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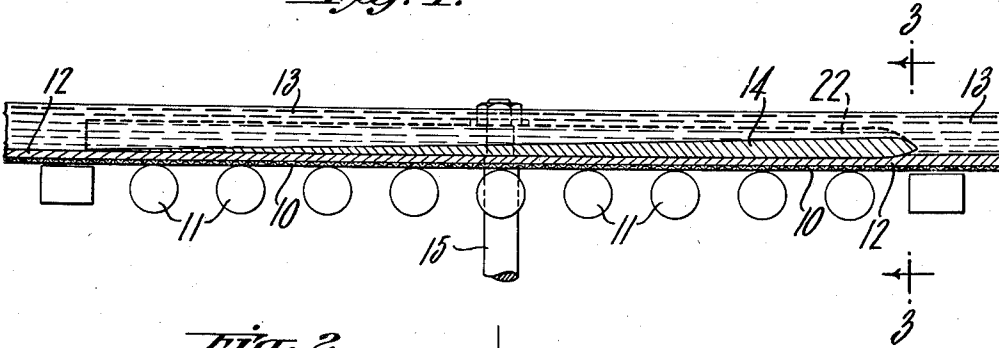
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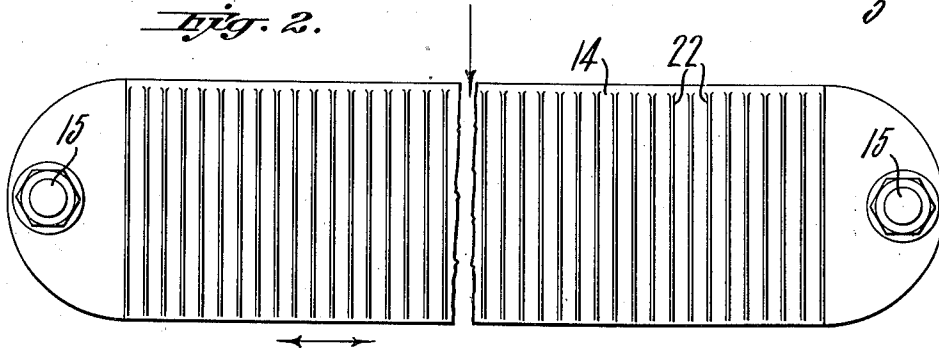
PROCESS OF AND APPARATUS FOR THE MANUFACTURE OF PAPER AND THE LIKE

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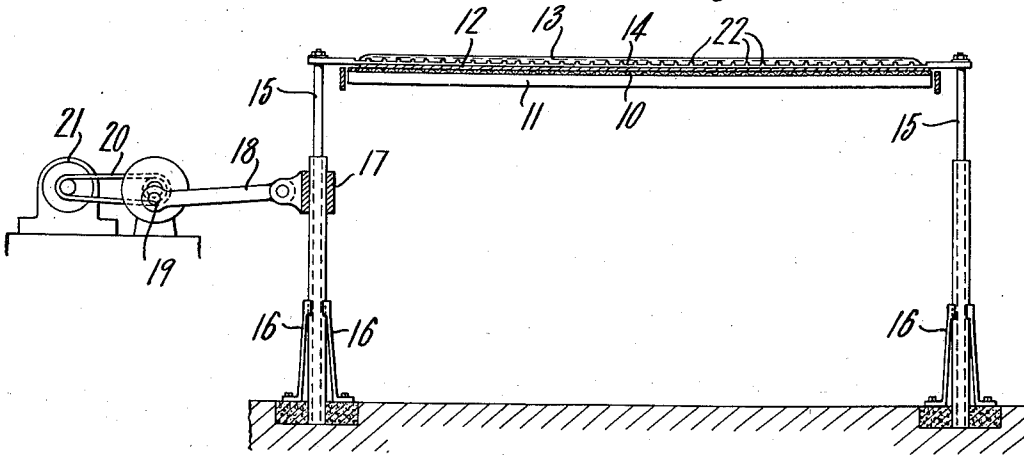
*Fig. 1.*



*Fig. 2.*



*Fig. 3.*



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# UNITED STATES PATENT OFFICE

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## PROCESS OF AND APPARATUS FOR THE MANUFACTURE OF PAPER AND THE LIKE

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4 Claims. (Cl. 92—38)

This invention relates to improvements in the manufacture of paper and like products, and, more particularly to an improved method of and apparatus for forming a web of fibrous material so that the said fibres are thoroughly interlaced and evenly distributed throughout the said web.

In the manufacture of paper on a paper machine of the Fourdrinier type, a suitably prepared fibrous stock of the desired consistency is deposited on an endless travelling screen or wire through which water in the stock is drained leaving the fibres shortly after the deposition of the stock on the screen or wire in the form of a web. To assist in the drainage of the water through the screen or wire various mechanisms such as table or tube rolls, suction boxes and the like, are normally employed. As the water is drained from the stock the fibres thereof gradually settle into web form so that there is a building up of the web to the desired thickness as the screen or wire travels over the table or tube rolls, suction devices, etc. By the time the web reaches the last suction box substantially all of the fibres have settled into web form. At the beginning of the settling of the fibres into web form I have found that the stock comprises essentially two parts, a layer of settled fibres adjacent the screen or wire and a layer of unsettled fibres supported by the first layer. As more and more of the fibres become settled into web form the thickness of the unsettled layer gradually diminishes.

I have also found that the formation of a poorly formed sheet or web is due, other conditions being the same, primarily to the fact that the fibres are improperly felted or interlaced and distributed in the sheet so that when the sheet is held in the light, cloths of fibres, appearing as darkened or blotched areas, may be seen. Such formation is generally designated as a "wild" sheet.

Accordingly, the primary object of my present invention resides in the development of a new method for controlling the formation of the web so that the finished sheet will show the fibres thereof thoroughly interlaced and matted and uniformly distributed throughout. Another object of my present invention resides in the provision of mechanism for carrying out the steps of the method.

Still another object of this invention resides in the provision of agitating mechanism located above the paper making screen and preferably, although not necessarily, completely immersed in the upper portion of the paper making stock. The agitating device is so designed as to smooth off the upper surface of the fibrous layer which

has already been formed and to agitate the fibres constituting the upper or unsettled layer of stock.

A further object of this invention resides in the provision of mechanism located above the paper making screen and mounted for reciprocation transversely thereof. Preferably the device is at least partially immersed in the paper making stock and is so designed as to smooth off this upper surface of the stock which has settled on the screen and to agitate the unsettled stock.

These and other objects of this invention will become more apparent from a study of the following description taken with reference to the accompanying drawing in which

Fig. 1 is an enlarged detailed sectional view of so much of a Fourdrinier screen or wire as is necessary to a clear understanding of the principle of operation of the invention,

Fig. 2 is a top plan view of the agitating device, and

Fig. 3 is a sectional view along the lines 3—3 of Fig. 1 showing a preferred mechanism for operating the plate or agitating device.

Referring now to the drawing in which like numerals indicate like parts, and particularly to Fig. 1 the numeral 10 represents the conventional Fourdrinier screen or wire which is, as is well known in the paper making art, of the endless type and travels from the breast roll to the couch roll of the machine, the latter being connected to suitable driving mechanism. The screen or wire is supported by table or tube rolls 11 which serve to assist in draining water from the paper making stock leaving the fibres thereof in the form of a web.

Assuming that the screen or wire is travelling in the direction indicated by the arrows and that the paper making stock has been deposited thereon by means of any of the well known stock depositing devices, it will be appreciated that those fibres adjacent the said screen or wire will form a layer or web 12 by virtue of the drainage of water from the stock, which drainage commences as soon as the stock is deposited. There will also be a layer 13 of unsettled stock from which the water has not been drained sufficiently to form a web. As the two layers of stock travel with the screen or wire more and more water is drained from the unsettled layer thereby gradually and progressively increasing the thickness of the settled layer until the unsettled layer has gradually disappeared.

Due to the rapidity with which the water is drained from the stock there is a tendency for the fibres to be unevenly distributed across the screen or wire. Moreover, the travel of the latter tends

to cause the fibres to be deposited in one direction and parallel to each other so that the fibres will be insufficiently interlaced or matted. Although this tendency varies to some extent depending upon the character of the stock used substantially all paper is stronger in the machine direction than in a direction transverse thereto.

To overcome the defects I have provided an agitating device comprising a plate 14 extending across the paper making screen or wire and preferably completely immersed in the paper making stock. The plate is secured at each end to the end of a spring arm 15 which is anchored in the foundation or floor of the mill. Spring leaf means 16 are provided to give to the spring arm 15 the necessary strength and flexibility. The plate is held by the spring arms under sufficient tension to prevent any substantial degree of sag. Reciprocatory or oscillatory motion is imparted to the spring arms by means of a yoke 17 pivotally connected to an eccentric strap 18 mounted on eccentric 19 and drive (not shown) thru drive 20 from a motor or other mechanism.

Preferably the stroke or reciprocation of the plate 14 is not over  $\frac{1}{2}$ " and at a frequency of from 600-3600 cycles a minute. The spring arms are designed so that their period of vibration is substantially equal to the frequency used. In this manner undue strains on the driving mechanism and mechanical parts are avoided and the power consumption is held sufficiently low as to permit an economical operation of the device.

The plate or agitator 12 is not of uniform thickness, being thicker at the breast or front end of the device and tapering toward the couch or rear thereof, as will be noted from an inspection of Fig. 1. The front end, although of substantial thickness, merges into a point. This construction in combination with the frequency of vibration employed prevents any tendency of the fibres to bunch or stick to the plate at this point. The under surface of the plate or agitator is smooth and rests on the settled layer of stock and due to the fact that the plate reciprocates across the said layer the top surface thereof is smoothed off, thereby distributing the fibres evenly across the screen or wire and thoroughly and uniformly interlacing or matting them together.

The upper surface of the plate or agitator is provided with a plurality of spaced ribs 22 which extend in a direction substantially transverse to the major axis thereof and parallel to the path of movement of the paper making screen. As will be appreciated these ribs serve to agitate the unsettled layer of stock thereby assisting in distributing the fibres uniformly across the screen or wire and in interlacing or matting them together. Hence by the time this unsettled layer has passed over the agitator the fibres thereof, when deposited on the initially formed layer, form a web, the fibres of which are uniformly

distributed throughout and evenly and thoroughly interlaced or felted. The agitation of the fibres of the unsettled layer in a direction transverse to their normal movement also substantially prevents any tendency of the fibres to be deposited in one direction. Thus the finished sheet of paper will exhibit no marked variation in strength lengthwise and across the said sheet.

While I have illustrated and described my invention with some degree of particularity, I realize that in practice many alterations therein may be made. I, therefore, reserve the right and privilege of changing the form of details of construction or otherwise altering the arrangement of the correlated parts without departing from the spirit of the invention or the scope of the appended claims.

Having now described my invention as required by the patent statutes, what I desire to claim as new is:

1. In a process for the manufacture of paper wherein a fibrous stock is deposited on a web forming device and subjected to drainage whereby gradually to build up a fibrous web of suitable thickness, the steps of smoothing over that layer of fibres which is initially formed into a web as water is withdrawn from the pulp suspension, and simultaneously agitating the remainder of said stock in a direction transverse to the movement of said formed web and thereafter forming said stock with said formed web into a unitary web of fibrous material.

2. In a device of the class described, a paper making screen on which a suitable paper making stock is deposited, means for agitating the upper layer of said stock comprising a plate having an uneven upper surface extending across said screen and immersed in said stock, and means to reciprocate said plate.

3. In a device of the class described, a moving paper making screen on which a suitable paper making stock is deposited, means for agitating the upper layer of said stock and for smoothing off the fibres of said stock which are initially deposited into web form comprising a plate immersed in said stock and having a smooth under surface resting on said web and an uneven upper surface, and means for reciprocating said plate.

4. In a device of the class described, a moving paper making screen on which a suitable paper making stock is deposited, means for agitating the upper layer of said stock and for smoothing off the fibres of said stock which are initially deposited into web form comprising a plate immersed in said stock and having a smooth under surface resting on said web and an uneven upper surface, and means for reciprocating said plate in a direction across said screen and at a frequency over 600 strokes a minute.

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