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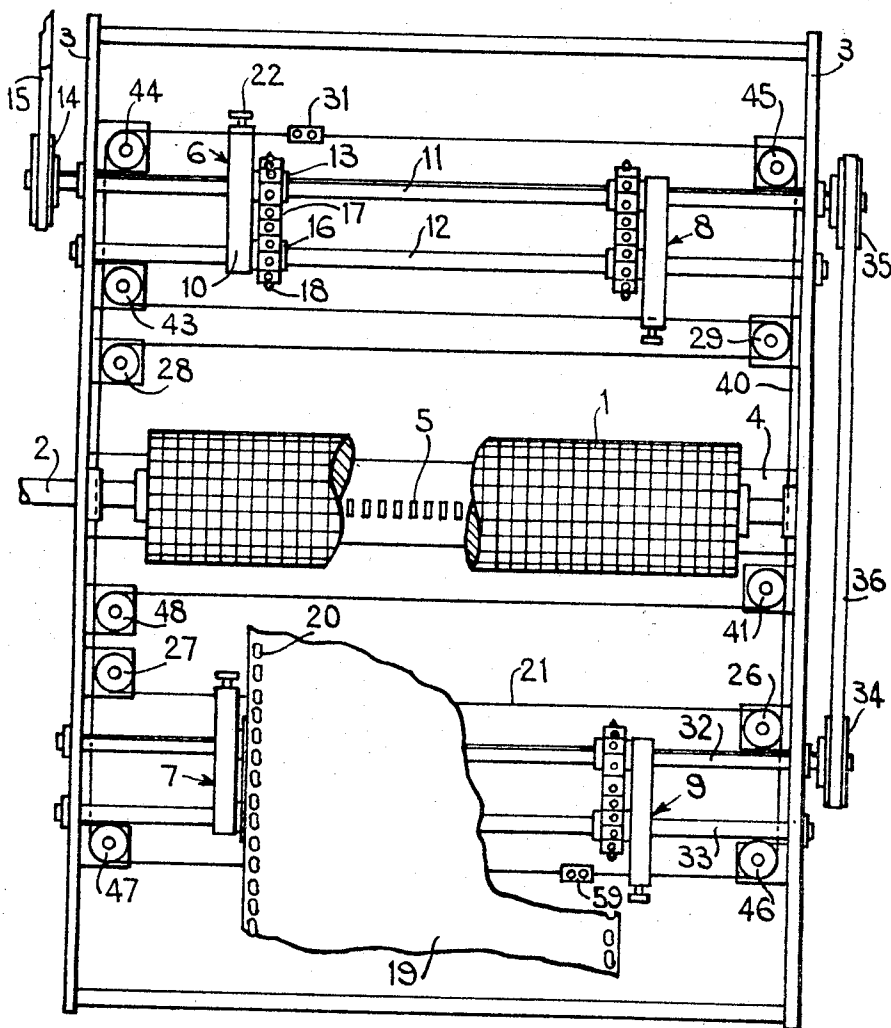
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WEB POSITIONING APPARATUS

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3,448,906

WEB POSITIONING APPARATUS

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4 Claims

ABSTRACT OF THE DISCLOSURE

Web positioning apparatus is described in which a web is fed longitudinally by a number of feeding stations along the length of the web. At each station the web, which may, for example, have edge perforations for the purpose, is engaged by separate web-feeding devices at opposite edges. All those web feeding devices, at all of the stations, which engage one particular side of the web are connected together by a flexible linkage. Similarly those web feeding devices, all of which are engageable with the opposite side of the web are also connected by a second linkage. The web feeding devices are mounted for transverse movement perpendicular to the longitudinal axis of the web, and the linkages are guided by pulleys to follow a path back and forth across the line of feeding of the web such that all feeding devices associated with one side of the web are moved synchronously and to the same extent. The two linkages are independently associated with their own drive motors, so that they may be driven in either direction independently. Also it is arranged to drive both motors together, so that all the devices, on both sides of the web, may be moved in synchronism.

This invention relates to web positioning apparatus.

U.S. Patent No. 3,154,235 describes a web feeding mechanism for use with a high speed printer. This mechanism includes a pair of tractors on the infeed side of the printing position and a pair of tractors on the outfeed side of the printing position. Each tractor is mounted to allow movement across the direction in which the web is being fed, and each tractor is secured to a steel band. The bands which are attached to the tractors engaging the left-hand edge of the web pass round drums which are mounted on a first shaft. Similarly, the bands which are attached to the tractors engaging the right-hand edge of the web pass round drums which are mounted on a second shaft. Separate manually operable means are provided for rotating each shaft, so that related pair of tractors are moved across the direction of movement of the web. The shafts may be coupled together by energisation of an electromagnetic clutch, so that rotation of either of the shafts causes the four tractors to be moved together.

The provision for moving each pair of tractors separately, and for moving both pairs of tractors together, is necessary to allow adjustment for different paper widths and for aligning the paper opposite to a selected group of print positions. The tractors of a pair must move in exact synchronism so that they are always in alignment. Any failure of alignment of the tractors will lead to skewing of the web relative to the printing mechanism, or to buckling of the web and faulty feeding. In the feeding mechanism described in the above-mentioned patent, each tractor is driven by a separate band. Consequently, the tractors will not be moved in synchronism if there is any slip between a band and its associated driving drum.

It is the object of the invention to provide an improved

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mechanism for moving the tractors, or other web engaging devices, in web positioning apparatus.

According to the invention web positioning apparatus includes a first set of spaced apart feeding members engageable with one edge of a web to be fed; a second set of spaced apart feeding members engageable with the opposite edge of said web; means for mounting the feeding members to permit independent movement of each of said members in a direction at right angles to said edges; first and second driving means, a first endless loop of flexible inextensible material coupled to the second driving means; means securing the feeding members of the first and second sets to the first and second endless loops, respectively at spaced apart points therealong; and pulleys engaging the first and second endless loops and constraining said loops to follow a predetermined path such that movement of each said loop is effective to move synchronously in the same direction all the feeding members which are secured thereto.

The invention will now be described way of example, with reference to the accompanying drawings, in which:

FIGURE 1 is a simplified view of part of a printing mechanism with a web feeding mechanism;

FIGURE 2 is a diagrammatic view showing the arrangement of driving wires for the web feeding mechanism; and

FIGURE 3 is a diagram showing the drive control circuit.

A print barrel 1 (FIG. 1) is carried by a shaft 2. The shaft is mounted in bearings in side plates 3, and is rotated by a power source (not shown). A plate 4 is mounted between the side plates 3 and supports a row of electromagnetically operated print hammers 5. A web 19 of paper to be printed upon is positioned between the print barrel 1 and the printing hammers 5 and it may be fed in a direction perpendicular to the axis of the barrel by paper feeding tractors 6, 7, 8 and 9. These elements, together with a mechanism (not shown) for feeding an ink ribbon between the type barrel and the paper, constitute a known form of high speed printing mechanism.

The feeding tractor 6 includes a plate 10 which is free to slide on a splined shaft 11 and a smooth shaft 12. The plate 10 carries a sprocket 13 which is keyed to engage with the splined shaft 11. A pulley 14 is secured to the shaft 11 and is driven from a motor and clutch assembly (not shown) by a belt 15. The plate 10 carries a second sprocket 16 which is free to rotate. A tractor band 17 on which are mounted pins 18, is supported by, and engaged with, the pair of sprockets 13 and 16. The pins 18 are adapted to engage perforations 20 adjacent to the edge of the web 19. Hence, rotation of the shaft 11 produces feeding of the web 19, through the rotation of the sprocket 13 and the resultant movement of the tractor band 17.

A wire, or band, 21 of steel, or a similar flexible but inextensible material, passes through a hole in the plate 10 and is clamped therein by a screw 22. The two ends of the wire 21 are joined by a clamp plate 31 to form an endless loop, which passes round pulleys 23 to 30 (FIG. 2.).

The tractors 7, 8 and 9 are similar to the tractor 6. The tractor 8 is also mounted on the shafts 11 and 12. The tractors 7 and 9 are mounted on a splined shaft 32 and a smooth shaft 33. A pulley 34 is mounted on one end of the shaft 32 and is coupled by a belt 36 to a pulley 35 which is mounted on one end of the shaft 11. Hence, the tractor belts on all the tractors are moved in synchronism when the shaft 11 is rotated by the belt 15.

The tractor 7 is clamped to the wire 21 in the same manner as the tractor 6. The wire 21 passes around the pulleys 23 to 30 in such a way that the path resembles the outline of the letter U. The pulley 27 is mounted on

a shaft 37, which is coupled through a reduction gear box 39 to the shaft of an electric motor 38. The motor 38 is reversible, so that the pulley 27 may be rotated in either direction. Clockwise rotation of the pulley 27 moves the wire 21 such that the tractors 6 and 7 are moved simultaneously, and to an equal extent, to the left as seen in FIGURES 1 and 2. Conversely, anti-clockwise rotation of the pulley 27 moves both tractors to the right.

The tractors 8 and 9 are clamped to a wire 40 which forms an endless loop passing round pulleys 41 to 48. The pulley 41 is mounted on a shaft 49 which may be driven by an electric motor 51 through a reduction gear box 50. The path of the wire 40 resembles the outline of the letter U, similarly to the path of the wire 21. The electric motor 51 is reversible, so that the pulley 41 may be rotated in either direction. Movement of the wire 40 by the pulley 41 in one direction, or the other direction, causes the tractors 8 and 9 to move simultaneously, and to an equal extent, to the left, or to the right, as seen in FIGURES 1 and 2.

The motors 38 and 50 may be energised selectively from power supply lines 52 and 53 (FIG. 3). A four-pole three position switch 54 selects the motors for energisation. The motor 38 is connected to lines 55 and 56 with the switch set in the position shown in FIGURE 3. The motor 51 is connected to the lines 55 and 56 in the next position of the switch 54. Both the motors 38 and 51 are connected to the lines 55 and 56 in the third position of the switch 54. The lines 55 and 56 may be connected to the positive and negative supply lines 52 and 53, respectively, by depression of a push button switch 57. Conversely, the lines 55 and 56 may be connected to the negative and positive supply lines 53 and 52, respectively, by depression of a push button switch 58. Hence, any combination of the motors 38 and 51 may be selected by setting the switch 54 and the direction of rotation of the selected motor, or motors, is then determined by operating the appropriate one of the switches 57 and 58. For example, with the switch 54 set in the position shown in FIGURE 3, the motor 38 will be energised to move both the tractors 6 and 7 to the left, or to the right, by depressing the switch 57, or the switch 58, respectively. Similarly, all four tractors will be moved to the left if the switch 54 is set to the third position and the switch 57 is depressed.

The tractors of each pair are clamped to a common inextensible wire, so that they always move in synchronism, and to the same extent. The requisite tension in the wires to ensure that they are driven by the pulleys 27 and 41 may be obtained by adjustment of the ends of the wires in clamp plates 31 and 59. Alternatively, or in addition, pulleys 28 and 48 may be mounted to act as spring jockey pulleys, as indicated by springs 60 in FIGURE 3.

The tractors may be replaced by other equivalent paper feeding devices, such as pinwheels or paper grippers. Furthermore, more than two paper feeding devices may be used to engage each edge of the paper. For example, four tractors may engage each edge of the paper, two of the four tractors being spaced apart along the infeed path of the paper, and the other two tractors being spaced apart along the outfeed path of the paper. Whatever the number of paper feeding devices may be, all the devices which engage with the same edge of the paper are clamped to, and moved by, a common wire.

What is claimed is:

1. Web positioning apparatus for feeding an elongate web in a direction parallel to the longitudinal axis thereof, including

at least two web feeding stations spaced apart along the direction of feeding of the web, each station having a pair of separate feeding means individually engageable respectively with opposite sides of the web;

means at each station for supporting the feeding means for independent movement in a direction transverse a web fed thereby at right angles to said feeding direction;

first and second driving means;

a first endless loop of flexible inextensible material coupled to the first driving means;

a second endless loop of flexible inextensible material coupled to the second driving means;

means for securing to said first endless loop, at spaced points therealong, those particular feeding means, at all the stations, which are engageable with one side of the web;

means for securing to said second endless loop, at spaced points therealong, those particular feeding means, at all the stations, which are engageable with the opposite side of the web; and

pulleys engaging the first and second endless loops and constraining each of said loops to follow a predetermined path such that the movement of each loop is effective to move synchronously in the same direction all the feeding means secured thereto.

2. Web positioning apparatus as claimed in claim 1, in which each driving means includes a reversible electric motor, and having,

a power supply for said motors;

a first switching means operable to control the connection of the power supply to the motors to select the direction of rotation thereof; and

a second switching means settable to first, second and third positions to select for energisation the motor of the first driving means, the motor of the second driving means, and the motors of both the driving means, respectively.

3. Web positioning apparatus as claimed in claim 1, having first and second reversible electric motors;

a first reduction gear box coupling the first electric motor to one of said pulleys which are engaged with the first endless loop;

a second reduction gear box coupling the second electric motor to one of said pulleys which are engaged with the second endless loop; and switching means for controlling selective energisation of the motors.

4. Web positioning apparatus as claimed in claim 1, having a first set of eight pulleys mounted on a first side plate; and

a second set of eight pulleys mounted on a second side plate spaced from the first side plate, the first and second endless loops passing round selected pulleys of both sets of pulleys such that each loop is constrained to follow a U-shaped path.

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