

UNITED STATES PATENT OFFICE

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FILTERING MATERIAL

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This invention relates to dust bags for suction cleaners, and more particularly to bags formed of paper or similar fibrous material for filtering the dust and other particles from the air passing through the cleaner.

While cloth, of various kinds, has been found to act as an efficient filtering medium, it is comparatively expensive, in time it becomes somewhat clogged by the dust particles, and it cannot be thoroughly and frequently cleaned without impairment of its filtering qualities. It has been heretofore suggested that paper be used as the filtering medium for this purpose, so that when the bag becomes clogged it may be destroyed, and replaced by a new one at comparatively small cost. The life of paper bags, however, has been found to be prohibitively short because of the lack of tensile strength and lack of resistance to abrasion and folding, the paper either tearing or becoming so weakened as to permit a considerable amount of dust to leak through at those points where the bag is folded or where it rubs on the carpet when the handle of the cleaner is lowered. It is not only essential that a dust bag be of reasonably long life without tearing, but also that its filtering efficiency remain uniform throughout the area of the bag, in spite of the repeated flexing at the folds and at the neck of the bag as it is inflated and deflated, and that its effect in maintaining a definite back pressure upon the suction means remain substantially constant throughout its life without permitting any leakage of dust particles and without varying widely in filtering efficiency by reason of clogging.

One of the objects of the invention is to provide a paper dust filtering bag which will be of requisite strength and endurance and will be at the same time efficient. A further object is to provide a bag for this purpose which can be economically manufactured and which will retain the necessary characteristics throughout its life without material variation, in spite of the flexing and abrasion and the subjection to widely varying conditions of temperature and moisture incident to use. Still further objects will be apparent from a reading of the following specification.

In accordance with the invention, the bag is formed of air-porous paper the fibers of which are so arranged as to give it greater strength lengthwise of the bag, and which is strengthened and toughened by the use of a slight amount of rubber latex, the effect of which is to form a thin permanently plastic coating upon the individual fibers of the paper and so render them more flexible and impervious to moisture. The latex is preferably incorporated in the paper at the time it is manufactured, a water dispersed solution of latex being added to the paper pulp in the beater and, after it has been thoroughly mixed into the pulp, coagulated by the addition of alum, acetic acid, aluminum sulphate, or any other substance which has a low hydrogen ion concentration in water solution as a coagulant, just before the pulp passes from the beater to the paper making machine.

The paper pulp is preferably relatively long manila hemp fiber and rubber is added, in the form of latex, to the amount of approximately eight per cent of the dry paper pulp, by weight. Commercial unvulcanized latex is preferably used, and contains approximately 30% of rubber by weight, the water dispersed solution being kept slightly alkaline, usually by the use of a slight amount of ammonia. If alum is used as the coagulant, the amount required is somewhat less by weight than that of the rubber. For instance, a normal beater charge may consist of:

	Pounds	
Pulp (dry weight)	1200	
Water	26000	
Commercial latex	320	
Alum	75 to 100	

It is frequently desirable to add a suitable dye to the pulp mass, and the alum will set the dye and also act as a coagulant of the latex, but it will be understood that other coagulants can be used if desired. While the amount of alum required varies somewhat with the characteristics of the pulp and the commercial latex used, alum or other coagulant may be added to the beater until the water which is squeezed from a handful of pulp is clear and shows no signs of dye bleed-

ing, or the coagulant may be added until the batch is no longer alkaline.

If desired the latex may be first vulcanized in the water dispersed solution, and such solution or colloidal suspension of the rubber in vulcanized form may be used in place of the unvulcanized commercial latex solution. In such case a suitable coagulant would also be added, preferably after considerable heating and thorough mixing of the latex with the pulp in beater, and the amount of the vulcanized latex solution would be regulated to provide rubber to the amount of approximately 8% of the weight of the dry pulp.

In either case the pulp passes from the beater through the usual processes for production of a loosely matted air-porous paper having a thickness of approximately eight thousandths of an inch and uncalendered. It is desirable that, in the finished bags, more of the individual fibers in the felted mat should run lengthwise of the bag than in the transverse direction. If the paper is made on a Foudrinier machine this difference of strength in the direction of the machine run and the transverse direction can be somewhat modified by controlling the operation of the "shaker", and if a cylinder machine is used the difference in strength in the two directions usually will be adequate without utilizing agitator blades in the vats or shake cylinders.

By thus treating the paper during its manufacture a considerable economy is effected, since blanks may be cut from the paper web and fashioned into bags, and the uniformity of the product will also be assured. However, if desired, the paper may be treated after manufacture, or may be first fashioned into bags and the finished bags similarly treated with a water-dispersed solution, formed by mixing commercial unvulcanized latex or a water dispersed solution of vulcanized latex with approximately an equal amount of water. In such case also alum or other coagulant would be used and, since the fibers are dry when the latex is applied, the coagulated latex effects approximately an 8% increase of weight of the dry treated bag over the untreated bag. It will be apparent that the amount of water mixed with the commercial unvulcanized latex or with a water dispersed solution of vulcanized latex can be readily varied to obtain the desired proportion of rubber content by weight in the finished product, which is preferably dried at a temperature of approximately 75° F.

The bag blanks are so cut from the roll of material that their longitudinal dimension will be lengthwise of the paper web, so as to be strongest in the direction of their length.

Since failure of paper bags used with suction cleaners occurs, almost without exception, at the neck of the bag within a few inches of the lower end, the treatment with the raw

or vulcanized latex solution may be confined to the neck, or to the neck and the areas adjacent the folds of the bag, such treatment being preferably carried out by dipping the neck or the folded edges, or both into, or by spraying or painting them with the latex and coagulant solutions.

By the treatment described a relatively thick loosely matted and exceedingly tough sheet of paper can be produced without materially reducing the porosity. The coating of the individual fibers increases the flexibility and the resistance to changes of temperature and humidity, without closing up the interstices between the fibers, so that the filtering efficiency is retained and remains constant throughout the life of the bag, and the life of the bag is greatly prolonged.

The invention having been thus described, what is claimed is:

A dust separating bag for use with a suction cleaner comprising an air-porous fibrous sheet the fibers of which have a coating of latex and which has greater strength longitudinally than transversely of its length.

Signed at North Canton, in the county of Stark, and State of Ohio, this 16th day of September A. D. 1929.

WALTER C. DAVIDSON.