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MEANS AND METHOD OF VIBRATING THE WIRE OF A PAPER MAKING MACHINE

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The present invention relates to a means and method of shaking a roll of a paper-making machine and to other similar devices where a vertical vibration is preferably desired. The invention may also be applied to the vibrations of other means, whether a machine or a container, in which some liquid or the like may be contained. In which vertical vibrations are necessary to obtain a proper treatment thereof.

In particular, however, the invention is applied to a paper-making machine and in this respect finds a particular utility and advantage in the combination set forth. Many difficulties are encountered in providing a proper shaking mechanism for the wire or screen in such a machine as a Fourdriner paper machine, particularly because of the large masses involved in the machine and the speed with which the wire travels over the rolls. In spite of this, the mechanism has been devised for providing a transverse and longitudinal vibration of the wire. This the applicant has accomplished by certain means and methods as indicated in the applicant’s application Serial No. 34,211, filed August 1, 1935. In this application the mechanical energy has been applied to a vibratory system in which one part is formed by the roll and the mass associated therewith, and the other part by a second mass to which the mass of the roll is coupled by elastic means. The energy may be applied to either mass in this system or between the masses. In such a system a balance is obtained and vibrations are imparted to the roll without great external effect on the surrounding machines or structures.

In the present invention principles of a similar nature are applied to obtaining a vibration of the paper roll in a direction perpendicular to the travel of the wire screen itself. In this case the roll may be placed with its ends or bearings upon the vibratory mechanism or structure and the whole roll may be moved simultaneously up and down, thus imparting a vertical vibration to the wire passing over the top of it. The vibratory energy may be applied to the roll either directly by mechanical motion or indirectly by means of electrical mechanism, applying a direct mechanical force to the masses in the system. The energy may be applied between the masses of a vibratory system which may be elastically coupled with a large mass, or a single mass coupled to a large fixed mass may be energized electrically or mechanically.

The present invention will be more fully described in connection with the drawing showing an embodiment of the invention in which Fig. 1 shows the mechanism in an elevated section; Fig. 2 shows a modification of the mechanism illustrated in Fig. 1; and Fig. 3 shows a still further modification.

In Fig. 1 the roll 1, commonly called a table roll of the Fourdriner paper-making machine, is supported by a shaft 2, one at each end of the roll. The rest of the mechanism may also be duplicated at each end of the roll to provide a vertical vibration at both ends of the roll.

It is preferable, however, to provide the equal amplitudes at both ends of the roll which may be in or out of phase with each other as desired, and this is obtained in the present instance. The bearing 2 is journaled in a mass 3 in which it may rotate freely. The mass 3 has vertical sides which are adapted to move against guides 4 and 5 on the left and right, respectively, as indicated in Fig. 1.

Guides may also be provided in the front and back, as viewed in Fig. 1, so that the mass 3 is adapted to move freely vertically in response to mechanical vibrations. The mass 2 is provided at the lower end with a collar 6 which has grooves cut around it to fit the helical spring 7, one end of which is held in this way to the collar.

The lower end of the spring 7 is mounted in a piece 8 in a manner similar to that in which the upper end of the spring is mounted. The central portion of the piece 8 is threaded to receive the screw 9 which is also threaded at the end 10 in the opposite direction in the base plate 11. The screw 10 is provided with a handwheel 12 by which the screw may be rotated to raise the mass 3. The guides 4 and 5 may form a part of the casing 13 which extends upward beyond the position of the mass 3 to receive the energizing mechanism which will now be described.

Just above the position of the mass 3 there is formed a shoulder 14 against which the blocks of laminations 15 and 16 may be placed. These laminations may be held in place by means of bolts 17 and 18 which screw into the shoulder 14 of the casing. These laminations may be U-shaped and a single coil 19 may pass through all of the blocks of laminations positioned about the central core 20 which is attached to or forms a part of the mass 3. The core or armature 20 may be of the shape indicated in the figure with the sides inclined at a slight angle so as to provide a comparatively long stroke with a minimum airgap thickness. Since the handwheel 12 may be turned to adjust the position of the mass 3, it follows that the armature 20 will
be adjusted in position to compensate for different loads on the table roll, and keep the airgap substantially constant for different loads.

In the embodiment shown in Fig. 2 the table roll 21 is supported by the shaft 22 in a mass 23 which may move between proper guides 24 and 25. A mass 26 is provided directly beneath the mass 23 and positioned to work in the same guides 24 and 25. This mass 26 is supported by a shaft 27 passing through an opening in the mass 23 and extending beyond it to the crank shaft 28 of the motor 29. The shaft 27 may be supported freely so that it can be set at any point angular displacement to follow the crank 28. Supported on the mass 26 is a spring 30 upon which the mass 23 rests carrying the table roll 21. As the motor 29 is rotated, the shaft 21 will move up and down setting up a vibration of the lower mass 26 which is communicated to the upper mass through the spring 30.

In the case of Fig. 1 vibration is established by energizing the coil 19 with suitable alternating current of a frequency designed to produce a resonance in the system. If it be such a case where the vibratory masses comprising on the one part a table roll and its associated mass, and on the other part practically the infinite mass of the base and the floor supporting structure, a resonance for the system may be reached in which the amplitude of the table roll is a maximum.

In the device shown in Fig. 2 the energy may be supplied either by direct or alternating current to the motor to vibrate the roll. Similar resonance conditions may be established as in the case of the system shown in Fig. 1.

An arrangement, shown in Figs. 1 and 2 is indicated here the table roll 40 is supported in a bearing 41 which has a center shaft 42 supporting it. The center shaft is attached to the armature 43 which is supported through the element 44 by the spring 45. The spring 45 is attached to a collar 46 which forms a part of a vertical shell 48 with a heavy base 47. At the upper part of the vertical shell there are attached the pole pieces 49 and 50 as well as two others similarly positioned at the front and back with reference to Fig. 3. The whole mechanism may be supported in a casing 51 which has a heavy base 52 at the center of which is an upwardly extending neck 53 supporting and positioning a spring 54 which supports the other internal elements within the casing 51.

In Fig. 3 it will be noted that there is a vibratory system which is substantially free from the supporting base. This comprises on the one part the table roll, the bearing 41, the armature 43 and the elements connecting the two, and on the other part the pole pieces 49 and 50 and the supporting base comprising the elements 48 and 47. This whole vibratory system is elastically coupled to the base 52 to which may be also considered as attached the floor 55. It will also be noted that the energy is applied between the masses of the elastic system and that the base furnishes a substantially infinite mass with an elastic coupling between the two vibratory masses. In this manner of design the base will have substantially little vibration and the vibration will practically entirely be confined to the vibratory system.

In the modification shown in Figs. 1 and 2 the system comprises a heavy base mass and a lighter mass associated with the table roll and its support in which the vibrational energy is applied to the lighter mass by making the supporting mass comprising the supporting base and the foundation large and comparatively rigid. Substantially no vibration is obtained in the larger mass and all of the vibration is concentrated in the small mass. The same conditions apply to Fig. 2. In both of these figures the vibration of the base in this manner is avoided.

The vibration may in the present invention, even with a rather large machine, be in the audible range although it is preferable to produce vibrations of about 10 to 30 cycles per second. The vertical vibration of the wire of the paper machine will tend to prevent the fibers from setting in a direction in the line of travel of the wire and at the same time disperse them sufficiently so that the fibers will lie in positions in all directions with respect to the direction of travel of the paper.

Having described my invention, I claim:

1. In combination with a paper machine having a moving wire and a roll supporting the same, means for vibrating said roll vertically comprising a framework, a bearing element carrying the shaft of said roll positioned to move freely vertically, means for supporting said bearing support comprising a helical spring and means supporting said helical spring in the base of said casing.

2. In combination with a paper machine having a table roll, means for vibrating said table roll including a casing, a bearing element freely supported within said casing, said bearing element supporting one end of said table roll, a helical spring supporting said bearing element, a base contained within said casing, means supporting said helical spring and means adjustable with respect to the base for adjusting said system.

3. In combination with a Fourdrinier wire machine, a roll adapted to carry said wire, said roll being provided with a shaft and means supporting said shaft adapted to be free for motion in a vertical direction, said means including a frame having side elements providing vertical guides for said supporting means, a helical spring on which said supporting means is mounted, a base mounted in the lower part of said frame and means supported on said base for supporting the lower end of said helical spring.

4. In combination with a Fourdrinier wire machine, a roll supporting said wire, a shaft extending from the ends of said roll, a bearing element for supporting said shaft, a frame including means providing vertical guiding elements for said bearing support whereby said bearing support is free to move in a vertical direction, means positioned above said bearing support for vibrating the same, means positioned below said bearing support including a base member and a helical spring positioned thereon and beneath said bearing element to support the same.

5. In combination with a Fourdrinier wire machine, having a roll for supporting the same with a shaft carried at the end of the roll, means for supporting said shaft and moving it in a vertical direction comprising a bearing element 65 positioned to guide said bearing element in its movement in a vertical direction, means positioned at the top of said frame for reciprocating said bearing element and means positioned beneath said frame including a supporting base and means positioned between said base and bearing element for supporting the latter.

6. In combination with a Fourdrinier wire machine having a table roll and a shaft carried at the end thereof, means for vibrating said shaft.
in a vertical direction including a bearing element supporting said shaft, a frame having guiding means for guiding said bearing element in a vertical direction, a helical spring supporting said bearing element, a base positioned within said frame and means mounted upon said base supporting said helical spring, said means being adjustable in a vertical direction.

7. In combination with a roll of a Fourdrinier paper machine having a shaft supporting said roll, means for vibrating said shaft in a vertical direction comprising a bearing element, means for guiding said bearing element to allow free motion in a vertical direction, spring means supporting said bearing element and means supporting said spring means including a base, a supporting core mounted on said base and supporting said helical spring and means connecting said core and said base for allowing the former to be elevated within desired limits.

8. In combination with a paper machine of the Fourdrinier type having a traveling wire, means for vibrating the wire vertically comprising a roll supporting said wire, a bearing element supporting said roll, means providing vertical guides for said bearing element and means for vibrating said bearing element vertically including an electromagnetic solenoid having one portion connected to said bearing element and the other portion connected to a support and means coupled between the support and the portion of the electromagnetic means supporting said bearing element.

9. In combination with a paper machine of the Fourdrinier type having a traveling wire, a roll supporting said wire and means for vibrating the said roll including a plurality of masses vertically positioned one above the other and spring means supporting the upper mass by the lower, said spring means providing free motion in a vertical direction, means for guiding said masses in said vertical motion, said upper mass having means supporting said roll and means attached to said lower mass and vertically aligned for vibrating the system.

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