

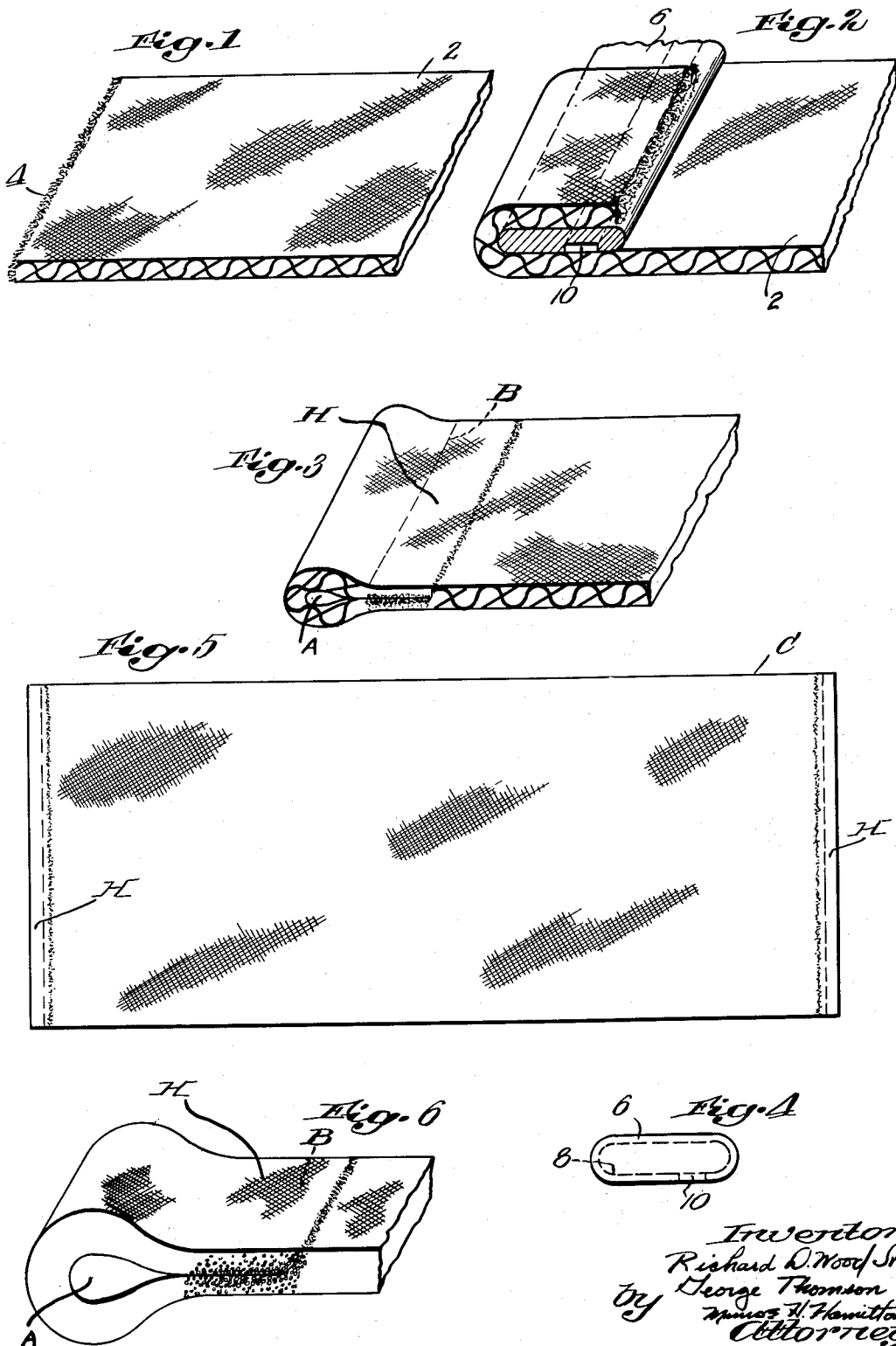
May 8, 1956

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2,744,844

HEMMED CLOTH WITH AN ADHESIVE TYPE BINDER

Filed Jan. 26, 1952



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HEMMED CLOTH WITH AN ADHESIVE TYPE BINDER

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Application January 26, 1952, Serial No. 268,372

4 Claims. (Cl. 154—43)

This invention relates to improvements in hemmed cloth and in methods of securing cut fiber ends of a sheet of textile material in hemmed relationship so as to prevent ravelling along parts of the textile material where a selvage is not provided.

The conventional procedure of sewing or stitching hems in a sheet material ordinarily involves separate handling operations which add to the cost of certain types of specialty cloth items such as diapers, towels, mechanics' wipe-up cloths, and the like, especially where it is desired to cut off lengths of the cloth from a web of material in a continuous operation.

To avoid stitching, many proposals have been made for securing together the folded portions of a hem by means of an adhesive type binder employed either as a coating or impregnating agent, or utilized in the form of fusible fibers interwoven with the strands of the material itself. None of these has proved to be a practical solution to the problem, due both to the objectionable characteristics which are imparted to the cloth hem and to the difficulties which are involved in continuously carrying out the impregnating and bonding operations in a satisfactory manner.

The present invention is concerned with the problems indicated in connection with securing a cloth hem with an adhesive type binder, and the invention aims to devise an improved adhesively secured hem which is free from objectionable change in its normal textile characteristics, which can be rapidly and cheaply produced, and which is capable of withstanding a great deal of hard usage, such as repeated exposure and washings in certain chemical reagents. It is also an object of the invention to provide an adhesive type binder which can be combined with the fibers of a hemmed sheet material so that a proper bonding of the folded portions is accomplished without modifying exposed surfaces of the hem and causing either roughness or stiffness. It is still a further object of the invention to provide improved methods of applying an adhesive type binder to the folded portions of a cloth hem so as to securely bond the folded portions to one another.

These and other objects and novel features will be more fully understood and appreciated from the following description of a preferred embodiment of the invention selected for purposes of illustration and shown in the accompanying drawings, in which—

Fig. 1 is a fragmentary perspective view showing a length of textile material with cut ends which are to be secured in hemmed relationship;

Fig. 2 shows the length of textile material with one edge thereof, including the cut ends, lying in folded relationship and further indicating means for applying an adhesive type binder to one of the folded sections;

Fig. 3 is a fragmentary perspective view showing the length of sheet material with a ribbon-like body of adhesive binder applied thereto and the folded sections pressed together in hemmed relationship in the manner taught by the invention;

Fig. 4 is a detailed end elevation of the forming and adhesive applying element which is shown in Fig. 2;

Fig. 5 is a plan view of a hemmed cloth showing the

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hemmed edges of the invention at two opposite sides of the material; and

Fig. 6 is an enlarged fragmentary cross-sectional view of Fig. 3, and more specifically illustrating the distribution of binder in and between the cloth hem portions.

In carrying out our invention and producing a hemmed cloth, we have found that it is important to employ a specialized form of binder which is suitable for application to a fabric surface in a controlled manner, and we have discovered that a relatively thin paste-like substance comprising a vinyl copolymer occurring in the form of an organosol, when specially modified with a correctly chosen filler, plasticizer, and swelling agent, may constitute an unusually satisfactory binder material.

The key to success in using an organosol as a satisfactory hem binder we find is largely dependent upon the fact that sharply controlled distribution of swollen organosol particles in the folded hem portions can be realized. It has been determined that since the swollen particles fuse together more easily than normally unswollen binder particles, it is practical to utilize a relatively thinner, more easily dispersed suspension. This type of organosol suspension in practical testing has been found to produce not only an adequate bonding after fusion but also a very desirable degree of pliability in the hem, whereas to obtain a similar bonding effect, with certain other fluid binders, it has been found necessary to use more plasticizer. Increased amounts of plasticizer make the hem heavier, and larger amounts of plasticizer are also subject to migrating difficulties as well as discoloring disadvantages.

We have further found that in utilizing a specialized form of binder, such as the one described above, we may very beneficially control the form and method of application of the binder so that it occurs in the shape of a relatively thin ribbon-like body extending longitudinally along the cloth hem and occurring in spaced relation to the outer border of the hem along its line of folding, with the result that there is formed a tubular margin. The term "ribbon-like body," as hereinafter employed in the specification and claims, is intended to define specifically a narrow strip or band of adhesive material partially impregnated in one or more fabric layers.

We have further discovered that if we thus provide at the outer border of the hem a tubular margin which is substantially free from binder, this tubular margin compensates for loss of pliability and drape at the cemented portions, and substantially reduces any tendency for the hem to develop objectionable stiffness. It appears from repeated testing and use of the hemmed cloth that the tubular margin at its unsecured parts actually constitutes a soft, yieldable, rolled edge, and it is this soft rolled edge extending along the ribbon-like body of binder which helps to maintain, to an important extent, a desirable degree of pliability and drape in the hem.

Moreover, the rolled edge will normally tend to be of a slightly greater thickness than the binder-held portions of the hem so that the ribbon-like body is not only completely hidden from sight or contact, but is actually disposed in a somewhat recessed or sunken position. It is pointed out that a ribbon-like body of binder in a position such as described will have little, if any, tendency to produce an edge of harsh binding, cutting, or abrasive characteristics.

In addition, we have found that the ribbon-like body of adhesive binder may be desirably controlled in another aspect. We find that if the binder is first brought into contact with the base portion of the hem, i. e., that portion of the sheet material adjacent to the folded portion, there may result a substantially greater concentration and impregnation of the ribbon-like body at and just below the surface of the base portion described.

There is thus produced a desirable anchoring base with which the free folded edge of the hem, including its cut ends, may be brought into register and in which the cut ends may be impressed and solidly embedded. In this way a maximum degree of bonding is achieved with little, if any, spreading of the adhesive binder beyond the cut edge of the folded hem portion taking place.

Moreover, we find that we are able to control the extent to which a binder, such as an organosol, strikes into the fibers of the hem portions and we can very definitely limit impregnation so that we preserve at the exposed fiber surfaces of the hem a great deal, if not all, of the normal textile characteristics of the sheet material.

In describing one specific embodiment of the invention, reference is had to producing, preferably from a continuous web of cotton textile material, pieces of hemmed cloth which are to be utilized as diapers. It is pointed out that with an article of this character it is especially essential for the textile characteristics of the hem to be carefully maintained in a condition such that when brought into contact with the skin of an infant there will be no more tendency for irritation and chafing to develop than would be the case of an ordinary cotton textile material. This is so because the hemmed edge of a diaper is usually pinned either about the waist or the legs of an infant and any increase in stiffness, thickness, or loss of pliability in the hemmed portion of the diaper may tend to result in an undesirable impression and a line of chafing or binding of a highly objectionable nature. The problem is further complicated in the case of diapers by the fact that such articles are frequently retained in a soiled condition for periods of time in closed containers during which time considerable ammonia develops due to bacterial action. The hemmed portion of the diaper must be capable of undergoing alternate wetting and washings involving both mechanical working, exposure to ammonia and various other chemical reagents, occurring in soaps and soap-like materials. Also, from a practical standpoint it should be understood that any binder which is to be used may be required to be colorless and capable of resisting any yellowing or change in color in use.

With the foregoing requirements in mind we have devised specific organosol type formulations for use in diapers and in which are compounded, with particles of the vinyl copolymer organosol resins, carefully selected amounts of filler, plasticizer, swelling agents and diluents which we have found will satisfy the conditions to an extent not heretofore realized, as far as we are aware, particularly when the material is combined with hem sections in the manner hereinafter disclosed.

As illustrative of specific formulations of vinyl copolymer organosols from which adhesive type binders for diaper hems may be obtained, there are cited the following examples:

Example I

	Parts
Vinyl chloride acetate.....	70
Resin-coated precipitate calcium carbonate.....	27
Titanium dioxide.....	10
Resinous polyester plasticizer.....	135
Petroleum thinner.....	31
Xylol.....	18
2.1 to 3.5 parts of non-toxic polymeric tin compounds.	

Example II

	Parts
Vinyl chloride acetate.....	100
Butyl phthalyl butyl glycollate.....	80
Resin-coated precipitate calcium carbonate.....	30
Titanium dioxide.....	15
Petroleum thinner.....	54
Xylol.....	36
3 to 5 parts of non-toxic polymeric tin compound.	

Example III

	Parts
Vinyl chloride acetate.....	67
Resin-coated precipitate calcium carbonate.....	27
Titanium dioxide.....	7.5
Resinous polyester plasticizer.....	97
Petroleum thinner.....	31
Xylol.....	18
2.0 to 3.4 parts non-toxic polymeric tin compound.	

Attention is directed to Figs. 1 to 3, inclusive, of the drawings, wherein we have shown diagrammatically the forming of a hem in a piece of cloth which is to be used as a diaper and utilizing a formulation such as that given in Example I above noted. In Fig. 1 we have illustrated fragmentarily a length of cotton textile material 2 which has been cut from a web or roll of this material and which presents cut fiber ends 4 shown at the left-hand edge of the material. For purposes of simplification we have shown the material 2 free of any supporting base or holder, although it should be understood that suitable means of this nature may be utilized.

In accordance with the invention, edge portions of the material 2, including the cut ends 4, are folded over upon one another to constitute a hem H, and while in this folded position a ribbon-like body of binder B is first applied to the base portion of the hem so that one edge of the ribbon-like body falls substantially in register with the cut ends 4 of the upper hem portion. The opposite edge of the ribbon-like body of binder B is located in spaced relation to the line of folding of the hem portions to provide a tubular margin A.

In thus applying a ribbon-like body of binder in spaced relation to the line of folding of the hem sections, one suitable method consists in utilizing a forming element, such as that indicated in Fig. 2 and denoted by the numeral 6. This forming element consists of a relatively thin flat body of metal or other fairly rigid material, having a width generally corresponding to the width of the hem desired to be formed, and the material at its line of folding is located firmly against one edge of the forming element 6 in the manner shown in Fig. 2. It is contemplated that the forming element may be placed in the position described in various ways, either manually or by mechanical means, and similarly the forming element may be removed by withdrawing it from between the hem portions or by re-arranging the position of the hem portions to facilitate withdrawal of the forming element.

With the forming element 6 arranged in the position shown in Fig. 2, it will be seen that the hem portions may be temporarily held in a substantially fixed relationship, either by hand or by means of some type of press apparatus applied at the top and bottom sides of the hem. We then apply adhesive binder, as noted above, utilizing the forming element 6 as a binder dispensing member through which the fluid binder may be forced. To facilitate this operation the former element 6 may be constructed with a chamber 8 into which the binder is forced and then extruded out through one or more feed slots, as 10, which open directly upon the lower section of the hem portion shown in Fig. 2, and provide for applying a ribbon-like body of the binder. The slot or slots 10 are preferably located along a line occurring somewhat nearer to one side of the former element than the other, as shown in Fig. 2, with the object of ensuring that one edge of the ribbon of binder may be disposed below, and substantially in register with, the cut ends of the top section of the hem.

It should be understood that suitable pressure feeding means for the binder, as well as conduit means, may be connected to the former element 6 in various ways. As the binder is applied there may occur a very short interval during which a binder, such as the organosol compound noted, has an opportunity to partially strike in

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to the base portion of the hem, and it is found that by correctly adjusting the consistency or viscosity of this type binder, and by selecting a suitable time interval, an exceedingly accurate control of impregnation can be obtained. Thereafter the top hem section is brought into contact with the binder with the cut ends being pressed down into the ribbon of binder, as suggested in Fig. 3. The result of this controlled impregnation is to provide a relatively greater concentration of binder at the base of the hem and a relatively smaller concentration in the folded over portion of the hem, as suggested in Fig. 3. This operation may be carried out by hand or by means of mechanical press bars, for example, arranged to simultaneously engage against top and bottom surfaces of the hem along a path corresponding to the underlying ribbon of binder.

The organosol binder used in the example above noted is of the type which requires heat to fuse the swollen particles of resin and press bars, such as those suggested above, may include heating means for applying heat to carry out the fusing step. For a binder such as the formulations noted in Examples I, II and III, a temperature of 350° F., for example, is satisfactory to properly fuse the binder particles and produce the cloth hem of the invention. The combined effect of applying heat and pressure along the ribbon-like body of adhesive is to compact the binder-held portions so that they have approximately the thickness of the material itself, as noted in Fig. 3.

The operations described may be repeated at an opposite edge of the piece of cloth, assuming that it does not have a selvage, and there is provided in this way a diaper C, as shown in Fig. 5, having hems H and H' at the opposite sides of the cloth.

The completed hem of the invention, obtained by a method such as has been suggested, is illustrated in Fig. 3 in a greatly enlarged manner. An outstanding feature of the hem is the tubular margin which has already been referred to in the specification and which is provided by folding the cloth about the forming element and applying the adhesive so that it is maintained in spaced relation to the line of folding of the hem. This tubular margin, as indicated in Fig. 2, necessarily occurs with a slightly greater thickness than the binder-held portions of the hem and therefore constitutes a protective edge which it is found may very satisfactorily prevent the effect of any tendency of the binder-held portions of the hem from developing an objectionable stiffness or roughness. It is also found that by thus providing two layers of untreated fabric which extend in close proximity to the binder-held portions, the normal flexing character of the woven layers can be made use of and there is obtained a rather small, but highly important, increase in yieldability of the hem, as a whole. This promotes desirable stretch and pliability characteristics generally corresponding to the same characteristics which would be exhibited by a conventional stitched hem. It is again pointed out that inasmuch as the organosol binder is of a type which does have yieldability characteristics, the combined effect of the binder and tubular margin, when applied to a hemmed cloth for use as a baby's diaper, is to almost entirely remove any roughness in the adhesively secured hem.

It is to be noted, also, that by maintaining the tubular margin free from binder, the fibers at the outer surfaces of the tubular margin retain their normal textile characteristics and thus provide a soft, yieldable band of material which compensates to a very considerable extent for any change in those fibers which are held by the ribbon of binder. It should further be observed that use of a former element of the general character indicated, when arranged in the position shown in Fig. 2, permits application of the organosol binder directly from the former to the cloth and there can thus be realized an unusually sharp control of the binder such that a rela-

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tively large proportion of the ribbon-like body B may be impregnated at and just below the surface of the lower or base portion of the hem. Nevertheless, a relatively smaller but necessary proportion of the binder strikes in to the fibers of the base portion to a limited extent suitable for furnishing a good anchoring base without the binder actually passing through those fibers which occur at the lower exposed surface of the hem. This has again been illustrated diagrammatically in Fig. 6 of the drawings.

In obtaining the controlled impregnation described, the importance of utilizing a binder compound having the properties of an organosol may be more fully appreciated at this point from a proper understanding of the mechanics by which, in our opinion, we obtain a distribution of binder down in to the fibers and yet keep the binder from filling the interstices between fibers to an undesirable extent. The following explanation is given by way of opinion only and is not to be taken as limiting the invention in any way.

With almost all types of adhesive binders which are known, it is necessary to provide for lowering viscosity by adding increased amounts of plasticizer or diluents in order to allow the binder to strike in fairly quickly. What happens is that in the case of the plasticizer it goes in and remains between the fibers in an amount such that as the diaper is used the plasticizer may migrate, may produce discoloring, and may modify the characteristics of the cloth.

In comparison, in the diaper of our invention we substitute for this kind of binder compound an organosol which can be lowered in viscosity to a desired point by adding a diluent of a volatile nature so that penetration of the organosol mix may be accelerated to a desired extent. The swelling agent and diluent may thereafter be dissipated with heat, leaving only the fused plasticizer resin material. In addition, the swollen particles thus dispersed fuse to one another more easily than non-swollen particles. These advantages, although of some minor importance in some types of adhesive binding, are of very great importance in dealing with a cloth hem and especially with a diaper hem.

As earlier pointed out, by first applying the binder to the base portion of the hem, while the latter is in a folded state, there occurs a slight interval during which the binder can strike in to the fibers. Before all of the binder which has been applied can strike in, however, the top hem section is pressed into place and the cut ends embedded at the upper surface of the body of binder. This results from the fact that the slot 10 is preferably located in a position such as that shown in Fig. 2 whereby one edge of the ribbon-like body of binder will occur substantially in register with the cut ends 4.

There is produced in this way a controlled impregnation such that a relatively greater proportion of binder is anchored in the base section of the hem and a relatively smaller proportion of binder becomes impregnated in the fibers of the top hem section. However, the cut ends of the top section have an opportunity to become thoroughly embedded in the binder when solidly pressed into place, and a very desirable bonding effect is realized. At the same time impregnation of the binder is limited in the manner indicated above so that the fibers at the exposed surfaces of the hem have little, if any, binder material present. Therefore, the normal textile characteristics of the sheet material are preserved at these exposed surfaces.

Attention is again directed to the fact that we provide for compacting those portions of the hem which are in contact with the ribbon-like body so that the thickness of the two hem sections, taken together, is reduced to a thickness approximately corresponding to the thickness of the textile material at adjacent points where no binder occurs, as has been diagrammatically indicated in Figs. 3 and 6. The formation of the hem with these compacted portions is found to be advantageous not only from the

standpoint of improving the bonded relationship of the parts, but also for the purpose of resisting any tendency for the hem edge to be separated away from the base portion when contacted by the pointed end of a flat-iron customarily used to press diapers, towels, and other cloth articles, after washing. It will be apparent that by having the cut fiber ends compacted into the hem base and binder in the specific manner described, there is little, if any, opportunity for the point of a flat-iron to get under the fibers and cause such a separation, and the hemmed portions will stand up longer.

It will be seen that by using the former element in the manner described above, there is afforded a convenient and rapid means of producing a folded hem, and by selecting a proper width of former element generally corresponding to the width of the hem, as described, and by locating the feed slot 10 at a desired distance from the edge of the former element, it becomes possible to produce a tubular margin of any desired size. Also, by the specific handling described, any tendency for adhesive to become extruded or transferred into the tubular margin is almost entirely avoided, and the ribbon of binder in the finished hem will always occur in spaced relation to the line of folding of the tubular margin and may be varied in accordance with the width of the former element.

We may also make hemmed cloth pieces in the manner described for use as towels, napkins, and table cloths. An example of a formulation which is particularly suited for hemming towels is as follows:

Example IV

	Parts
Vinyl chloride acetate.....	50.0
Resin-coated precipitate calcium carbonate.....	11.3
Titanium dioxide.....	7.5
Alkyl aryl phosphate.....	60.0
Petroleum thinner.....	27.0
Xylol	18.0
1.5 to 2.5 parts non-toxic polymeric tin compound.	

Similarly, we have devised a hemmed cloth for use as a mechanics' wipe-up cloth in the manner described and using another specific formulation which is capable of withstanding dry cleaning with solvents such as perchlor ethylene, and which will resist contact with petroleum products, such as gasoline and kerosene.

An example of a formulation which is particularly suited for mechanics' and printers' wipe-cloths is as follows:

Example V

	Parts
Vinyl chloride acetate.....	67
Resin-coated precipitate calcium carbonate.....	27
Titanium dioxide.....	7.5
Tisinous polyester plasticizer.....	97
Petroleum thinner.....	31
Xylol	18
2.0 to 3.4 parts non-toxic polymeric tin compound.	

From the foregoing description it will be evident that we have provided a cloth hem, together with a method of hemming, which includes a number of novel features and which successfully deals with specific problems earlier noted, reference being had especially to diapers. It should be understood that most of the features and advantages set forth above are not limited to the cloth articles referred to but are also pertinent with respect to other cloth articles requiring hems such, for example, as sheets, pillowcases, handkerchiefs, flags, curtains, and the like. These features make possible a rapid and cheap hemming operation susceptible of control to an extent not heretofore realized. Particularly, we have succeeded in preserving

to a very great extent the normal textile characteristics of the material from which the hems are formed, notwithstanding the fact that an adhesive type binder is employed.

While we have shown and described preferred embodiments of our invention, it should be understood that various modifications may be resorted to in keeping with the scope of the invention as defined in the appended claims.

We claim:

1. As an article of manufacture, a textile material comprising a sheet of woven fibrous strands which present cut ends along one side of the material, portions of the textile material including the cut ends being folded to provide a hem, said hem having a binder consisting of a vinyl copolymer organosol disposed between the interfaces of the folded portions, said binder occurring as a substantially continuous ribbon-like body which is present in limited amounts and distributed so that a relatively larger proportion of the binder is concentrated at the interfaces and a relatively lesser proportion is impregnated in the respective sides of the hem, said hem further including a tubular margin which is substantially free from binder, and said tubular margin in conjunction with the binder in its limited state of distribution preserving in the hem the normal textile characteristics of the said textile material.

2. As an article of manufacture, a diaper comprising a sheet of woven fibrous strands which present cut ends along one side of the diaper, portions of the said diaper including the cut ends being folded to provide hems adapted to constitute waistband portions of the said diaper, said hem having a binder disposed between the interfaces of the folded portions, said binder comprising a yieldable adhesive substance obtained from the fusion of swollen particles of a vinyl copolymer organosol which, when combined with the fibers, is capable of being stretched, said hem further including a tubular margin which is free from binder and which cooperates with the yieldable binder to preserve in the hem the stretching and flexing characteristics substantially corresponding to those of the said sheet of woven strands.

3. As an article of manufacture, a rewashable textile material comprising a sheet of woven fibrous strands which are cut along one side of the material, portions of the material including the cut strands being folded to provide a hem, said hem having a yieldable binder disposed between the interfaces of the folded portions, said binder comprising a product obtained from fusing swollen particles of a vinyl copolymer organosol, which particles have been diffused through the fibers from a suspension of the organosol so controlled that the particles are distributed throughout most of the fibers of the hem without striking through the surface.

4. As an article of manufacture, a rewashable diaper comprising a sheet of woven fibrous strands which are cut along one side of the diaper, portions of the diaper including the cut strands being folded to provide a hem adapted to constitute a waistband portion for the said diaper, said folded portions being secured together by a yieldable binder occurring as a ribbon-like body which extends longitudinally along the hem, said binder comprising a fused product obtained from a vinyl copolymer occurring in the form of an organosol whose plasticizer and swelling agent content is so chosen as to provide flexibility characteristics in the binder impregnated portions of the hem substantially corresponding to those of the sheet of woven strands, and the said fused product being distributed internally of the hem so that a relatively large proportion of the ribbon-like body is held between the interfaces and a relatively small proportion of the ribbon-like body is impregnated in the constituent fibers at the interfaces, the exposed outer surfaces of the hem presenting woven fibers which are substantially free from binder and which have the normal fiber characteristics of the said sheet of woven strands.

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