June 30, 1942. W. E. BUCHANAN 2,288,512

MULTIPLE STRAND FOURDRINIER WIRES

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FIG. 1

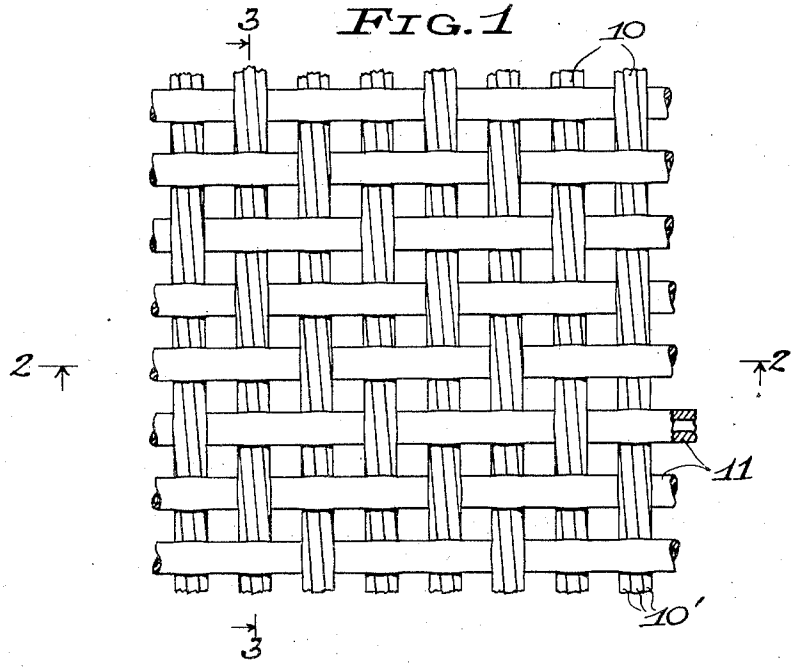


FIG. 2

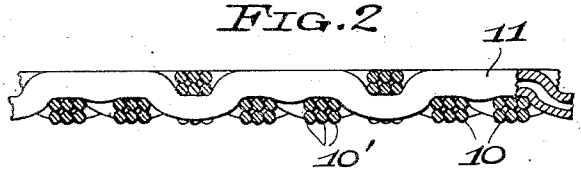
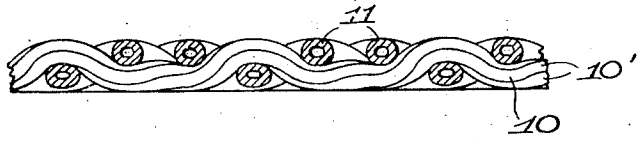


FIG. 3



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FIG. 4

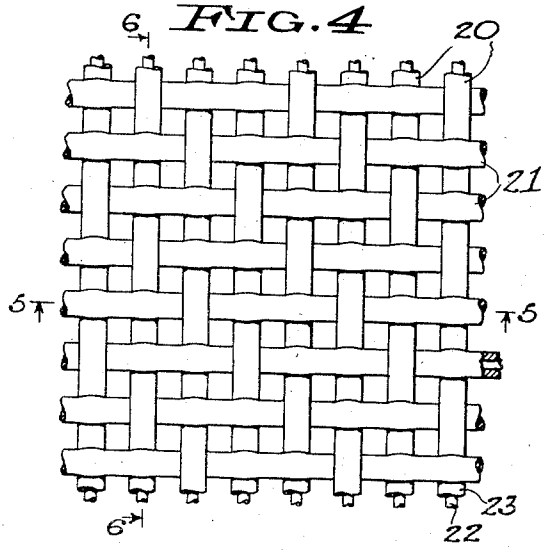


FIG. 10

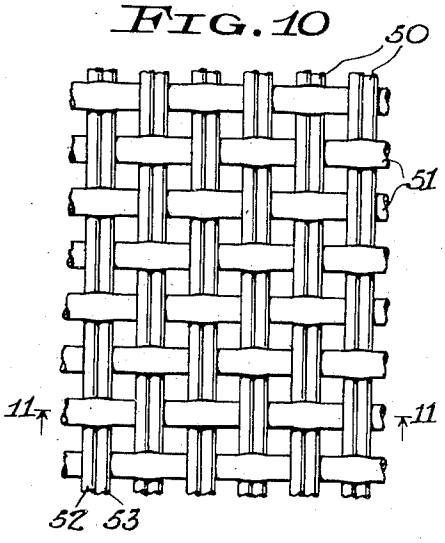


FIG. 5

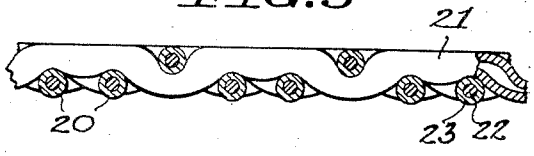


FIG. 11

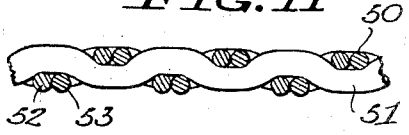


FIG. 6

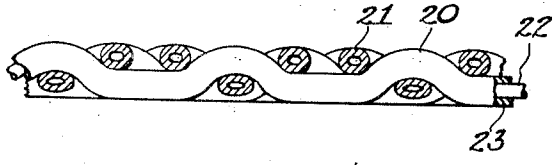


FIG. 12

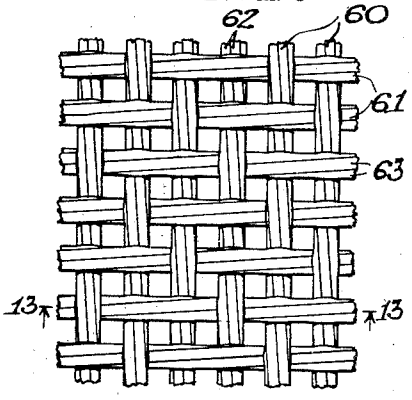


FIG. 7

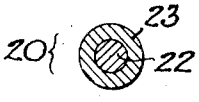


FIG. 8

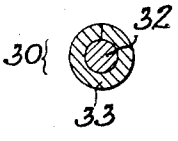


FIG. 9

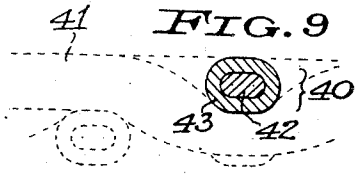


FIG. 13



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UNITED STATES PATENT OFFICE

2,288,512

MULTIPLE STRAND FOURDRINIER WIRE

William E. Buchanan, Appleton, Wis., assignor to Appleton Wire Works, Inc., Appleton, Wis., a corporation of Wisconsin

Application June 5, 1939, Serial No. 277,483

4 Claims. (Cl. 139—425)

This invention relates to woven wire fabrics and more particularly to wire belts for use on paper-making machines of the Fourdrinier type.

The life of a Fourdrinier wire belt is limited by various factors, such as attritional wear by passage of the belt over the rolls, suction boxes and other parts of the Fourdrinier machine, cracking of the wire fabric by repeated bending and other causes, and corrosion of the fabric. During the weaving operation the component wires may be subject to cracking or crystallization by the crimping of the wires. Fourdrinier wire fabrics are commonly made with wires of relatively soft metals, such as brass or phosphor bronze, which permit satisfactory weaving, but which are deficient in wear-resisting qualities and under some conditions are subject to corrosion.

From the standpoint of resisting wear and corrosion, it would be desirable to use wires of variout other materials, such as stainless steel and certain nickel alloys, for example, "Monel" metal. Wires of these materials, however, are subject to crystallization and cracking during weaving and by the bending they undergo on the Fourdrinier machine. In the case of nickel alloys, this bending would tend to harden the material because of the work-hardening properties of nickel.

It is an object of the present invention to provide an improved Fourdrinier wire fabric incorporating multiple strand wires to minimize crystallization and cracking of the wires, to permit deep crimping, and to enable the use of a wide choice of wire materials, such as stainless steel and nickel alloys, for increasing the strength and durability of the fabric.

Another object of the invention is to provide a Fourdrinier wire fabric in which the multiple strand wires are formed of component elements or strands of different materials.

A further object is to provide a Fourdrinier wire fabric embodying a multiple strand wire which consists of wire elements or strands arranged one within another, thus facilitating the bending of the composite wire while permitting the use of different materials for these parts, such as a hard wear-resisting material for the outer part and a soft and flexible material for the inner part.

Still another object is to provide a wire fabric in which the component warp and weft members are firmly locked in position so as to avoid sleaziness.

A still further object is to provide a wire fabric having an improved paper-making surface and possessing adequate porosity.

The invention further consists in the several features herein described and claimed.

In the accompanying drawings, illustrating certain embodiments of the invention:

Fig. 1 is an enlarged plan view of a portion of wire fabric belt constituting one embodiment of the invention, the fabric being of the twill weave type, and the paper-making side of the fabric being shown;

Fig. 2 is a transverse sectional view, taken generally along the line 2—2 of Fig. 1;

Fig. 3 is a longitudinal sectional view, taken generally along the line 3—3 of Fig. 1;

Fig. 4 is a plan view, similar to Fig. 1, of a modified form of wire fabric;

Fig. 5 is a transverse sectional view, taken generally along the line 5—5 of Fig. 4;

Fig. 6 is a longitudinal sectional view, taken generally along the line 6—6 of Fig. 4;

Fig. 7 is a transverse sectional view of one of the warp members of the fabric of Fig. 4;

Fig. 8 is a transverse sectional view of another form of warp member similar to that of Fig. 7;

Fig. 9 is a transverse sectional view of still another modified form of warp member;

Fig. 10 is a plan view, similar to Fig. 1, of another modified form of wire fabric, the fabric being of the plain weave type;

Fig. 11 is a transverse sectional view, taken generally along the line 11—11 of Fig. 10;

Fig. 12 is a plan view, similar to Fig. 1, showing still another modified form of wire fabric, and

Fig. 13 is a transverse sectional view, taken generally along the line 13—13 of Fig. 12.

The Fourdrinier wire fabric illustrated in Figs. 1 to 3 of the drawings comprises warp members 10 interwoven with weft members 11, a length of the woven fabric being formed into a belt for use on a paper-making machine. The mesh of the fabric is selected according to the type of paper to be produced, and usually varies from 60 to 100 wires per inch.

The warp members 10 are each formed of a plurality of wires or filaments 10', preferably more than two and twisted together, although in some instances they may be braided together. The weft members 11 are here shown to be hollow or tubular wires, so as to render them deformable at the intersections with the warp members. The fabric is preferably of the twill

weave type in which each warp member passes under two and over one weft member. However, plain weave and other weaves may be used.

The upwardly crimped knuckles of the warp and weft members lie approximately in a common plane and present a paper-forming surface, the weft knuckles being elongated. The downwardly crimped elongated knuckles of the warp members present wearing surfaces and preferably extend below the downwardly crimped knuckles of the weft wires.

During the weaving operation, the cable-forming warp members become widened and flattened at the intersections with the weft wires. The weft wires passing over the elongated bottom warp knuckles tend to become indented therein, as seen in Fig. 3, thus preventing lateral shifting of the weft wires. The flexibility of the warp members permits deep crimping without danger of fracture or crystallization. The hollow weft wires are also capable of deep crimping without damage, and during weaving become widened and flattened at their intersections with the warp members. The elongated top knuckles of the weft wires are indented at their lower surfaces by the warp members, as seen in Fig. 2, thus preventing lateral shifting of the warp members. The flattening of the warp and weft members is more or less confined to the intersections of these members, thus avoiding any material reduction in the effective size of the mesh openings so as not to impair drainage. The cable warp members preferably extend over the entire width of the belt, including the selvages.

The long flattened top knuckles of the warp and weft members present an improved paper-forming surface which will avoid wire-marking. The flexibility of the cable warp members permits easy passage of the belt over the rolls and other supporting surfaces of the paper-making machine and avoids danger of crystallization and cracking.

Some or all of the component wires **10'** of each warp member are preferably formed of a strong, hard, durable, wear-resisting material, such as stainless steel or certain nickel alloys, for example, "monel" metal, thus increasing the useful life of the fabric. Solid warp wires of these metals are not satisfactory, because of the likelihood of damage during weaving and the danger of fatigue-induced cracking during the repeated bending of the fabric on the paper-making machine. However, these objections are obviated by making the warp members of multiple wires, the small thickness of which enables them to withstand the bending.

The use of stranded wires permits considerable latitude in the make-up of the fabric to suit the requirements of individual paper-making machines. Where one or more but not all of the individual wires or strands of each composite wire are formed of relatively hard metals having superior wear-resisting qualities, the remaining individual wires or strands of the ordinary soft metals cooperate therewith to furnish the required bulk and to provide the necessary pulp-supporting surfaces. The presence of the hard metal wires or filaments in the warp members provides sufficient firmness or impressionability to form locking shoulders during weaving so as to avoid sleaziness of the fabric, even though the fabric is made in twill weave. In some cases the weft wires may also be made of special metals to improve the wear-resisting and corrosion-resisting qualities of the fabric, the thin walls of the tubular weft wires permitting the use of harder metals than would otherwise be possible.

While Fig. 1 shows all the warp members to be stranded it is sufficient in some instances to intersperse stranded wear-resistant warp members among solid warp wires, the latter wires in such event being made of the usual relatively soft materials such as brass and phosphor bronze.

The modified form of twill weave fabric illustrated in Figs. 4 to 7 comprises warp members **20** interwoven with weft members **21**, the latter being in the form of tubular wires as in the fabric of Fig. 1. Each warp member consists of a core **22** surrounded by a tubular casing or sheath **23**, thus providing a composite wire resembling a solid wire but having better bending characteristics. The core is preferably formed of a single solid wire of relatively soft metal such as brass or phosphor bronze, while the casing or sheath is preferably formed of a tubular wire element or strand of harder and more durable metal such as stainless steel or "monel" metal, the thinness of the casing walls permitting crimping and bending of this metal without danger of damage. The core and casing are capable of a slight relative slipping with respect to each other when they are subjected to bending. The casing not only resists wear but also encloses and protects the core, which might otherwise be subject to damage, as by corrosion. The warp and weft members possess sufficient firmness to form locking shoulders during weaving, so as to avoid sleaziness of the fabric.

Fig. 8 shows a modified form of warp member **30** having a wire core **32** surrounded by a casing or sheath **33** formed by wrapping a flat metal strip about the core. This can be made by simultaneously drawing the core strand and outer strip through a suitable die.

Fig. 9 shows another modified form of warp member **40** in which the core **42** and its casing **43** are of flattened or oval shape, the warp member thus having an oblong cross-section. In the woven fabric, which includes weft wires **41**, the long dimension of the cross-section of the warp member extends parallel to the surface plane of the fabric.

Composite warp members of the type shown in Figs. 7 to 9 are similar in external configuration to warp members of the single-wire or solid-wire type and will have less tendency to mark the paper than twisted or braided cable-type warp members.

Figs. 10 and 11 show another modified form of wire fabric having interwoven warp and weft members **50** and **51**, respectively, each warp member being formed of a pair of parallel wires **52** and **53** and each weft member being a solid wire. The fabric is here indicated to be of plain weave but it may also be made in twill weave. One or both of the wires **52** and **53** of each warp member are formed of a hard durable metal such as stainless steel or "monel" metal.

The modified twill weave fabric shown in Figs. 12 and 13 comprises interwoven warp and weft members **60** and **61**, respectively, each warp member consisting of a plurality of wires **62** and each weft member consisting of a plurality of wires **63**. Some or all of the wires **62** and **63** are formed of a hard wear-resisting metal such as stainless steel or "monel" metal. The fabric of Figs. 12 and 13 is otherwise the same as that of Fig. 1.

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

1. A wire fabric for paper-making machines, comprising interwoven warp and weft wires, at least some of said wires each comprising a core of relatively soft metal and a surrounding casing of harder metal.

2. A woven wire fabric for paper-making machines, comprising interwoven warp and weft members, a substantial proportion of said members being each composed of a casing wire and a core wire arranged within said casing wire.

3. A woven wire fabric for paper-making machines, comprising interwoven warp and weft members, a substantial proportion of said members being each composed of a wire element of relatively soft metal and another wire element of relatively hard metal, said last-named wire element forming a wear-resistant surfacing for said first-named wire element.

4. A woven wire fabric for paper-making machines, comprising interwoven warp and weft members, a substantial proportion of said members being each composed of a core wire and a casing of a strip of corrosion-resisting metal surrounding said core wire.

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