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PROCESS AND APPARATUS FOR FORMING AN IMPREGNATED FIBER PRODUCT

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Fig. 1.

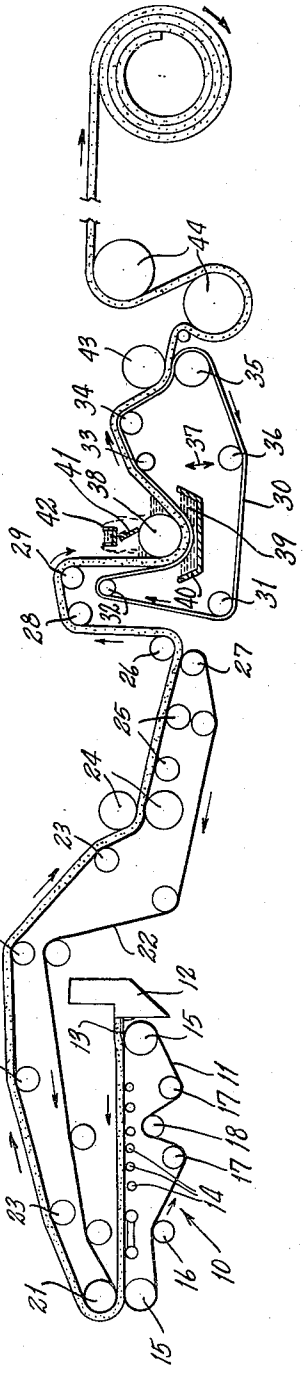


Fig. 3.



Fig. 2.



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PROCESS AND APPARATUS FOR FORMING AN IMPREGNATED FIBER PRODUCT

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The present invention relates to a process and apparatus for forming an impregnated fiber product, and more particularly to a means for making a fibrous web similar in some respects to a paper web and which is wet-impregnated with some organic material or materials, so that it may be employed for certain special purpose uses, for example, as insoles for shoes.

In the past it has been common to form a web of fibrous material similar to a paper web by using a Fourdrinier-type machine or other paper-making machine, then to pass such a web directly to a wet-impregnating means, wherein the web is impregnated with a dispersion of some type of latex or other organic material or a combination thereof, the product then being dried and being used for many purposes, for example, as insoles for shoes. It has been found, however, that in the first operation in making the relatively thick web used for this purpose from a feed stock or aqueous slurry of various length fibers plus, in the usual case, some suspended solid materials as fillers, pigments and the like, that the web as formed on the Fourdrinier-type paper-making machine had in its lower portion a mat, which was presumably first formed of the longer fibers of the feed stock; then the mat was built up by the continued abstraction of water through the Fourdrinier wire, there resulted a web having in its lower portion, for example, about the lower half of its thickness, a major part of the very short fibers and a major part of the solid powder-like materials which were incorporated in the feed stock. This formed a quite dense lower portion of the web at this point, which was somewhat difficult to pass water through. This web, according to the prior art, was then impregnated by more or less conventional wet-impregnation methods and means as shown, for example, in the patent to Novak, No. 2,104,052, issued January 4, 1938, which resulted in a product having a lower portion which was impressed not only with the pattern of the Fourdrinier wire, but also with the pattern of the wire used to support the web during the wet-saturation thereof, and which lower portion was quite tough and resistant. The upper portion of this web was relatively soft and spongy by contrast with the lower portion. When this product was used in making insoles, it was necessary that the lower portion, which had been impressed with the wire pattern as aforesaid be made the undersurface of the insole, so as to keep it out of contact with the foot of the wearer of the shoe in question. Thus the surface which received the abrasive wear by contact with the foot of the wearer of the shoes was the one which was more loosely matted. As a result, these insoles had a relatively short life, with respect to that which is desired and which is in fact attained in accordance with the present invention.

The present invention seeks to obtain a final product having a more nearly uniform distribution of the constituent materials throughout its thickness and one which has a superior wearing surface, which will be smooth so as to be adapted for contact with the foot of the wearer, when the product is used as a shoe insole, all so as greatly to increase the life of the product and to provide other advantages which will be set forth hereinafter.

This desirable result is attained first by forming the web initially substantially the same as heretofore on a suitable paper-making machine as a Fourdrinier type.

The web is then reversed in direction, so that the surface which is relatively dense and which is the lower portion as initially formed on the paper-making machine becomes the uppermost surface. While in this reversed condition, the web is passed to and through a wet-impregnating apparatus and therein is passed in a predetermined path below the surface of a bath of a saturant liquid, while being supported from below by a liquid-pervious endless belt. This broadly results in some redistribution of the smaller or finer fibers of the web from the denser now uppermost surface throughout the thickness of the web. The same action occurs simultaneously as to the relatively fine particles of powderous materials which are present in the web. While the shorter fibers and powderous materials aforesaid will tend to be redistributed throughout the thickness of the web, the initially formed mat of the longer and usually tougher fibers, now at the upper surface, will remain in place and can serve as a framework for an abrasion-resistant surface in the final product. At the same time, the support of the web during the wet-impregnation cycle upon an endless wire screen or the like, which is broadly termed as a water-pervious belt, serves to form any screen marks that will remain on the final product on what will be the lower surface in the final product and, therefore, is immaterial in its effect in the making of shoe insoles; as in such products the lower surface is not used in contact with the foot of a wearer.

In a preferred form of the present invention, the wet impregnation is effected substantialy as taught in the copending application of Stickel, Serial No. 754,740, filed August 13, 1958, and entitled, "Apparatus for Saturating Webs of Felted Fibers." The details of this Stickel application, to the extent that they are important in the present application, are fully disclosed herein. This apparatus and the process resulting from the use thereof is coordinated with the present process and apparatus, in that it produces a greatly superior product than was possible using prior saturating apparatus as aforesaid and particularly in that it tends to force saturant liquid downwardly through the web during the saturation process, so as to augment the redistribution of the smaller or shorter fibers and of the powderous material throughout the thickness of the web in a more positive manner than was possible using other prior art apparatus and further serves to give a very smooth top surface for the final product, which is thus made more abrasion-resistant as aforesaid incident to the presence in this surface of a mat of the longer fibers of the original slurry, the top surface further being so smooth that it can be printed so, for example, to simulate the appearance of leather.

The invention will be more clearly understood by reference to the accompanying drawings in which:

FIG. 1 is a diagrammatic illustration of certain elements of apparatus for carrying out the process of the present invention, this apparatus comprising a Fourdrinier-type paper-making machine, web-reversing means and a wet-saturating means;

FIG. 2 is an enlarged view as seen from the edge of the web as it is about to emerge from the paper-making machine of FIG. 1 and prior to the reversal of its direction of movement, illustrating the distribution of various fibers and other materials throughout different parts of the thickness of the web; and

FIG. 3 is an enlarged view similar to that of FIG. 2, illustrating the web subsequent to the completion of the redistribution of the materials as caused by the process of the present invention and by the use of the apparatus thereof.

Referring now to the accompanying drawings, and particularly to FIG. 1 thereof, there is illustrated generally at 10 a paper-making machine having a single endless wire fabric 11 on which the web is formed, the machine

10 in this instance being of the well-known Fourdrinier type, in which a slurry of paper stock, combined with such other suspended solid particles of materials as may be desired to be used therewith, is supplied to a headbox 12 and therefrom is supplied over a flexible apron 13 onto a substantially horizontal reach of the endless wire fabric 11, which is in part supported on spaced rolls 14 as shown. The wire fabric 11 is also trained around end rolls 15 and one or more intermediate rolls as 16, 17 and 18. Conventional or any desired means may be provided to drive any one or more of these rolls, so as to move or drive the wire fabric 11 at a desired speed, which more or less approximates the speed at which the paper stock is supplied onto the wire fabric 11 from the headbox 12. It will be understood that the consistency of the paper stock, the rate of supply thereof and the rate of movement of the wire 11 will be coordinated together in a manner which is conventional in the making of paper, so as to form a web of a desired thickness from the point of view of the product being made. It will further be understood that as the paper stock flows onto the wire the water content thereof progressively passes through the wire and is thus extracted from the slurry supplied onto the wire, so as to form a desired paper web. Furthermore, in the normal course of paper formation, as is well known in the paper art, the longer and coarser and hence tougher fibers contained in the slurry or paper stock are first trapped on the wire 11 and form a mat, which serves to prevent the passage through the wire of smaller particles. Thus the paper web, as finally built up on the wire 11, is substantially as shown in FIG. 2, wherein the lower portion indicated at 19, which includes the wire-engaging surface of the web, contains a substantial mat formed of the longer fibers from the paper stock; and this portion serves to trap much of the relatively fine solid particles, which were in suspension in the paper stock as supplied to the headbox 12. The upper portion 20 of the web as shown in FIG. 2 is, by contrast to the portion 19, much less dense and consists primarily of fibers of the paper stock of varying lengths with relatively little of the denser solid particles which were in suspension in the paper stock, such solid particles including, for example, not only short fibers but fillers, anti-oxidants, zinc oxide and the like. As such, therefore, the portion 20 of the web is relatively soft and spongy by contrast with the lower portion 19 thereof.

In accordance with the prior art, the web emerging from the Fourdrinier machine or other paper-forming machine (and the invention is intended to include within its scope other types of paper-forming machines in addition to Fourdrinier-type machines as shown herein), was carried through one or more sets of squeeze rolls serving to squeeze out a major portion of the water remaining therein and then was passed directly to a wet-impregnating machine such as is taught, for example, in the Novak patent, above-referred to. This left the lower portion of the web, which had the wire impression thereon from the wire 11, also marked to some extent with the wire supporting the web during the wet impregnation thereof and further, left the uneven distribution of materials throughout the thickness of the web as indicated generally in FIG. 2. When this web was, for example, impregnated with a latex and used as insoles for shoes, it was necessary that the wire-marked surface, which is the undersurface as seen in FIG. 2, and which was the undersurface in contact with the wire 11 of FIG. 1 (and was also in contact with the supporting wire during saturation, according to the prior art), should be directed downwardly in the finished shoe, as this surface was not smooth enough to permit its use in contact with the foot of the wearer of a shoe and further, this surface did not lend itself to imprinting of a grain pattern simulating leather. As a result, in the prior art, the custom has been to use the surface which is formed on the more loosely matted portion 20 of FIG. 2 as the foot-engaging surface of the

insole. The loose-matted characteristics of the fibrous material of the portion 20 was quite comfortable in cushioning the foot of the wearer, but had relatively little abrasion resistance and hence wore rapidly. Furthermore, the surface of the portion 20 was not such that it could be imprinted, more closely to resemble leather as distinguished from a manufactured material.

The redistribution of the powdered material is important, not only for the reasons hereinabove set forth, but also for the reason that anti-oxidants, zinc oxide and other materials, introduced into the paper stock in powder form, have particular functions when the web is later impregnated by a latex suspension, either of natural or artificial rubber, in that the anti-oxidants serve to preserve this rubber against unduly rapid aging, and zinc oxide serves to neutralize any HCl evolved by partial deterioration of chlorine-containing rubber-like materials which may be present. Thus, from a general point of view, the presence substantially uniformly throughout the thickness of the web of the solid materials in fine particle form is important as this material is necessary to give the desired aging characteristics and quality characteristics to the final product. If the fine particles of material were present in substantial amounts in one portion only of the thickness of the web as the portion 19 of FIG. 2, then the rubber in this portion only would be adequately protected; while the rubber impregnating the portion 20 of FIG. 2 would be inadequately protected and the product as a whole would have a much shorter life.

All these difficulties gave rise to the present invention wherein the web as formed by the paper machine, whether it be a Fourdrinier machine as shown in FIG. 1 or some other type of paper-forming machine, is first turned so that the initial wire-engaging portion of the web is brought uppermost. In the present instance this is accomplished by carrying the web around a roll 21, FIG. 1, in contact with an endless belt of felt or the like shown at 22. This endless belt supports the web between rolls and carries it not only around the roll 21, but also across a plurality of rolls shown at 23 arranged in a suitable manner to support and guide the paper web to and between a pair of press rolls 24 and thence across one or more further supporting rolls 25 to a guide roll 26 located above a second roll 27, about which the endless belt 22 is trained. By this time the paper web has been dried sufficiently, in conjunction with the squeezing action of the rolls 24, so that it is somewhat self-supporting. The paper web is then passed from the roll 26 upwardly around rolls 28 and 29, and thence downwardly into and through a bath of a suitable impregnating liquid, such, for example, as an aqueous solution or suspension of latex, along with such other materials as may be desired for use in this impregnating liquid. In this instance, however, it is noted that the portion 19 which was lowermost as the web was formed, is now substantially uppermost as the web passes through the bath of impregnating liquid.

While it is broadly within the purview of the present invention that the impregnation may be effected by prior art means, such for example as disclosed in the Novak patent hereinabove referred to, it is preferred in accordance with the present invention that the wet-impregnation of the paper web be effected in accordance with the teaching of the prior and copending application Serial No. 754,740, also referred to hereinabove.

In either case, the web is supported from below upon a liquid-pervious endless belt 30 as a flexible wire fabric, as the web is so weak that if it were unsupported while being passed beneath the surface of a liquid in its still wet condition, it would disintegrate at least to some extent. Thus, both Novak and the present applicants in their teachings include such a support. It will be understood that the endless supporting belt or wire 30 is suitably trained around a plurality of rolls as shown at 31, 32, 33, 34, 35 and 36; and that at least one of these rolls, as the roll 36 in the device diagrammatically illustrated in FIG. 1, is

adjustable as indicated by a double arrow 37, so as to control the tension on the belt or wire 30 and thereby to control the pressure exerted by the belt 30 on the web in squeezing it between this belt and a rotatable drum 38. In the Novak patented disclosure aforesaid, the device which is generally equivalent to the drum 38 is a hollow pervious cylindrical structure having an outside cylindrical cover of liquid-pervious wire mesh. The roll or drum 38 in any event is mounted so that the lower portion thereof extends below the normal level of a saturant liquid shown at 39 in a container 40, suitable arrangements being provided, for example, as generally hereinafter set forth to establish and maintain saturant liquid in the container 40 up to substantially a predetermined level.

In accordance with the Stickel prior and copending application above referred to and as preferred in accordance with the present invention, the drum 38 is driven only by contact with the paper web and is provided with an imperforate smooth cylindrical outer surface; and further, means are provided, as a doctor blade 41, to assure that the smoothness of that surface is not impaired by any particles adhering thereto and remaining thereon. In addition, means are provided, shown as a trough-like structure 42, extending across the entire width of the drum 38 (parallel to the axis thereof) for supplying saturant liquid to the entering nip between the web and the drum 38, at the left of the drum 38 as seen in the drawing in FIG. 1, and/or to the exit nip at the right thereof, and preferably on both sides as shown in the accompanying drawing.

The action during wet saturation, when using prior art saturating equipment as taught in the patent to Novak above referred to is that both sides of the web are subjected to the action of the saturating liquid; and as the portion shown at 19 in FIG. 2 is now uppermost, the penetrating action of the saturating liquid will tend to cause some redistribution of fine fibers and other fine solid particles throughout the web, thus tending to cause a more uniform distribution of various-sized particles throughout the thickness of the web as indicated, for example, in FIG. 3.

This action is, however, greatly augmented when using the saturating equipment of copending application Serial No. 754,740 referred to above, in that when that method and apparatus are used, and with the web moving in the path shown in FIG. 1 and with saturants supplied to the entering nip as shown at the left of the drum 38 in FIG. 1, there will first be a tendency for the saturant to flow into and through the web from the portion 19 toward the portion 20. This will tend to wash finer particles of solid material and shorter fibers through the web. This action is believed to occur as the web moves into the entering nip wherein some of the saturant liquid is squeezed into the web by the imperforate outer surface of the drum 38 and is forced to pass through the web toward the pervious supporting belt 30 due to that imperforate surface. The next action is that the web is squeezed between the belt 30 and the drum 38 by reason of the tension placed upon the belt 30, so as to squeeze out of the web as much water as is possible in view of the pressure under which the web is then placed. To the extent that saturant liquid is forced into the web as aforesaid, it is believed that what is squeezed out is primarily water, leaving the organic material introduced with that water largely in the web. The penetration of saturant liquid from the bath 39 thereof in the container 40 through the pervious belt 30 and thence into the web while it is squeezed between the belt and the drum 38 is thus not depended upon according to this invention. However, as the web now passes to the exit nip, pressure thereon is relieved; and the web, due to its somewhat spongy nature at this point, tends immediately to expand back to its normal uncompressed state. At this time, more saturant liquid is preferably supplied to the exit nip and serves to be absorbed during and as a direct result of the expansion of the web back to its normal uncompressed state, so that a maximum amount of the saturant liquid is taken up by the web. The web is then carried in the normal course of the belt 30 over the rolls 33 and 34 up to the roll 35. At this point the web is again squeezed between the roll 35 and a cooperating squeeze roll 43 to express therefrom surplus liquid, while preferably leaving a maximum amount of the saturant material, which was dissolved or suspended in the liquid, remaining in the web.

During the course of this process in the preferred form of the invention, the action of the liquid in flowing always in a single direction from the surface bounding portion 19 toward that surface bounding the surface 20 serves to a maximum extent to cause a redistribution of the fine particles of solid material, including fine fibers, from the portion 19 toward the portion 20 and thus causes the web to become more nearly homogeneous in its general distribution of solid materials throughout its thickness. This is illustrated in FIG. 3. Furthermore, due to the fact that the now upper portion of the web has been pressed firmly into contact with the smooth imperforate surface of the drum 38, this surface is given a smooth and almost polished finish, which it is found will receive printing such, for example, as will give the finished material an appearance closely resembling leather, which is desirable from the point of view of users of this material, particularly when it is used for insoles.

From another point of view, it will be seen that the now upper surface of the web, which was that formed as a boundary of the portion 19, and which is now smooth, will still contain a substantial mat of longer fibers of the original paper stock, coupled with a reasonable but not excessive proportion of other solid materials and further coupled with a proportion of the impregnating material. This in practice is particularly adapted for use as the upper surface of the insoles as finally used, as this surface is smooth so as not to be objectionable by reason of roughness or wire marks and further, has a very much greater resistance to abrasion than was provided by the prior art materials as explained hereinabove. Again, the now lower surface of the web, which was in contact with the pervious wire 30 may be slightly marked, but this is immaterial as this surface is normally used for the bottom of the insoles and hence does not need to be as smooth.

The formation of a web on a Fourdrinier-type paper machine takes place at a rate substantially equal to the rate of extraction of water from the slurry or paper stock; the initial strata forms rapidly and each subsequent strata at a slower rate. The slurry has but one velocity and direction as it leaves the headbox and traverses the apron, but soon comes under a second force at the apron edge where there is an immediate and rapid drainage. The flow of fiber is a resultant vector velocity of the forward velocity and the downward pull of water through the wire. The resultant vector velocity approaches the horizontal as the rate of drainage decreases. The wire speed and forward velocity become the same, thus cancelling the forward velocity, and the slurry then comes only under the velocity of the drainage rate. Thus, due to the slowing rate of formation and vector velocity, grain is built into the web, permitting the web to tear at one angle through its thickness easier than at another such angle.

In the prior art the web thus formed on a Fourdrinier machine and supported upon a suitable endless belt was passed between squeeze rolls, one of which engaged the surface of the web opposite the wire-engaging surface thereof. There was a tendency for portions of the web to adhere to the squeeze roll in contact therewith which, in turn, tore up portions of the web due to the grain angle aforesaid, digging deeper and tearing into the web to a substantial extent. When, however, in accordance with the present invention the direction of the web travel is first reversed, so that the wire-engaging portion as formed on the Fourdrinier machine is uppermost, and the web in this reversed position is supported upon an endless belt of

felt or the like, the web is similarly passed through squeeze rolls, except that the only one of the squeeze rolls which is now in direct contact with the web engages that surface thereof which was formed in contact with the Fourdrinier wire. Under these circumstances, if any portion of this one web tends to adhere to the squeeze roll which is in contact therewith, the tendency will be only to lift up a relatively thin layer or strata of the web and not to dig into it, again due to the grain angle aforesaid, thus minimizing possible damage to the web incident to fibers adhering to the squeeze rolls.

Following the treatment of the web as above set forth, it is carried through to a drying means, which may take the form of upper and lower series of rotating substantially cylindrical drums as indicated at 44. Only one of each of these series of drums is shown in the diagrammatic illustration of FIG. 1, as these devices have become quite conventional in the paper art. Following this, the web is rolled up and treated in any suitable manner. The web may then be cut up or handled in any desired manner in accordance with the ultimate purpose and the desires of the makers or users thereof.

While the invention has been described primarily from the point of the making of impregnated paper material for use as shoe insoles, the principles thereof are also adaptable for the making of a large number of other products as will occur to those skilled in the art from the foregoing description. We do not wish to be limited, therefore, except by the scope of the appended claims, which are to be construed validly as broadly as the state of the art permits.

What is claimed is:

1. The process of forming an impregnated fiber product, comprising the steps of continuously forming a moving web from an aqueous slurry of fibers of various lengths and including finely divided solids in suspension, by supplying said slurry to a paper-making machine having an endless wire fabric on which the web is formed; moving said endless wire fabric continuously while extracting water therethrough from said slurry, so as to form a web having a wire-engaging portion of its thickness containing a mat of some of the longer of said fibers and also containing a major portion of the smaller fibers and of said solids; changing the direction of movement of said web, so that said wire-engaging portion thereof is uppermost; passing the web as thus changed in its direction of movement to a wet saturation means, and there causing it to travel in a predetermined path having a portion disposed below the level of a bath of a saturant-containing liquid, while supporting the web from below during its passage through said bath on an endless liquid-pervious belt, and thereby simultaneously redistributing some of the finer particles of fiber and of said finely divided solids throughout the thickness of the web and impregnating the web with the saturant contained in the liquid of said bath; and drying the web.

2. The process of forming an impregnated fiber product, comprising the steps of forming a moving web from an aqueous slurry of fibers of various lengths and including finely divided solids in suspension, by supplying said slurry to a paper-making machine having an endless wire fabric on which the web is formed; moving said endless wire fabric continuously, while extracting water therethrough from said slurry, so as to form a web having a wire-engaging portion of its thickness containing a mat of some of the longer of said fibers and also including a major portion of the smaller fibers and of said solids; changing the direction of movement of the web, so that said wire-engaging portion thereof is uppermost; passing the web as thus changed in its direction of movement to a wet saturation means, and there causing it to travel in a predetermined path having a portion disposed below the surface of a bath of saturant-containing liquid, while supporting the underside of the web during its passage through said bath upon an endless liquid-pervious flexible support and while pressing the web incident to the tension of said liquid-pervious flexible support against a moving, substantially cylindrical, imperforate smooth surface, which extends below the surface of said bath and causes said predetermined path to extend below said surface, and thereby redistributing some of the finer particles of the fibers and said finely divided solids throughout the thickness of the web and impregnating the web with the saturant contained in the liquid of said bath; and drying the web.

3. The process of forming an impregnated fiber product in accordance with claim 2, comprising the further step of supplying the saturant-containing liquid to the entering nip between the web and said cylindrical surface so that some of this saturant-containing liquid will be forced into and through the web to assist in the redistribution of fine particles of fiber and of said finely divided solids as aforesaid.

4. The process of forming an impregnated fiber product in accordance with claim 2, further comprising the step of supplying the saturant-containing liquid to the exit nip where the web moves away from said cylindrical surface and which is located at a level above that of the surface of said bath, so that a part of this saturant-containing liquid will be absorbed into the web at this point in its travel incident to its elastic expansion upon release from the squeezing of the web between the endless liquid-pervious belt on which it is supported from below and said cylindrical surface, and thereby further assisting in the thorough saturation and redistribution of fine particles of fiber and of said finely divided solids.

5. The process of forming an impregnated fiber product in accordance with claim 2, further comprising the steps of supplying saturant-containing liquid to the entrance and to the exit nips where the web moves into contact with said cylindrical surface member and moves out of contact with said cylindrical member respectively, and wherein both said nips are located at levels above that of the surface of said bath, so as to augment the redistribution of the finer particles of the fibers and of said finely divided solids throughout the thickness of the web.

6. Apparatus for forming an impregnated fiber product, comprising a paper-making machine having a continuously moving, endless wire fabric on which the web is formed, said machine being adapted to be supplied with an aqueous slurry of fibers of various lengths and including some finely divided solids in suspension and operating to form a moving web having a wire-engaging portion of its thickness containing a mat of some of the longer of said fibers and also containing a major portion of the smaller fibers and of said solids; means for receiving a web formed continuously on said paper-making machine and for changing its direction of movement, so that the wire-engaging portion of the thickness of the web will be uppermost; a wet-saturation apparatus, means for passing the web as thus changed in direction to said wet-saturation apparatus; said wet-saturation apparatus including means providing a bath of a saturant-containing liquid, means for guiding the web in a predetermined path through said bath including means for supporting the web from below throughout its passage through said bath, and thereby for simultaneously saturating the web with saturant contained in the liquid of said bath and effecting a redistribution of some of the shorter of said fibers and of said finely-divided solids throughout the web; and means for thereafter drying the web.

7. Apparatus for forming an impregnated fiber product, comprising a paper-making machine having a continuously moving, endless wire fabric on which the web is formed, said machine being adapted to be supplied with an aqueous slurry of fibers of various lengths and including some finely divided solids in suspension, and operating to form a moving web having a wire-engaging portion of its thickness containing a mat of some of the longer of said fibers and also containing a major portion

of the smaller fibers and of said solids; means for receiving a web formed continuously on said paper-making machine and for changing its direction of movement, so that the wire-engaging portion of the thickness of the web will be uppermost; a wet-saturation apparatus, means for passing the web as thus changed in direction to said wet-saturation apparatus; said wet-saturation apparatus including means providing a bath of a saturant-containing liquid, a liquid-pervious endless belt for supporting the web from below and for guiding it in a predetermined path including a portion through said bath, a member having an imperforate cylindrical surface extending the full width of the web and disposed with its axis parallel to said width and arranged so that the lower portion of said cylindrical surface extends into said bath and into contact with the web passing therethrough, means exerting a predetermined tension on said endless belt so as to squeeze the web against the outer cylindrical surface of said member with sufficient pressure to express water from the web, said wet-saturation apparatus serving to assist in the redistribution of some of the finer particles of fiber and of said finely divided solids throughout the thickness of the web; and means for thereafter drying the web.

8. Apparatus for forming an impregnated fiber product in accordance with claim 7, further comprising means for supplying the saturant-containing liquid to the entering nip as the web approaches contact with said cylindrical surfaced member, and wherein the path of said web is such in respect to the position of the cylindrical-surfaced member that said entering nip is located at a level substantially above that of said bath, so that the movement of the web into the entering nip will tend to cause some of this liquid to be forced through the web and to assist in the redistribution of finer particles of fiber and of said finely divided solids.

9. Apparatus for forming an impregnated fiber product in accordance with claim 7, further comprising means for supplying said saturant-containing liquid to the exit nip, above that place where the web moves out of contact with said cylindrical surfaced member, and wherein the path of said web is such in respect to the position of the cylindrical-surfaced member that said exit nip is located at a level substantially above that of said bath, so as to supply said saturant-containing liquid to be taken up by the web upon the web being released from pressure between said liquid-pervious belt and the imperforate cylindrical surface of said member.

10. Apparatus for forming an impregnated fiber product in accordance with claim 7, further comprising means for supplying said saturant-containing liquid to and across both the entrance and exit nips above the places where the web moves into contact with the imperforate cylindrical surface of said member and out of contact therewith respectively, and wherein the path of said web is such in respect to the position of the cylindrical-surfaced member that both said entering and said exit nips are located at a level substantially above that of said bath, so as to augment the action of the saturation means in tending to cause redistribution of the finer particles of fiber and of said finely divided solid material throughout the thickness of the web.

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