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3,034,212

METHOD OF PRODUCING FORMING SCREEN

Filed July 17, 1959

3 Sheets-Sheet 1

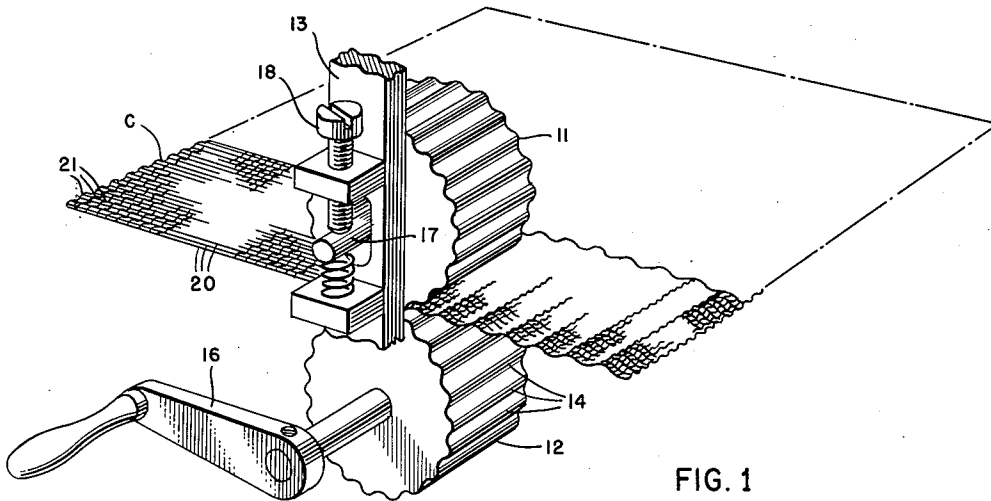


FIG. 1

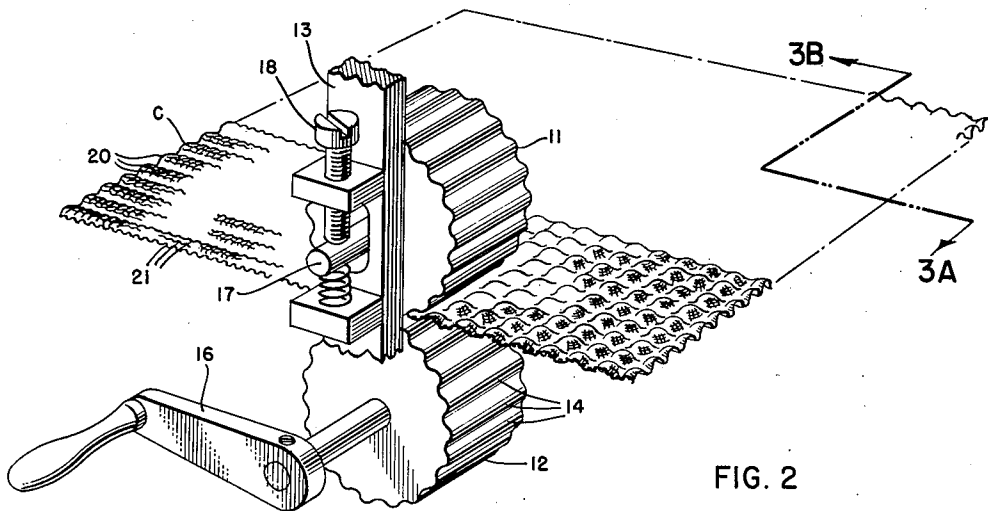


FIG. 2

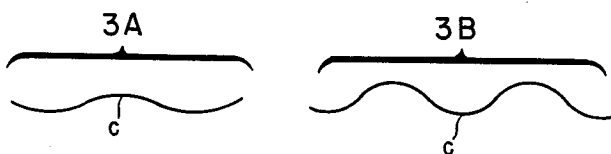


FIG. 3

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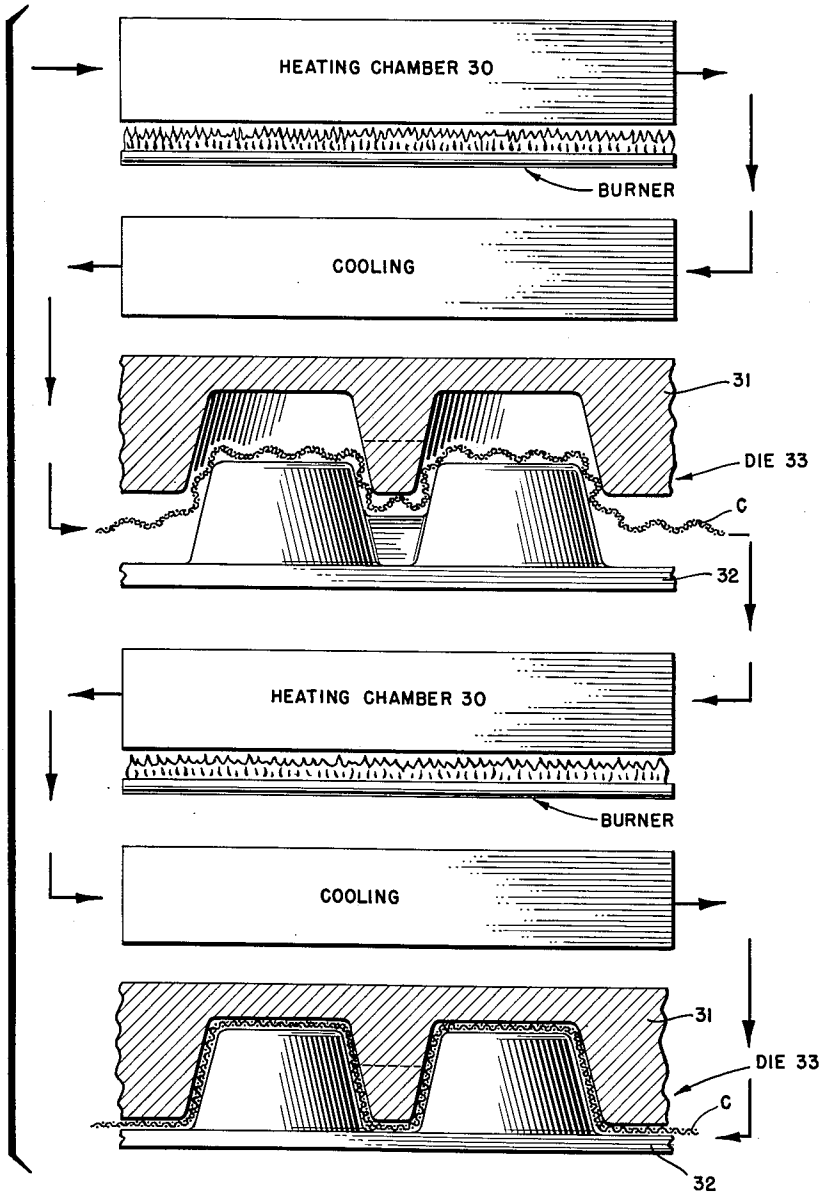
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FIG. 4



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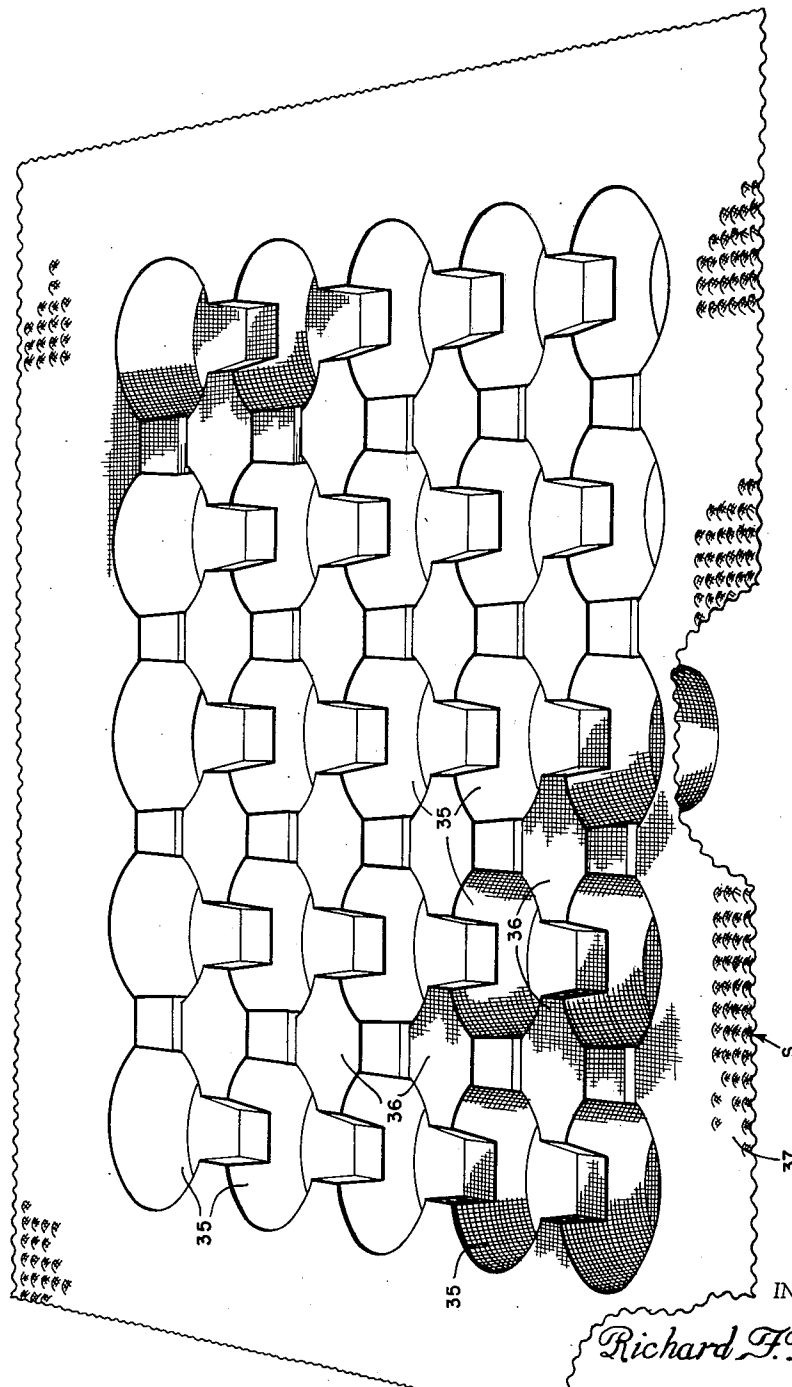


FIG. 5

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3,034,212

METHOD OF PRODUCING FORMING SCREEN

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The present invention relates to a method of producing forming screen, and more particularly to a method of producing forming screen wherein metallic cloth is provided with corrugations.

Articles of molded pulp are conveniently produced on forming dies, these being in the proper shape and made of a heavy metal, such as brass. This die is provided with a great number of small holes extending from one surface thereof to the other. The die is immersed into a slurry of pulp fibers and water, and has suction applied to one surface thereof to draw the water through the die. A forming screen that extends over the forming face of the die collects the pulp fibers and prevents them from passing through the small holes. After a period of time, a thickness of pulp fibers is built up on the forming screen, and the die is removed from the slurry and the article is then removed from the die.

While the provision of forming screen for a relatively simple article, such as a pie plate, does not present any great difficulty, the workers in the art have heretofore provided forming screens of many parts in the cases of more complex articles, such as egg trays and egg cartons. These articles are characterized by many upstanding posts and depressed cells, and in some cases it has been the practice to provide an individual piece of forming screen for each one or two of the cells and posts.

The making of the individual forming screen parts for use on a molding die for a complex article has been found to be both tedious and expensive, as is the fitting of the small pieces of forming screen together on the forming die in proper relationship to the forming die and to each other.

Thus, it will be understood that in the prior art the production of relatively complex molded pulp articles could only be accomplished at a relatively higher price than simpler articles, due in great measure to the cost of manufacturing the multi-part forming screens and in mounting these parts onto the forming die.

An object of the present invention is to provide a method of producing a forming screen for a molded pulp forming die of highly complex shape.

Another object of the present invention is the provision of a method for producing a single forming screen which may be used for a molded pulp forming die of highly irregular shape.

Still another object of the present invention is to provide a method of producing screening that may be readily formed, in a single piece, into a forming screen of complex configuration.

A further object of the present invention is the provision of a method of producing screening that is capable of being formed into highly irregular and complex configurations without tearing or piecing.

A still further object of the present invention is to provide a method for producing forming screen for molded pulp forming dies that will be more economical than previously used methods, in order to reduce the cost of complex molded pulp articles.

Other objects and the nature and advantages of the present invention will be apparent from the following description taken in conjunction with the accompanying drawings, wherein:

FIG. 1 is a perspective view showing a first step in

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the method of the present invention, wherein metallic cloth is being corrugated.

FIG. 2 is a view similar to FIG. 1, and showing a second step in accordance with the present invention wherein the cloth of FIG. 1 is being corrugated at right angles to the step of FIG. 1.

FIG. 3 is a cross-sectional view of a piece of metallic cloth after it has passed through the steps shown in FIGS. 1 and 2.

FIG. 4 illustrates diagrammatically further steps in the preparation of a forming screen in accordance with the present invention.

FIG. 5 is a perspective view of a forming screen of a highly complex configuration that has been made in accordance with the present invention.

Referring now to the drawings, wherein like reference characters are used for like or corresponding parts throughout the several views, there is shown in FIG. 1 a pair of crimping rollers 11 and 12, which are carried by a framework, generally denoted 13. The crimping rollers 11 and 12 have transversely extending crimp producing surfaces 14 thereon, and one or both of the rollers 11 and 12 may be rotated, as by crank 16. The axle 17 of upper crimping roller 11 is carried in a bearing that may be adjusted vertically by means of the adjusting screw 18, in known fashion. Thus, the turning of the adjusting screw 18 will serve, in known fashion, to change the distance between the centers of the crimping rollers 11 and 12; there is, of course, a similar adjusting screw on the other side of the frame 13.

A metallic screen or cloth C may be seen to be passing through the nip of the crimping rollers 11 and 12. The metallic cloth C is preferably Phosphor bronze wire cloth having a mesh of 50 x 41 and of 0.23 inch thickness. As shown in FIG. 1, the straight wires 20 of the cloth C extend in the direction of travel of the cloth C through the nip of crimping rollers 11 and 12, and transversely of the surfaces 14 thereof. There may also be seen in FIG. 1 wires 21 which extend in an undulating fashion transversely of the wires 20. The wires 21 correspond to the wool threads of conventional cloth and the wires 20 correspond to the warp threads in a conventional cloth.

As may be seen from the cloth C extending to the right of the crimping rollers 11 and 12 in FIG. 1, these crimping rollers have produced in the cloth C a series of corrugations extending transversely of the straight wires 20.

After the cloth C has passed through the crimping rollers 11 and 12 as shown in FIG. 1, the rollers are slightly separated by means of the adjusting screw 18. In practice, it has been found that when the wire cloth C is of Phosphor bronze having a mesh of 50 x 41 and a thickness of .023 inch, best results are obtained when the rolls are backed off by .020 inch. Once the rolls are separated, the piece of wire cloth C is passed through the nip of the crimping rollers 11 and 12 with the straight wire 20 extending generally perpendicularly to the direction of travel. This may be seen in FIG. 2, wherein the cloth C may be seen to have single corrugations at the left of the crimping rollers 11 and 12, these single corrugations corresponding to those at the right of the rollers 11 and 12 in FIG. 1, and the cloth C having double corrugations to the right of the crimping rollers 11 and 12 in FIG. 2.

FIG. 3 is a cross-sectional view of the wire cloth C after it has been treated as above described in order to provide it with the double corrugations. FIG. 3 is taken on the line 3A, 3B of FIG. 2, and it will be understood that the part 3A thereof shows the appearance of the cross-section of the double corrugated cloth C which

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is perpendicular to the straight wires 20 and that the part marked 3B of FIG. 3 is a cross-sectional view taken parallel to the straight wire 20. It will be understood, of course, that the reference to "straight wires 20" is only an indication of the condition of these particular wires before any corrugation had been imparted to the metallic cloth C and that in fact after the double corrugations have been imparted thereto, these straight wires 20 are not in fact straight. In the section 3A of FIG. 3, the metallic cloth C may be seen to have a generally sinusoidal character, and is relatively flattened. On the other hand, in the cross-section designated 3B the depth of the cloth is relatively greater.

The metallic cloth C, as it is in the form shown in FIG. 3, is adaptable to being used with a pulp forming die, as discussed herein above. It may be additionally treated as described below.

Referring now to FIG. 4, there is shown an oven 30, or equivalent heating apparatus. The metallic cloth C, as shown in FIG. 3, is first placed into the heating chamber 30. Preferably it is heated at a temperature of 1000° F. for a period of approximately two minutes. After thus being heated, the metallic cloth C is allowed to cool in still air at room temperature. Following the cooling of the cloth C, it is placed between the mating members 31 and 32 of a wire forming die 33. Such dies are well known in the art, and are carried in a suitable press, usually hydraulic. As will be understood, the wire forming die 33 is shaped to conform to the pulp forming die on which the metallic cloth C will be subsequently placed, and of course is also of the shape of the molded pulp article to be produced. Once the metallic cloth C is placed between the mating members 31 and 32 of die 33, the aforementioned press is actuated so that it applies a force of one ton and stretches the corrugations of the corrugated cloth C as shown in FIG. 4.

The metallic cloth C is only partially formed after this initial pressing step, and thereafter, it is again placed in the heating chamber 30, where it is again subjected to a temperature of 1000° F. for a period of approximately two minutes. Thereafter, it is removed and allowed to cool, as before, in still air at room temperature. It is again placed in the die 33, due care being exercised in order to register the partially formed metallic cloth with the configuration of the mating dies 31 and 32. The press is then actuated to produce a force of twenty tons, and there thus results the desired forming screen.

While the heating and cooling of the cloth C may be effected as hereinabove described, these steps are not necessary and in some instances may be omitted, depending upon the character of cloth C.

An example of a complex article that may be made with a single forming screen is shown in FIG. 5, wherein there may be seen a forming screen S for a tray-like container having a depth of approximately 3/4 inch, with sides approximately nine inches long, and having twenty-five cells, sixteen upstanding posts and a peripheral flange along the four sides thereof. Thus, the corresponding screen S may be seen to have the cells 35 and the upstanding posts 36, as well as the surrounding flange 37.

There has been provided a method of producing screening which may be made into forming screens with a pulp forming die. This screening may be formed into a highly complex forming screen of a unitary piece of material, thus avoiding all the draw-backs of multi-part forming screens. There has also been provided a method for producing forming screens in which such screens of highly complex and irregular configuration may be produced from a single sheet of metallic cloth. With the utilization of the metallic cloth in accordance with the present invention, the problems inherent in both piecing together individual parts of the forming screen and in the initial production of such forming screens, are eliminated. As a result, by the above described methods, the production of equipment to produce highly complex molded pulp

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articles may be accomplished with a substantial reduction in cost and time, and thus the cost of the finished molded pulp articles may also be reduced.

It will be obvious to those skilled in the art that various changes may be made without departing from the spirit of the invention and therefore the invention is not limited to what is shown in the drawings and described in the specification but only as indicated in the appended claims.

What is claimed is:

1. The method of preparing metallic cloth for use as screening on a pulp forming die comprising corrugating said cloth in one direction, corrugating said cloth in a second direction substantially perpendicular to said first direction, and forming said cloth in the corrugated area to make a formed screen for the pulp forming die wherein said screen corresponds in shape to the molded pulp article to be manufactured.

2. The method of preparing a metallic cloth screen for a pulp forming die as set forth in claim 1, wherein the step of forming said cloth in the corrugated area is carried out by stretching the corrugations over a die corresponding to the shape of the molded pulp article to be manufactured.

3. The method of preparing a metallic cloth screen for a pulp forming die as set forth in claim 2, wherein after the cloth is corrugated in both directions and before it is stretched, the double corrugated cloth is heated and then the double corrugated cloth is cooled.

4. The method of preparing a metallic cloth screen for a pulp forming die as set forth in claim 3, wherein after the stretching step the stretched cloth is heated and then cooled.

5. The method of preparing a metallic screen for a pulp forming die as set forth in claim 1, wherein the step of corrugating the cloth in the first direction is carried out by passing said cloth through mating crimping rollers having transversely extending crimping surfaces with the center-to-center distance of said rollers spaced a predetermined amount, and the step of corrugating said cloth in the second direction is carried out by passing said cloth through mating crimping rollers having transversely extending crimping surfaces with the center-to-center distance of said rollers spaced more than said predetermined amount.

6. The method of preparing metallic cloth for use as screening on a pulp forming die comprising passing a piece of the metallic cloth through mating crimping rollers, thereafter passing the said piece of metallic cloth through said crimping rollers in a direction perpendicular to the first pass, whereby to produce a double corrugated piece of metallic cloth, heating said double-corrugated piece of metallic cloth, cooling said cloth, partially forming said metallic cloth in a wire forming die to make a formed screen for the pulp forming die wherein said screen corresponds in shape to the molded pulp article to be manufactured, repeating said heating and cooling steps, and completely forming said metallic cloth in said wire forming die.

7. The method of preparing metallic cloth for use as screening on a pulp forming die comprising passing a piece of the metallic cloth through mating crimping rollers with the straight wires parallel to the direction of travel, thereafter passing the said piece of metallic cloth through said crimping rollers with the straight wires perpendicular to the direction of travel, whereby to produce a double corrugated piece of metallic cloth, heating said double-corrugated piece of metallic cloth, cooling said cloth, partially forming said metallic cloth in a wire forming die to make a formed screen for the pulp forming die wherein said screen corresponds in shape to the molded pulp article to be manufactured, repeating said heating and cooling steps, and completely forming said metallic cloth in said wire forming die.

8. The method of preparing metallic cloth for use as

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screening on a pulp forming die comprising passing a piece of the metallic cloth through mating crimping rollers with the straight wires parallel to the direction of travel, thereafter slightly increasing the center to center distance of said crimping rollers and passing the said piece of metallic cloth through said crimping rollers with the straight wires perpendicular to the direction of travel, whereby to produce a double corrugated piece of metallic cloth, heating said double-corrugated piece of metallic cloth, cooling said cloth, partially forming said metallic cloth in a wire forming die to make a formed screen for the pulp forming die wherein said screen corresponds in shape to the molded pulp article to be manufactured, repeating said heating and cooling steps, and completely forming said metallic cloth in said wire forming die.

9. The method of preparing metallic cloth for use as screening on a pulp forming die comprising passing a piece of the metallic cloth through mating crimping rollers having transversely extending crimp-producing surfaces with the straight wires parallel to the direction of travel and transversely of said surfaces, thereafter passing the said piece of metallic cloth through said crimping rollers with the straight wires perpendicular to the direction of travel, whereby to produce a double corrugated piece of metallic cloth, heating said double-corrugated piece of metallic cloth, cooling said cloth, partially forming said metallic cloth in a wire forming die to make a formed screen for the pulp forming die wherein said screen corresponds in shape to the molded pulp article to be manufactured, repeating said heating and cooling steps, and completely forming said metallic cloth in said wire forming die.

10. The method of preparing metallic cloth for use as screening on a pulp forming die comprising passing a piece of the metallic cloth through mating crimping rollers having transversely extending crimp-producing surfaces with the straight wires parallel to the direction of travel and transversely of said surfaces, thereafter slightly increasing the center to center distance of said crimping rollers and passing the said piece of metallic cloth through said crimping rollers with the straight wires perpendicular to the direction of travel, whereby to produce a double corrugated piece of metallic cloth, heating said double-corrugated piece of metallic cloth, cooling said cloth, partially forming said metallic cloth in a wire forming die to make a formed screen for the pulp forming die wherein said screen corresponds in shape to the molded pulp article to be manufactured, repeating said heating and cooling steps, and completely forming said metallic cloth in said wire forming die.

11. The method of preparing metallic cloth for use as screening on a pulp forming die comprising passing a piece of the metallic cloth through mating crimping rollers having transversely extending crimp-producing surfaces with the straight wires parallel to the direction of travel and transversely of said surfaces, thereafter slightly increasing the center to center distance of said crimping rollers and passing the said piece of metallic cloth through said crimping rollers with the straight wires perpendicular to the direction of travel, whereby to produce a double corrugated piece of metallic cloth, heating said double-corrugated piece of metallic cloth, cooling said cloth, forming said metallic cloth in a wire forming die under a force of one ton to make a formed screen for the pulp forming die wherein said screen corresponds in shape to the molded pulp article to be manufactured, repeating said heating and cooling steps, and forming said metallic cloth in said wire forming die under a force of twenty tons.

12. The method of preparing metallic cloth for use as

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screening on a pulp forming die comprising passing a piece of the metallic cloth through mating crimping rollers having transversely extending crimp-producing surfaces with the straight wires parallel to the direction of travel and transversely of said surfaces, thereafter slightly increasing the center to center distance of said crimping rollers and passing the said piece of metallic cloth through said crimping rollers with the straight wires perpendicular to the direction of travel, whereby to produce a double corrugated piece of metallic cloth, heating said double-corrugated piece of metallic cloth, cooling said cloth in still air at room temperature, forming said metallic cloth in a wire forming die under a force of one ton to make a formed screen for the pulp forming die wherein said screen corresponds in shape to the molded pulp article to be manufactured, repeating said heating and cooling steps, and forming said metallic cloth in said wire forming die under a force of twenty tons.

13. The method of preparing metallic cloth for use as screening on a pulp forming die comprising passing a piece of the metallic cloth through mating crimping rollers having transversely extending crimp-producing surfaces with the straight wires parallel to the direction of travel and transversely of said surfaces, thereafter passing the said piece of metallic cloth through said crimping rollers with the straight wires perpendicular to the direction of travel, whereby to produce a double corrugated piece of metallic cloth, heating said double-corrugated piece of metallic cloth for two minutes at a temperature of 1000° F., cooling said cloth in still air at room temperature, forming said metallic cloth in a wire forming die under a force of one ton to make a formed screen for the pulp forming die wherein said screen corresponds in shape to the molded pulp article to be manufactured, repeating said heating and cooling steps, and forming said metallic cloth in said wire forming die under a force of twenty tons.

14. The method of preparing metallic cloth for use as screening on a pulp forming die comprising passing a piece of the metallic cloth through mating crimping rollers having transversely extending crimp-producing surfaces with the straight wires parallel to the direction of travel and transversely of said surfaces, thereafter slightly increasing the center to center distance of said crimping rollers and passing the said piece of metallic cloth through said crimping rollers with the straight wires perpendicular to the direction of travel, whereby to produce a double corrugated piece of metallic cloth, heating said double-corrugated piece of metallic cloth for two minutes at a temperature of 1000° F., cooling said cloth in still air at room temperature, forming said metallic cloth in a wire forming die under a force of one ton to make a formed screen for the pulp forming die wherein said screen corresponds in shape to the molded pulp article to be manufactured, repeating said heating and cooling steps, and forming said metallic cloth in said wire forming die under a force of twenty tons.

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