March 13, 1934. B. W. LUTTENBERGER 1,950,988

PROCESS OF AND APPARATUS FOR APPLYING A FIBROUS COATING TO A FILAMENT OR WIRE

Original Filed July 2, 1930 2 Sheets-Sheet 1

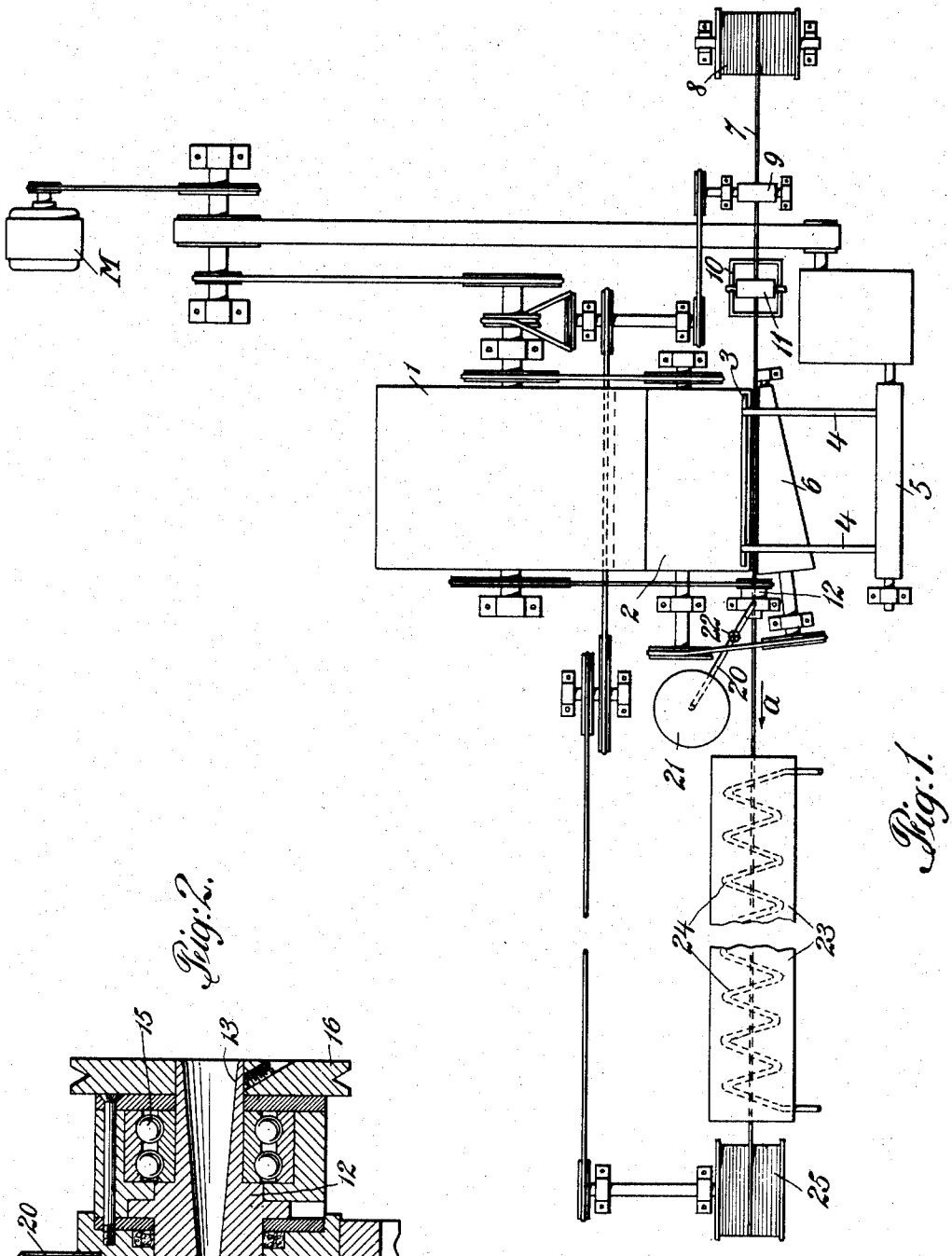


Fig. 1.

Fig. 2.

Benjamin W. Luttenberger INVENTOR

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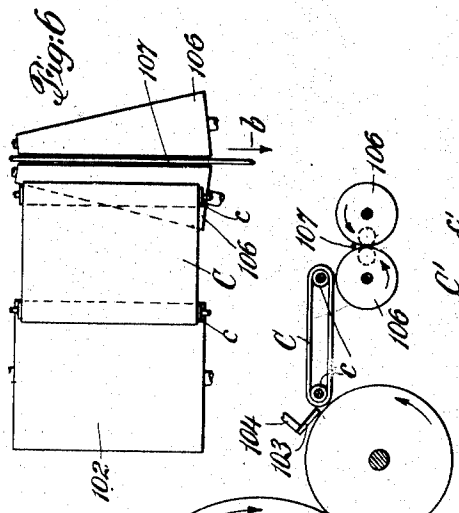
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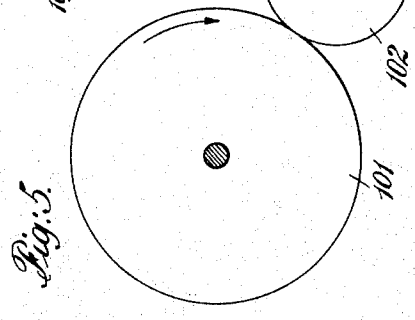
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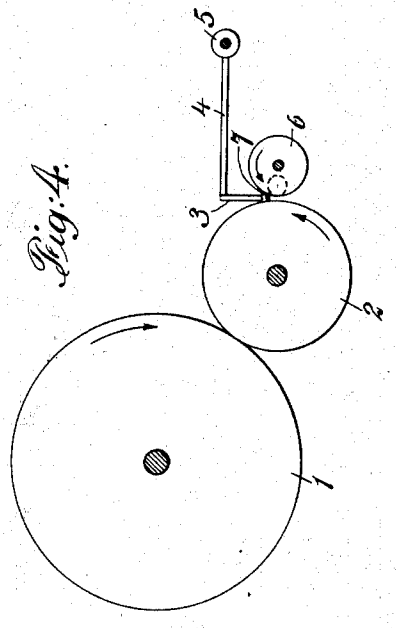
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PROCESS OF AND APPARATUS FOR APPLYING A FIBROUS COATING TO A FILAMENT OR WIRE

Original Filed July 2, 1930 2 Sheets-Sheet 2







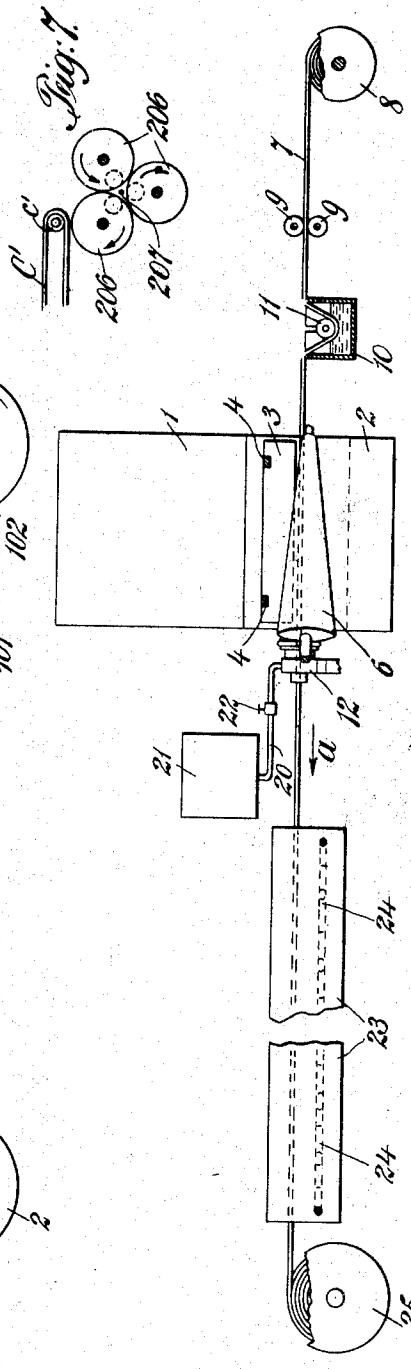


Fig. 3

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1,950,988

UNITED STATES PATENT OFFICE

1,950,988

PROCESS OF AND APPARATUS FOR APPLYING A FIBROUS COATING TO A FILAMENT OR WIRE

Benjamin Weber Luttenberger, Manheim, Pa., assignor to Raybestos-Manhattan, Inc., Passaic, N. J., a corporation of New Jersey

Application July 2, 1930, Serial No. 465,363
Renewed April 27, 1932

41 Claims. (Cl. 117—40)

My invention consists in the novel features hereinafter described, reference being had to the accompanying drawings which illustrate one form of apparatus for carrying my invention into effect, and several modifications thereof, selected by me for purposes of illustration, and my said invention is fully described in the following description and claims.

The object of my invention is to cheaply and effectively cover a filament with a coating of fibers in unspun and untwisted condition, and is particularly adapted to the formation of an insulating covering upon wires used for conducting electrical currents, in which case the fibers employed will ordinarily be asbestos fibers, and my invention permits the formation of a compact and smooth insulating covering upon such wires or conductors from short asbestos fibers and dispenses with the necessity of spinning, weaving or braiding the fibers employed.

Briefly stated my invention consists in continuously feeding a filament, wire or conductor, which may or may not be provided with a thin coating of adhesive material, delivering into juxtaposition to a portion of the filament, fibers of the covering material, as asbestos or other fibers, and subjecting the fibers to the action of a rotating surface, or a plurality of rotating surfaces, the surface speed of which increases gradually in the direction of movement of the filament to wind the fibres about and upon the filament, and gradually increase the thickness of the coating formed, to the desired extent, and to condense the fibres forming said coating. For this purpose I conveniently employ a smooth conical roller increasing in diameter in the direction of travel of the filament and having its surface substantially parallel to the filament and its axis at an angle to the filament, which roller may receive the fibers directly from the doffer roll of a carding apparatus and may have its surface parallel to the surface of the doffer roll, or I may employ two or more of such conical rollers. In either case the increasing surface speed of the roll (or rolls) effects a drawing action on the fibers longitudinally of the filament in the direction of travel thereof which assists in laying the fibers around the filament to the desired thickness and in condensing them.

The covered filament is then passed through a rapidly revolving whirl having a conical interior surface decreasing in diameter and therefore in surface speed, in the direction of travel of the covered filament. The action of the interior surface of the whirl tends to further condense the fiber covering, and exerts a drawing effect on the fiber coating in a direction opposite to the direction of travel of the filament, which has the effect of smoothing down surface irregularities, and bring the covered filament to a substantially uniform diameter. My invention also includes the supplying of a moistening liquid of any desired character, or composition, to the fiber covering, while it is being acted upon by the whirl, and this tends to further condense the fiber covering and smooth and finish its exterior surface.

The covered filament may be passed through suitable drying means, and wound upon suitable reels. In practice the covered filament may also be further treated with impregnating liquids or other materials, with waterproof compounds, and with any suitable finishing or protecting surface coating, as desired, and dried or cured in any suitable manner, that its subsequent treatment may require.

In the accompanying drawings, in which I have illustrated one embodiment of apparatus for carrying my invention into effect, together with several modifications thereof,

Fig. 1 is a diagrammatic plan of an apparatus for covering wire which has been found suitable for carrying out my invention.

Fig. 2 is an enlarged sectional view of the whirl shown in Fig. 1.

Fig. 3 is a diagrammatic elevation of the apparatus shown in Fig. 1.

Fig. 4 is a detail of a portion of the apparatus drawn to a larger scale.

Fig. 5 is a view similar to Fig. 4, showing a modification in which two conical rollers are employed.

Fig. 6 is a partial plan view of the parts illustrated in Fig. 5.

Fig. 7 is a detail of an arrangement similar to that shown in Figs. 5 and 6, in which three conical rollers are employed.

In the apparatus shown in Figs. 1 to 4 inclusive, 1, represents the main card cylinder of a carding apparatus of usual or of any preferred construction. 2, represents the doffer roll and 3, represents the doffer comb, supported by arms, 4, from a shaft, 5, and operated in the usual manner. These parts operate in the manner usual in carding apparatus to the end that the flocculent fibers, which in this instance are asbestos fibres, are delivered in the form of a web of the desired width. In practice, in applying insulating covering to wires or conductors I prefer, for cheapness, to employ short asbestos fibres, such, for example, as

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are unsuitable for spinning or weaving, but it is to be understood that longer fibres may be employed and also that my invention is not limited to asbestos fibres, but is capable of being carried into effect with other fibres such as cotton, jute, ramie, linen, etc., when desired.

On the outer side of the doffer roll I arrange a conical winding and condensing roller, 6, having its surface disposed substantially parallel to the surface of the doffer roll and its axis at an angle thereto, as clearly shown in Fig. 1. 7 represents the filament to be covered (in this case a wire or conductor) which is supplied to the apparatus from a spool, indicated at 8, from which it is withdrawn (preferably continuously) by feed rolls, 9, 9, for example, and the wire is passed longitudinally along the trough or space formed between the contiguous surfaces of the doffer roll, 2, and conical roll, 6. The conical roll is so placed that its diameter, and therefore its surface speed, increases gradually in the direction of travel of the filament, or wire, the direction of movement of which is indicated by the arrow, *a*, in Figs. 1 and 3.

Where it is desired to give the filament or wire a coating of adhesive material before applying the fibre coating, this can be done in any desired manner. For example, I have shown a tank, 10, for holding an adhesive liquid of any desired character or composition the tank being provided with a roller, 11, under which the filament or wire passes, to immerse it in the liquid before it passes to the conical roller, 6.

It will be seen that when the apparatus is in operation a thin web of flocculent fibers is delivered from the doffer roll and comb, continuously into juxtaposition to a predetermined length of the filament or wire. Arrows in Fig. 4 indicate the directions in which the doffer roll, 2, and the conical roll, 6, are respectively and continuously rotated. The adjacent surfaces of the doffer roll and conical roll move in opposite directions and the conical roll winds or rolls the fibers around the filament or wire. The coating of adhesive material as employed contributes to the rolling action by attaching the fibres nearest to the filament securely thereto. As the filament or wire passes along the cone roller, the increasing surface speed of the latter causes the fibres to build up a coating of the desired thickness which can be determined by the width of the fibre sheet and the speed of travel of the wire and rotating parts, and the gradually increasing surface speed of the conical roller exerts a drawing effect in the direction of travel of the filament or wire, upon the fibres, which assists in winding them and condensing them upon the filament or wire at a substantially uniform thickness.

As the covered filament leaves the cone roller, 6, at its larger end, it is passed longitudinally through a rapidly revolving whirl, 12, one form of which is shown in section in Fig. 2. The interior surface of the whirl is conical, as shown at 13, and the covered wire enters at the larger end and leaves at the smaller end, which is conveniently provided with a tubular aperture, 14, of substantially uniform diameter and of approximately the size desired for the covered filament or wire. The whirl is mounted in suitable bearings, as the ball-bearing, 15, and is provided with a suitable grooved pulley, 16 (or other means) for rotating it at high speed.

As the covered filament or wire passes through the whirl, 12, it is subjected to further rolling or winding effect by the inner surface, 13, of the whirl, the surface speed of which gradually decreases, with the diameter, in the direction of travel of the filament or wire. This has the effect of smoothing down surface irregularities of the fibre coating and further condensing it. The surface, 13, of the whirl also has a drawing effect on the fibre coating in a direction opposite that of the travel of the filament or wire. In passing through the whirl the fibre coating is therefore condensed to the diameter of the passage, 14, at the smaller end, and is smoothed and pressed with an action similar to an ironing action, so that it leaves the whirl in a smooth, uniform and compacted condition.

In some instances I have found it advantageous to treat the covered filament or wire while in the whirl with a liquid (water, or any other desired liquid) to lubricate it and assist in the final condensation and consolidation of the fibre coating. In Fig. 2, for example, I have shown the body of the whirl provided with radial passages, 17, communicating at their inner ends with the central tapering passage, and at their outer ends with a circular groove, 18, in a portion of the bearing support, 19, surrounding the whirl, which is supplied with liquid by a pipe, 20, from a reservoir, 21, the pipe, 20, being under the control of a suitable valve, 22. As the passage for the liquid from the reservoir to the axial passage of the whirl is entirely enclosed, the liquid will be continuously supplied under the pressure of the liquid in the reservoir (or any other pressure means) and the tendency to throw the liquid outwardly by the rotation of the whirl will be overcome. The supply of liquid can be accurately regulated by the valve, 22.

Where the coating is moistened it will usually be desirable to dry it, and I have shown a drier, 23, heated by steam pipes, 24 (or otherwise) through which drier the covered filament or wire is led, after which it may be wound upon a suitable receiving spool, 25. The supply spool 8 and receiving spool 25 are shown as being supported by stationary bearings, so that the filament is at all times held from rotation. If the covering is to be water-proofed, or impregnated with suitable compounds, or subjected to a protecting exterior coating, it may be withdrawn from the receiving spools for such treatments, dried as necessary, and rewound, or it may be conducted directly through such treatments in the usual or any preferred manner before being wound.

In Fig. 1 I have indicated more or less diagrammatically the means for driving the various parts of the apparatus from a prime mover, as an electric motor, M, but as the particular driving means forms no part of my invention and would obviously be varied by different constructors of the apparatus, no purpose would be served by describing the various belts, pulleys, etc., in detail.

In some instances, instead of employing a single conical winding and condensing roll, as shown, which conveniently operates in conjunction with the doffer roll and possesses the advantage of receiving the fibres directly as they are released from the doffer by the doffer comb. I may in some instances employ two or more of such conical rolls, and convey the fibre web to them from the doffer roll, the filament or wire in such case passing longitudinally between the conical rolls.

In Figs. 5 and 6 for example, in which the parts corresponding with those previously described are given the same reference numerals with the

addition of 100, I have shown a pair of conical winding and condensing rollers, 106, 106, having their surfaces substantially parallel, and their axes each at an angle to the direction of movement of the filament or wire, 107, which direction is indicated by the arrow, 6, in Fig. 6, and each roll increasing in diameter, and therefore in surface speed in the direction of movement of the filament or wire. The web of fibres is delivered from the doffer roll, 102, and comb, 103, upon a conveyor, indicated at C, (in this instance an endless belt supported on rolls, c, c,) and is delivered between the rolls, 106, 106, in juxtaposition to the wire. The conical rollers are driven in the same direction so that the adjacent surfaces travel in opposite directions, to wind and condense the fibres around and upon the filament or wire, substantially as heretofore described, except that the fibres will be acted upon by the rolls substantially on opposite sides of the filament or wire. The other parts of the apparatus will be and operate as previously described with reference to Figs. 1 to 4.

In Fig. 7 I have shown a further modification, in which three conical rolls, 206, 206, 206, are arranged around the path of the filament or wire, all of which may be rotated in the same direction as indicated, or certain of said rolls may be rotated in the reverse direction to others, as is found most desirable or advantageous. The web of fibres may be delivered to the wire and conical rollers by a conveyor, C', in a manner similar to that shown in Figs. 5 and 6. The other parts of the machine will be and operate in the manner previously described with reference to Figs. 1 to 4.

What I claim and desire to secure by Letters Patent is:—

1. The combination with means for continuously feeding a filament, and means for delivering fibres into juxtaposition thereto, of means for continuously winding the fibres around portions of the filament having surface portions for engaging the fibres moving at a speed increasing in the direction of movement of the filament.

2. The combination with means for continuously feeding a filament, and means for delivering fibres into juxtaposition thereto, of winding and condensing means having rotating surface portions substantially parallel to and moving substantially transversely to the filament, said surface portions traveling at speeds gradually increasing in the direction of travel of the filament.

3. The combination with means for continuously feeding a filament, and means for delivering fibres into juxtaposition thereto, of winding and condensing means including a conical roll having its surface substantially parallel to the filament, and its axis at an angle thereto, said roller increasing in diameter and surface speed in the direction of movement of the filament, and means for rotating said roll.

4. The combination with means for continuously feeding a web of carded fibres, of means for continuously feeding a filament longitudinally in a direction transversely of said web, and means for winding the fibres of said web continuously around and upon the filament having surface portions traveling, at a speed increasing gradually from one edge of the web to the other in a direction of movement of the filament.

5. The combination with means for continuously feeding a web of fibres, of means for continuously feeding a filament longitudinally in a direction transversely of said web, and winding and condensing means including a conical roller having its surface substantially parallel to the filament and its axis at an angle thereto, said roller increasing in diameter and surface speed in the direction of movement of the filament.

6. The combination with carding apparatus including a doffer roll and doffer comb, of means for continuously feeding a filament parallel to the face of the doffer roll, in position to receive a web of carded fibres therefrom, and means for winding the fibres of said web around and upon the filament having surface portions traveling at a speed increasing gradually from one edge of the web to the other in the direction of movement of the filament.

7. The combination with carding apparatus including a doffer roll and doffer comb, of means for continuously feeding a filament parallel to the face of the doffer roll, in position to receive a web of fibres therefrom, and winding and condensing means including a conical roll having its surface substantially parallel with and closely adjacent to the filament, said conical roll increasing in diameter and surface speed in the direction of movement of the filament, and means for continuously rotating said conical roll.

8. The combination with means for continuously feeding a filament, and means for delivering fibres into juxtaposition thereto, of means for continuously winding the fibres around portions of the filament having surface portions traveling at a speed increasing in the direction of movement of the filament, and compressing and smoothing means for the covered filament having rotating surface portions moving at a speed decreasing in the direction of movement of the filament.

9. The combination with means for continuously feeding a filament, and means for delivering fibres into juxtaposition thereto, of winding and condensing means having rotating surface portions substantially parallel to and moving substantially transversely of the filament, said surface portions traveling at speeds gradually increasing in the direction of travel of the filament, and compressing and smoothing means for the covered filament having rotating surface portions disposed angularly to the filament and decreasing in the distance therefrom and in surface speed in the direction of movement of the filament.

10. The combination with means for continuously feeding a filament, and means for delivering fibres into juxtaposition thereto, of winding and condensing means having rotating surface portions substantially parallel to and moving substantially transversely of the filament, said surface portions traveling at speeds gradually increasing in the direction of travel of the filament, and a rotating whirl substantially coaxial with the moving filament and having conical inner surface portions, decreasing in diameter and surface speed in the direction of movement of the filament.

11. The combination with means for continuously feeding a filament, and means for delivering fibres into juxtaposition thereto, of winding and condensing means including a conical roll having its surface substantially parallel to the filament, and its axis at an angle thereto, said roller increasing in diameter and surface speed in the direction of movement of the filament, and means for rotating said roll, and compressing and smoothing means for the covered filament having rotating surface portions disposed angularly to the filament and decreasing in the distance therefrom and in surface

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speed in the direction of movement of the filament.

12. The combination with means for continuously feeding a filament, and means for delivering fibres into juxtaposition thereto, of winding and condensing means including a conical roll having its surface substantially parallel to the filament, and its axis at an angle thereto, said roller increasing in diameter and surface speed in the direction of movement of the filament, and means for rotating said roll, and a rotating whirl substantially coaxial with the moving filament and having conical inner surface portions, decreasing in diameter and surface speed in the direction of movement of the filament.

13. The combination with means for continuously feeding a web of carded fibres, of means for continuously feeding a filament longitudinally in a direction transversely of said web, and means for winding the fibres of said web continuously around and upon the filament having surface portions traveling, at a speed increasing gradually from one edge of the web to the other in a direction of movement of the filament, and compressing and smoothing means for the covered filament having rotating surface portions disposed angularly to the filament and decreasing in the distance therefrom and in surface speed in the direction of movement of the filament.

14. The combination with means for continuously feeding a web of fibres, of means for continuously feeding a filament longitudinally in a direction transversely of said web, and means for winding the fibres of said web continuously around and upon the filament having surface portions traveling, at a speed increasing gradually from one edge of the web to the other in a direction of movement of the filament, and a rotating whirl substantially coaxial with the moving filament and having conical inner surface portions, decreasing in diameter and surface speed in the direction of movement of the filament.

15. The combination with means for continuously feeding a web of fibres, of means for continuously feeding a filament longitudinally in a direction transversely of said web, winding and condensing means including a conical roller having its surface substantially parallel to the filament and its axis at an angle thereto, said roller increasing in diameter and surface speed in the direction of movement of the filament, and a rotating whirl substantially coaxial with the moving filament and having conical inner surface portions, decreasing in diameter and surface speed in the direction of movement of the filament.

16. The combination with carding apparatus including a doffer roll and doffer comb, of means for continuously feeding a filament parallel to the face of the doffer roll, in position to receive a web of carded fibres therefrom, and means for winding the fibres of said web around and upon the filament having surface portions traveling at a speed increasing gradually from one edge of the web to the other in the direction of movement of the filament, and a rotating whirl substantially coaxial with the moving filament and having conical inner surface portions, decreasing in diameter and surface speed in the direction of movement of the filament.

17. The combination with carding apparatus including a doffer roll and doffer comb, of means for continuously feeding a filament parallel to the face of the doffer roll, in position to receive a web of fibres therefrom, winding and condensing means including a conical roll having its surface substantially parallel with and closely adjacent to the filament, said conical roll increasing in diameter and surface speed in the direction of movement of the filament, and means for continuously rotating said conical roll, and a rotating whirl substantially coaxial with the moving filament and having conical inner surface portions decreasing in diameter and surface speed in the direction of movement of the filament.

18. The combination with means for continuously feeding a filament, and means for delivering fibres into juxtaposition thereto, of means for continuously winding the fibres around portions of the filament having surface portions traveling at a speed increasing in the direction of movement of the filament, compressing and smoothing means for the covered filament having rotating surface portions moving at a speed decreasing in the direction of movement of the filament, and means for supplying moisture to the fibre coating of the filament.

19. The combination with means for continuously feeding a filament, and means for delivering fibres into juxtaposition thereto, of winding and condensing means having rotating surface portions substantially parallel to and moving substantially transversely of the filament, said surface portions traveling at speeds gradually increasing in the direction of travel of the filament, and compressing and smoothing means for the covered filament having rotating surface portions disposed angularly to the filament and decreasing in the distance therefrom and in surface speed in the direction of movement of the filament, and means for moistening the fibres surrounding the filament during the compressing and smoothing thereof.

20. The combination with means for continuously feeding a filament, and means for delivering fibres into juxtaposition thereto, of winding and condensing means having rotating surface portions substantially parallel to and moving substantially transversely of the filament, said surface portions traveling at speeds gradually increasing in the direction of travel of the filament, and a rotating whirl substantially coaxial with the moving filament and having conical inner surface portions, decreasing in diameter and surface speed in the direction of movement of the filament, and means for moistening the fibres surrounding the filament while being acted on by the whirl.

21. The combination with means for continuously feeding a filament, and means for delivering fibres into juxtaposition thereto, of winding and condensing means having rotating surface portions substantially parallel to and moving substantially transversely of the filament, said surface portions traveling at speeds gradually increasing in the direction of travel of the filament, and a rotating whirl substantially coaxial with the moving filament and having conical inner surface portions, decreasing in diameter and surface speed in the direction of movement of the filament, and means for introducing liquid into the whirl, for moistening the fibres surrounding the filament while passing through the whirl.

22. The combination with means for continuously feeding a filament, and means for delivering fibres into juxtaposition thereto, of winding

and condensing means having rotating surface portions substantially parallel to and moving substantially transversely of the filament, said surface portions traveling at speeds gradually increasing in the direction of travel of the filament, and a rotating whirl substantially coaxial with the moving filament and having conical inner surface portions, decreasing in diameter and surface speed in the direction of movement of the filament, the said whirl being provided with radial passages communicating with the space within said conical inner surface thereof, a housing surrounding the portion of the whirl containing said passages, and provided with a recess adapted to communicate with said passages, and means for supplying a liquid to said recess.

23. The combination with means for continuously feeding a filament, and means for delivering the fibres into juxtaposition thereto, of winding and condensing means having rotating surface portions substantially parallel to and moving substantially transversely of the filament, said surface portions traveling at speeds gradually increasing in the direction of travel of the filament, and a rotating whirl substantially coaxial with the moving filament and having conical inner surface portions, decreasing in diameter and surface speed in the direction of movement of the filament, said whirl being provided with radial liquid passages, a stationary housing surrounding portions of the whirl and provided with an annular recess in communication with said passages, and means for supplying a liquid to said annular recess.

24. The combination with means for feeding a web of asbestos fibres, of means for continuously feeding longitudinally a metallic wire transversely with respect to said web, means for winding and condensing the fibres of said web around and upon the wire, including a rotating conical roll having its surface substantially parallel to said wire and its axis at an angle thereto, the diameter and surface speed of said conical roll increasing in the direction of movement of said wire.

25. The combination with means for feeding a web of asbestos fibres, of means for continuously feeding longitudinally a metallic wire transversely with respect to said web, means for winding and condensing the fibres of said web around and upon the wire, including a rotating conical roll having its surface substantially parallel to said wire and its axis at an angle thereto, the diameter and surface speed of said conical roll increasing in the direction of movement of said wire, and a rotating whirl disposed coaxially with the covered wire and having an interior conical surface decreasing in diameter and surface speed in the direction of travel of the wire to smooth the surface of the fibre covering and further condense the fibres thereof.

26. The combination with means for feeding a web of asbestos fibres, of means for continuously feeding longitudinally a metallic wire transversely with respect to said web, means for winding and condensing the fibres of said web around and upon the wire, including a rotating conical roll having its surface substantially parallel to said wire and its axis at an angle thereto, the diameter and surface speed of said conical roll increasing in the direction of movement of said wire, and a rotating whirl disposed coaxially with the covered wire and having an interior conical surface decreasing in diameter and surface speed in the direction of travel of the wire to smooth the surface of the fibre covering and further condense the fibres thereof, and means for moistening the fibres of the coating while they are being acted on by the whirl.

27. The herein described process of coating a filament with fibres, which consists in continuously moving a filament longitudinally past a smooth conical surface, moving transversely with respect to said filament, and having its surface speed increasing in the direction of movement of the filament, continuously bringing fibres to the filament throughout longitudinal portions thereof contiguous to said conical surface.

28. The herein described process of coating a filament with fibres, which consists in continuously moving a filament longitudinally past a smooth conical surface, moving transversely with respect to said filament, and having its surface speed increasing in the direction of movement of the filament, continuously bringing fibres to the filament throughout longitudinal portions thereof contiguous to said conical surface, and passing the covered filament axially through a hollow part having conical surface, the surface moving transversely with respect to the filament and having its surface speed decreasing in the direction of movement of the filament.

29. The herein described method of coating a filament with fibres, which consists in bringing the fibres into juxtaposition to the filament, and subjecting the fibres to the action of a moving surface, moving transversely with respect to said filament and having its surface speed increasing in a direction longitudinally of the filament, to wind the fibres upon the filament and upon each other.

30. The herein described method of coating a filament with fibres, which consists in feeding the filament longitudinally, bringing the fibres into juxtaposition to the filament and subjecting the fibres to the action of a moving surface, moving transversely with respect to said filament and having its surface speed increasing in the direction of the longitudinal movement of the filament to wind the fibres upon the filament and upon each other.

31. The herein described method of coating a filament with fibres, which consists in feeding the filament longitudinally and holding it against rotation, bringing the fibres into juxtaposition to the filament and subjecting the fibres to the action of a moving surface, moving transversely with respect to said filament and having its surface speed increasing in the direction of the longitudinal movement of the filament to wind the fibres upon the filament and upon each other.

32. The herein described method of coating a filament with fibres, which consists in continuously moving the filament longitudinally, forming a web of fibres and continuously moving said web into juxtaposition to said filament, in an angular direction with respect to the filament, and subjecting the fibres of said web to the action of a moving surface, moving transversely with respect to the filament and having its surface speed increasing in the direction of the longitudinal movement of the filament to wind the fibres of said web upon said filament and upon each other.

33. The herein described method of coating a filament with fibres, which consists in continuously moving the filament longitudinally, forming a web of carded fibres with the fibres disposed therein substantially longitudinally with respect to the web, and continuously moving said

web longitudinally in an angular direction with respect to said filament, into juxtaposition thereto, and subjecting the fibres of said web to the action of a moving surface, moving transversely with respect to said filament and having its surface speed increasing in the direction of the longitudinal movement of the filament to wind said fibres upon said filament and upon each other.

34. The herein described method of coating a filament with fibres, which consists in continuously moving the filament longitudinally, forming a web of fibres and continuously moving said web into juxtaposition to said filament, in an angular direction with respect to the filament and subjecting the fibres of said web to the action of a moving surface, moving transversely with respect to the filament and having its surface speed increasing in the direction of the longitudinal movement of the filament, to wind the fibres of said web upon said filament and upon each other, said surface speed of said surface relative to the longitudinal movement of the filament being such as to subject the fibres to a drawing action in the direction of travel of the filament as the fibres are wound therein.

35. The herein described method of coating a filament with fibres, which consists in feeding the filament longitudinally, bringing the fibres into juxtaposition to the filament, and subjecting the fibres to the action of a moving surface, moving transversely with respect to said filament, and having its surface speed increasing in the direction of the longitudinal movement of the filament, to wind the fibres upon the filament and upon each other, and subjecting the coated filament to the action of a moving pressing and smoothing surface, moving transversely with respect to the filament, and having its surface speed decreasing in the direction of movement of the filament.

36. The herein described method of coating a filament with fibres, which consists in feeding the filament longitudinally, bringing the fibres into juxtaposition to the filament, and subjecting the fibres to the action of a moving surface, moving transversely with respect to said filament, and having its surface speed increasing in the direction of the longitudinal movement of the filament, to wind the fibres upon the filament and upon each other, and subjecting the coated filament to the action of a moving pressing and smoothing surface, moving transversely with respect to the filament, and having its surface speed decreasing in the direction of movement of the filament, and causing said last mentioned surface to exert a pressure on the fibre coating toward said filament, increasing in the direction of movement of the filament.

37. The herein described method of coating a filament with fibres, which consists in feeding the filament longitudinally, bringing the fibres into juxtaposition to the filament, and subjecting the fibres to the action of a moving surface, moving transversely with respect to said filament, and having its surface speed increasing in the direction of the longitudinal movement of the filament, to wind the fibres upon the filament and upon each other, and subjecting the coated filament to the action of a moving pressing and smoothing surface, moving transversely with respect to the filament, and having its surface speed decreasing in the direction of movement of the filament, and moistening the fibres of the coating while being subjected to the action of portions of said pressing and smoothing surface.

38. The herein described process of applying an insulating layer of asbestos fibres to conducting wires, which consists in feeding the wire longitudinally past a moving surface, moving transversely with respect to the wire and having its surface speed increasing in the direction of movement of the wire, continuously bringing fibres of asbestos into juxtaposition to the wire throughout longitudinal portions thereof contiguous to said moving surface.

39. The herein described process of applying an insulating layer of asbestos fibres to conducting wires, which consists in feeding the wire longitudinally past a moving surface, moving transversely with respect to the wire and having its surface speed increasing in the direction of movement of the wire, continuously feeding a web of asbestos fibres having a width substantially equal to the length of the portion of said wire contiguous to said moving surface into juxtaposition to the wire and said surface.

40. The herein described process of applying an insulating layer of asbestos fibres to conducting wires, which consists in feeding the wire longitudinally past a moving surface, moving transversely with respect to the wire and having its surface speed increasing in the direction of movement of the wire, continuously feeding a web of carded asbestos fibres in which the fibres are disposed substantially longitudinally of said web in a direction angular with respect to the wire into juxtaposition to the portion of said wire contiguous to said moving surface, and in juxtaposition to said surface.

41. The herein described method of forming an insulating coating of asbestos fibres upon electric conductors, which consists in feeding the conductor longitudinally, bringing asbestos fibres continuously into juxtaposition with a certain length of the conductor with the fibres disposed at an angle to the axis of the conductor, and acting on the fibres to effect the winding thereof around the conductor at a speed increasing gradually throughout the length of the conductor treated and in the direction of the movement of the conductor, and condensing the fibres in a direction toward the axis of the conductor.

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Fibrous Coating to a Filament or Wire, Process of (US Patent 1,950,988, 1934)
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