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WEB TENSIONING AND DRIVING DEVICE

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FIG. 1

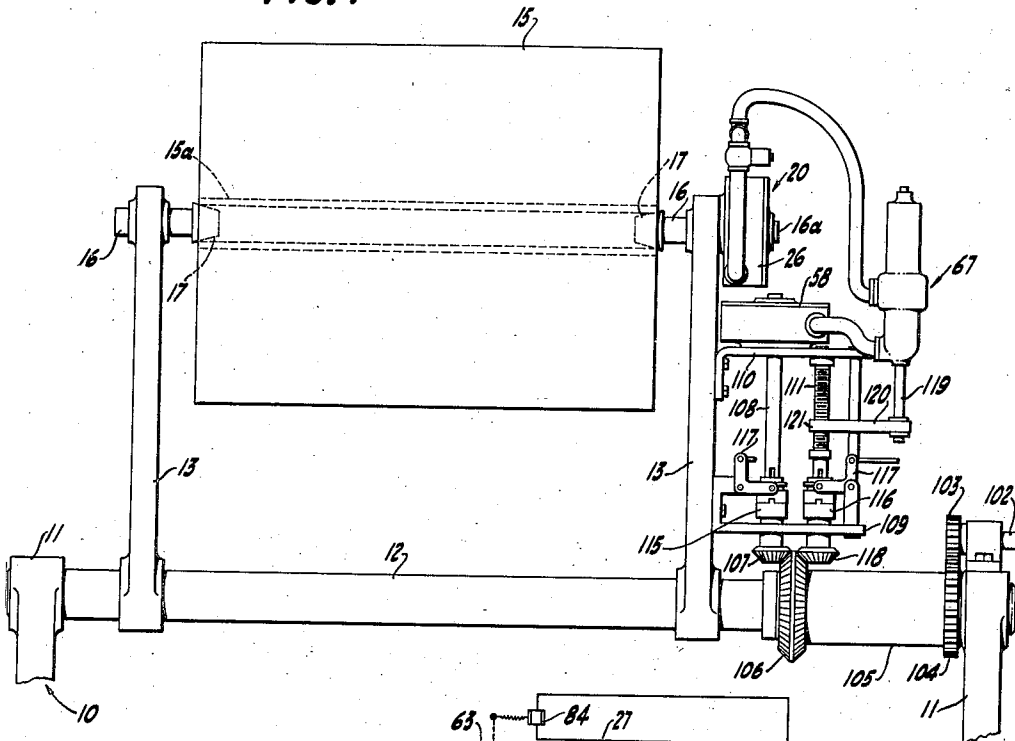
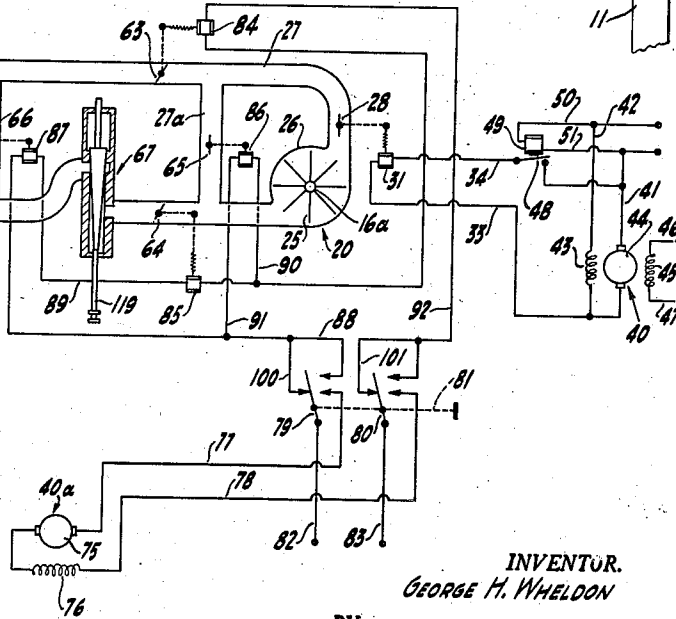


FIG. 2



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WEB TENSIONING AND DRIVING DEVICE

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10 Claims. (Cl. 242-75)

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This invention relates to a mechanism for driving a roll of newsprint or the like and for maintaining a proper tension thereon.

This application is a continuation in part of my copending application Ser. No. 52,377, filed October 1, 1948, entitled "Web Tensioning and Driving Mechanism."

As set forth in my copending application, in supplying a web to a rotary printing press, such as a newspaper printing press, a roll of newsprint is supported upon a reel. It is common practice to feed the web from the reel to the press by means of straps trained over rollers and driven at a speed governed by the speed of the press, such as to unwind the roll at a proper speed and to maintain a proper tension upon the web as it is fed to the press. As set forth in my copending application, an improved means is provided for maintaining a proper tension upon the web and also for driving the roll of newsprint at the proper speed.

It is an object of the present invention to provide improvements upon the mechanism described in my copending application.

It is a further object of the present invention to provide means of driving a roll of newsprint or the like by tension of the web during operation at normal press speed, and to provide a positive drive for the roll of newsprint during initial, slow movement of the press, as while the web is being threaded through the press.

It is a still further object of the present invention to provide a means of positively driving a new, oncoming roll of newsprint in synchronism with a nearly exhausted roll of newsprint so as to facilitate operation of what is known in the art as a flying paster.

These and other objects of the invention will be apparent from the ensuing description and the appended claims.

One form which the invention may assume is exemplified in the following description and illustrated by way of example in the accompanying drawings, in which:

Fig. 1 is a fragmentary view in elevation of a reel stand embodying the driving and braking mechanism of the invention.

Fig. 2 is a diagrammatic view of the hydraulic and electric circuits.

Referring now to the drawings, there is shown a reel 10 of known type including a reel stand 11 having a shaft 12 journaled therein and extending between opposite posts of the stand. The reel is of well-known construction and is shown, for example, in Wheldon et al., United States

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Patent Number 2,064,638, issued December 15, 1936, entitled "Web Tensioning Mechanism." Briefly, and as modified for purposes of the present invention, the reel comprises three pairs of radial arms 13 (of which only one pair is shown), the arms being fixed to the shaft 12 so as to rotate therewith. A roll 15 of newsprint wound upon a suitable core 15a is supported between each pair of arms by means of stubshafts 16 and spuds 17, the latter being inserted in the ends of the core. As also described in the above mentioned patent, and as is well known in the art, the rolls mounted upon such a reel are unwound one at a time, and as a roll approaches exhaustion a device known as a "flying paster" is employed to paste the end of a full roll to the web leaving the exhausted roll.

In accordance with the present invention there is provided at one end of each roll an hydraulic braking and driving mechanism generally designated as 20. This mechanism comprises an impeller 25 (see Fig. 2) secured to an extension 16a of one of the stubshafts 16 and disposed in a fluid-tight casing 26 secured to an arm 13 of the reel. Normally, valves 63 and 64 are closed and valve 65 is open, so that conduits 27 and 27a provide a circuit for an hydraulic liquid in the casing 26. The functions of the valves 63, 64 and 65 are described hereinafter. Disposed within the conduit 27 is a valve 28, which can be adjusted manually in the manner described in my copending application, to exert any desired degree of resistance to the hydraulic circuit consisting of the casing 26 and conduits 27 and 27a. The valve 28 is also controlled by a solenoid 31 having leads 33 and 34 in the manner hereinafter described, and a gauge (not shown) may also be provided for measuring the hydraulic pressure in the conduit 27.

It will be seen that, as the roll 15 is unwound, the impeller 25 will rotate, thus causing hydraulic fluid to circulate through the circuit, and that the tendency of the fluid will be to open the valve 28. By manually setting the valve any desired degree of resistance may be opposed to the flow of fluid, and thus any desired degree of braking of the roll 15 and tensioning of the web may be applied.

The solenoid 31 is energized in the following manner. A main press motor 40 is shown, such motor providing the power to drive the press at high speed. As is well known, and as described in Hentschell and Wheldon Patent No. 1,929,114, issued October 3, 1933, entitled "Automatic Break Web Switch and Cutter," the press drive mecha-

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nism may also include an auxiliary motor 40a to start the press and to operate the same at slow speed while the web is being threaded through the press, and a contact assembly switch (not shown) for stepping up the speed of the press motor and of the press. The system described in the above-mentioned patent also includes means for automatically cutting the web when the press motor is stopped, such means being actuated by an E. M. F. generated by the press motor 40 when its main circuit has been broken. Details of this system will be found in the said patent and need not be repeated herein except for the portion of the press motor circuit illustrated in Fig. 2.

As there shown, the press motor 40 is provided with leads 41 and 42 which are energized by the main leads (not shown) of the press motor circuit, and it is also provided with a series field 43 and an armature 44. The motor is also provided with a shunt field 45 which is constantly energized through leads 46 and 47. The motor 40 is also connected to an auxiliary circuit including the above-mentioned leads 33 and 34 and the solenoid 31. This circuit is controlled by a switch 48 which is normally closed but is kept open when the main circuit of the motor is closed. This is accomplished by means of a solenoid 49 which is energized by the motor circuit through leads 50 and 51. As long as the main motor circuit is closed, the switch 48 is open, and hence, the auxiliary circuit is broken and the solenoid 31 is de-energized. When, however, the main motor circuit is broken, the switch 48, hence also the auxiliary circuit, is closed.

It is apparent that when, for any reason, the main press motor circuit is broken, the armature 44 will continue to rotate for a brief period owing to its momentum, and that because of the shunt field 45, the motor 40 will generate an E. M. F. By reason of the closing of switch 48 and of the press motor auxiliary circuit, the solenoid 31 will be energized. Accordingly, the valve 28 will be urged to closed position, thus providing an extra braking action on the roll 15 to bring it quickly to a stop.

The hydraulic braking and tensioning mechanism 20 also includes an impeller 57 disposed in a casing 58, and conduits 59 and 60. Electrically operated valves 63 and 64 are disposed in conduits 27 and 59, respectively, and electrically operated valves 65 and 66 are disposed in conduits 27a and 60, respectively. Also disposed in conduit 59 is a slide valve 67.

A circuit is provided for operating the valves 63, 64, 65 and 66, as follows: The auxiliary motor 40a, which has an armature 75 and a series field 76 is energized through leads 77 and 78, switch arms 79 and 80 operable manually as by an arm 81, and leads 82 and 83. It will be apparent that when the switch arms 79 and 80 are moved to the right as viewed in Fig. 2, the auxiliary motor will be energized. Also energized are solenoids 84, 85, 86 and 87, which control valves 63, 64, 65 and 66, respectively. The solenoids 84, 85, 86 and 87 are energized when the auxiliary motor circuit is closed, through leads 88, 89, 90, 91 and 92, as illustrated.

When the switch arms 79 and 80 are moved to the left as shown in Fig. 2, they will contact leads 100 and 101, respectively, and will thereby energize the solenoids 84, 85, 86 and 87 without, however, energizing the auxiliary motor 40a. In an intermediate or neutral position, the switch arms 79 and 80 will open both the auxiliary motor and the solenoid circuits.

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Referring again to Fig. 1, the impeller 57 is driven by the press through the medium of a shaft 102, a pinion 103 fixed to the shaft 102 and meshing with a gear 104 on a sleeve 105, which is rotatable on the shaft 12, and a double bevel gear 106 fixed to the sleeve and meshing with a bevel pinion 107 fixed to the shaft 108 of impeller 57. The shaft 103 is journaled in brackets 109 and 110, as is a threaded shaft 111. The shafts 108 and 111 are provided with clutches 115 and 116, respectively, having levers 117, and the shaft 111 is driven by the bevel gear 106 through a pinion 118. The stem 119 of slide valve 67 is actuated by an arm 120 connected at one end to the stem and provided at its other end with a half nut 121 in threaded engagement with the shaft 111.

In operation the device functions as follows: Assuming that a full roll 15 is in operative position and that it is desired to thread the web through the press while operating the press at slow speed, switch arms 79 and 80 are moved to the right as viewed in Fig. 2, to close the auxiliary motor circuit and also the circuit of solenoids 84, 85, 86 and 87. The press is now operating at low speed and these solenoids are energized. Valves 63 and 64, as mentioned, are normally closed but are opened when their solenoids are energized, and valves 65 and 66 operate oppositely and are closed when the auxiliary motor is operating. Thus, an hydraulic circuit is established through impeller 57 (which is driven by the press, clutches 115 and 116 having been previously engaged), conduit 59, impeller 25 and conduit 27. Therefore, impeller 25, and with it roll 15 are positively driven and the web is supplied to the press.

Moreover, the web is supplied to the press at a rate which is synchronized with the press speed, regardless of the diameter of roll 15. This is accomplished by the screw feed of the slide valve 67, through the pinion 118, threaded shaft 111, half nut 121 and arm 120. Initially the nut 121 will be set at a point on the shaft 111 corresponding to the diameter of the roll. For example, if a full roll is used, the nut 121 will be set at its innermost position (bottom position as viewed in Fig. 1), thus setting the valve 67 at its most restricted position. As the roll 15 is rotated and the web is fed to the press, thus diminishing the diameter of the roll, the nut 121 will be fed outwardly and the valve 67 opened more widely. Thus, less resistance is opposed to hydraulic pressure from the driving impeller 57 and the driven impeller 25, hence also the roll 15 will be driven faster. The pitch of the threads on shaft 111 is such that as roll 15 rotates and its diameter diminishes, the web will be delivered at a constant linear speed in relation to the press speed.

Moreover, provision is made for synchronizing the rotation of two rolls during operation of the flying paster. This is accomplished in the following manner: Assume that a roll 15 is approaching exhaustion and it is desired to prepare another, full roll to take its place. The nearly exhausted roll will be rotating at press speed and it is desirable to rotate the full roll at a speed to unwind its web at the same linear speed as that of the web from nearly exhausted roll. The full roll is, of course, provided with a driving mechanism 20 and circuits as described above and as shown in the drawings. Its switch arms 79 and 80 will be pushed to the left to energize leads 100 and 101, hence the solenoids 84, 85, 86 and 87, without, however, energizing the auxiliary

motor 40a. The clutches 115 and 116 of the full roll will have been engaged and the corresponding half nut 121 will have been set at full roll position. Therefore, the press will now drive the full roll at a rate to deliver the web at the linear speed of the web from the nearly exhausted roll. Accordingly, there will be no relative motion of the old web and the new web and the latter can be pasted to the former by the flying paster.

It will thus be apparent that a system has been provided for maintaining proper tension on the web unreeled from a roll of newsprint; of bringing the roll to halt quickly when the main press motor is stopped; of positively driving the roll during slow speed operation of the press; of varying the angular speed of the roll during slow speed operation of the press to deliver the web at a constant linear speed; and of delivering a new web at the same linear speed as the old web during operation of the flying paster.

While I have shown the preferred form of my invention, it is to be understood that various changes may be made in its construction by those skilled in the art without departing from the spirit of the invention as defined in the appended claims:

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

1. In a press assembly comprising a press, electrical means for driving the same and a reel for supplying a web to said press, said reel including a rotatable shaft for supporting a roll of paper, the improvement which comprises a first impeller mechanically connected to said shaft and rotatable therewith, a second impeller, means interconnecting said second impeller and said press, an hydraulic circuit including said first and second impellers, and electrical means responsive to the operation of said press for opening and closing said hydraulic circuit.

2. A press assembly comprising a press, electrical means for driving said press at slow speed, a reel for supplying a web to the press, said reel comprising a shaft for supporting a roll of paper, hydraulic means for driving said shaft including a first impeller mechanically connected to and rotatable with said shaft, a second impeller, an hydraulic circuit including both said impellers, mechanical means interconnecting said second impeller with said press drive and electrically operable valve means for opening and closing said hydraulic circuit, said valve means being operable to close said circuit when said electrical means is inoperative and to open said circuit when said electrical means is energized.

3. A press assembly comprising a press, electrical means for driving the same at low speed, a reel for supplying a web to the press, said reel including a rotatable shaft for supporting a roll of paper, hydraulic means for driving said shaft including a first impeller mechanically connected to and rotatable with said shaft, a second impeller mechanically connected to and driven by said low speed press drive, an hydraulic circuit including both said impellers, electrically operated valve means for opening and closing said hydraulic circuit and operable to open said circuit when said electrical means is energized and to close said circuit when said electrical means is de-energized, and means for accelerating the rotary speed of said first impeller to deliver a web at a constant linear speed as the diameter of a roll of web is diminished.

4. Web supply means for a rotary press comprising a reel including a shaft for rotatably supporting a roll of paper, first hydraulic means in-

cluding a first hydraulic circuit mechanically connected to said shaft so as to rotate therewith, second hydraulic means including a second hydraulic circuit comprising said first hydraulic means, means for mechanically and operatively connecting said second hydraulic means with the press drive, and means operable by the press for accelerating the angular speed of the reel to deliver the web at a constant linear speed as the roll of web diminishes in diameter.

5. Web supply means for a rotary press comprising a reel including a shaft for rotatably supporting a roll of newsprint or the like, a first impeller operatively connected to said shaft so as to rotate therewith, an hydraulic circuit including said first impeller, a second impeller disposed in said hydraulic circuit, means operable to provide a driving connection between said second impeller and the press drive, a valve operable to control the flow of fluid through said hydraulic circuit, and means operable by the press drive to gradually open said valve wider so as to accelerate the angular speed of said reel and thereby deliver the web to the press at a constant linear speed as the roll of web diminishes in diameter.

6. Apparatus of the character described comprising a press, electrical means for driving said press, a reel including a shaft for rotatably supporting a roll of newsprint or the like for delivering a web to said press, hydraulic means for driving said shaft including a first impeller operatively connected with the shaft so as to rotate therewith, a second impeller, an hydraulic circuit including said first and second impeller, means mechanically connecting said second impeller and press drive so as to drive said second impeller, electrically operated valve means operable to open and close said hydraulic circuit in response to operation of said press, and other valve means also operable by said press for controlling the flow of hydraulic fluid through said circuit so as to accelerate the angular speed of said reel to deliver the web at a constant linear speed as the roll of web diminishes in diameter.

7. Apparatus of the character described comprising a rotary press, electrical means for driving said press including an electric motor for driving the same at slow speed, a reel including a rotatable shaft for supplying a web of newsprint or the like to said press, hydraulic means for driving said shaft including an hydraulic circuit and first and second impellers included in said circuit, said first impeller being mechanically connected to said shaft to rotate therewith, means mechanically connecting said second impeller with the press drive for driving said second impeller, valve means for opening and closing said hydraulic circuit, electrical means for operating said valve means to open the same when said electric motor is operating and to close the same when said electric motor is not operating, other valve means for controlling the flow of hydraulic fluid through said circuit, and means operable to control said valve and responsive to operation of said press for accelerating the angular speed of said reel so as to deliver web therefrom at a constant linear speed as the roll decreases in diameter.

8. A press assembly comprising a press drive including a motor for driving the press, a reel including a rotatable shaft for supporting a roll of newsprint, a first impeller rotatable with said shaft, a second impeller, means for driving said second impeller from the press, an hydraulic circuit including both said impellers, valve means

for opening and closing said circuit, and valve means operated by the press drive to cause said first impeller and roll to deliver a web at a constant linear speed in relation to press speed.

9. A press assembly comprising a press drive including a press motor for driving the press at high speed and an auxiliary motor for driving the press at low speed; a reel including a rotatable shaft for supporting a roll of newsprint; a first impeller rotatable with said shaft; a second impeller rotatable by the press drive; an individual hydraulic circuit for each said impeller and a main hydraulic circuit including both said impellers; first valve means operable to close said individual circuits; second valve means operable to control said main circuit; electrical means operable to close said first valve means and open said second valve means when said auxiliary motor is operating and to open said first valve means and close said second valve means when said auxiliary motor is not operating; and third valve means operable by the press drive to control said main circuit to deliver web from said roll at a constant linear speed in relation to the press speed.

10. A press assembly comprising a press drive including a press motor for driving the press at high speed and an auxiliary motor for driving the press at low speed; a reel including a rotatable shaft for supporting a roll of newsprint; a first impeller rotatable with said shaft; a second impeller rotatable by the press drive; an individual hydraulic circuit for each said impeller and a main hydraulic circuit including both said im-

pellers; first valve means operable to close said individual circuits; second valve means operable to control said main circuit; electrical means operable to close said first valve means and open said second valve means when said auxiliary motor is operating and to open said first valve means and close said second valve means when said auxiliary motor is not operating; third valve means operable by the press drive to control said main circuit to deliver web from said roll at a constant linear speed in relation to the press speed, and other electrical means operable to actuate said first and second valve means when said auxiliary motor is not operating to close said individual circuits and open said main circuit.

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