May 28, 1935. H. G. SPECHT 2,003,124

WOVEN WIRE BELT FOR PAPER MAKING MACHINES

Filed June 22, 1934

Fig. 1.

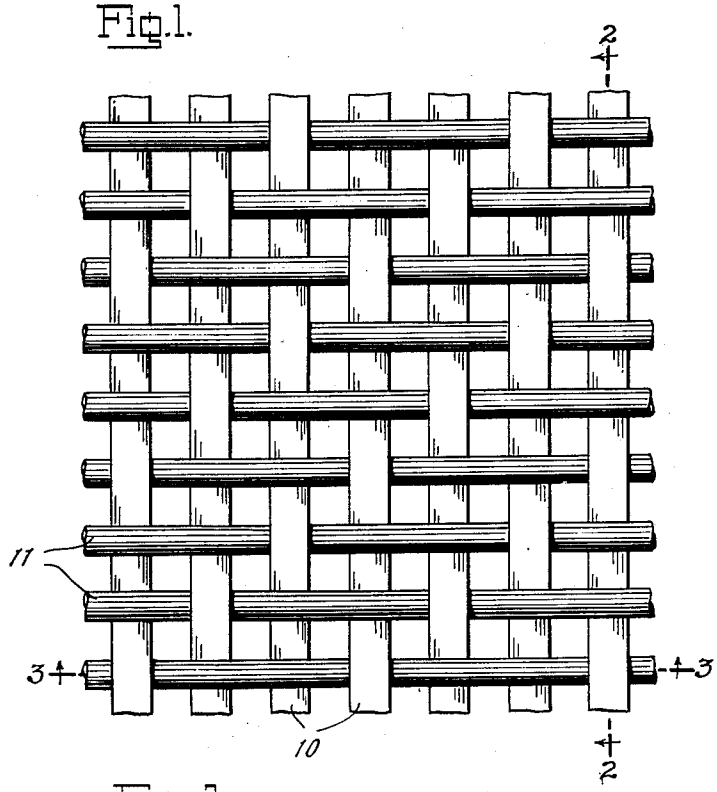
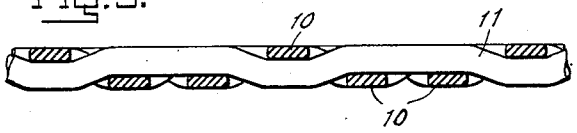


Fig. 2.

Fig. 3.



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WOVEN WIRE BELT FOR PAPER MAKING MACHINES

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9 Claims. (Cl. 245—8)

The present invention relates to woven wire belts, particularly for paper making machines of the Fourdrinier type, the invention relating especially to twill weave wires in which the warp wires are carried under two and over one weft wire to provide long knuckles and greater wearing surface at the under side. These belts, as is well known, are in the form of a continuous band of fine wire mesh which moves over spaced supporting rolls and in contact with suction boxes and rolls. In modern machines the greater number of rolls, the increased width of the machines, and the increased speed at which the machines operate, have been such that belts which would stand up for a normal period upon older types of machines fail in the modern machines due to fatigue brought about by the belt being bent around the great number of rolls at highly increased speed. In order to provide strength and flexibility to meet these modern conditions twill weave wires have been woven with heavier sizes of wires in which the weft count was reduced because of the impossibility with these heavier sizes of obtaining of a fine beat up of the weft, with the result that the mesh openings became increasingly greater in the longitudinal direction of the wire. In an ordinary Fourdrinier wire construction, standard wires are made of 60 to 100 mesh, the 60 mesh wire usually having 60 warp wires and 40 weft wires to the inch, and the 100 mesh wire having 100 warp wires and 86 weft wires to the inch, the intermediate sizes being proportionate. While greater strength has been obtained a number of objections are inherent in these belts, among which may be mentioned the roughness of the paper formation surface which produces deep depressions in the paper, and the tendency of the fibres to turn down into the mesh opening. This condition is accentuated in the usual twill weave because of the spacing of the warp knuckles to every fourth weft wire instead of to every second wire as in the regular weave, so that twill weave wires have not been desirable heretofore where a fine surface paper is to be produced.

It is highly desirable to provide a belt which will not only have increased wear surfaces, will be more flexible in the longitudinal direction of the cloth, and in which fatigue due to rapid flexing is greatly reduced, but one in which the paper formation will be as nearly flat as possible while providing adequate drainage, and it is an object of the present invention to provide a twill weave wire belt having these desirable characteristics. To this end I particularly propose to provide warp wires of flat wire, that is having a substantially rectangular ribbon-like cross-section and to weave these with shoot or weft wires of circular cross-section, and which due to the flat shape and relative thinness of the warp may be beat up to a much finer mesh than has heretofore been possible with circular cross-section warp wires of the necessary strength and gauge. While it has not been possible in the standard construction to beat a 60 mesh wire up finer than 50, due to warp and weft dimensions, it is possible according to my invention to beat a 60 mesh up to 80.

Heretofore the crimp of the weft wires when woven with circular cross-section warp wires, particularly where the warp count was high, was not great enough to bring the weft knuckles up to or near the plane of the warp knuckles, so that depressions were provided at the top side which produced roughness in the paper, and at the wear side the weft knuckles would not provide any substantial wear surfaces, the wear being almost entirely confined to the warp knuckles. According to my invention the weft wires, due to the relative thinness of the warp wires as compared to the diameters of the weft wires will undergo less deformation in the crimping than does the more flexible warp wires, and at the same time the knuckle surfaces may be brought in the plane of the warp wire knuckles. Also these weft knuckles due to their being formed over flat warp wires present substantially flat paper contact and wear surfaces as distinguished from the point contact surfaces of weft knuckles when formed over circular cross-section warp wires, there being a greater weft knuckle surface contiguous to the plane of the projected warp knuckles than would be the case if the weft knuckles were formed about circular cross-section warp wires.

By providing both an increase in the number of knuckles and flat knuckles a very greatly increased wearing surface is produced which will remain uniform throughout a longer wearing life.

The fibres of stock used in making paper, when running on a wire, tend to turn down into the mesh openings, particularly where the opening is longer in the longitudinal direction of the wire, causing an unevenness of the sheet, clogging of the drainage and loss of stock. This is also accentuated by the circular cross-section wires which provide a natural diverging entrance

to the mesh openings, and by the wide spacing in twill weave of the knuckles on the paper formation side. The finer beat up of the shoot wires permitted according to my invention and the flat surface of both the warp and shoot knuckles, overcomes these objections, the fibres being so supported that they bridge the mesh openings rather than turn down into them as heretofore.

With the above and other objects in view, an embodiment of the invention is shown in the accompanying drawing, and this embodiment 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 twill weave wire belt, according to the illustrated exemplary embodiment of my invention.

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

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

Similar reference characters indicate corresponding parts throughout the several figures of the drawing.

Referring to the drawing, the twill weave Fourdrinier wire, according to the exemplary embodiment shown therein, comprises warp wires 10 of flat ribbon-like form, and weft wires 11 of circular cross-sections, the upwardly crimped knuckles of both the warp and weft wires providing the upper paper formation surface, and the downwardly bent knuckles providing the lower wearing surface. The warp wires are woven under two and over one weft wire, thus providing long knuckles on the wear side. The warp wire is preferably a rolled or drawn bronze wire which is annealed before weaving, and the weft wires are preferably of brass.

Bronze wire has a greater tensile strength under elongation than brass wire, and this factor is of importance in the successful weaving of the wire mesh according to my invention. In the proper weaving of the wire the warp should control or predominate the weft. The stronger warp wires permit of beating the weft wires up to a finer mesh, the flattened warp wires being highly flexible and directly taking the punishment and strain necessary in this operation. The weft wires, which are shaped by and follow the action of the warp wires, only indirectly take the strain imposed by the beating up operation, and should not be such as to overcome the predominance or control of the warp wires. Where both the warp and weft are of the same material, as for instance when they are both of brass, this control is lost, as neither the warp nor the weft will predominate over the other. Other material than bronze and brass may be used for the warp and weft, as for instance stainless steel for the warp and bronze or brass for the weft.

The dimensions of the warp wire are proportioned with respect to the weft wire diameter, the width being such as to provide a relatively wide paper formation and wear surface and the thickness being such as to permit a fine beat up of the weft, and at the same time allow the knuckles of the weft, with a lesser deformation in the crimping of the weft than in the warp, to come into or very close to the plane of the warp knuckles. For instance with a .009 of an inch diameter weft the width of the warp may be .012 of an inch and the thickness .004 of an inch. The relative thinness of the flat warp wires, it will be seen, allows beating up a large number of weft wires per inch, while their relative wideness gives an area equivalent to or greater than that of the largest round warp wire permissible. The edges of the warp wires are preferably slightly rounded to allow free drainage through the mesh opening.

The flat knuckles of the warp as well as the flat knuckles of the weft produce a paper formation surface in which the fibres will be supported by flat contact, as distinguished from the point contact with wires having circular cross-section warp and weft. At the same time the fine beat up of the weft provides a smooth surface which will support the paper stock without the usual tendency to turn down into the mesh and clog it. Without sacrificing this support the mesh openings may be of adequate size to provide full drainage.

The fine beat up of the weft also disposes more knuckles on the wear side and as these have flat surfaces the wearing life will not only be greatly increased but the wear will be substantially uniform throughout the life of the wire. The knuckles of wires formed with circular cross-section warp and weft wires have point contact when first in use so that there is a very rapid wear during the beginning of the run of the wire. The wire according to a preferred embodiment of my invention has flat knuckles both in the warp and the weft, the latter being produced by their being crimped over the flat surfaces of the warp. By crimping the weft knuckles over the flat surfaces of the warp, the bending being about the spaced corners formed between the flat top and bottom surfaces and the side surfaces, substantially flat weft knuckles are produced having a greater weft knuckle surface contiguous to the plane of the projected warp knuckles than would be the case if the weft knuckles were formed about circular cross-section warp wires.

The flat warp wires while providing a much greater tensile strength are at the same time more flexible than circular cross-section warp wires, so that they may be operated at high speed over rolls for a considerably greater time than heretofore before fatigue sets in.

While the mesh openings are shown as approximately square it will be understood that by reason of the fine beat up of the weft permitted by my invention these openings may have a dimension between the weft wires shorter than between the warp wires.

I have illustrated and described a preferred and satisfactory embodiment of my invention, but it will be obvious that changes may be made therein, within the spirit and scope thereof, as defined in the appended claims.

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 being carried over one and under a plurality of weft wires, the warp wires throughout their length being of non-circular cross-section elongated in one dimension, said elongated dimension being parallel to the plane of the woven wire fabric whereby the weft knuckles cross the elongated faces of the warp wires and have their outer projected surfaces substantially co-extensive transversely with

said elongated faces to present a greater weft knuckle surface contiguous to the plane of the projected warp knuckles than would be the case if the weft knuckles were formed about circular cross-section warp wires.

2. 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 being carried over one and under a plurality of weft wires, the warp wires throughout their length being of flat substantially rectangular cross-section elongated in one dimension, said elongated dimension being parallel to the plane of the woven wire fabric whereby the weft knuckles cross the elongated faces of the warp wires and have their outer projected surfaces substantially co-extensive transversely with said elongated faces to present a greater weft knuckle surface contiguous to the plane of the projected warp knuckles than would be the case if the weft knuckles were formed about circular cross-section warp wires.

3. 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 being carried over one and under a plurality of weft wires, the warp wires throughout their length being of flat substantially rectangular cross-section elongated in one dimension, said elongated dimension being parallel to the plane of the woven wire fabric whereby the weft knuckles cross the elongated faces of the warp wires and have their outer projected surfaces substantially flat and co-extensive transversely with said elongated faces to present a greater weft knuckle surface contiguous to the plane of the projected warp knuckles than would be the case if the weft knuckles were formed about circular cross-section warp wires.

4. 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 being carried over one and under a plurality of weft wires, the warp wires throughout their length being of flat substantially rectangular cross-section elongated in one dimension, said elongated dimension being parallel to the plane of the woven wire fabric whereby the weft knuckles cross the elongated faces of the warp wires and have their outer projected surfaces substantially co-extensive transversely with said elongated faces and extending substantially to the plane of the projected warp knuckles to present a greater weft knuckle surface contiguous to the plane of the projected warp knuckles than would be the case if the weft knuckles were formed about circular cross-section warp wires.

5. 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 being carried over one and under a plurality of weft wires, the warp wires throughout their length being of non-circular cross-section elongated in one dimension, said elongated dimension being parallel to the plane of the woven wire fabric whereby the weft knuckles cross the elongated faces of the warp wires and have their outer projected surfaces substantially co-extensive transversely with said elongated faces to present a greater weft knuckle surface contiguous to the plane of the projected warp knuckles than would be the case if the weft knuckles were formed about circular cross-section warp wires, the warp wires having greater strength than the weft wires whereby they control the weft wires during the weaving of the fabric.

6. 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 being carried over one and under a plurality of weft wires, the warp wires throughout their length being of flat substantially rectangular cross-section elongated in one dimension, said elongated dimension being parallel to the plane of the woven wire fabric whereby the weft knuckles cross the elongated faces of the warp wires and have their outer projected surfaces substantially co-extensive transversely with said elongated faces to present a greater weft knuckle surface contiguous to the plane of the projected warp knuckles than would be the case if the weft knuckles were formed about circular cross-section warp wires, the side surfaces of the projected warp knuckles defining two opposed sides of the water draining passages through the fabric and forming substantially non-flaring passage between said opposed sides.

7. 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 being carried over one and under a plurality of weft wires, the warp wires throughout their length being of flat substantially rectangular cross-section elongated in one dimension, said elongated dimension being parallel to the plane of the woven wire fabric whereby the weft knuckles cross the elongated faces of the warp wires and have their outer projected surfaces substantially co-extensive transversely with said elongated faces to present a greater weft knuckle surface contiguous to the plane of the projected warp knuckles than would be the case if the weft knuckles were formed about circular cross-section warp wires, the side surfaces of the projected warp knuckles defining two opposed sides of the water drainage passages through the fabric and forming substantially non-flaring passage between said opposed sides, and with said increased weft knuckle surface contiguous to the plane of the projected warp knuckles decreasing the lateral area of the drainage passages contiguous to said plane of the projected warp knuckles.

8. 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 being carried over one and under a plurality of weft wires, the warp wires throughout their length being of flat substantially rectangular cross-section elongated in one dimension, said elongated dimension being parallel to the plane of the woven wire fabric, and the elongated faces each forming with the side faces a pair of spaced corners whereby the weft knuckles cross the elongated faces of the warp wires and are each bent about said spaced pair of corners and have their outer projected surfaces substantially co-extensive transversely with said elongated faces to present a greater weft knuckle surface contiguous to the plane of the projected warp knuckles than would be the case if the weft knuckles were formed about circular cross-section warp wires, the bending of the weft knuckles about said spaced corners substantially closing the surface

of said weft wires beneath said knuckles to the entrance of paper fibre and corrosive agents.

9. 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 being carried over one and under a plurality of weft wires, the warp wires throughout their length being of flat substantially rectangular cross-section elongated in one dimension, said elongated dimension being parallel to the plane of the woven wire fabric and the elongated faces each forming with the side faces a pair of spaced corners whereby the weft knuckles cross the elongated faces of the warp wires and are each bent about said spaced pair of corners and have their outer projected surfaces substantially flat and co-extensive transversely with said elongated faces and extending substantially to the plane of the projected warp knuckles to present a greater weft knuckle surface contiguous to the plane of the projected warp knuckles than would be the case if the weft knuckles were formed about circular cross-section warp wires, the bending of the weft knuckles about said spaced corners substantially closing the surface of said weft wires beneath said knuckles to the entrance of paper fibres and corrosive agents.

HARRY G. SPECHT.