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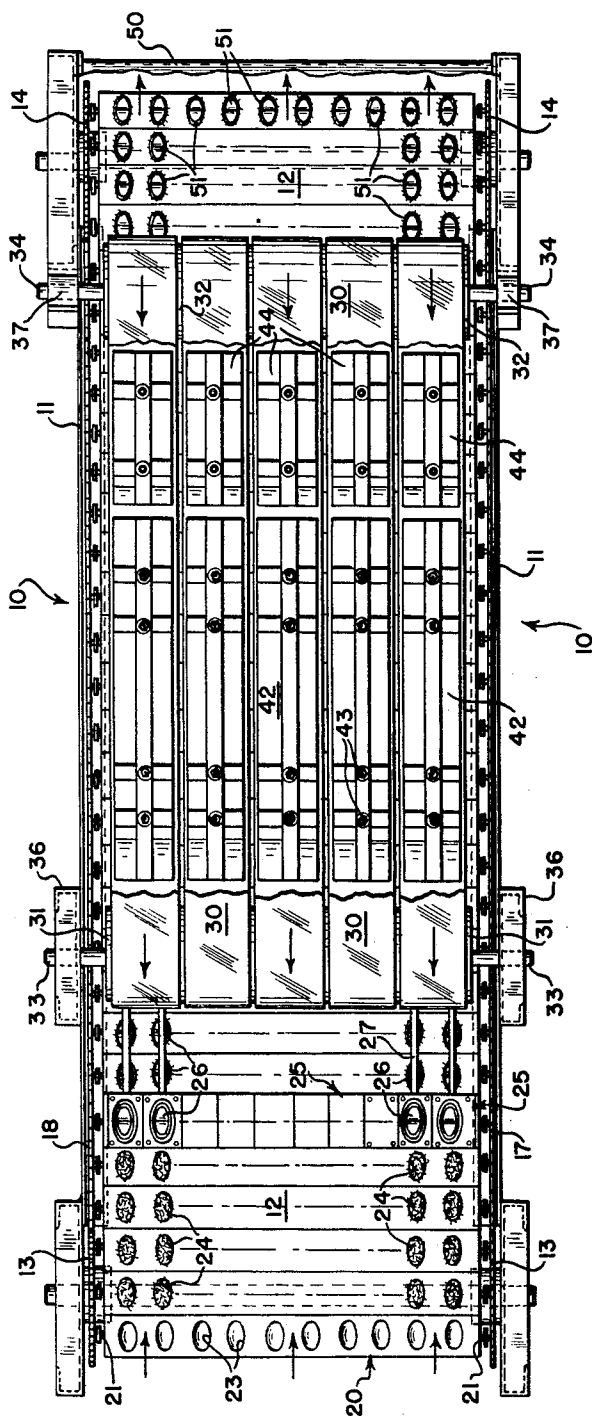
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METHOD FOR ATTACHING A BACKING TO A FIBROUS BODY

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2 Sheets-Sheet 1

FIG. 1



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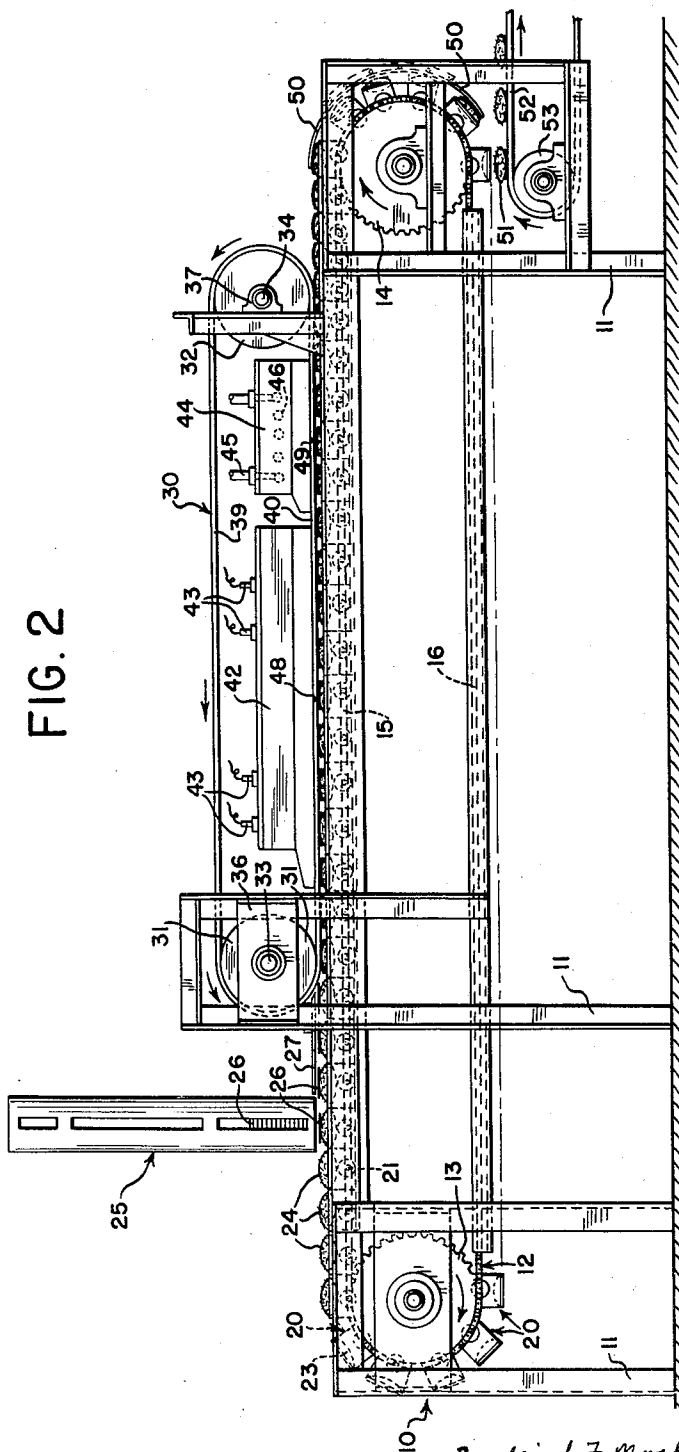
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FIG. 2



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METHOD FOR ATTACHING A BACKING TO A FIBROUS BODY

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This invention relates to a method and apparatus for attaching a backing to a body comprised of a multiplicity of fibers. More particularly, the invention is concerned with a method and apparatus for attaching a flexible backing sheet to a scouring pad composed of mingled steel wool filaments.

Metal wool, for example so-called steel wool, has gained wide acceptance for scouring household articles such as pots and pans. Scouring and polishing pads made of steel wool which has been matted or felted together or interwoven or interwoven into a mass of filaments, are marketed in a variety of sizes and shapes. The form of the pads must be such as to enable them to be easily gripped by a housewife to permit a proper scouring and polishing motion to be applied to the pads. In such use the pads are highly effective.

However, it will be seen that metal wool scouring pads used while being grasped present several undesirable characteristics. Metal wool, itself, is harsh and unpleasant to the touch. Rusting may occur after several immersions of a pad in water, and contact between the user's hand and rusted, wet, metal surfaces of the pad is disagreeable. Moreover, there is a tendency for metal wool to break or "splinter," which can result in slivers of the metal entering the skin of the user.

It has, therefore, long been a problem to provide a scouring pad with means enabling the pad to be gripped and manipulated in the scouring and polishing of pots and pans, such gripping means to be formed from material which will have no deleterious effect on the hand of a user and not be unpleasant to the touch. Furthermore, the gripping means should preferably be firmly secured to a plurality of metal wool filaments so that through all normal uses of the pad the gripping means will remain in place on the pad.

Also, the finished scouring pad preferably is of such structure that the pad can be manufactured by a method which is continuous as opposed to a batch-type process, which method can be carried out with little if any assistance from a human agency. The apparatus which, in operation, performs the novel method should be such as will enable the method to be carried out substantially automatically. Moreover, the apparatus should be such as will perform the steps of the method in sequence so that in a continuous operation, a plurality of individual pads and backings are simultaneously constructed into finished scouring pads provided with suitable backings.

It is, therefore, an object of the present invention to provide a method and apparatus for attaching a backing to a fibrous pad, which method and apparatus are continuous in operation and substantially fully automatic, and which perform the functions requisite to producing a backed scouring pad efficiently and economically.

The method of the present invention essentially comprises bringing together a body of fibrous material and a backing which has adhered to one surface thereof a composition which is heat-activatable to a flowable condition. The backing is, of course, of suitable dimensions, preferably, when properly oriented, covering a major portion of the surface of the body to which the backing is to be attached. The backing so contacts the fibrous body that the heat-activatable composition which is adhered to the backing is disposed adjacent to the body,

and more particularly, against the surface of the body to which the backing is to be attached. The composition is then heated to activate it and cause it to flow about portions of the fibrous body. When the composition is subsequently cooled, it solidifies about those body portions and thereby interlocks the body and the backing together into a single unit.

It has been found advantageous to apply pressure to force the body and backing together during or immediately after the heating of the composition so that the composition in flowable condition intimately contacts fiber portions of the body, preferably completely encasing fiber portions of the body adjoining the composition to provide as firm an interlocking as possible when the composition is subsequently cooled. In order that the intimate relationship between the fiber portions of the body and the flowable composition be maintained during the cooling of the composition to a temperature where it is no longer flowable, pressure is preferably applied to force together the body and the backing during the cooling of the composition. Such cooling may be accomplished merely by exposing the composition and its associated body and backing to the ambient atmosphere or by special cooling means.

The apparatus of the present invention is such as will enable the method to be carried out in an efficient, continuous manner. In a preferred embodiment, such apparatus includes an endless belt on which a body of interwoven or intertwined fibers is placed and means for positioning a backing on the body as the body moves at a continuous, uniform speed. After the backing has been applied, means are provided to keep the backing in proper position on the fibrous body until the body and its superimposed backing reach means for heating the composition, which is disposed between the backing and the body. The heating means and the cooling means which, in turn, act upon the composition, cause the composition to flow and then solidify to interlock the body and the backing.

According to a distinctive feature of the apparatus of the invention, the means for maintaining the backing in proper superimposition on the body includes a second endless belt formed from material resistant to deterioration at increased temperatures and moved at a surface velocity substantially equal to that of the endless belt which carries the fibrous body. The second endless belt is so positioned with regard to the body-carrying endless belt that one flight of the former is substantially parallel to a body-carrying flight of the latter and is spaced from the body-carrying flight a distance such that the second belt flight overlies and presses relatively lightly against a backing on its underlying fibrous body. Because the second endless belt is formed from heat-resistant material, a heating element in contact with a flight of that belt can heat a backing, its associated composition, and the body therebeneath, through the belt during movement thereof without substantially harming the belt. Such a belt is made of Teflon or similar heat-resistant material. Likewise, a cooling element is preferably disposed following the heating element, and the cooling element cools the composition which passes therebeneath through the Teflon belt.

It has been found desirable to form both the heating and cooling elements from material which is fairly heavy so that, in addition to their respective heating and cooling functions, the elements will concomitantly apply a relatively heavy pressure to force the backing and body together. Such pressure ensures intimate commingling of the composition and adjoining fibers of the body during the heating and cooling steps of the method of the invention. A preferred heating element may be formed from a block of steel or other material with a high

coefficient of thermal conductivity, in which a plurality of high-resistance wires are inserted. In a similar manner, the cooling element can be formed from a block of steel or thermally conductive material with or without cooling coils inserted therein in a conventional manner. Such a cooling element will easily acquire heat from the scouring pads passing beneath it and thus cool the pads.

The endless belt which carries the fibrous bodies of the present invention may be composed of a series of links formed with aligned, hollowed-out portions, each of which functions to retain a body therein as the body passes through the various steps of the method. In practice these links are formed with a multiplicity of such hollowed-out portions, and the bodies are initially located in their respective portions by means of an automatically operated hopper or by being placed therein by hand. After scouring pads, each having a backing affixed thereto, have been produced, the pads are discharged from their hollowed-out portions in the endless belt as the supporting flight of the belt passes around its associated pulley and is inverted in a return flight. The pads so discharged may be collected and packaged by conventional means.

As stated hereinbefore, a pad body according to this invention is preferably composed of elongated filaments of steel or the like intertwined or interwoven more or less randomly with respect to one another. The metal wool body preferably also has incorporated therein some form of soap or saponaceous composition which serves as a lubricant as well as a detergent and effects appropriate scouring and polishing of pots and pans and similar articles. In accord with present commercial practices, the metal wool mass can be assembled into a suitable pad having an oval or rectangular outline and can be of a compressible, springy nature such that it will yield upon the application of pressure as the composition is activated and pressed about the metal wool filaments. The surface of the pad is preferably plane on that side of the pad which is to receive the plastic composition, but may be rounded or sloping, particularly near the marginal edges of the pad.

A backing which has been preferred for use in forming the present scouring pad is composed of a sheet of flexible paper, which has a desirable amount of firmness so that it will resist disintegration upon strenuous use. Such a backing may have a handle portion incorporated therein, the handle portion being produced by folding the backing sheet at a central portion to produce two face-to-face plies thereof. When such a handle is incorporated in the backing sheet, the handle may have its inner surfaces coated with the same composition which adheres to the remainder of the backing and which is utilized to interlock the body and the backing. If desired, the plies which form the handle may be secured together by the same heating and cooling steps which serve to join the flowable composition to fiber portions of the body.

Sheet material for a backing which has been found advantageous in use is that having properties usually found in fibrous cellulosic material or paper, i.e., flexibility and tendency to absorb quantities of plastic resins applied thereto. Although paper in the common or usual sense means a material made from such sources as wood, rag, or bagasse (sugar cane), a broader interpretation of the term paper is intended herein, the term being understood to include such kindred materials as artificial and natural textile fibers which are matted and woven. Also included in the term, paper, are composite structures made by laminating such paper or paper-like compositions to other sheets such as plastic films, metal foil and the like, which may be relied upon to offer an attractive appearance either through an applied design or the appearance of the material itself. As a rule, the paper backing sheet for use in combination with the backing film will be one

capable of being printed and will range in weight from 8-90 lbs., preferably about 45 lbs. (basis weight of 24"×36" i.e., 2'×3' times 500 sheets=3000 sq. ft.)

Various kinds of paper that can be used are: papers made from chemical pulps including sulphate papers, sulphite paper, sulphate-sulphite combination papers, soda pulp papers, these various papers being either uncoated or coated on one or both sides with a coating comprising clay, titanium dioxide, and binder; papers made from chemical pulp or chemical pulp and groundwood combinations, coated or uncoated, which have been calendered or supercalendered, such as publishing papers, glassine, supercalendered sulphite papers, machine finish sulphite-sulphate papers, and machine finish and machine glazed sulphite-sulphate papers, and other materials such as cellulosic films including cellophane and cellulose acetate, foil and the like.

The heat activatable composition according to the present invention may be directly coated on those portions of the backing which overlie the body and will be maintained in face-to-face relationship with one surface of the body in the finished scouring pad. In other embodiments the heat activatable composition may be in the form of a plastic film which is fixed to the backing by being held within the handle portion thereof or by being spot-welded at various locations on the surface of the backing. This film can be fixed to the backing at such a plurality of points so that it will substantially conform to the outline thereof, or at such few points that the film may be free for limited movement with respect to the backing prior to heat activation. In the latter form the film may be recognized as flaps extending on either side of the handle.

The composition or film according to the present scouring pad preferably has a thickness substantially equal to or greater than the largest cross-sectional dimension of the metal filaments of the body, and when activated is capable of receiving filament loops therein to the extent that successive loops of a plurality of filaments will have the composition fused therearound. Thus, the composition is so characterized that, when activated, it will melt and flow around portions of the filaments to interlock the composition to the filaments. If film flaps are utilized to provide the flowable composition, such flaps will be secured to the backing at the same time that they are fixed to filament portions of the body, thus effecting a unitary structure.

To effect a stable structure the heat-activatable composition should be of high tensile strength as well as dimensional stability at least at temperatures below 140° F., that is, at those temperatures normally encountered in household use. At such temperatures the composition should also remain relatively inert to the action of alkalis, hot water and soaps, and should be non-toxic, odorless and of such flexibility that, at the thickness required for proper interlocking of film loops of the body and the backing, the composition alone or in combination with a backing sheet of paper, foil, woven fabrics or the like, will be flexible in use.

The composition may be of any suitable, activatable material which lends itself to liquefaction through the action of heat, such as plastic resins. Such compositions as the polymerized olefins, e.g., polyethylene, are preferably employed. Other suitable film compositions include microcrystalline waxes with added polyethylene; polyisobutylene with added paraffin; vinyl acetate; polyamides; butyl rubber emulsions, and like moisture-proof adhesive resins.

These and other objects, features and advantages of the present invention will become more apparent when taken in connection with the following detailed description of a preferred embodiment of the invention and the illustration of that embodiment in the accompanying drawings, which form a part hereof, and in which:

FIG. 1 is a top plan view of an embodiment illustrating

the apparatus of the invention and the method performed thereby, with portions of the apparatus cut away; and

FIG. 2 is a side elevational view of the apparatus and method of FIG. 1.

Referring now to the drawings, the apparatus 10 for attaching a backing to a fibrous body or scouring pad comprises a frame 11 which supports an endless belt 12 as the belt is propelled by means of sprocket wheels 13 actuated by conventional motor means (not shown). Endless belt 12 is trained over and around pairs of sprocket wheels 13 and 14 at either end of frame 11 and thereby forms a pair of flights. When all four sprocket wheels 13 and 14 are aligned horizontally, the belt is thereby comprised of an upper horizontal flight 15 and a lower horizontal flight 16 substantially parallel to the upper flight 15 (FIG. 2).

The structure of the endless belt indicated generally by reference numeral 12 is best seen in FIG. 1. The endless belt 12 is formed from two horizontally spaced chain members 17 and 18, each of which cooperates with and is trained around one of a pair of sprocket wheels 13 and one of a pair of sprocket wheels 14 on either end of the frame 11. Propelled by and extending between chain members 17 and 18 are a plurality of links 20 which have pins 21 formed integrally therewith at their ends. Pins 21 are engaged with the chain members 17 and 18 and so maintain their respective links 20 in fixed longitudinal position with respect to chain members 17 and 18.

Each link 20 is provided with a series of spaced, hollowed-out portions 23, which are of such shape and dimensions as to readily retain a fibrous body 24 therein when the portions 23 are in upright position. A scouring pad 24 located in a hollowed-out portion 23 protrudes upwardly beyond the plane of its link 20 and is thereby in position to be contacted by other parts of the apparatus 10 in the course of the passage of the pad through the apparatus.

The horizontal flight 15 of the endless belt 12 formed by opposed chain members 17 and 18 and links 20 has been illustrated in the drawings as moving from left to right. As soon as a link 20 has assumed a substantially horizontal position as part of the upper flight 15, a pad body 24 of interwoven or intertwined steel wool filaments is inserted in its respective hollowed-out portion 23. The pad next passes to a device for positioning a paper backing according to the invention on each of the pads 24. Backing applicator 25 is indicated generally in FIG. 2 and may include any one of a number of mechanism such as would occur to those skilled in the art as suitable for this purpose. Since each backing 26 is substantially flat when located on its respective pad, the applicator 25 merely functions to locate a flat backing 26 on each pad 24 as the pad moves at a uniform rate of speed beneath the applicator 25. Applicator 25 extends across all of the hollowed-out portions of a link 20 passing beneath it. Because the belt 12 moves at a uniform rate of speed, the pad-locating function of the applicator 25 may be synchronized with the movement of the belt, or applicator 25 may be actuated by mechanical means such as by passage of a link 20 into the proximity of the applicator 25. In addition, a human agency could substitute for the automatic functioning of applicator 25.

A backing 26 which is adapted to be utilized in the applicator 25 of the present invention may be one such as is illustrated and disclosed in either of two co-pending applications, one of which is in the names of Mark J. Perkovich, Charles R. Wardwell and Edgar H. Wolfe, and the other of which is in the name of Mark J. Perkovich.

After backings 26 have been applied to a row of pads 24 on a link 20 by means of applicator 25, the pads 24 with the backings 26 positioned thereupon pass under resilient fingers 27, which press lightly against backings 26 and maintain the backings in position over their respective pads. Each pad and its backing then passes under a second endless belt 30 which is propelled by passing over

and around a spaced pair of rollers 31 and 32. Each of rollers 31 and 32 is mounted on a corresponding axle 33 and 34, which has end portions extending outwardly beyond its associated, cylindrical roller. Forward roller 31 has its axle 33 journaled in apertures in support members 36 fixed to part of the frame 11, while rearward roller 32 has the ends of its axle 34 journaled in pillow blocks 37, which are likewise attached to the frame 11 of the apparatus 10.

As seen in FIG. 2, endless belt 30 is so disposed about rollers 31 and 32 as to form upper and lower flights 39 and 40, respectively, each of which flights is parallel to the parallel flights 15 and 16 of endless belt 12. As indicated by arrows on FIGS. 1 and 2, upper flight 39 of endless belt 30 moves from right to left in the drawing, which direction is opposite to that of corresponding upper flight 15 of endless belt 12. Corresponding lower flights 40 and 16 of the two endless belts also move in opposite directions. Endless belt 30 is so disposed above endless belt 12 that lower flight 40 is positioned adjacent to upper flight 15 of endless belt 12. Endless belts 12 and 30 move at the same surface velocity. Since upper flight 15 and lower flight 40 move in the same direction and at the same speed, when lower flight 40 is positioned to overlie and contact successive rows of backings 26 on their pads 24, there will be no relative movement between lower flight 40 and those backings and pads. Consequently, endless belt 30 maintains each backing 26 on its respective pad 24 during the further steps of the method performed by operation of the apparatus 10.

As illustrated in the embodiment of the invention seen in FIG. 1, endless belt 30 actually consists of a plurality of aligned belt sections. However, it will be understood that such embodiment is illustrated merely for the purposes of showing a specific embodiment of the invention and that endless belt 30 can, of course, be formed from one continuous length of belt material. In contrast to lower endless belt 12, which is composed of links 20, endless belt 30 is preferably formed from continuous belt material resistant to deterioration at increased temperatures, such as Teflon or the like.

Heating element 42 is located in the path of movement of pad bodies 24 and their backings 26. Heating element 42, which is conventionally energized by heater coils (not shown) supplied with electric power through contacts 43 at the surface of the element, is made of a heavy, highly heat-conductive material. Heating element 42 is located over lower flight 40 of endless belt 30 and presses against lower flight 40 and backings 26 and their respective pads 24 by reason of the weight of the heating element 42 itself.

A cooling element 44 having conventional cooling coils 46 therein and receiving a refrigerating fluid by means of conduits 45 is next in the direction of movement of upper flight 15 and lower flight 40. Cooling element 44, like heating element 42, is formed from a heavy, heat-conductive material, such as a metal having a high coefficient of thermal conductivity and, therefore, presses against lower flight 40 of heat-resistant belt 30 and against the backings 26 and pads 24 carried by upper flight 15 of endless belt 12. Lower surfaces 48 and 49 of heating element 42 and cooling element 44, respectively, are of such a degree of smoothness as to permit heat-resistant flight 40 to pass therebeneath with a minimum amount of friction. Consequently, the rows of pads 24 and their overlying backings 26 in hollowed-out portions 23 pass freely beneath heavy heating element 42 and cooling element 44 with no appreciable reduction in their velocities due to the pressure of the heating and cooling elements.

Having passed beneath cooling element 44, the pads with their associated backings then approach the end of the path of movement of horizontal flight 15 of endless belt 12. Held in their respective grooves by a curvilinear guide 50, which conforms generally to the rotary path of movement of endless belt 12 around the rearward sprocket

wheels 14, the finished scouring pads 51 with backings 26 and bodies 24 firmly attached to each other are inverted and dropped onto a discharge belt 52. Discharge belt 52 passes around pulley 53 and is of any conventional design. It functions to move the finished scouring pads to inspection and packing stations by passing the pads on the upper flight of that belt toward the right of the apparatus, as best seen in FIG. 2.

The method of the present invention is performed by the apparatus described hereinbefore and illustrated in the drawings as follows: A body 24 is first located in one of the hollowed-out portions 23 of a link 20 by means of a hopper having a discharge mechanism synchronized with movement of endless belt 12, or by other means, human or mechanical. In its groove or hollowed-out portion 23 the body 24 moves at a uniform speed through the steps of the method. First, body 24 passes beneath backing applicator 25, where a backing 26 is positioned on the upper surface of the pad and maintained thereupon by resilient finger 27. Passing from beneath resilient finger 27, backing 26 and its associated body 24 are moved beneath lower flight 40 of endless belt 30, which flight presses backing 26 lightly against body 24 therebeneath. Moved further by its link 20, backing 26 passes under relatively heavy heating element 42, where it is pressed firmly against its associated fibrous body and simultaneously heated. As they emerge from beneath the heating element 42, the backing 26 and body 24 pass beneath cooling element 44, where they are simultaneously pressed together and cooled. The finished scouring pads 51 are then discharged from endless belt 12 onto conveyor 52.

In the course of operation of the apparatus 10 to perform the method of the present invention, a backing having adhered thereto a composition heat-activatable to a flowable condition is brought into contact with a fibrous body so that the composition is disposed adjacent to the body. The composition is then heated and thereby activated to a flowable condition. Simultaneously with such heating the backing is pressed against the fibrous body so that the composition in its flowable state intimately contacts fiber portions of the body. The composition is then cooled while the backing is pressed against the body, whereby the composition solidifies about those fiber portions with which it is intimately in contact. The cooled composition, which has remained adhered to the backing and is now firmly fixed to fiber portions of the body, thereby functions to interlock the backing and the body to form, as a unitary structure, a scouring pad having a backing attached thereto.

While the present invention has been described hereinbefore and illustrated in the drawings with particular reference to a specific embodiment thereof, it will be understood that the invention is not to be limited to such embodiment. Its scope is intended to be defined only by reference to the following, appended claims.

What is claimed is:

1. A continuous method of forming a scouring pad composed of a mass of metal wool filaments having a backing adhered thereto, comprising moving a mass of metal wool filaments of a size suitable for forming an individual scouring pad along a predetermined path and while said mass is so moving, bringing into contact therewith a thin flexible backing of dimensions such that it will substantially overlie only a single said mass, said backing having adhered thereto a composition heat activatable to a flowable condition, pressing said backing against said mass, thereafter heating said composition to activate it and cause it to flow and intimately contact filaments of said mass, and then cooling said composition to solidify it about said filaments and thereby interlock said mass and said backing, said mass being maintained in motion during said pressing, heating and cooling thereof.

2. A continuous method of forming a scouring pad composed of a mass of metal wool filaments having a

backing adhered thereto, comprising moving a mass of metal wool filaments of a size suitable for forming an individual scouring pad along a predetermined path and while said mass is so moving, bringing into contact therewith a thin flexible backing of dimensions such that it will substantially overlie only a single said mass, said backing having adhered thereto a composition heat activatable to a flowable condition, pressing said backing against said mass with relatively light pressure, thereafter simultaneously increasing said pressure and heating said composition to activate it and cause it to flow and intimately contact filaments of said mass, and then cooling said composition to solidify it about said filaments and thereby interlock said mass and said backing, said mass being maintained in motion during said pressing, heating and cooling thereof.

3. A method as claimed in claim 2, in which cooling of said composition is carried out while the increased pressure on said backing is maintained.

4. A continuous method of forming a scouring pad composed of a mass of metal wool filaments having a backing adhered thereto, comprising moving a mass of metal wool filaments of a size suitable for forming an individual scouring pad along a predetermined path and while said mass is so moving, bringing into contact therewith a thin flexible backing of dimensions such that it will substantially overlie only a single said mass, said backing having adhered thereto a composition heat activatable to a flowable condition, passing said backing and said mass under a member contiguous with said backing and moving at the same speed as said backing and said mass to exert pressure on said backing, heating said composition to activate it and cause it to flow and intimately contact filaments of said mass, maintaining said pressure after heating, and then cooling said composition to solidify it about said filaments and thereby interlock said mass and said backing, said mass being maintained in motion throughout said method.

5. A continuous method of forming a scouring pad composed of a mass of metal wool filaments having a backing adhered thereto, comprising disposing a mass of metal wool filaments of a size suitable for forming an individual scouring pad on a first moving endless belt, and while said mass is so moving, bringing into contact therewith a thin flexible backing of dimensions such that it will substantially overlie only a single said mass, said backing having adhered thereto a composition heat activatable to a flowable condition, passing said backing and said mass under a second endless belt contiguous with said backing and moving at the same speed as said first belt to exert relatively light pressure on said backing, increasing said pressure and heating said composition to activate it and cause it to flow and intimately contact filaments of said mass, maintaining the backing and mass after heating under the pressure of said second endless belt, and then increasing said pressure again and cooling said composition to solidify it about said filaments and thereby interlock said mass and said backing, said mass being maintained in motion during said method.

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