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O. M. STARKE

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APPARATUS FOR CLEANING PAPERMAKING MACHINE FELTS

Filed Aug. 30, 1961

2 Sheets-Sheet 1

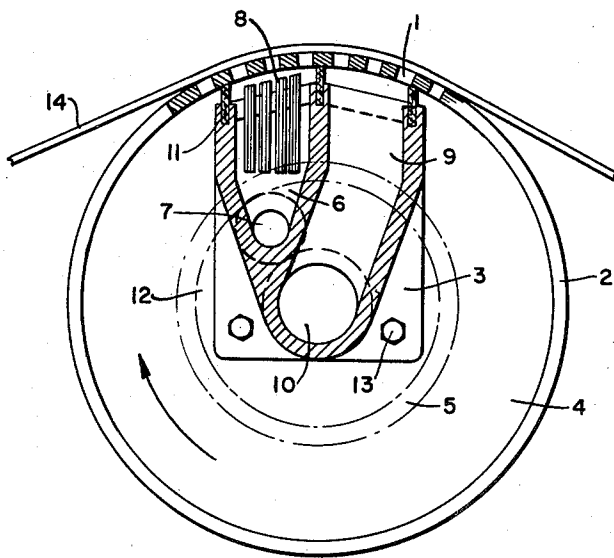


FIG. 1.

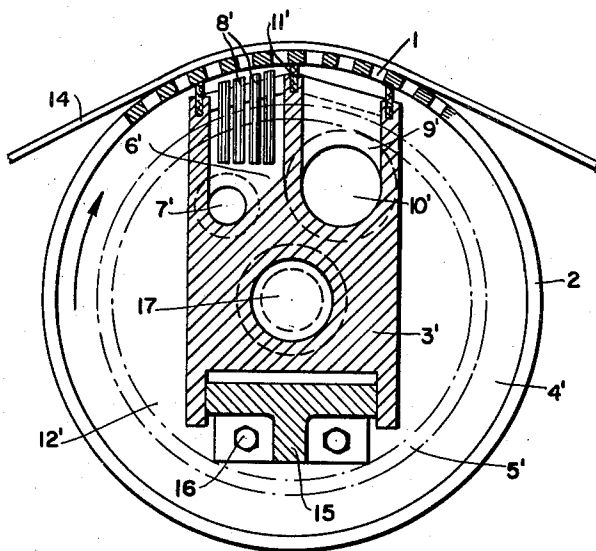


FIG. 2.

INVENTOR
Otto Martin Starke

BY *Spencer & Kaye*
ATTORNEYS

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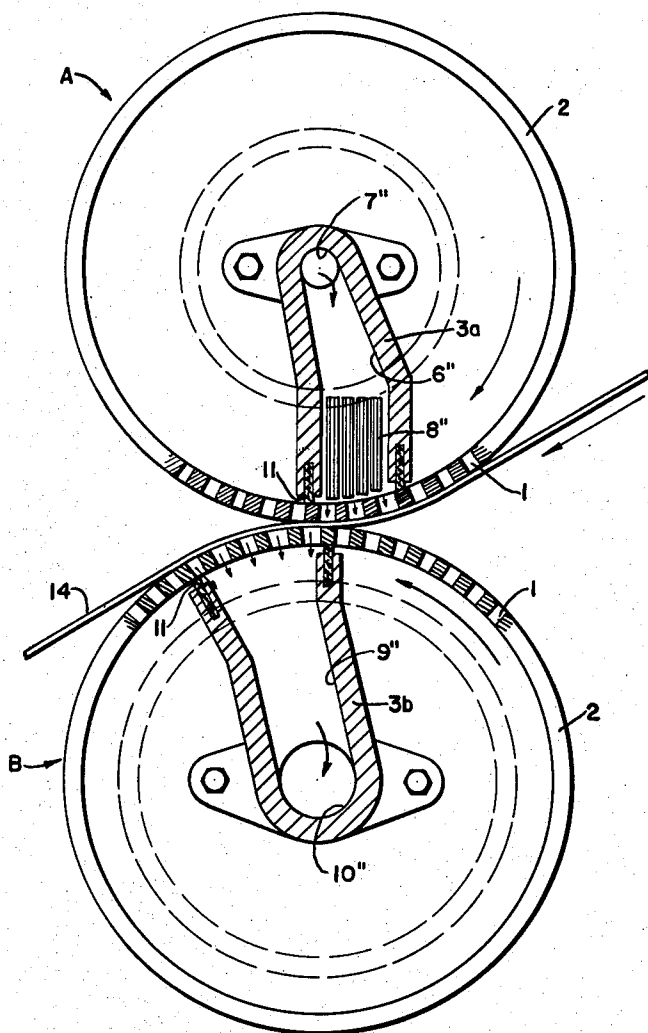


FIG. 3.

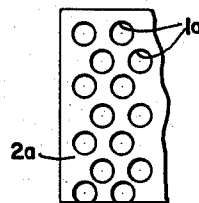


FIG. 4.

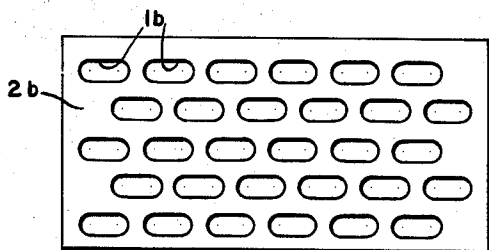


FIG. 5.

INVENTOR
Otto Martin Starke

BY *Spencer & Kaye*
ATTORNEYS

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3,190,793

APPARATUS FOR CLEANING PAPER-MAKING MACHINE FELTS

Otto Martin Starke, Duren, Rhineland, Germany, assignor to O. Dorries A.G., Duren, Rhineland, Germany, a firm

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10 Claims. (Cl. 162-278)

This invention relates to a method and apparatus for cleaning the felts of papermaking machines.

When making paper board, or like materials, a web of stock is formed from a suspension from which fillers, binding agents, colour additives, and other particles of dirt are deposited so as to adhere to the felt of the papermaking machine and penetrate into the pores of the felt. As a result, the felt loses the porosity which it requires in order to remove the water from a web being formed thereon. In this way, the felt rapidly becomes unserviceable and has to be replaced.

In order to enable felts in such machines to be used for a longer time apparatus has been built into the papermaking machines for continuously cleaning the felts during operation of the machine.

In addition to felt washing apparatus, in which the felt is guided through a cleaning bath and is additionally treated mechanically in this bath, apparatus is known wherein the felt slides over a stationary housing, or a housing which is reciprocated transversely of the direction of travel of the felt. During this sliding movement a cleaning liquid is supplied under pressure to penetrate into the felt and release particles of dirt which are carried away by the liquid upon removal of the latter from the felt by suction.

In other known apparatus, suction is applied to the felt through a slot at the end of a suction tube. Before reaching the tube the felt is sprayed with a cleaning liquid or is brushed by a rotating cylindrical brush for detaching and loosening particles of dirt from the felt.

The cleaning effects of such devices vary, but do not achieve the optimum value, which is desirable. A particular disadvantage of these devices consists in that the felt is subjected to undesirable mechanical stresses. If cylindrical brushes are used, the wool of the felt is torn out. As a result, the felt loses the absorbency required for removing water from a web being formed into paper. As the felt slides over a suction tube or over a stationary or reciprocating housing, it is also subjected to an undesirable abrasion resulting in the felt becoming prematurely unserviceable. Furthermore, the cover plates of the housing are subjected to considerable wear, so that they have to be renewed from time to time. As the felt slides over such cover plates, the pores of the felt become restricted or even closed as a result of the necessary application pressure, and the intended cleaning action, more particularly the detaching of impurities which have penetrated into the felt, is made difficult.

An object of the invention is to provide an improved method and apparatus for cleaning the felt of a papermaking machine which reduces or eliminates the above disadvantages by reducing the abrasion and wear on the felt during cleaning or that the felt remains serviceable for the removal of water from the stock for a substantially longer time than was previously possible.

According to the invention there is provided a method of cleaning papermaking machine felts comprising, whilst the felt is rolling over a rotating roller, applying a cleaning liquid under pressure to the felt, subjecting the cleaning liquid to high-frequency vibrations in order to loosen dirt from the pores of the felt, and then removing by

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suction the liquid with entrained dirt from the felt. Preferably the high-frequency vibrations are in the ultra-sonic range.

The present invention also provides apparatus for cleaning felts by the above method and comprising a rotatable roller having an apertured cylindrical wall, and a housing non-rotatably mounted within the roller and provided with at least one pressure chamber adapted to be supplied with cleaning liquid under pressure and opening to a portion of the inner surface of the cylindrical wall, a high frequency oscillation generator mounted in the pressure chamber, and a suction chamber opening to a portion of the inner surface of the cylindrical wall, the arrangement being such that, during use of the apparatus a felt to be cleaned is passed partly around the roller so as at least to contact those portions of the cylindrical wall at which are located the pressure and suction chambers.

The apertures in the cylindrical wall may be constructed as circular bores or as slots and be distributed uniformly in rows over the cylindrical wall—consecutive rows preferably being offset by half a pitch. If the apertures are of slot-like construction they may extend circumferentially, axially, or at some intermediate oblique direction in relation to the cylindrical wall surface.

The apertures in the case of a stationary housing, are, at the most equal in length to half the axial length of the roller.

The rolling movement of the felt to be cleaned over a roller rotating at a suitable peripheral speed avoids abrasion of the felt, the tearing-out of fibres, narrowing or closing of pores or the like. The cleaning liquid which is under pressure and is subjected to high-frequency oscillations penetrates deeply into the texture of the felt and it detaches the adhering impurities, which are removed together with the cleaning liquid by the downstream suction chamber. If the zone of action of the emitter extends over the full machine width, the felt is completely cleaned during one passage through the machine and it thus becomes possible to interrupt the cleaning operation temporarily. The cleaning roller then continues to rotate as a normal guide roller. The apertures in the cylindrical wall of the roller can be of many possible shapes and can be adapted very extensively to actual requirements as long as the inherent strength of the cylindrical wall of the roller is guaranteed. The cleaning device can be located whenever convenient in a particular machine and is not limited to positions wherein the felt is guided horizontally or only at a slight inclination to the horizontal.

If the device is equipped with an ultrasonic emitter extending over the full working width of the roller, the drive for reciprocating a housing need not be provided. With a suitable mounting, the rotation of the cylindrical part of the roller can be effected by the felt.

It will be seen that with the improved cleaning of the present invention the relatively expensive felt need only be replaced in the machine after fairly long periods of time. Interruptions in operation and loss of production occur less frequently.

The invention is described merely by way of example, with reference to the accompanying drawings, in which:

FIGURE 1 is a cross-sectional view of a felt-cleaning roller according to the invention having a stationary housing for simultaneously cleaning the entire width of a felt.

FIGURE 2 is a cross-sectional view of a further embodiment of a felt-cleaning roller according to the invention wherein cleaning is effected by means of a housing reciprocated axially of the roller.

FIGURE 3 is a cross section through a still further embodiment of a felt-cleaning roller arrangement wherein two rollers are used.

FIGURE 4 is a fragmentary elevational view of a roll having circular apertures.

FIGURE 5 is an elevational view of a roll having slot-like apertures.

Referring to the drawings, FIGURE 1 shows a felt-cleaning roller consisting essentially of a rotating cylindrical wall 2 provided with apertures 1. A non-rotatable housing 3 extending over the full width of the machine is mounted within the roller and carries at each end a bearing ring 5 supporting the ends of the roller which are secured to wall 2 of the roller. Provided in the housing 3 is a pressure chamber 6 into which during use of the apparatus a cleaning liquid under pressure is introduced through the inlet 7. Arranged in the pressure chamber 6 are high-frequency oscillation generators in the form of vibration emitters 8. The emitters 8 extend over the full width of the roller. The housing 3 also comprises a suction chamber 9 connected via a suction connection 10 to a suction pump or the like (not shown). The two chambers 6 and 9 are provided, where they open to portions of the inner surface of the cylindrical wall, on every side with packings 11 which are preferably elastic so as to engage the inner cylindrical surface of the roller. The connections 7 and 10 are taken through non-rotatable bearing journals 12 at each end of the housing. The roller is mounted by means of bearing rings 5 on the journals 12 while the antifriction housing 3 is secured to the end faces of the journals 12 by bolts 13.

During use the cleaning roller rotates in the direction indicated by the arrow, the felt 14 covering those apertures 1 in communication with the pressure chamber 6 and the suction chamber 9. A cleaning liquid introduced through the inlet 7 under pressure flows through the pressure chamber 6 and forms above the ultra-sonic vibration emitters 8 a pool of liquid which extends through the apertures 1 to the felt surface and is subjected to high-frequency oscillations under the influence of the ultra-sonic vibrations. The cleaning liquid thus penetrates with a pulsating action deeply into the felt 14 and detaches dirt and various impurities from the felt. As the felt 14 passes into the zone above the suction chamber 9 the negative pressure prevailing in this suction chamber removes the liquid and entrained dirt and impurities from the felt, the dirty liquid finally being discharged through the suction connection 10.

The cleaning roller shown in FIGURE 2 comprises a rotating cylindrical wall 2 provided with apertures 1 and end walls 4. The apertures may be circular as shown in FIGURE 4 where apertures 1a in roll 2a are circular. They may be slot-like as shown in FIGURE 5 where apertures 1b in roll 2b are in the form of slots. A housing is non-rotatably mounted in the roller upon a guide bar 15 upon which it is slidable axially of the roller. Provided in the housing 3 is a pressure chamber 6' to which a pressure liquid may be supplied through an inlet 7'. Arranged in the pressure chamber 6' are ultra-sonic vibration emitters extending for the entire axial length of the pressure chamber 6'. Provided adjacent the pressure chamber 6' is a suction chamber 9' which is connected by way of a suction connection 10' to a suction pump which is not shown in the drawings. The chambers 6' and 9' are provided on all sides with elastic packings 11' sealingly engaging the inner cylindrical surface of the roller. The connections 7' and 10' are connected to flexible pipes which pass through nonrotating bearing journals 12' upon which the roller is mounted by means of bearing rings 5' supporting the end wall 4'. The guide bar 15 is fixed by means of bolts 16 to the end faces of the bearing journals 12'. A screw spindle 17 arranged on the central axis of the roller and mounted in the journals 12' co-operates with an internal screwthread in the housing 3' so that the latter may be reciprocated axially of the roller upon rotation of the spindle 17 in alternating directions. During use of the apparatus the housing 3' is reciprocated over

the full width of the machine so as to clean the entire width of the felt 14. It will be appreciated that instead of one housing 3' a plurality of housings 3' may be mounted on the spindle 17 and guide bar 15, the various housings travelling, in use, through individual distances which together make up the full width of the machine felt.

During the constant rotation of the cylindrical wall 2 of the roller, while cleaning a felt 14, a cleaning liquid under pressure is introduced through a flexible pipe and the inlet 7' into the pressure chamber 6' where it is subjected to high-frequency oscillations by the ultra-sonic vibration emitters 8' and forms a pool above the ultra-sonic wave emitters 8', extending into the apertures 1 of the cylindrical wall 2. The pulsating cleaning liquid penetrates deeply into the felt and detaches the adhering dirt and impurities. The felt 14 immediately afterwards passes over the suction chamber into which is sucked the cleaning liquid and the entrained dirt and impurities. The liquid with the entrained impurities is then discharged through the suction connection 10'.

In an alternative embodiment of the invention the felt to be cleaned is passed in contact with two rollers in such a manner that one roller contains the pressure chamber with the ultra-sonic wave emitters for the washing liquid and the other roller the suction chamber for discharging the liquid with its impurities. In this case the cleaning process can be carried out by passing cleaning fluid right through the felt, preferably from the side which has no contact with the web of stock which is being produced. The arrangement of the rollers must be such that each of the chambers is fully covered by the felt.

Such an arrangement, for example, is shown in FIGURE 3 wherein a pair of rotating cylindrical walls 2 are provided, and have apertures 1. The upper of these may be considered roller A and the lower may be considered roller B. The rollers are arranged so that a sheet of felt 14 can pass between them. A housing is provided in each of the rollers and the housing 3a of roller A defines a pressure chamber 6'' to which a pressurized liquid may be supplied through an inlet 7''. A plurality of ultra-sonic vibration emitters 8'' are provided in chamber 6''.

In the lower roller B the housing 3b defines a suction chamber 9'' connected to a suction pump (not shown) via a suction connection 10''. The chambers 6'' and 9'' are provided on either side with elastic packings 11 to sealingly engage the inner cylindrical surfaces of the rollers A and B. The remainder of the construction of this embodiment is similar to the above described embodiments and, therefore, will not be further described in detail. Furthermore, the operation thereof is similar to the other embodiments except for the fact that the cleaning fluid is provided through the felt 14 from one side to the other as described above.

It will be understood that the above description of the present invention is susceptible to various modifications, changes, and adaptations, and the same are intended to be comprehended within the meaning and range of equivalents of the appended claims.

I claim:

1. Apparatus for cleaning papermaking machine felts comprising rotatable roller means having an apertured cylindrical wall, housing means non-rotatably mounted within said roller means, means defining a pressure chamber and means defining a suction chamber within said housing means and both opening to the surface of said cylindrical wall, an inlet for the supply of cleaning liquid to said pressure chamber, a high frequency oscillation generator mounted in said pressure chamber, and a suction connection communicating with said suction chamber, the arrangement being such that, during use of the apparatus, a felt to be cleaned is passed partly around the roller means so as at least to contact those portions of said cylindrical wall at which are located the pressure and suction chambers.

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2. Apparatus according to claim 1 wherein said high frequency oscillation generator is an ultra-sonic vibration emitter.

3. Apparatus according to claim 1 wherein said housing means extends along the entire axial length of said roller means.

4. Apparatus for cleaning papermaking machine felts comprising rotatable roller means having a cylindrical wall, means defining a plurality of circular apertures through such wall, said apertures being arranged in rows and consecutive rows being offset by half a pitch, housing means non-rotatably mounted within said roller, means defining a pressure chamber and means defining a suction chamber within said housing means and both opening to the surface of such cylindrical wall, an inlet for the supply of cleaning liquid to said pressure chamber, a high frequency oscillation generator mounted in said pressure chamber, and a suction connection communicating with said suction chamber, the arrangement being such that, during use of the apparatus, a felt to be cleaned is passed partly around the roller means so as at least to contact those portions of such cylindrical wall at which are located the pressure and suction chambers.

5. Apparatus for cleaning papermaking machine felts comprising rotatable roller means having a cylindrical wall, means defining a plurality of slot-like apertures through such wall, housing means non-rotatably mounted within said roller means, means defining a pressure chamber and means defining a suction chamber within said housing means and both opening to the surface of such cylindrical wall, an inlet for the supply of cleaning liquid to said pressure chamber, a high frequency oscillation generator mounted in said pressure chamber, and a suction connection communicating with said suction chamber, the arrangement being such that, during use of the apparatus, a felt to be cleaned is passed partly around the roller means so as at least to contact those portions of such cylindrical wall at which are located the pressure and suction chambers.

6. Apparatus for cleaning papermaking machine felts comprising a rotatable roller having a cylindrical wall, means defining a plurality of apertures through said wall, each aperture having a length less than half the axial length of the roller, a housing non-rotatably mounted within said roller and extending through the entire length of said roller, means defining a pressure chamber and a suction chamber within said housing opening to the surface of said cylindrical wall, an inlet for the supply of cleaning liquid to said pressure chamber, a high frequency oscillation generator mounted in said pressure chamber, and a suction connection communicating with said suction chamber, the arrangement being such that, during use of the apparatus, a felt to be cleaned is passed partly around the roller so as at least to contact those portions of said cylindrical wall at which are located the pressure and suction chambers.

7. Apparatus for cleaning papermaking machine felts comprising a rotatable roller having an apertured cylindrical wall, a housing non-rotatably mounted within said roller, means supporting the housing for reciprocating movement axially of the roller, means defining a pressure chamber and a suction chamber within said housing opening to the surface of said cylindrical wall, an inlet for the supply of cleaning liquid to said pressure chamber, a high frequency oscillation generator mounted in said pressure chamber, and a suction connection communicating with

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said suction chamber, the arrangement being such that, during use of the apparatus, a felt to be cleaned is passed partly around the roller so as at least to contact those portions of said cylindrical wall at which are located the pressure and suction chambers.

8. Apparatus for cleaning papermaking machine felts comprising a rotatable roller having an apertured cylindrical wall, a housing non-rotatably mounted within said roller, a guide bar extending axially of said roller and slidably supporting said housing, screw threaded spindle rotatably mounted axially of the roller, said housing being provided with an aperture threadably engaged by said spindle whereby rotation of said spindle alternately in opposite directions reciprocates said housing axially of the roller, means defining a pressure chamber and a suction chamber within said housing, opening to the surface of said cylindrical wall, an inlet for the supply of cleaning liquid to said pressure chamber, a high frequency oscillation generator mounted in said pressure chamber, and a suction connection communicating with said suction chamber, the arrangement being such that, during use of the apparatus, a felt to be cleaned is passed partly around the roller so as to at least contact those portions of said cylindrical wall at which are located the pressure and suction chambers.

9. Apparatus for cleaning papermaking machine felts comprising two rotatable rollers each including an apertured cylindrical wall; a first housing non-rotatably mounted in one roller; means defining a pressure chamber provided in said first housing opening to the inner surface of the said cylindrical wall of said one roller; an inlet for the supply of cleaning liquid under pressure to said pressure chamber; a high frequency oscillation generator mounted within said pressure chamber; a second housing non-rotatably mounted within the other roller; means defining a suction chamber in said second housing and opening to the inner surface of the cylindrical wall of said other roller; and a suction connection communicating with said suction chamber.

10. Apparatus according to claim 9 wherein the two rollers are so arranged that, during use, they contact opposite sides of the felt being cleaned.

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DONALL H. SYLVESTER, *Primary Examiner*.

CHARLES A. WILLMUTH, MORRIS O. WOLK, WILLIAM B. KNIGHT, *Examiners*.