

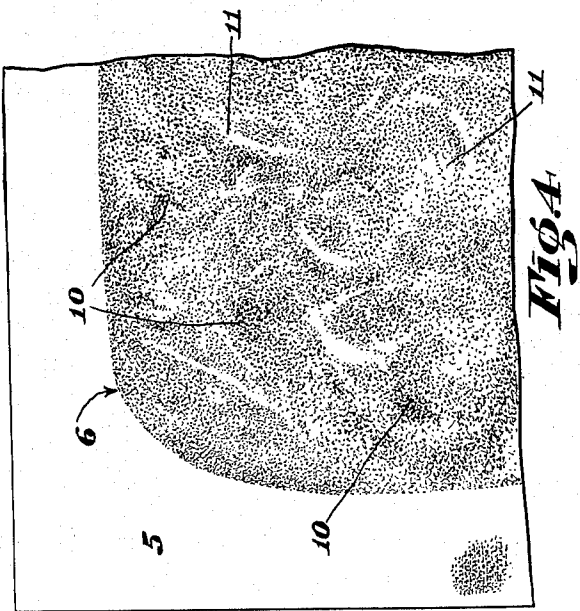
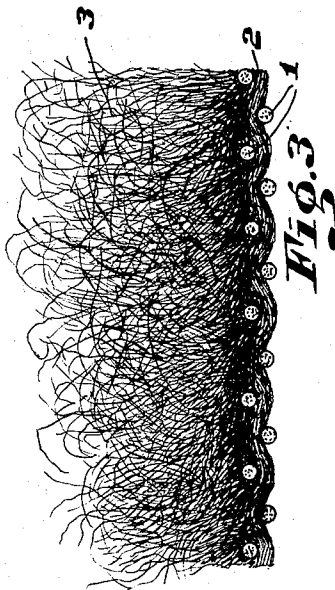
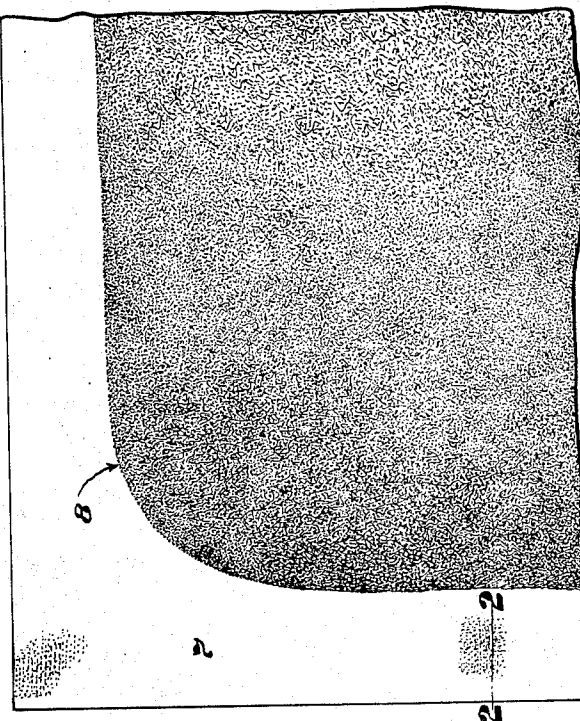
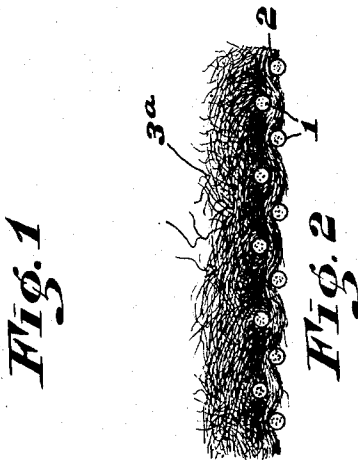
April 13, 1937.

C. COOPER

2,076,980

FILTERING METHOD

Filed March 13, 1935



INVENTOR:

Charles Cooper

BY *Richard W. H. H. H.*

ATTORNEY

UNITED STATES PATENT OFFICE

2,076,980

FILTERING METHOD

Charles Cooper, Boston, Mass., assignor to Pepperell Manufacturing Company, Boston, Mass., a corporation of Massachusetts

Application March 13, 1935, Serial No. 10,836

2 Claims. (Cl. 210—204)

This invention relates to fabrics adapted for use in filtering milk and other liquids and it particularly pertains to an artificially napped material which I have found to be highly effective for use in filtering liquids, such as pasteurized milk, which contain sediment in minutely divided particles.

It has been common heretofore to employ, as filters for liquids, fabrics of various types of weave and with natural or artificial naps on one or both surfaces of the fabric. The purpose of employing such naps has been to provide a fine mesh filter which will effectively remove the fine sediment without unduly retarding the flow of liquid. However, it has been my experience that the nap fabrics which have been used heretofore have had their limitations in that the long fuzzy fibres which form the nap are dislodged under the influence of the liquid flowing through the fabric under pressure, with the result that the fibres tend to distribute themselves unevenly over the surface of the fabric, thereby forming bunches or matted portions on certain sections of the cloth surface which obstruct the flow of liquid, and barren areas on other sections of the surface, formed by the parting of the nap fibres, which permit passage of the liquid through the fabric without proper filtration. Furthermore, the common types of nap fabrics have had the further disadvantage in the tendency of the nap fibres to separate from the body of the fabric during the filtering operation, with the result that an appreciable amount of the minute fibres is carried away with the filtered liquid which is obviously undesirable, particularly where comestibles such as milk are being filtered.

It is the object of my invention to eliminate the disadvantages which have been inherent in prior filtering fabrics of this nature and to provide a fabric which is artificially napped on one or both surfaces in such a manner that the long nap fibres are mechanically distributed and compacted on the napped surface so that segregating or bunching of the nap is eliminated and a permanently uniform filtering surface is provided in which all tendency of the nap to become separated from the body of the fabric during the flow of liquid is eliminated.

As will appear from a detailed description of my invention, the individual fibres of my napped fabric are disposed in directions which are generally normal to the direction of flow of the liquid through the fabric, whereby a filtering medium of minute mesh and consequent high filtration efficiency is provided.

These and further objects and advantages of my invention will become apparent from a detailed description thereof, taken in connection with the accompanying drawing in which:

Fig. 1 is a face view of the napped surface of my novel filter material on which is indicated diagrammatically the even distribution of the fine sediment obtained by the use of my preferred type of nap;

Fig. 2 is a greatly enlarged section of the fabric taken along the filling threads, as on the line 2—2 of Fig. 1;

Fig. 3 is a view similar to Fig. 2 showing my filter fabric at an intermediate stage in its process of manufacture; and

Fig. 4 is a view similar to Fig. 1 in which is diagrammatically indicated the uneven distribution of sediment which results from the use of filter cloths of the type heretofore commonly employed.

The fabric which I employ in the manufacture of my novel filter cloth is preferably a cotton cloth woven of warp threads 1 (Fig. 3) and weft or filling threads 2. As indicated in Fig. 3, the fabric is of a type commonly employed for napping in that the filling threads 2 are larger in diameter and softer in texture than the warp threads 1 and in the napping process the nap, indicated at 3, is picked chiefly from the filling threads and very little, if any, nap comes from the warp threads.

The first step in the napping operation is the raising of the nap 3 from one surface of the fabric to form thereon a multitude of long fuzzy fibres. As is well known in the art of napping, the fibres 3 may be produced by passing the cloth a number of times over napping rolls or cylinders, the peripheries of which are provided with a large number of cloth engaging needles or picking elements, which, in the aggregate, are known as napper clothing.

After the fabric has been thus processed to produce the nap 3, I further process the cloth for the purpose of mechanically distributing the nap 3 over the surface of the cloth to produce the compact nap illustrated at 3a in Fig. 2. In this operation the nap fibres are mechanically engaged by napper clothing of the type used in my first nap raising operation and the fibres so engaged are tucked back in the direction of the base of the nap and even somewhat into the body of the cloth itself. The result of this second operation is to dispose the fibres in directions which are generally normal to the direction of flow of liquid through the fabric during the filtering operation,

thereby providing a multitude of filtering elements which are properly disposed relative to the direction of flow of the liquid. Furthermore, the nap on the surface of the fabric is compacted and, to a certain degree, secured in close proximity to the body of the fabric so that movement or dislodgement of the fibres during the filtering operation is materially restrained.

Neither the method of producing my novel filtering material nor the machines which are employed to produce it are the subject of the present invention as such methods and machinery are all old and well known in the art. The method which I employ to produce my novel filtering cloth of Fig. 2 may suitably comprise that heretofore employed in the commercial manufacture of duvetyne and the product which I employ as a filtering medium may suitably comprise the commercial duvetyne.

If desired, the fabric may be napped on both sides to produce the nap illustrated in Fig. 2 on both the top and bottom surfaces of the fabric. It has been my experience, however, that such double napping is not required, except possibly in filtering apparatus in which the liquid is forced alternately in opposite directions through the cloth, as the single napped fabric contains a sufficient number of fibre strands properly positioned to filter, effectively, even the minutely divided sediment which is present in milk after it has been pasteurized.

In using the strainer cloth for the filtering of milk, for example, the fabric is incorporated into one of the many types of pressure filtering apparatus which are commonly used in the milk straining industry. The fabric is inserted and secured in the machine in the proper position to insure that the liquid to be filtered passes into the napped surface and flows out of the unnapped surface of the filter fabric.

In Fig. 4 I have diagrammatically indicated at 6 the disposition of the sediment deposited on the old types of napped filter cloths, the numeral 5 indicating the clean, but napped, margin along which the fabric was secured in the filtering machine. In Fig. 1 I have indicated the clean margin 7 and sediment 8 deposited on my novel filter cloth and Figs. 4 and 1 give a comparison between the results obtained from the use of old napped fabrics and the napped fabric of my invention. The darker areas 10 in Fig. 4 represent sections of the cloth which have removed the greatest amount of sediment from the milk and the lighter and relatively clean areas 11 represent sections which have removed comparatively little sediment and hence were comparatively less efficient in their filtering function. The nap illustrated in Fig. 3 which is produced during the first stage of the process of manufacture of my fabric is typical of the final naps in some of the filter fabrics which have been employed heretofore and which produce the uneven distribution of sediment which is indicated in Fig. 4. It is my opinion that the uneven sediment distribution illustrated in Fig. 4 is the result of a parting of the mass of loose nap illustrated in Fig. 3 thereby forming the relatively barren areas 11. This parting of the nap fibres is the result of the looseness of the nap and is caused by the force of the liquid as it flows into the napped surface. This force also tends to bunch together the nap

fibres to form closely matted areas which filter out relatively more sediment as indicated by the darker areas 10 in Fig. 4.

Contrasting this result with that produced by my filter material, as illustrated at 8 in Fig. 1, the sediment is seen to be of relatively even distribution with the entire surface approximately as dark, if not darker, than the darkest areas in Fig. 4. It is believed that the uniform darkness in shade representing the amount of sediment deposited on the surface of my filter fabric is due to the fact that although my fabric has substantially the same amount of nap as that illustrated in Fig. 3, yet the nap is compacted so that it cannot swirl or become dislodged under the force of the liquid flow to form the concentrated and barren areas formed on the fabric of the prior art. Furthermore, the generally horizontal disposition of the nap fibres of my strainer cloth is obviously effective in providing a multitude of minute straining elements disposed across the path of travel of the liquid as contrasted with the fibres of the Fig. 3 construction, which are disposed in a rather hit or miss fashion, and are entirely free at their ends to move under the influence of the liquid.

In the use of my novel fabric commercially, it has been found that not only is the efficiency of the straining operation enhanced as determined by the amount of sediment extracted from the milk, but furthermore, that this desirable result is not effected at a sacrifice to the speed of the straining operation, as my fabric does not retard the passage of milk through it any more than it was retarded by the fabric filters of the prior art. Furthermore, the compacting and securing of the nap fibres overcome any tendency of the fibre to pull away from the base of the fabric and be carried away with the liquid.

I claim:

1. The method of filtering milk and similar fluids which comprises conducting fluid from a supply to a receiver, interposing in the path of movement of the fluid a multitude of long yarn fibres protruding from a fabric surface and forming a continuation of the fibres constituting the yarns of the fabric, the tips of the fibres of the nap being deflected toward the plane of the fabric and intermeshed with each other and closely matted together whereby to secure the body portions of the nap fibres in a matted condition and to restrain displacement of the fibres during passage of the fluid therethrough.

2. The method of filtering milk and similar fluids which comprises conducting fluid from a supply to a receiver, interposing in the path of movement of the fluid a multitude of long yarn fibres protruding from a fabric surface, the bases of the fibres of the nap joining integrally with fibres of the yarns of the fabric, the body portions of the nap fibres being disposed at random in positions generally parallel to the plane of the fabric and the tips of the fibres of the nap being deflected toward the plane of the fabric and intermeshed with each other and closely matted together whereby to secure the body portions of the nap fibres in their said positions and to restrain displacement of the fibres during passage of the fluid therethrough.

CHARLES COOPER.