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WEB ACCELERATING MECHANISM FOR WEB SPLICING DEVICES

Filed Oct. 7, 1950

4 Sheets-Sheet 2

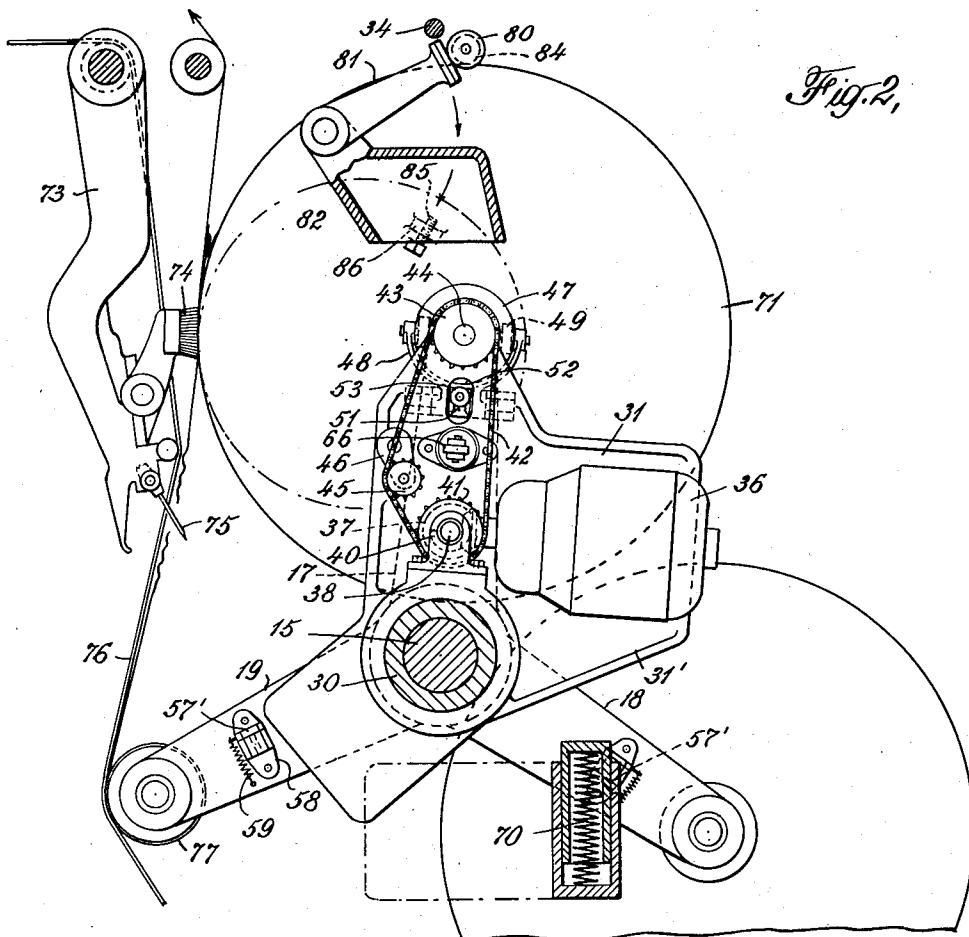


Fig. 2,

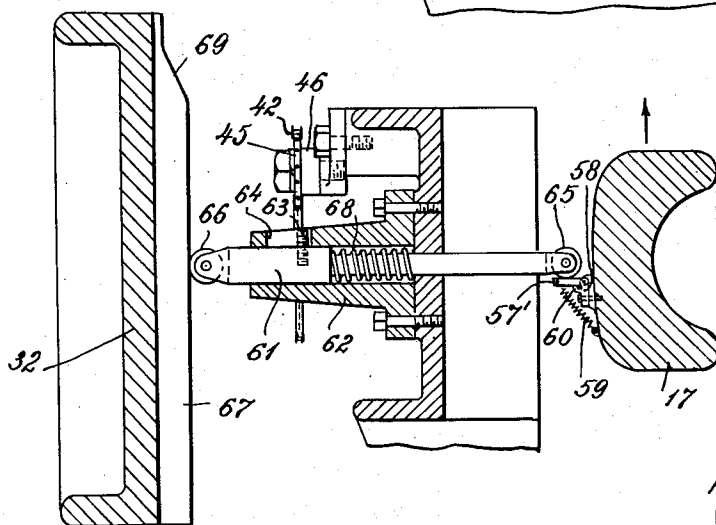


Fig. 4,

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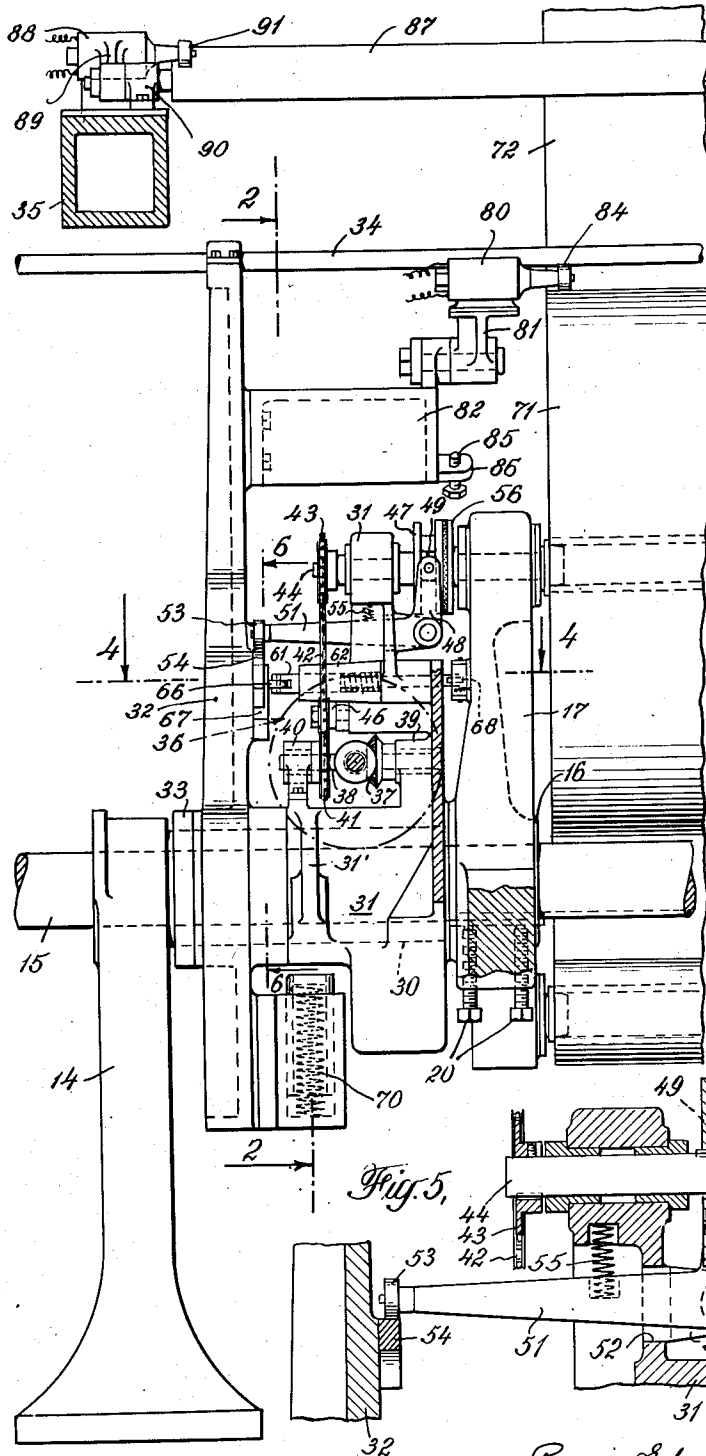


Fig. 3,

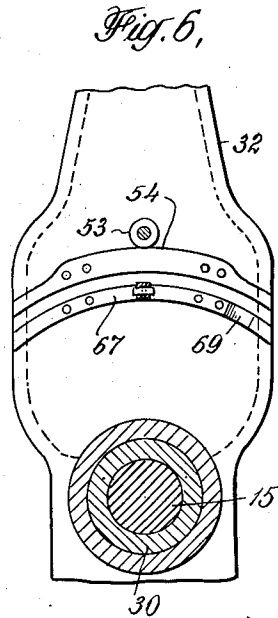
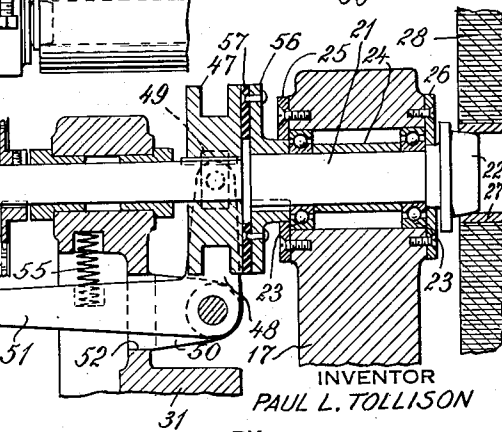


Fig. 6,

Fig. 5,



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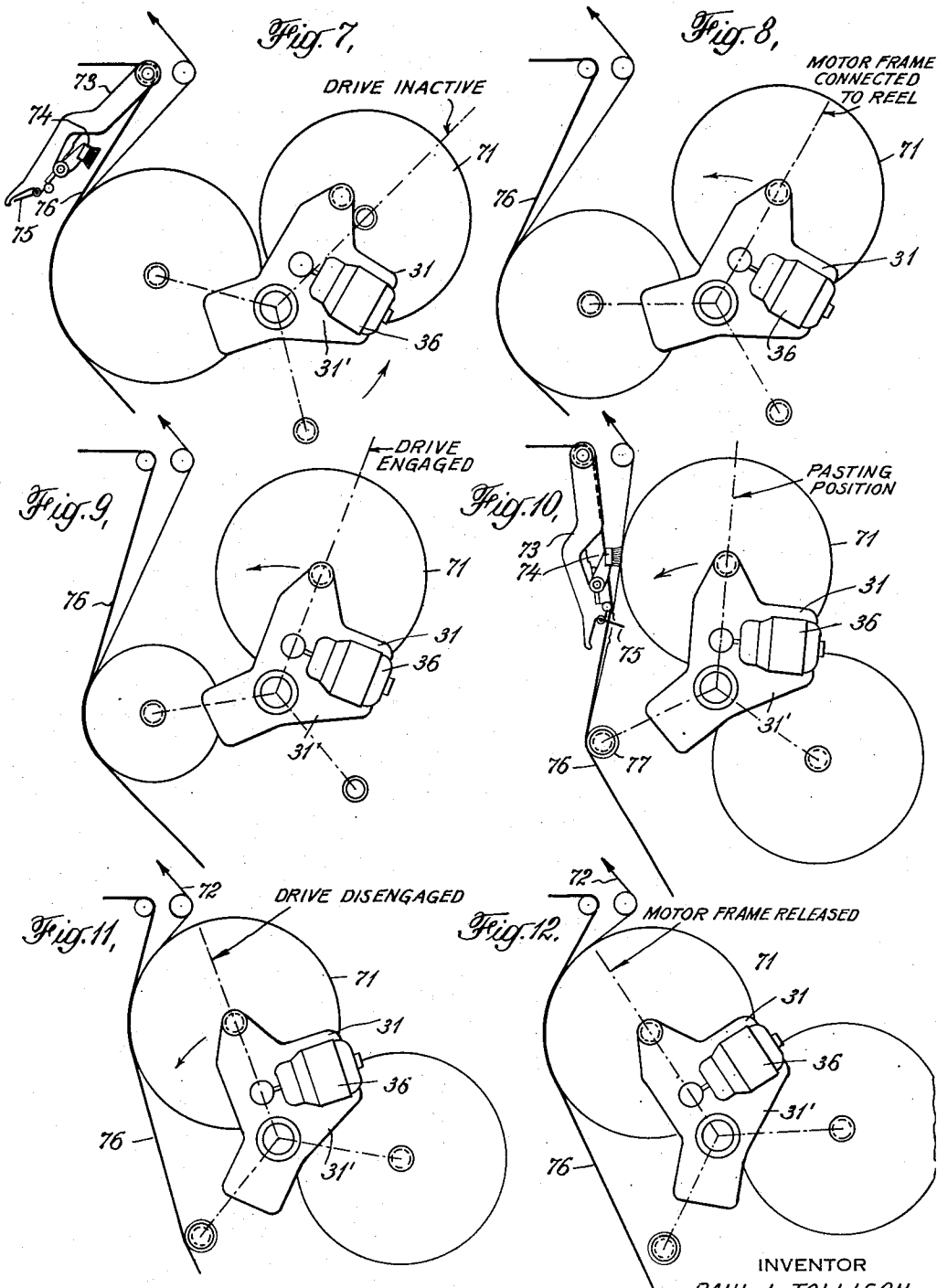
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4 Sheets-Sheet 4



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WEB ACCELERATING MECHANISM FOR WEB
SPlicing DEVICES

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11 Claims. (Cl. 242—58)

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This invention relates to web roll accelerating and web splicing devices and more particularly concerns improved apparatus for connecting a driving motor successively drive the several rolls carried on different arms of a multi-arm web roll reel.

One known form of mechanism for periodically replacing web rolls from which a continuous running web is fed to a printing press or other web consuming apparatus employs a web roll reel having two or more, and frequently three, arms. The reel carries the web rolls on spindles rotatably mounted in angularly displaced reel arms that turn about a central reel axis to bring successive fresh web rolls through an accelerating position and up to a pasting position adjacent the web running from a depleted roll on the reel to the web consuming apparatus. At the pasting position, the leading end of the web on the fresh roll is spliced or pasted to the running web, and thereafter the web running from the depleted roll is severed behind the splice.

In the above-described operation, it is necessary to accelerate each successive fresh web roll to a rotative speed such that its peripheral velocity approximates or equals the linear velocity of the running web. Each fresh web roll may be accelerated by an electric motor that drives the roll through its spindle, and this arrangement has the advantage that the motor may be used to apply dynamic braking to the newly-spliced-in roll and thereby maintain the requisite tension on the running web while the new roll is being moved by the reel from the pasting position to a running position in which the conventional roll surface engaging tension straps or belts are effective.

It is the object of the present invention to provide improved mechanism by means of which a single electric motor is selectively connected to drive a succession of rolls on a single reel. The so connected motor may also act to supply dynamic braking to each accelerated roll in order to apply tension to the web running therefrom after the splice is made. A further object of the invention is to provide mechanism of the type described, which is simple in construction and reliable in operation.

In describing the invention in detail, reference will be made to the accompanying drawings, in which an embodiment of the invention is illustrated.

In the drawings:

Fig. 1 is an elevation of web splicing mecha-

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nism including a web roll reel and associated mechanism embodying the invention;

Fig. 2 is a sectional view of the mechanism taken along the line 2—2 of Fig. 3;

Fig. 3 is a side elevation of the mechanism of Fig. 1 taken along the line 3—3 of Fig. 1;

Fig. 4 is an enlarged sectional view taken along the line 4—4 of Fig. 3;

Fig. 5 is an enlarged sectional view taken along line 5—5 of Fig. 1;

Fig. 6 is an elevation of the interior of the banjo frame taken along the line 6—6 of Fig. 3;

Fig. 7 is a diagrammatic end elevation of the mechanism showing the relative positions of the reel arms and the driving motor frame when the driving motor is inactive;

Fig. 8 is an elevation similar to Fig. 7 showing the positions of the parts when the driving motor frame is first engaged and moved by the reel;

Fig. 9 is an elevation similar to Fig. 7 showing the positions of the parts when the roll driving connection to the motor is engaged;

Fig. 10 is a similar elevation showing the parts in pasting or splicing position;

Fig. 11 is a similar elevation showing the parts in the position in which the driving connection between the motor and the spliced-in roll is disengaged; and

Fig. 12 is a similar elevation showing the parts in the position in which a driving motor frame is released from the reel for return to its initial inactive position illustrated in Fig. 7.

In general, the apparatus of the invention combines with a multi-arm web roll reel, a driving motor frame mounted to turn about the reel axis, and further provides mechanism that successively connects the motor frame to the reel in positions to move with and adjacent each successive arm of the reel. Further mechanism is provided which acts during the period when the motor frame is so connected to engage a driving connection between the motor and the web roll carried on the adjacent reel arm, so that the roll is accelerated to running web speed. This driving connection is maintained until after the splice is made and the newly-spliced-in roll is moved beyond the splicing position and into effective engagement with roll surface engaging tension elements. At this point, the driving connection is disengaged and thereafter the motor frame is released from the reel and turns back to its initial inactive position in which it is subsequently connected to move with the reel adjacent the next successive roll carrying reel arm. The mechanism for connecting the motor

frame to and disconnecting it from the reel and for engaging and disengaging the driving connection is operated in proper timed relation by the movement of the motor frame by the reel relative to a stationary part.

Referring to the drawings, there is shown in Figs. 1 and 2 a three-armed web roll reel mounted to turn about its axis in a pair of spaced pedestals, one of which is shown at 14. The reel shaft 15 is journaled in the pedestal 14 and the axis of this shaft is the reel axis. The reel shaft 15 carries two spiders, one of which is shown at 16, and in the disclosed embodiment each spider has three equally spaced arms 17, 18 and 19. The spider 16 is splined to the reel shaft 15 to turn therewith and is releasably locked in position against movement axially of the reel shaft when adjusted to accommodate the width of the roll carried by the set screws 20 (Fig. 3). Each arm of the reel rotatably carries adjacent its outer end a roll carrying spindle 21, 21' and 21'', having a roll core engaging chuck 22 at its inner end. As shown in Fig. 5, the spindle 21' is carried in anti-friction bearings 23 spaced by a sleeve 24 and retained by seal rings 25 and 26. The chuck 22 may be engaged with the core 27 of a web roll 28. As will be understood by those skilled in the art, suitable power driving mechanism is preferably provided to turn the reel so as to move the web rolls carried by its several spider arms to successive operating positions. Such driving mechanism is well known and is illustrated herein as a worm wheel 30 fixed to the reel shaft 15 and engaged by a worm 31 driven by a motor 32 fixed to the pedestal 14.

A sleeve 30 is secured to the spider 16 and moves with it. A motor frame 31 is journaled on the sleeve 30 adjacent the outer face of the spider 16 (Fig. 3). A banjo bracket 32 is mounted on the sleeve 30 adjacent and outside of the motor frame 31 and a collar 33 is fixed to the sleeve 30 outside and adjacent the banjo bracket. The spider 16, the motor frame 31 and the banjo bracket 32 may be moved together longitudinally of the reel shaft 15 to accommodate rolls of different width, the motor frame 31 may turn about the reel shaft on the sleeve 30, but the banjo bracket 32 is held against turning about the reel axis by engagement with a stationary rod 34 slidably engaged in an opening near the upper end of the banjo bracket, as shown. The rod 34 runs parallel to the reel axis and is suitably fixed to the stationary frame 35.

A roll driving motor 36 is suitably fixed to the motor frame 31 and its shaft is connected through the bevel gears 37 to a shaft 38 extending parallel to the reel shaft 15 and journaled in spaced bearings 39 and 40 carried by the motor frame, as shown in Figs. 2 and 3. A sprocket 41 secured to the shaft 38 is connected by a chain 42 to a sprocket 43 secured to a shaft 44, also journaled in motor frame 31. The shaft 44 is parallel to the reel shaft 15 and the roll spindle 21 and its axis is spaced the same radial distance from the axis of the reel shaft 15 as are the axes of the several reel arm spindles 21, 21' and 21''. An idler sprocket 45 adjustably carried by a crank bracket 46 engages the chain 42 and may be moved to take up slack in the chain (Fig. 2). A clutch spool 47 is splined to the shaft 44 and is movable longitudinally of the shaft by a yoke 48 carrying thrust blocks 49 that engage the groove of the clutch spool 47. The yoke 48 is pivotally mounted on a bracket 50 on the motor frame 31, and an integral arm 51 of

the yoke extends through an opening 52 in the motor frame and carries at its end a roller 53 that engages a clutch cam 54 fixed to the banjo bracket 32. A spring 55 is compressed between the arm 51 and the motor frame 31 and biases the arm 51 to move the clutch spool 47 to its retracted or disengaged position. Each of the web roll spindles 21, 21' and 21'' carries a clutch plate 56 secured to its outer end and provided with a lining 57. When one of the spindles 21, 21' or 21'' is in line with the shaft 44, and the arm 51 is lifted by the cam 54, the clutch spool 47 engages the lining 57 of the clutch plate 56, and a driving connection is formed between the motor 36 and the roll spindle through which the web roll carried by the spindle is driven and accelerated to web speed.

Suitable known tension means, such as the stationary straps 76, is provided adjacent the web feed side of the reel, as shown in Figs. 1 and 2. The straps shown are engaged by the cylindrical surfaces of the successive running rolls and apply sufficient retarding force to the rolls to maintain the requisite tension on the running web 72.

Adjacent the side of the reel from which the running web 72 passes upward to the web consuming apparatus there is provided a pivotally mounted brush arm 73 of known construction carrying a pasting brush 74 and a web severing knife 75. The brush 74 and knife 75 are subdivided in a known manner to pass between the tension straps 76 when a new web roll is in pasting position, as is illustrated by the roll 71 in Figs. 1 and 2, and has been accelerated to web speed and when the running web roll (77 in Fig. 1) has run off to the extent that replacement is required, the brush arm 73 is lowered to the position shown in Fig. 1, the brush 74 is extended to press the running web 72 against the cylindrical surface of the accelerated new roll 71 so as to splice the paste carrying leading end of the new roll web to the running web, and the knife 75 is extended to sever the old web behind the splice (Figs. 2 and 10).

Means are provided for causing the motor frame 31 to be carried along with the reel adjacent each successive reel arm 17, 18 and 19 as such reel arm moves through the positions in which the web roll carried thereby is to be accelerated, spliced and moved into effective contact with the tension straps. Each arm of the spider carries on its outer face an outwardly extending toe 57' pivotally secured to a bracket 58 on the arm 17 and normally held outward against a stop 60 by a tensioned spring 59 (Figs. 3 and 4). A rod 61 is slidably carried in a hollow bracket 62 secured to the motor frame 31 and the sliding movement of the rod is limited by a stud 63 engaging the rod 61 and sliding in a slot 64 in the bracket 62. A roller 65 is carried by the rod 61 at its inner end, and a roller 66 on the outer end of the rod engages a cam 67 mounted on the stationary banjo bracket 32. A compressed spring 68 surrounds the rod 61 within the hollow bracket 62, biases the rod to move toward the cam 67 and so keeps the roller 66 in contact with the cam.

As shown in Fig. 6, the cam 67 has a high portion that extends throughout most of its length and ends in an incline 69 on the running web side of the vertical center line of the reel. The cam 67 has a high portion ending in inclined portions symmetrically disposed with respect to the vertical center line of the banjo bracket.

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The motor frame 31 is biased by the weight of the eccentrically disposed motor 36 to turn by gravity clockwise as viewed in Figs. 1 and 2 to the position in which its lower face 31' engages and is stopped by a spring buffer 70 carried by the banjo bracket 32. When the motor frame 31 thus engages the buffer 70, the parts are in the position illustrated in Fig. 7, and the rod 61 is extended by the cam 67 so that its roller 65 lies in the path of the toe 57 on the reel arm. As the reel is turned in the direction of the arrow in Fig. 1, the toe 57' of a reel arm 17 engages the roller 65 on the rod 61 and so causes the motor frame 31 to move with the roller adjacent the arm and with the reel arm spindle 21 in alignment with the motor frame clutch shaft 44. The position of the motor frame 31 when it is thus picked up by the reel is illustrated in Fig. 8. Shortly after the start of this motor frame movement, the cam roller 53 is lifted to the high portion of the cam 54, whereby the roll driving clutch is engaged and the new web roll 71 carried by the reel arm 17 is driven and accelerated to web speed by the motor 36. The position of the motor frame 31 when the clutch is so engaged is illustrated in Fig. 9. The reel is advanced to the pasting position illustrated in Fig. 10 and the splice is made, as explained above, when the running web roll 77 is depleted to the point where replacement is required. After the splice is made, the newly-spliced-in roll 71 is moved into the running position illustrated in Fig. 11 in which it effectively engages the tension straps 76. At this point, the roller 53 moves off of the raised portion of the cam 54 and the roll driving clutch is disengaged.

During movement of the reel from the pasting position illustrated in Fig. 10 to the running position illustrated in Fig. 11, the motor remains connected to the newly-spliced-in roll 71 and may be employed to apply dynamic braking to the roll and so to maintain tension on the web until the reel is turned to the point where the tension straps 76 become effective for this purpose. Upon continued movement of the reel to the position illustrated in Fig. 12, the roller 66 descends the incline 69 of the cam 67 and the spring 62 moves the rod 61 to the left, as viewed in Fig. 4, thus moving the roller 65 out of engagement with the toe 57' and releasing the motor frame 31 from the reel. The motor frame 31 then turns back by gravity in the opposite direction from that in which the reel has carried it to the position illustrated in Fig. 7, where the lower face 31' of the frame 31 engages the spring buffer 70 which absorbs the shock of arresting the return movement of the frame. During this return movement, the clutch spool 47 is extended and retracted by the action of the cam 54, but since no reel arm is located in the arc of return movement of the motor frame, the clutch spool movement has no effect.

The motor frame 31 is picked up and moved with the reel adjacent the successive reel arms in the manner described. If the operator turns the reel in a direction opposite that indicated by the arrow in Fig. 1, the toes 57' on the reel arms move pivotally away from their stops 60 against bias of the springs 59 so that breakage of parts is avoided.

The peripheral velocity to which the motor 36 accelerates each fresh web roll may be controlled to approximate or equal the linear velocity of the running web by motor energization control mechanism governed by the relation between voltages

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generated by two tachometer generators that are respectively driven at speeds corresponding to the peripheral velocity of the fresh web roll and the linear velocity of the running web. Voltage comparing roll driving motor control mechanism of this type is described in my copending application Serial No. 71,896, filed January 21, 1949, now Patent No. 2,601,071. A roll speed tachometer generator 80 is secured to the end of an arm 81 that is pivotally secured to a bracket 82 attached to the banjo bracket 32 adjacent its upper end (Figs. 1, 2 and 3). The generator shaft carries a driving roller 84 having a friction tread and disposed to engage the peripheral surface of a roll 71 being accelerated. A stop screw 85 carried by a lug 86 on the bracket 32 limits the downward movement of the generator carrying arm 81. As each fresh web roll moves up to accelerating and splicing positions, the peripheral surface of the roll engages the generator drive roller 84 and lifts the generator on its pivoted arm 81, whereby the generator is driven at roll surface speed. When the roll moves on to running position, it disengages the generator roller 84 and the arm 81 rests against the stop screw 85.

The running web 72 passes over a bending roller 87, the surface speed of which is thus web speed. A web speed tachometer generator 88 is secured to an arm 89 pivotally attached to a bracket 90 secured to the frame 35. A friction tread roller 91 on the generator shaft bears against the surface of the bending roller 87 so that the generator 88 is driven at a speed proportional to the linear velocity of the running web.

I claim:

1. In a device of the character described, the combination with a web roll reel rotatable about a central axis and having radially extending angularly spaced arms carrying rotatable web roll supporting spindles adjacent their ends, means for successively accelerating web rolls carried by said several reel arm spindles in preparation for splicing the webs of the accelerated rolls to a web running from another roll comprising a frame mounted to turn about the reel axis adjacent the reel, a driving motor carried by said frame, means for releasably connecting said frame to said reel at points adjacent said reel arms, a clutch for releasably connecting said driving motor to the spindle of a reel arm adjacent said frame, and means operated by movement of said reel about its axis for operating said releasable connecting means and said clutch at selected points during the rotation of said reel.

2. In a device of the character described, the combination with a web roll reel rotatable about a central axis and having radially extending angularly spaced arms carrying rotatable web roll supporting spindles adjacent their ends, means for successively accelerating web rolls carried by said several reel arm spindles in preparation for splicing the webs of the accelerated rolls to a web running from another roll comprising a frame mounted to turn about the reel axis adjacent the reel, a roll driving motor carried by said frame, cooperating means on said reel and said frame for connecting said frame to said reel adjacent each successive reel arm whereby said frame turns with said reel during a part of the rotation of said reel, an engageable and releasable driving connection between said roll driving motor and the roll spindle of an adjacent reel arm, and means operated by the turning movement of said frame with said reel for successively engaging

and releasing said driving connection during such turning movement of said frame.

3. In a device of the character described, the combination with a web roll reel rotatable about a central axis and having radially extending angularly spaced arms carrying rotatable web roll supporting spindles adjacent their ends, means for successively accelerating web rolls carried by said several reel arm spindles in preparation for splicing the webs of the accelerated rolls to a web running from another roll comprising a frame mounted to turn about said reel axis adjacent said reel arms, a roll driving motor carried by said frame, a clutch on said frame operatively connected to said motor and disposed radially of the reel axis for alignment with the roll spindles of said reel arms, an element carried by said frame and movable with respect thereto for releasably connecting said frame to turn with said reel in positions in which said clutch is aligned with the spindles of said respective reel arms, a stationary cam adjacent said frame in the path of said movable element for controlling said frame and reel arm connection, and means for engaging and disengaging said clutch with the spindle of an adjacent reel arm.

4. In a device of the character described, the combination with a web roll reel rotatable about a central axis and having radially extending angularly spaced arms carrying rotatable web roll supporting spindles adjacent their ends, means for successively accelerating web rolls carried by said several reel arm spindles in preparation for splicing the webs of the accelerated rolls to a web running from another roll comprising a frame mounted to turn about said reel axis adjacent said reel arms, a roll driving motor carried by said frame, a clutch on said frame operatively connected to said motor and disposed radially of the reel axis for alignment with the roll spindles of said reel arms, an element carried by said frame and movable with respect thereto for releasably connecting said frame to turn with said reel in positions in which said clutch is aligned with the spindles of said respective reel arms, a stationary cam adjacent said frame in the path of said movable element for controlling said frame and reel arm connection, and means including a second stationary cam adjacent said frame for engaging said clutch with the spindle of an adjacent reel arm while said frame is connected to move with said reel.

5. In a device of the character described, the combination with a web roll reel rotatable about a central axis and having radially extending angularly spaced arms carrying rotatable web roll supporting spindles adjacent their ends, means for successively accelerating web rolls carried by said several reel arm spindles in preparation for splicing the webs of the accelerated rolls to a web running from another roll comprising a frame mounted to turn about said reel axis adjacent said reel arms, a roll driving motor carried by said frame, a clutch on said frame operatively connected to said motor and disposed radially of the reel axis for alignment with the roll spindles of said reel arms, an element carried by said frame and movable with respect thereto for releasably connecting said frame to turn with said reel in positions in which said clutch is aligned with the spindles of said respective reel arms, a stationary cam adjacent said frame in the path of said movable element for controlling said frame and reel arm connection, a second stationary cam adjacent said frame, and movable means on said

frame in the path of said second cam for engaging and disengaging said clutch with the spindle of an adjacent reel arm in response to movement of said frame relative to said cam.

6. In a device of the character described, the combination with a web roll reel rotatable about a central axis and having radially extending angularly spaced arms carrying rotatable web roll supporting spindles adjacent their ends, means for successively accelerating web rolls carried by said several reel arm spindles in preparation for splicing the webs of the accelerated rolls to a web running from another roll comprising a frame mounted to turn about said reel axis adjacent said reel arms, a roll driving motor carried by said arm, a shaft on said frame driven by said motor and disposed parallel to the reel axis and at the same radial distance therefrom as said reel arm roll spindles, a clutch element on said shaft movable axially thereof into driving engagement with an aligned reel arm roll spindle, means for releasably connecting said frame to turn with said reel in positions in which said frame shaft is aligned with said reel arm spindles, and means operated by turning movement of said frame for moving said clutch element into driving engagement with a reel arm roll spindle.

7. In a device of the character described, the combination with a web roll reel rotatable about a central axis and having radially extending angularly spaced arms carrying rotatable web roll supporting spindles adjacent their ends, means for successively accelerating web rolls carried by said several reel arm spindles in preparation for splicing the webs of the accelerated rolls to a web running from another roll comprising a frame mounted to turn about said reel axis adjacent said reel arms, a roll driving motor carried by said frame, a shaft on said frame driven by said motor and disposed parallel to the reel axis and at the same radial distance therefrom as said reel arm roll spindles, a clutch element on said shaft movable axially therefrom into driving engagement with an aligned reel arm roll spindle, means for releasably connecting said frame to turn with said reel in positions in which said frame shaft is aligned with said reel arm spindles, a stationary cam adjacent the path of turning movement of said frame, and means on said frame operated by said cam during the turning movement of said frame for moving said clutch element into driving engagement with a reel arm roll spindle.

8. In a device of the character described, the combination with a web roll reel rotatable about a central axis and having radially extending angularly spaced arms carrying rotatable web roll supporting spindles adjacent their ends, means for successively accelerating web rolls carried by said several reel arm spindles in preparation for splicing the webs of the accelerated rolls to a web running from another roll comprising a frame mounted to turn about the axis of said reel adjacent said reel arms, a roll driving motor mounted on said frame eccentrically of said reel axis, a stationary stop disposed in the path of said frame for limiting the turning movement of said frame under the gravity bias of said eccentrically mounted motor, means for turning said reel in a direction opposite to the biased turning movement of said frame, cooperating abutments on said frame and said respective reel arms for connecting said frame to turn with said reel adjacent each successive reel arm against the gravity bias of said motor, a clutch on said frame

operatively connected to said motor and disposed in alignment with one of said reel arm spindles when said frame is connected to turn with said reel, means for engaging said clutch with said spindle during each connected movement of said frame with said reel, and means for disengaging said cooperating abutments to permit return movement of said frame by gravity into engagement with said stop.

9. In a device of the character described, the combination with a web roll reel rotatable about a central axis and having radially extending angularly spaced arms carrying rotatable web roll supporting spindles adjacent their ends, means for successively accelerating web rolls carried by said several reel arm spindles in preparation for splicing the webs of the accelerated rolls to a web running from another roll comprising a frame mounted to turn about the axis of said reel adjacent said reel arms, a roll driving motor mounted on said frame eccentrically of said reel axis, a stationary stop disposed in the path of said frame for limiting the turning movement of said frame under the gravity bias of said eccentrically mounted motor, means for turning said reel in a direction opposite to the biased turning movement of said frame, cooperating abutments on said frame and said respective reel arms for connecting said frame to turn with said reel adjacent each successive reel arm against the gravity bias of said motor, a clutch on said frame operatively connected to said motor and disposed in alignment with the spindle of the adjacent reel arm when said frame is connected to turn with said reel, means responsive to the turning movement of said frame for engaging said clutch with said spindle during each connected movement of said frame and said reel, and means responsive to the turning movement of said frame for disengaging said cooperating abutments to permit return movement of said frame by gravity bias into engagement with said stationary stop.

10. In a device of the character described, the combination with a web roll reel rotatable about a central axis and having radially extending angularly spaced arms carrying rotatable web roll supporting spindles adjacent their ends, means for successively accelerating web rolls carried by said several reel arm spindles in preparation for splicing the webs of the accelerated rolls to a web running from another roll comprising

a frame mounted to turn about the axis of said reel adjacent said reel arms, a roll driving motor mounted on said frame, a clutch on said frame operatively connected to said motor and disposed for alignment with the spindles of said reel arms, means for turning said reel, means for successively turning said frame in unison with said reel in positions to align said clutch with said several reel arm spindles, and means responsive to such turning movement of said frame for engaging said clutch with the aligned reel arm spindle.

11. In a device of the character described, the combination with a web roll reel rotatable about a central axis and having radially extending angularly spaced arms carrying rotatable web roll supporting spindles adjacent their ends and tension elements adjacent said reel for engagement with the peripheral surfaces of web rolls on said reel to keep the web running from said rolls under tension, means for successively accelerating web rolls carried by said reel arm spindles in preparation for splicing the webs of such rolls to a web running from another roll and for applying tension to such rolls after splicing and before effective engagement of the spliced-in roll with said tension elements comprising a frame mounted to turn about said reel axis adjacent said reel arms, a motor carried by said frame, means for turning said reel to advance each of its successive roll arms to move through roll accelerating positions to a splicing position and then to a running position in which such roll effectively engages said tension elements, cooperating abutments on said frame and said reel for connecting said frame to turn with said reel adjacent each successive reel arm, means responsive to such connected movement of said frame for connecting said roll driving motor to drive the spindle of the adjacent reel arm, and means responsive to such turning movement of said frame for disconnecting said spindle driving connection when the reel arm has turned to a position to place a roll carried thereby in effective engagement with said tension elements.

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