The subject of this invention is the manufacture of paper strands, fabrics, and other products. Such strands and fabrics are usually made from strips or narrow ribbons of paper which have been wetted and then furled or twisted to round form. The wetting is advantageous in that it renders the paper pliable, thereby discouraging the tendency which would otherwise exist for the rounded strands to unroll and eliminate the formation of sharp creases which would otherwise characterize the furled or twisted strip and weaken it. Here-fore, the pliable quality desired in the paper could be realized only when the paper was waterleaf, that is, was entirely free from sizing or other ingredients which detract from the absorptivity of the paper and its component fibers for water.

In accordance with the present invention, the paper strip which undergoes a mechanical rounding operation, such as furling or twisting, is made to contain an agent which imparts strength, and more especially wet strength, thereto, but which does not appreciably impair its capacity for absorbing water. An important advantage residing in such a method is that the rounded strip tends to stay round once put into such form, and at the same time the mechanical rounding operation may be practiced with much less danger of rupturing the strip. While not restricted thereto, we prefer to use paper strips containing regenerated cellulose as the strength-giving agent, for this agent is able to bring about a phenomenal increase in the wet strength of papers. For instance, when as little as 1% regenerated cellulose is distributed through a kraft paper, one finds that the wet strength of such paper may be quadruple or an even greater multiple of the wet strength of similar untreated or waterleaf paper, and further that the paper has not suffered an appreciable decline in water absorptivity, but rather is still able to absorb water very readily.

There are various methods of producing papers containing regenerated cellulose. Any one of the known methods, or such methods as may come into being, would serve the purpose of the present invention, which, although based upon the use of a paper containing regenerated cellulose and having greatly increased wet strength, is independent of the method by which such paper is made. For instance, a paper answering the purpose of our invention could be prepared by incorporating viscose into the paper stock in the beater engine and adding a suitable cellulose-regenerating agent before the stock is delivered to the papermaking machine. Or the desired paper might be prepared by initially forming a waterleaf paper, dipping it into a bath of viscose and then into a bath of cellulose-regenerating agent, and finally drying the impregnated product.

With the foregoing and other features and objects in view, our invention will now be described in conjunction with the accompanying drawing, wherein

Figure 1 represents diagrammatically and conventionally, in side view, an apparatus such as might be employed in practicing our method.

Figure 2 is a fragmentary plan view of the apparatus.

Figures 3 and 4 illustrate the kind of products for which our novel strand material is intended.

Referring to Figure 1, at 1 is shown a roll of regenerated-cellulose-containing paper which may be progressively unwound and passed under a series of rotary knives 2 serving to sever the sheet into a plurality of strips 4 while it travels over a supporting roll 3. These strips are fanned out somewhat in passing onto an endless carrier 5, which may be a wire cloth traveling horizontally between the rolls 6 and 7, thence downwardly from the roll 7 to a roll 8, and from the roll 8 back to the roll 6. Upon reaching the carrier 5, the strips may receive a spray of water from a spray pipe 9. The water is quickly absorbed by the strips as they pass to the roll 8, whereat they make a downward turn and then are subjected, between the rolls 7 and 8, to a lateral furling action, as by contact with an endless roving belt 10, supported on a pair of spaced rolls 11. The rolls 11 are arranged at an angle to the horizontal, whereas the rolls 7 and 8 are horizontally disposed so that the belt travels in angular relation to the direction of travel of the carrier 5 and the moistened strips supported thereon. This relative angular motion between the contacting surfaces causes a rolling out or furling of the moist paper strips into round bodies or strands. Each rounded body or strand is sucked immediately after issuing from between the moving surfaces into the intake end 12 of a relatively long directing tube 13 leading to a spinning pot 14, wherein the strand is gradually deposited as an annular mass. Preferably, a rotating guide roll 15 is arranged directly under the lower roll 11 to receive the strand immediately after its release and to carry its end near the suction created at the intake end 12. The suction may be caused by a jet.
of air delivered under suitable superatmospheric pressure from a nozzle 16, past the intake 12. The method of delivering and accumulating the strands as herein described is preferable over such other methods as have come to our attention, as it ensures accumulation at high speeds without tendency of the strands breaking or becoming entangled with one another. It constitutes an independent invention disclosed and claimed in application Ser. No. 504,029, filed December 22, 1930, by Milton O. Schur. With this method, as shown in Figure 2, the pots or accumulators may be arranged in staggered relation in order to avoid an impractical tandem arrangement in a line many times the width of the machine. The staggered arrangement of pots is a compact, convenient one, and at the same time the direction of travel of each strand to its pot is positively controlled, with no possibility of snarls between strands or catching of the strands outside the pots.

The strands accumulated in the pots may be intertwisted into yarns or twines, which may to advantage be woven into a fabric 17 of coarse mesh, such as shown in Figure 3. Such a fabric may be used directly as, say, a floor or seat covering, or may be converted into a burlap-like bag 18, such as shown in Figure 4, of the type used for the collection and shipment of farm products of the class of onions, carrots, potatoes, and the like. These bags were heretofore made from strips of light-weight, water-leaft kraft paper, which were moistened, twisted, and woven into a fabric of coarse mesh. They could stand a considerable amount of handling, but suffered from the disadvantage that when subjected to soaking in water, they lost materially in strength. In fact, were such a bagful of vegetables hosed off with water to remove dirt, or were it exposed to a rainstorm, it had to be handled with care in order to avoid rupture. By making the bags from woven strips of twist-

ed or furled kraft paper containing regenerated cellulose, in accordance with the present invention, not only do the bags have much higher wet strength, but this increased wet strength enables the twisting or furling to be done at very high speeds, as the moistened paper is able to resist greater mechanical stresses.

We shall speak of the twisting of strips of paper in the claims generally as “furling” or “rounding”, since twisting accomplishes more or less of both rounding and furling of the strip into a compact body, usually of higher strength than the original strip. It is preferable to moisten the strip before rounding or furling it, although we do not regard it as a departure from our invention if one were to postpone the twisting until after rounding or furling, in order to inhibit the tendency of the strand to open up or unfurl. This inhibition is brought about by the permanent setting of the moistened strip in its rounded or furled state, the springiness or tension in the original dry-twisted product having been largely absorbed or destroyed with the assumption by the product of a moist, more or less pliable condition.

We claim:

1. A woven fabric made up of yarns consisting of twisted strips of paper containing not more than about 1% of regenerated cellulose as an impregnant in the body of the paper, such strips tending to persist in their twisted state.

2. A burlap-like bag especially adapted for holding vegetables of the class of onions, carrots, potatoes, and the like, consisting of coarse-leaft, twisted strips of paper containing not more than about 1% of regenerated cellulose imparting increased wet strength to the paper but having little effect on its water absorbency, said strips tending to persist in their twisted state.

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