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APPARATUS FOR MAKING PAPER

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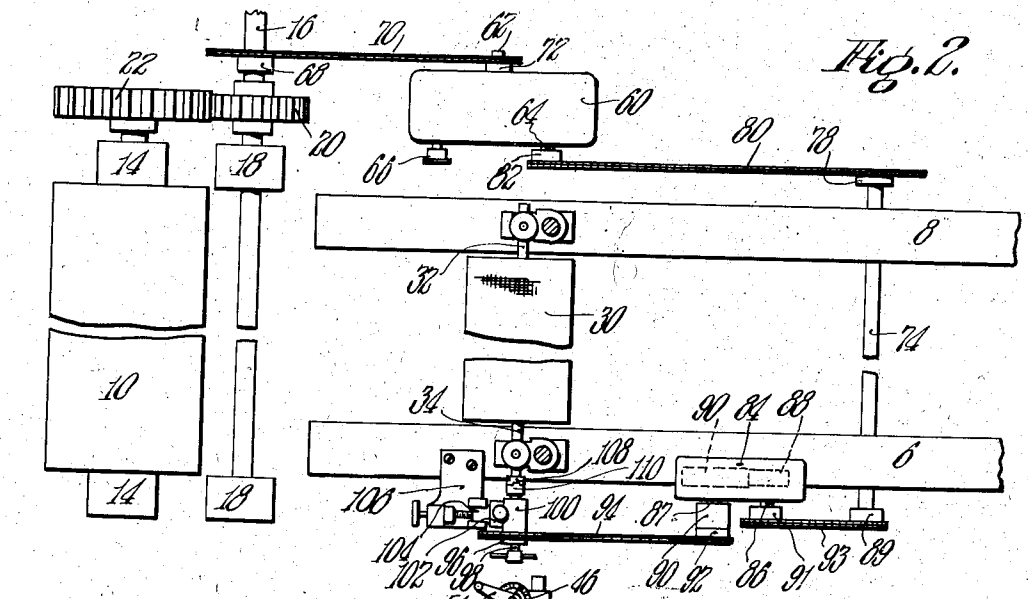


Fig. 2.

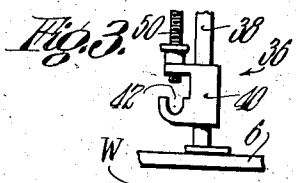


Fig. 3.

Fig. 1.

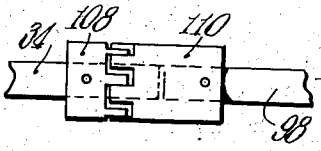


Fig. 4.

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APPARATUS FOR MAKING PAPER

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6 Claims. (Cl. 92—48)

This invention relates to improvements in apparatus for making paper and is directed more particularly to the operation of the dandy roll of a paper-making machine for producing new and novel effects.

The principal objects of the invention are directed to the provision of apparatus for making paper wherein the dandy roll of a paper-making machine is positively driven from some rotating element of the said machine whereby the dandy roll rotates in such a way that the surface speed thereof bears some predetermined relationship to the surface speed of the paper-making element such as the Fourdrinier wire. It is thereby possible to obtain the desired formation of the paper and water-marking thereof and obtain improved results.

According to prior practice in the paper-making art the dandy roll has been mounted at its ends over the Fourdrinier wire for free rotation so that it rests on, and is driven by, the paper being formed on the wire.

The prior practices have numerous and serious objections and disadvantages, more particularly in that the speed of the dandy tends to lag to some extent relative to that of the Fourdrinier wire due to slippage.

Because of this the formation of the paper is not as uniform and perfect as is desired and where watermarking or other devices are used on the dandy to watermark the paper or apply designs thereto, the results are considerably blurred and indistinct. Also the speed of the paper machine or the Fourdrinier wire is necessarily reduced or its speed is limited by the ability of the wire and paper being formed to drive the dandy. Not only does the lag increase as the wire speed increases but the speed of the wire is limited to the point where it is possible to obtain any results from the dandy.

Further, because the usual dandy is rotated by reason of its contact with the paper being formed on the wire and is not positively driven so as to cause the lag or slippage, a mound or wave of water and paper-making fibers builds up ahead of the dandy. There is, in effect, an excess of water and fibers ahead of the dandy because the dandy operates somewhat after the manner of a dam against the paper-making material being carried along by the wire.

The excess water ahead of the dandy is not taken away and the formation of the paper and the watermark, where used, are seriously impaired. By reason of the mound or wave of water and fibers ahead of the dandy referred to it is often necessary to limit the speed of the wire to a speed which will best accommodate the undesirable conditions.

According to this invention, the dandy roll is positively driven or rotated from some positively driven rotating element of the paper machine so that its surface speed may bear a predetermined relation to that of the wire, thereby eliminating the lag or slippage referred to and the building up of a wave or mound ahead of the dandy thereby greatly improving the formation of the paper as well as providing distinct non-blurred and clear effects of the dandy. Even if the dandy were to be driven frictionally from means other than the paper stock on the wire there is, in the prior art practice, the lag and objectional results.

Preferably, according to this invention, the surface speed of the dandy roll will be definitely related to, and slightly greater than, that of the wire as distinguished from the relatively less and non-uniform dandy speed of the prior art. To accomplish this, means is provided to drive the dandy at some predetermined speed relative to that of the wire, which speed is varied in synchronism with variations or an increase or decrease in the speed of the wire, all to the end that the dandy operates at all times at a speed having some predetermined relation to that of the wire. And as a further feature of the invention, the relation of speeds of the dandy and wire may be varied to alter that of the dandy as may be desired, although I have found that it is desirable that the speed of the roll be from, say, 1½% to 3 or 4% greater than that of the wire.

Various other novel objects and advantages of the invention will be observed from the following description of the preferred form thereof, reference being had to the accompanying drawing, wherein:

Fig. 1 is a side elevational view, more or less diagrammatic, showing a portion of a paper-making machine where the dandy roll is usually placed and having the novel features of the invention associated therewith.

Fig. 2 is a plan view of that portion of a paper-making machine shown in Fig. 1;

Fig. 3 is a side elevational view of one of the dandy roll stands; and

Fig. 4 is a plan view of an end of the dandy roll shaft and a coupling means associated with said shaft connecting the same to a dandy roll drive shaft.

Referring now to the drawing more in detail, the invention will be fully described.

Supports 2 and 4 are shown in Fig. 1 which represent the supports usually at the near side of the machine. There are similar supports at the far side, and said supports are usually tied together in some convenient manner. The supports 2 and 4 support a side rail 6 and a similar rail 8 is supported at the far side of the machine by the supports which correspond to the supports 2 and 4.

A couch roll is represented by 10, a shaft 12 of which is rotatable in bearings 14. In the form of the invention shown a shaft 16 rotatable in bearings 18 is geared by gears 20 and 22 to the couch roll 10 and said shaft is operatively connected with the shafts of other units of the machine.

According to the invention, the dandy roll is driven from some rotating element of the machine which rotates in synchronism with the Fourdrinier wire. In the case shown, the dandy roll is driven positively by said shaft 16, as will be described.

It has been found to be desirable in some cases to drive the dandy from the shaft 16 although some other rotating element of the machine may be used for the purpose with equal results.

The Fourdrinier wire represented by W passes over the couch roll as usual and runs along beneath the side rails 6 and 8, it being supported in the usual manner by rolls thereunder, although not shown. As usual, suction boxes will be located for their usual function beneath the wire although they are not shown as an important part of the present invention.

A dandy roll is represented by 30 and it is obvious that it may be of various forms and sizes or diameters depending upon the results to be obtained. As usual the dandy roll has journal shafts 32 and 34 and these are received for rotation in dandy stands carried by the rails 6 and 8 and indicated generally by 36.

The stands include upstanding members 38 on which are slidable brackets 40 having bearings 42 for the dandy roll journals. Members 44 on the uprights 38 have journalled therein a cross-shaft 46 and carry gears 52. Gears 48 on the upper ends of threaded rods 50 which are rotatable in the members 44 are in mesh with the gears 52 while an operating member 54 is provided on shaft 46.

The lower ends of rods 50 threadedly engage the members 40 and as shaft 46 is rotated in one direction or the other the dandy roll is moved up or down, or is adjusted relative to the wire. It will be noted that the dandy is supported for rotation, or so that it may operate on the paper-making material on the wire in the way intended.

In the form of the invention being disclosed the shaft 16 as previously pointed out provides the motive power for driving the dandy roll and it will be obvious that the shaft or any other element used for driving the dandy roll which operates in synchronism with the wire will vary in speed accordingly as the speed of the wire varies.

A variable speed unit is represented by 60. This will be a device having an input shaft 62 and an output shaft 64 with connecting mechanism to operate shaft 64 at some speed relative to that at which shaft 62 is driven. The mechanism is variable to vary the relative speeds of said shafts and an operating member 66 is provided whereby the varying or adjusting of said speeds is accomplished.

Such a unit as has been used for the successful practice of the invention is a P. I. V. unit marketed by Link Belt Company, of Chicago, Illinois, and shown in its catalogue, Book No. 1574, 1939 edition at pages 21–22 and title P. I. V. Gear.

Sprockets 68 and 72 fixed on shafts 16 and 62 are operatively and positively connected by a chain 76. A cross-shaft 74 journalled in bearings 76 carried by supports such as 4 is connected to shaft 64 by means of the sprockets and chain 78, 80, and 82.

A speed reducing unit is indicated by 84 and is for convenience carried by rail 6. Said unit has input and output shafts 86 and 87 which carry intermeshing gears 88 and 90. Sprockets 89, 91 fixed on shafts 74 and 86 and a chain 93 positively connect said shaft 74 with the reducer 84.

An overriding clutch 90 is carried by shaft 87 and a sprocket 92 associated therewith is connected positively by a chain 94 to a sprocket 96 on a dandy roll drive shaft 98. The shaft 98 is rotatable and slightly reciprocable in a bearing construction 100.

The said bearing is slidable up and down in a bracket 102 that has a part 104 slidable horizontally in a support 106 secured to rail 6. A half-coupling or clutch part 108 is carried by dandy journal 34 and a member engageable therewith is carried by dandy roll drive shaft 98.

The bearing construction for the dandy roll shaft is disclosed in my co-pending application Ser. No. 304,345, filed November 14, 1939, and by the means thereof it is possible to move the dandy roll drive shaft up and down or back and forth to align the dandy roll drive shaft or accommodate the same to the dandy journal 34. Also the drive shaft 98 may be moved in and out to engage and disengage the dandy journal.

From the foregoing it will be observed that the dandy is mounted for rotation independently of the dandy drive shaft yet the said shaft and dandy are connected so that the dandy is positively rotated.

The clutch 90 referred to provides a positive drive for the dandy in a clockwise direction in the illustration shown yet in the event the driving mechanism fails it allows the dandy to be driven by the wire or paper web thereon and avoids the possibility of the dandy destroying the web of paper. Such a clutch or free wheeling device as 90 may take various forms and include interengaging pawls and sprockets, wedge rollers, or the like.

In the operation of the apparatus as shaft 16 rotates the unit 60 is operated to drive shaft 74 which in turn by means of the connections and unit 84 operates to drive the dandy roll drive shaft 98 so that the dandy coupled thereto is rotated. The unit 60 may be adjusted to provide the difference in speed of the dandy and wire or whereby the dandy is driven at some predetermined speed relative thereto.

It will be observed that the dandy is positively driven from an element which operates in unison or in synchronism with the wire so that as the speed of the wire increases or decreases that of the dandy likewise increases or decreases all to the end that the dandy is maintained at a desired speed relative to that of the wire.

While I have described the invention in great detail and with respect to the present preferred form thereof, it is not desired to be limited thereto since changes and modifications may be made therein without departing from the spirit and

scope of the invention. The invention may be embodied in other specific forms without departing from the essential characteristics thereof. The present embodiments are therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description, and all changes which come within the meaning and range of equivalency of the claims are therefore intended to be embraced therein.

What it is desired to claim and secure by Letters Patent of the United States is:

1. The combination in a paper making machine of, a traveling foraminous element, means for moving the same including a rotatable member rotatable in synchronism therewith, a dandy roll for acting on paper being formed on said element having a shaft, means for rotatably supporting said dandy, means for rotatably supporting a dandy drive shaft independently of the dandy and in substantial alignment with the shaft thereof, a dandy drive shaft rotatable therein, coupling means for connecting said shaft and dandy shaft, and positive driving connections between said rotatable member and drive shaft whereby said dandy is positively driven from said rotatable member to provide a surface speed thereof that bears a predetermined relation to that of said wire.

2. The combination in a paper making machine of, a traveling foraminous element, means for moving the same including a rotatable member rotatable in synchronism therewith, a dandy roll for acting on paper being formed on said element having a shaft, means for rotatably supporting said dandy shaft, means for rotatably supporting a dandy drive shaft independently of the dandy and in substantial alignment with the shaft of the dandy, a dandy drive shaft rotatable therein, disengageable coupling means for connecting said shaft and dandy, and positive driving connections between said rotatable member and drive shaft whereby said dandy is positively driven to provide a surface speed thereof that bears a predetermined relation to that of said foraminous element, said connections including a unit provided with input and output shafts interconnected by variable means to vary the relative speeds thereof of the foraminous element and dandy.

3. The combination in a Fourdrinier paper machine of, a traveling wire, means for driving the wire including a rotatable member operable in synchronism with the wire at all of its speeds, a dandy roll having a shaft, dandy bearings at opposite sides of the machine for rotatably supporting opposite ends of the dandy shaft with said dandy bearing on a web on said wire, a drive shaft bearing for rotatably supporting a dandy drive shaft in alignment with said dandy shaft, a dandy drive shaft rotatable in said bearing, disengageable connections associated with said dandy and drive shafts permitting up and down movements of the dandy relative to the drive shaft, and positively operable connections connecting said rotatable member and dandy drive shaft for positively driving the latter from the former whereby the dandy is driven at a predetermined surface speed and in synchronism with that of the wire at all speeds of the said wire.

4. The combination in a Fourdrinier paper machine of, a traveling wire, means for driving the wire including a rotatable member operable in synchronism with the wire at all of its speeds, a dandy roll having a shaft, dandy bearings at opposite sides of the machine for rotatably supporting opposite ends of the dandy shaft with said dandy bearing on a web on said wire, a drive shaft bearing for rotatably supporting a dandy drive shaft in substantial alignment with said dandy shaft, a dandy drive shaft rotatable in said bearing, disengageable driving connections associated with said dandy and drive shafts, and positively operable connections connecting said rotatable member and dandy drive shaft for positively driving the latter from the former whereby the dandy is driven at a predetermined surface speed and in synchronism with that of the wire at all speeds of the said wire, said driving connections including a variable speed unit having input and output shafts interconnected by variable speed means whereby the speed of the dandy relative to the wire while in synchronism may be varied and an overrunning clutch mechanism whereby said dandy roll is free to rotate in one direction independently of said drive shaft.

5. The combination in a Fourdrinier paper machine of, a traveling wire, means for driving the wire including a rotatable member operable in synchronism with the wire at all of its speeds, a dandy roll having a shaft, dandy bearings at opposite sides of the machine for rotatably supporting opposite ends of the dandy shaft with said dandy bearing on a web on said wire, a drive shaft bearing for rotatably supporting a dandy drive shaft independently of and in alignment with said dandy shaft, a dandy drive shaft rotatable in said bearing, disengageable driving connections associated with said dandy and drive shafts, and positively operable connections connecting said rotatable member and dandy drive shaft for positively driving the latter from the former whereby the dandy is driven at a predetermined surface speed and in synchronism with that of the wire at all speeds of the said wire, the said dandy bearings and drive shaft bearing being independently adjustable whereby said drive and dandy shafts may be rotatably supported in various relative positions.

6. The combination in a Fourdrinier paper machine of, a traveling wire, means for driving the wire including a rotatable member operable in synchronism with the wire at all of its speeds, a dandy roll having a shaft, dandy bearings at opposite sides of the machine for rotatably supporting opposite ends of the dandy shaft with said dandy bearing on a web on said wire, a drive shaft bearing for rotatably supporting a dandy drive shaft in alignment with said dandy shaft, a dandy drive shaft rotatable in said bearing, disengageable driving connections associated with said dandy and drive shafts, and positively operable connections connecting said rotatable member and dandy drive shaft for positively driving the latter from the former whereby the dandy is driven at a predetermined surface speed and in synchronism with that of the wire at all speeds of the said wire, the said dandy bearings and drive shaft bearings being independently adjustable whereby said drive and dandy shafts may be rotatably supported in various relative positions, said dandy roll drive shaft being axially movable to engage and disengage the connections associated with the dandy and drive shafts.

JOHN A. SPENCER.