then substantially free of all impurities and is in a somewhat similar condition to that when entering the machine at the commencement of the operation, except that soluble matters which are added or extracted from the goods during the cleaning operation remain in solution. The solution of solvent and soap may be used repeatedly for subsequent operations until such time as there is a surcharge of soluble matters when distillation or equivalent treatment becomes necessary. The fatty acids of the solvent soaps can be recovered and refined and used over again or employed for other purposes.

The filter press used in accordance with this invention should be fed by a pump, or pumps, in such manner that a constant rate of flow is maintained through the washing machine, or where a number of washing machines are used, arrangements should be made to secure a substantially constant flow

through each washing machine. The filter should be so proportioned that the pressure does not rise to an extent necessitating cleaning until a conveniently large number of washings have been performed. The solvent remaining in the cake taken off the filter may be removed by blowing with air, or a convenient vapour or gas.

In large plants, where a number of filter presses are used the cake may be rapidly blown or washed down and removed from the main press, and mixed up and fed to another press for final drying, in order to allow the main press to work with a minimum of lost time. In such cases, self discharging presses may be used for the main press, but in general any known type of pressure filter may be employed.

It will be seen that according to this invention, at the end of the operation, the soiled solvent soap solution removed from the washing machine is completely dehydrated and all colloidal suspensions removed. The time for the operation may vary from 10 to 30 minutes, according to the amount and quality of the filter aid and the reagents used and the capacity of the filter-press employed. Further, each cleaning operation is conducted in a shorter time and since the same solvent and soap solution can be used over again for a much larger number of times there is effected a great economy of both solvent and soap.

What I claim is:—

1. A process for clarifying and dehydrating the soiled solvent of washing machines used for dry cleaning, consisting in withdrawing the soiled solvent from the washing machine, adding to the soiled solvent finely divided porous cellular silica of low specific gravity, passing the solvent containing particles of said silica in suspension to a filter, there filtering the solvent, and then returning the filtered solvent to the washing machine in a continuous cyclic process.

2. A process for clarifying and dehydrating the soiled solvent of washing machines used for dry cleaning, consisting in withdrawing the soiled solvent from the washing machine, adding to the soiled solvent finely divided porous cellular silica of low specific gravity, passing the solvent containing particles of said silica in suspension to a filter, there filtering the solvent, and then returning the filtered solvent to the washing machine in a continuous cyclic process, the rate of passing the solvent through the washing machine being adapted to change the bath at least once in every five minutes.

3. A process for clarifying and dehydrating the soiled solvent of washing machines used for dry cleaning, consisting in withdrawing the soiled solvent from the washing machine, adding to the soiled solvent finely divided porous cellular silica of low specific

gravity, also adding to the soiled solvent a reagent adapted to cause immediate flocculation of the foreign bodies contained in the solvent; passing the solvent containing particles of said silica in suspension to a filter, there filtering the solvent, and then returning the filtered solvent to the washing machine in a continuous cyclic process.

4. A process for clarifying and dehydrating the soiled solvent of washing machines used for dry cleaning, consisting in withdrawing the soiled solvent from the washing machine, adding to the soiled solvent finely divided porous cellular silica of low specific gravity and a decolorizing medium, passing the solvent containing particles of said silica in suspension to a filter, there filtering the solvent, and then returning the filtered solvent to the washing machine in a continuous cyclic process.

5. A process for clarifying and dehydrating the soiled solvent of washing machines used for dry cleaning, consisting in withdrawing the soiled solvent from the washing machine, adding to the soiled solvent finely divided porous cellular silica of low specific gravity and decolorizing carbon, passing the solvent containing particles of said silica in suspension to a filter, there filtering the solvent, and then returning the

filtered solvent to the washing machine in a continuous cyclic process.

6. A process for clarifying and dehydrating the soiled solvent of washing machines used for dry cleaning, consisting in withdrawing the soiled solvent from the washing machine, adding to the soiled solvent finely divided porous cellular silica of low specific gravity and decolorizing carbon, also adding to the soiled solvent a reagent adapted to cause immediate flocculation of the foreign bodies contained in the solvent, passing the solvent containing particles of said silica in suspension to a filter, there filtering the solvent, and then returning the filtered solvent to the washing machine in a continuous cyclic process.

7. A process for clarifying and dehydrating the soiled solvent of washing machines used for dry cleaning, consisting in withdrawing the soiled solvent from the washing machine, passing the soiled solvent to a filter, there filtering the solvent, returning the filtered solvent to the washing machine in a continuous cyclic process, and during the process adding finely divided porous cellular silica to the soiled solvent.

In testimony whereof I have signed my name to this specification.

ARTHUR EDWARD HATFIELD.

CERTIFICATE OF CORRECTION.

Patent No. 1,704,604.

Granted March 5, 1929, to

ARTHUR EDWARD HATFIELD.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 1, line 72, after the word "tamping" insert the sentence "A very suitable type of filter aid for use according to this invention is described in British patents Nos. 229,021 and 234,735"; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 2nd day of April, A. D. 1929.

(Seal)

M. J. Moore,
Acting Commissioner of Patents.

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