

Jan. 7, 1941.

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2,227,669

WOVEN WIRE FOR USE IN PAPER-MAKERS' MACHINES OR APPARATUS

Filed May 29, 1940

FIG. 1.

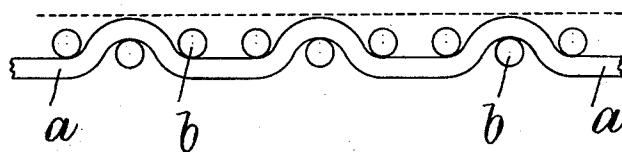


FIG. 2.

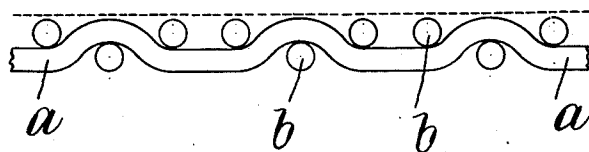


FIG. 3.

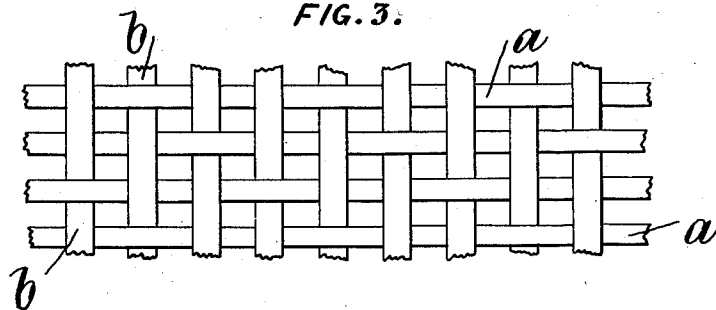


FIG. 4.

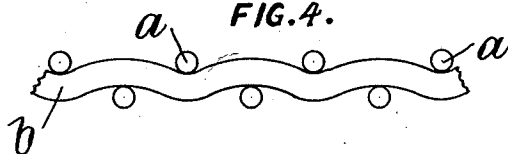
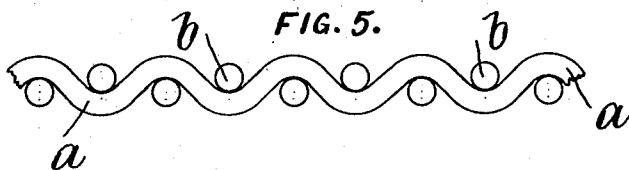


FIG. 5.



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2,227,669

WOVEN WIRE FOR USE IN PAPER-MAKERS' MACHINES OR APPARATUS

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Application May 29, 1940, Serial No. 337,845
In Great Britain April 19, 1939

5 Claims. (Cl. 139—425)

This invention relates to woven wire surfaces for use on paper-makers' machines, as for example, to Fourdrinier wires, or wire coverings for cylinder moulds, dandy rolls or such like.

6 The object of the invention is to produce a complete woven wire cloth with a level top surface and one which is more robust and durable than known wires.

10 The invention facilitates the production of a more durable wire cloth with level top surface without the need for the use of extremely soft weft wire and with less careful adjustment or setting of the loom.

15 Wire cloth which contains such very soft weft wire having a very low limit of elasticity necessarily partakes of the fragile nature of the weft. Therefore, in the past, the best woven machine wires from the point of view of level top surface and freedom from liability to wire mark the paper, have been the most fragile wires.

20 Attempts have been made to obtain a level top surface on wires woven with harder weft wires by finally grinding off or burnishing surface irregularities with carborundum rollers or such like.

25 A method of producing woven wire cloth with a uniformly level top surface by a suitable choice of soft weft wire and adjustment of the loom making use of a twill weave has been known since 1869 when a British Patent No. 988 was granted to J. B. Rowcliffe.

30 It is to twill woven wires that the present invention applies more particularly, although plain weaving for certain of the indicated uses is also improved and included under the invention.

35 In producing more robust paper-makers' woven wire surfaces according to this invention I in the first place make use of a copper and nickel alloy wire for the warp. The copper and nickel alloy from which the warp wire is produced consists according to this invention of about 55 to 70 per cent of copper and from 45 to 30 per cent of nickel, the most suitable proportions being about 65 per cent of copper and about 35 per cent of nickel. These proportions have by research and investigation been found to be distinctly advantageous for fulfilling practical working requirements. If too much nickel is present, the warp, due to work hardening in service, becomes brittle and cracks owing to continual bending in passing over rolls. If the alloy wire used for warp contains less than 30 per cent of nickel same affords insufficient resistance to wear and abrasion. Such warp wire with less than 30 per cent of nickel has insufficient ductility whilst its break-

ing strength and yield point are low for the purpose intended. A suitable ductility of alloy wire (to serve as warp) for the purpose of weaving and bending, together with strength, hardness and good resistance to abrasive action can be obtained within the limits of the percentage of nickel stated. Also the resistance to corrosion of the wire warp of copper nickel alloy within the range given is well suited for use with materials worked in slightly acid solution. Corrosion and roughness cause deposition of chemicals from the paper stock and of fibres, and such deposits interfere with the drainage action of paper machine wires.

15 It is found that the use as warp of such a copper nickel alloy facilitates the production of wire cloth having the desired non-marking qualities referred to and that such wire can be readily woven in the usual way. In addition to facilitating the production of the aforementioned desirable characteristics such copper nickel alloy as warp renders the use of such particularly soft weft wire (either well annealed phosphor bronze or brass) non-essential, that is, relatively harder weft wire may be used, and most advantageously, phosphor bronze weft, and so the resulting machine wire is far more robust and able to better withstand the handling and treatment to which same is subjected in practice.

20 In preparing wire from copper nickel alloy as specified for use as warp wire, the wire is drawn to required gauge and is sufficiently annealed prior to weaving. This may be advantageously effected in a tube furnace. It is preferred to anneal at such a temperature and for such a time that the softening point of the alloy is only exceeded by about 20° C. In this way the maximum ductility is obtained combined with the minimum loss of strength.

25 Such a combination of physical properties is most desirable in the warp wires of Fourdrinier wires, and the alloy described gives great resistance to wear due to abrasion, when so annealed. Further it effectively withstands the constant bending to which it is subjected in service. The careful preparation of the copper nickel alloy warp wire by effective annealing is a matter of importance. Further, annealing such as might not affect the ductility very much, reduces the strength and wear resistance considerably, and is not considered suitable.

30 The above-described copper nickel wire alloy properly annealed is used as the warp in the weaving of the wires and it is at once strong, 35

tough, wear resisting, sufficiently non-corrosive and ductile.

There is woven with said warp wires of copper and nickel alloy, weft wires (which for certain limited uses may be of brass) but for general use such weft wires are of relatively hard phosphor bronze which has been sufficiently annealed.

The invention renders it unnecessary to anneal the alloy used as weft to the same extent as when phosphor bronze warp is used (that is, a relatively harder weft of phosphor bronze can be used) and yet a level top surface is produced which affords numerous points of support for the paper. By relatively harder weft wire, is meant, when contrasted with the soft weft wire used with ordinary phosphor bronze warp wire when seeking to produce a wire with level top surface.

The alloy of copper and nickel has a strength and hardness so much greater than that of phosphor bronze so generally previously used as warp, that it ensures weft wire of relatively harder phosphor bronze bending and knuckling more completely and with less difficulty in weaving. The ability to make use of more robust weft wire that is relatively hard phosphor bronze makes the wire fabric as a whole stronger and less likely to crease in service, even on fast-running paper machines.

Further, I prefer to weave the copper nickel alloy warp wire and the relatively harder phosphor bronze or brass weft, twill, as such a weave with warp and weft wires of the character described can be so woven as to produce a very level surface to the wire not only with knuckles which are very level but which are evenly and closely distributed, the stiffer weft wire assisting the obtainment of a level surface, and when combined with the warp wire of considerably greater strength and hardness ensuring an altogether more robust and durable wire.

Whilst a twill weave is preferred, the weave may be plain, as even in such case the copper nickel warp wires and sufficiently hard phosphor bronze (or for limited uses brass) weft can be so woven and the weft beaten-up as to produce a top surface with level knuckles and a wire robust in every way.

Referring to the accompanying drawing:

Fig. 1 indicates the result in a "twill" weave, which would be normally produced with weft of phosphor bronze of a temper or hardness such as I prefer to employ, if same were used with ordinary phosphor bronze warp. It will be seen that the relatively hard weft wires have not been beaten-up or disposed to the same level as the knuckles of the warp wires.

Fig. 2 is intended to show how in a "twill" weave the same or relatively hard weft wires of phosphor bronze when beaten-up rise to the level of the warp knuckles when the warp wire used is the harder and stronger copper and nickel alloy set forth and defined herein, and the use of such renders it easier to produce the effect indicated at Fig. 2.

Fig. 3 shows the general appearance in plan of a "wire" woven "twill" and according to Fig. 2.

Fig. 4 indicates diagrammatically a fragmentary lateral cross-section of a "wire" in plain weave with warp wires of copper and nickel alloy, and,

Fig. 5 indicates such a plain weave in broken longitudinal section.

In the several figures the warp wires are lettered *a* and the weft wires *b*.

As an example in the production of a "wire"

making use of a copper and nickel wire warp as defined herein, I instance the production of a 60 mesh twill weave which would have 60 warp wires of the described copper nickel alloy per inch each of a diameter of about .0096" and 45 weft wires the other way of relatively hard annealed phosphor bronze wire of about .0104" diameter. Similar appropriate and proportionate sizes of such copper and nickel alloy for warp and sufficiently annealed phosphor bronze or brass wire as weft could be used for other meshes suited to other apparatus used in the paper trade, such as wire coverings for cylinder moulds, dandy rolls, or such like.

It will be clear that according to this invention the desired result is obtained without having to use very soft non-durable weft, but by using a copper and nickel alloy which is harder and stronger and which used as warp will cause tougher weft wire of phosphor bronze or brass to crimp more readily. Thus a wire can be woven twill or plain which will bend without cracking and produce a sufficiently uniform top surface so that a woven fabric which is robust and stiff results having better physical properties and one which will wear longer.

With a relatively hard phosphor bronze weft and copper and nickel alloy warp, a woven wire fabric is produced which does not corrode to any marked degree as a result of electro-chemical action set-up during service.

I declare that what I claim is:

1. A woven paper-maker's "wire" or wire surface for paper-maker's machines and apparatus and distinguished in that the warp wires are of a copper-nickel alloy in the proportions of at least approximately 63 per cent of copper and approximately 37 per cent of nickel, said warp wires being drawn to the required gauge and annealed, whilst the weft wires are of relatively hard alloy of phosphor bronze, the copper and nickel and alloy warp and the weft wires of said relatively hard alloy as herein specified being woven together in manner set forth.

2. A woven paper-maker's "wire" or wire surface for the purposes stated and distinguished in that the warp wires are of a copper-nickel alloy in the proportions of at least approximately 63 per cent of copper and approximately 37 per cent of nickel, said warp wires being drawn to the required gauge and annealed, whilst the weft wires are of relatively hard phosphor bronze, the said warp and weft wires being woven together in the manner and for the purposes stated.

3. A woven paper-maker's "wire" or wire surface for the purposes stated and distinguished in that the warp wires are of a copper-nickel alloy in the approximate proportions of 65 per cent of copper and 35 per cent of nickel, said wires being drawn to the required gauge and annealed to give maximum ductility with minimum loss of strength, the weft wires being of relatively hard phosphor bronze, said warp and weft wires being woven together twill, so as to produce a level surface, in the manner and for the purposes described.

4. A woven paper-maker's "wire" or wire surface for the purposes stated and distinguished in that the warp wires are of a copper-nickel alloy in proportions of 55 to 70 per cent of copper and 45 to 30 per cent of nickel, the wire being drawn to gauge and annealed and being of approximately .0096" in diameter and used as warp ends whilst the weft wire is of relatively hard alloy of phosphor bronze and of a diameter

about .0104", said warp and weft ends being woven together to produce a wire fabric as described.

5 5. A woven paper-maker's "wire" or wire surface for the purposes herein stated and distinguished in that the warp wires are of a copper-nickel alloy in proportions of about 65 per cent of copper and about 35 per cent of nickel, the wire being drawn to gauge and sufficiently

annealed and being of approximately .0096" in diameter and used as to about 60 warp ends per inch, whilst the weft wire is of relatively hard phosphor bronze or brass wire about 45 weft ends to the inch and of a diameter about .0104", said 5 warp and weft wires being woven together twill in the manner and for the purposes stated.

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