Oct. 4, 1938. L. N. WEBER 2,132,252

WOVEN WIRE BELTS FOR PAPER MAKING MACHINES

Filed Jan. 5, 1938

FIG. 1

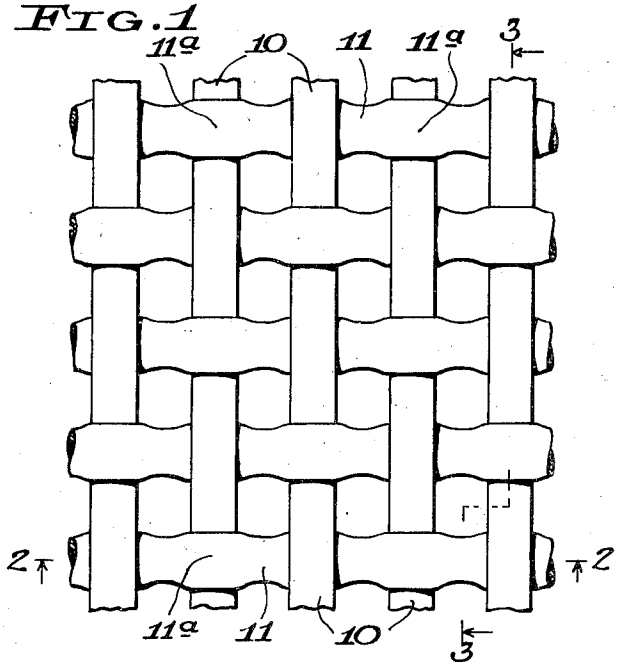


FIG. 3

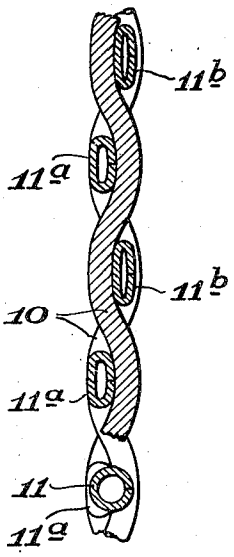


FIG. 2

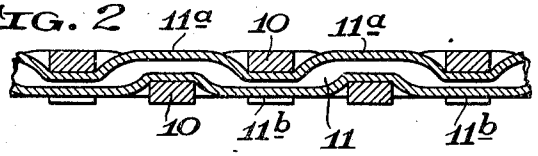


FIG. 4

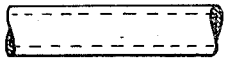


FIG. 6

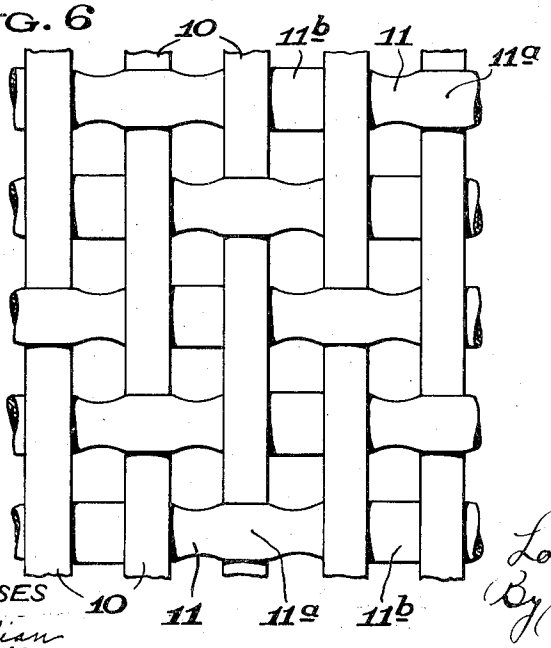
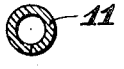


FIG. 5



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UNITED STATES PATENT OFFICE

2,132,252

WOVEN WIRE BELT FOR PAPER MAKING MACHINES

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Application January 5, 1938, Serial No. 183,461

7 Claims. (Cl. 139—425)

The present invention relates to woven wire belts particularly for paper making machines of the Fourdrinier type, and is an improvement over the woven wire belts disclosed in United States Letters Patent Nos. 2,003,123 and 2,003,124 granted to Harry G. Specht on May 28, 1935, and United States Letters Patent No. 600,352 granted to John C. Bell on March 8,1898, in which patents there are disclosed woven wire belt structures in which the warp wires are in the form of flat ribbon-like wires and in which the weft wires are in the form of solid circular cross-section wires. According to these inventions a much finer beat up of the woven wire is permitted with an increase in the flat knuckle surfaces of the warp wires whereby there is provided a better paper formation surface and a longer wearing surface.

It is an object of the present invention to provide in combination with flat cross-section warp wires tubular weft wires, of circular cross-section in their normal condition before weaving, and which will be deformed by the warp wires to produce a crimped and knuckled structure in which the crimp will be relatively deeper than has been possible with solid cross-section weft wires, and without imposing undue strain upon the weft wires during the weaving process. It is further proposed to provide tubular weft wires in combination with flat cross-section warp wires woven in such manner that relatively flattened knuckles are produced in the weft wires which will be substantially in the plane of the relatively flat knuckles of the warp wires, and will provide therewith a smoother paper formation surface of increased area, without reducing the necessary drainage characteristics of the wire. It is proposed to produce this condition in the weft knuckles by deforming and crimping the circular cross-section tubular weft wire through indentation of the flat upper and lower surface of the warp wires, the longitudinal edges of the warp wires forming spaced anvil points about which the weft wire will be deformed, these spaced edges causing the tubular weft wire, as the edges of the weft wire are pressed into it, to buckle between the longitudinal edges of the warp wires and thus produce a tight interlocking engagement with the warp wires and a substantially flat projected knuckle surface, which surface will approximate the projected flatness and area of the relatively flat warp knuckles, thus greatly increasing the flat projected knuckle surface of the paper formation surface.

Another object is to provide a woven wire belt in which the weft knuckles at the paper formation side will be substantially in the plane of the warp knuckles, while the weft knuckles at the wear side will be upwardly offset with respect to the knuckles of the warp wires so that the wear will be taken by the flat warp knuckles at the wear side during the life of the wire in the Fourdrinier machine, without wearing through the knuckles of the tubular weft wires. Another object is to provide a woven wire belt which, while having increased wear, better paper formation surface, greater flexibility and less fatigue in moving over the rolls of the machine, and longer life, will at the same time employ less metal and be substantially reduced in weight over the woven wire belts heretofore in use employing round solid cross-section warp and weft wires. By employing the flat cross-section warp wires and the tubular weft wires the amount of metal employed and the weight of the woven wire may be reduced as much as 50%, while still maintaining the same mesh count.

Hollow shute crimps more than solid shute, and therefore where a flat warp is used with hollow shute it is possible to use a thicker wall on the flat warp.

Also, where a thinner walled flat warp must be used in finer meshes, it would be detrimental to the cloth to carry an excess amount of weight or tension during the weaving operation. Less tension on the warp is required when tubular shute is used than with solid shute.

It has been found that the best results from the wire marking point of view are obtained when a Fourdrinier wire is made with the warp wires and shute wires on the top side of the cloth in the same plane. This can best be accomplished when hollow shute is used with flat wire.

With the above and other objects in view, embodiments of the invention are shown in the accompanying drawing and these embodiments will be hereinafter more fully described with reference thereto, and the invention will be finally pointed out in the claims.

In the drawing:

Fig. 1 is an enlarged plan view of a portion of a regular woven wire belt, according to the invention.

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

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

Fig. 4 is a side elevation of a portion of a weft wire before being woven into the wire belt.

Fig. 5 is a cross-section thereof.

Fig. 6 is an enlarged plan view of a portion of a

twill weave woven wire belt, according to the invention.

Referring to Figs. 1 to 5 of the drawing the Fourdrinier wire according to the exemplary embodiment of the invention shown therein comprises warp wires 10 of flat ribbon-like form, and weft wires 11 of circular tubular form, the knuckles of the weft wires being formed during the weaving by causing the warp wires to become indented therein through the beating up of the weft wires between the upper and lower sheds of the warp wires, the indentations and the resulting knuckle projections corresponding to the crimp of the usual weft wires. The projected knuckles 11^a of the weft wires at the paper formation side are approximately in the plane of the upper knuckle surfaces of the warp wires, while the projected weft knuckles 11^b at the wear side are upwardly offset from the projected knuckles of the warp wires at the wear side, so that these wear knuckles of the warp wires will become worn to the maximum during the life of the wire in the Fourdrinier machine, without imposing any wear upon the tubular weft wires, or in any case such wear as would penetrate the lower knuckle walls.

This difference in projection of the weft knuckles at the paper formation and wear sides is produced by providing in the well known manner different degrees of tension for the upper and lower warp wires of the shed, the adjustment of the tension of the top shed so that it is less than the tension of the bottom shed causing the projection of the weft knuckles at the paper formation side to be brought to the top of the fabric, and the deeper embedding of the warp wires through the greater tension of the bottom shed causing the projected lower weft knuckles to be upwardly offset.

It will be noted that the hollow weft wire is bent transversely over the flat surface of the warp wires, so that the longitudinal edges of the warp wires provide anvil points where the bends occur, with the result that the projected knuckle surfaces of the weft wires buckle at the bending points and produce a flat bridge between the bending points, so that each projected weft knuckle constitutes a paper formation surface or area which is substantially flat both in its longitudinal and transverse dimensions. By calculating the gauge of the weft wire so that these projected flat knuckle surfaces of the weft wire substantially correspond to the flat projected knuckle surfaces of the warp wires a paper formation surface is produced which consists of substantially uniformly spaced flat warp and weft knuckle surfaces, with the result that the paper stock is better supported with a minimum loss through drainage, and an extremely smooth paper may be produced. At the same time the wire has substantially the same drainage characteristics for water removal as the usual type of wire of the same mesh count.

The crimping of the warp wires over the flattened lower weft knuckles 11^b, which are flattened to a greater extent than the upper weft knuckles 11^a, causes the projected knuckles of the warp wires at the paper formation side to become substantially flat longitudinally of the warp wires as well as transversely thereof, the buckling and bridging effect produced in the weft wires through the longitudinal flattening transversely between the longitudinal edges of the warp wires causing the weft knuckles to also acquire a substantially rigid flat surface transversely, and over which the warp knuckles tend to flatten longitudinally.

The tubular weft wires may be formed either by drawing flat wire into a tube through suitable dies in which case there is a seam or by extrusion in which case the wire is seamless. In the former case the weft wires are preferably woven so that the seam faces the under side, and is therefore not only out of contact with the paper formation surface, but through the upward offsetting of the knuckles 11^b is also out of the plane of the wear knuckles of the warp wires.

In Figs. 1 to 3 I have shown the invention as incorporated in a plain weave Fourdrinier wire, while in Fig. 6 I have shown it incorporated in a twill weave Fourdrinier wire. In both forms the interlocking of the warp wires through their indentation into the weft wires produces a tight fabric free from sleaziness. This is of particular importance in the case of the twill weave which normally has a greater degree of sleaziness than plain weave wire.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

1. Woven wire fabric for paper making machines comprising interwoven warp and weft wires with knuckles produced in both the warp and weft wires, the warp wires throughout their length being of non-circular cross-section elongated in one dimension with flattened upper and lower faces of greater lateral extent than the thickness of the wire from top to bottom, said elongated dimension being parallel to the plane of the woven wire fabric whereby the weft knuckles cross the flattened faces of the warp wires and have their outer projected surfaces of a width substantially co-extensive with that of said flattened faces, the weft wires being tubular whereby they are deformable at their intersections with said warp wires to produce substantially flattened knuckles.

2. The invention as defined in claim 1 further characterized in that said tubular weft wires are of circular cross-section throughout their length before being interwoven in said fabric.

3. The invention as defined in claim 1 further characterized in that said warp wires are substantially rectangular in cross-section and have flat upper and lower surfaces, the spaced longitudinal edges of the upper and lower surfaces forming anvil points about which the tubular weft wires are deformed and whereby the deformed knuckle portions between said anvil points constitute flattened bridging portions extending between said points.

4. The invention as defined in claim 1 further characterized in that said flattened bridging portions of the weft wires cause the warp knuckles to become substantially flattened longitudinally of the warp wires.

5. The invention as defined in claim 1 further characterized in that the warp wires are carried over one and under a plurality of weft wires.

6. The invention as defined in claim 1 further characterized in that the weft knuckles are projected to a common plane with the warp knuckles on the top of the fabric.

7. The invention as defined in claim 1 further characterized in that the weft knuckles are projected to a plane about the plane of the warp knuckles on the bottom of the fabric.

LOUIS NICHOLAS WEBER.

CERTIFICATE OF CORRECTION.

Patent No. 2, 132, 252. October 4, 1938.

LOUIS NICHOLAS WEBER.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 2, second column, line 71, claim 7, for the word "about" read above; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 15th day of November, A. D. 1938.

Henry Van Arsdale

(Seal) Acting Commissioner of Patents.