

April 14, 1936.

W. C. NASH

2,037,086

AUTOMATIC WEB GUIDE

Filed July 23, 1934

3 Sheets-Sheet 1

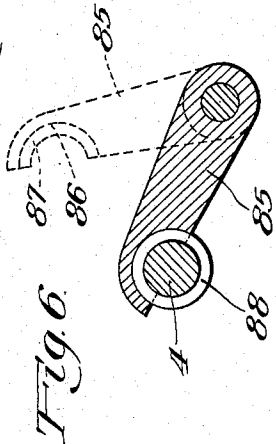


Fig. 6

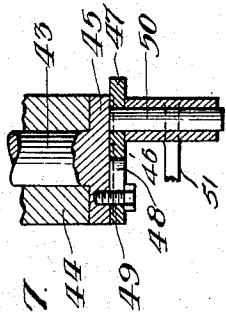


Fig. 7

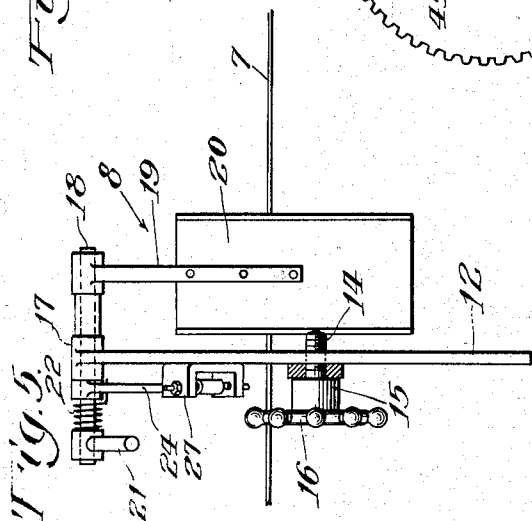


Fig. 5

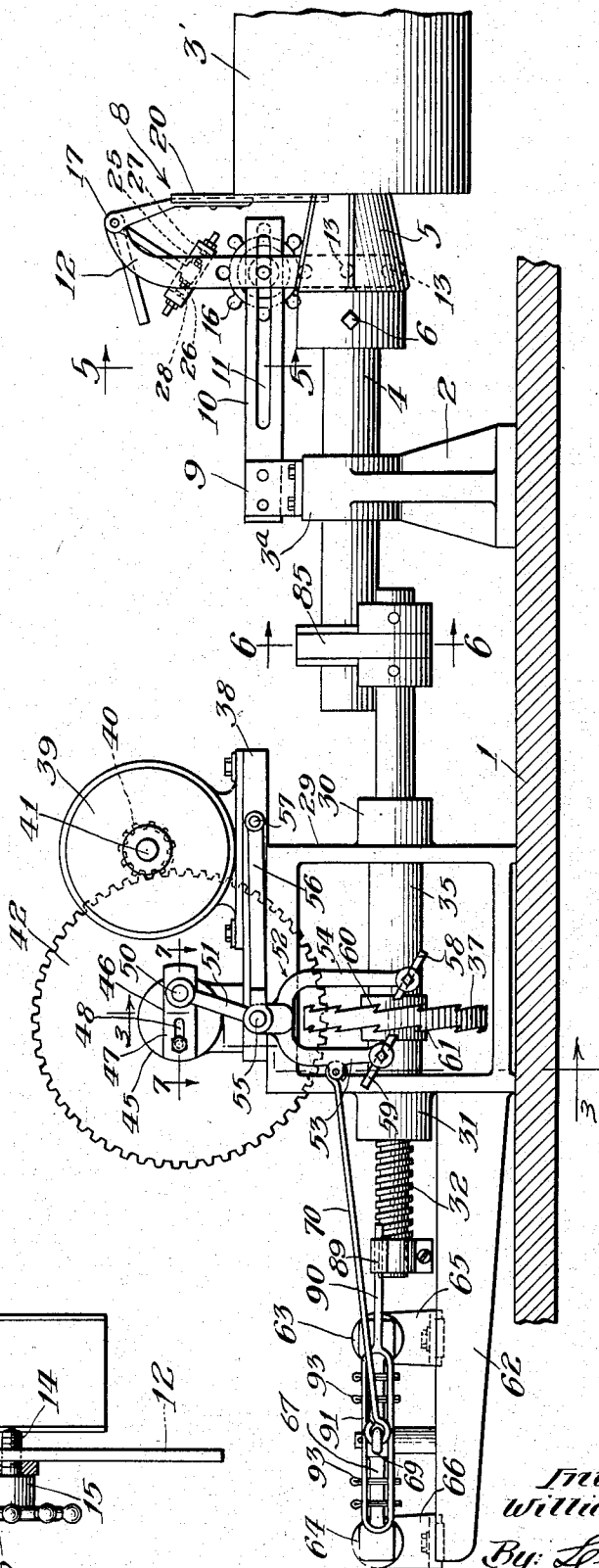


Fig. 1

Inventor
William C. Nash,
By: Lee J. Gary
Attorney

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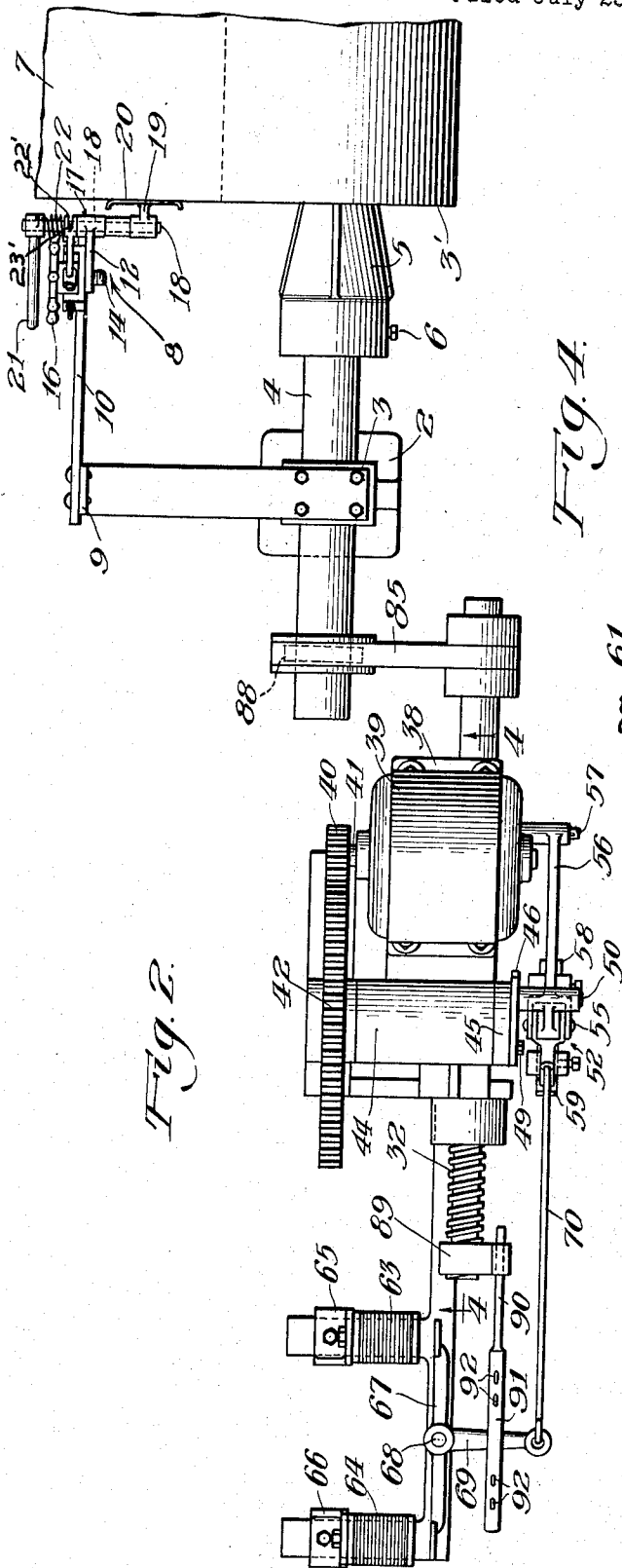
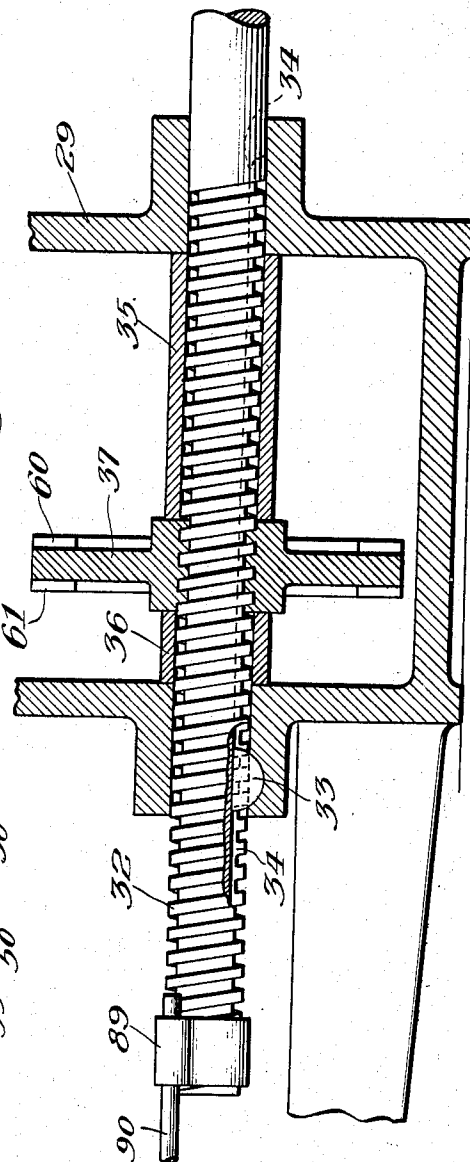


Fig. 2.

Fig. 4.



Inventor:
William C. Nash.
By: Lee J. Gary
Attorney.

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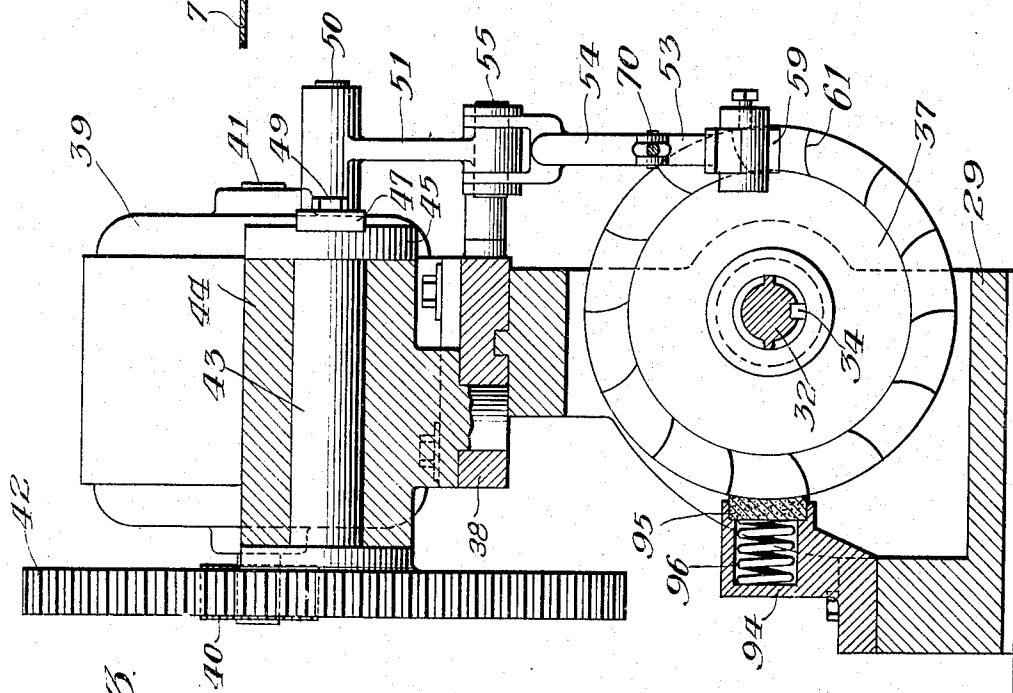
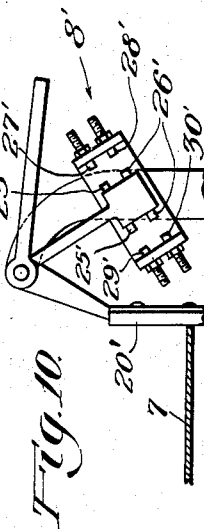
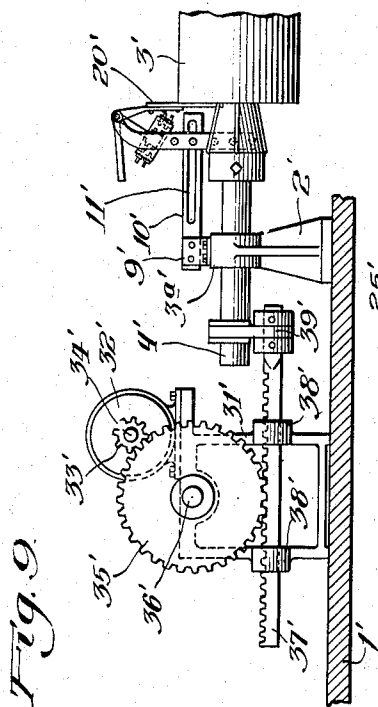
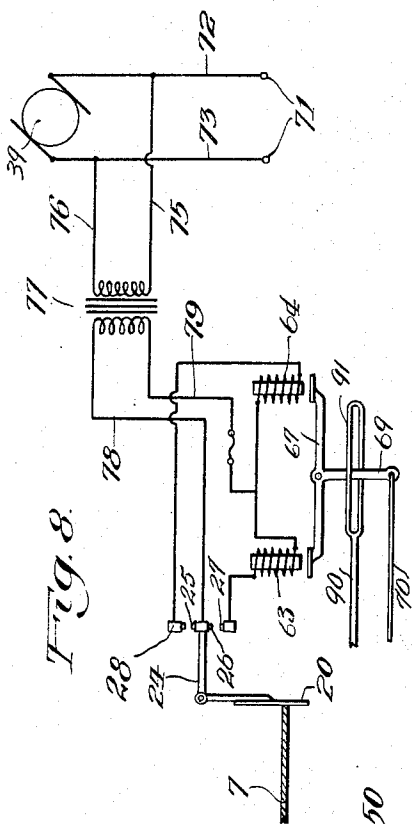
W. C. NASH

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Filed July 23, 1934

3 Sheets-Sheet 3



Inventor:
William C. Nash,
By: Lee J. Gary
Attorney.

UNITED STATES PATENT OFFICE

2,037,086

AUTOMATIC WEB GUIDE

William C. Nash, Neenah, Wis., assignor of one-fifth to Mary Jones and one-fifth to Marie Duvall Nash, Neenah, Wis., one-fifth to William M. Nash, Chicago, Ill., and one-fifth to Roy A. Nash, New Rochelle, N. Y.

Application July 23, 1934, Serial No. 736,441

3 Claims. (Cl. 242-76)

This invention relates to improvements in a web aligning device and refers specifically to a device for maintaining the travel of a continuously advancing flexible web, unrolled from a roll or other source of supply, in a straight line.

In feeding webs of paper, fabric or like flexible material to a device which is adapted to operate on the advancing web, for instance, to print upon, coat or cut the web, it is usually necessary that the lateral edges of the advancing web be kept in alignment with the operating mechanism so that a uniform operation can be performed upon the web, and the web be prevented from tearing or creasing. In rewinding paper or fabric webs from one roll to another, a similar condition must obtain, that is, the web drawn from the feeding roll which may be wound in a more or less haphazard manner, must, when being rewound, be directed to the receiving roll with its lateral edges in a substantially straight line.

To maintain the lateral edges of continuously advancing webs in alignment with devices operating upon the webs or receiving rolls in the case of rewinding, it has heretofore been the practice to provide an index for ascertaining alignment and manually controlled means for shifting the feeding roll or the web to maintain the same in alignment with the index. This, of course, requires the constant attention of an operator for controlling the shifting means.

An object of my invention is to provide means whereby the advancing web may be automatically maintained in desired alignment and said means when once adjusted needs no further attention except to maintain the working parts in proper mechanical repair and properly lubricated. Briefly described my invention comprises a feeler which is adapted to continuously contact the lateral edge of an advancing web. Said feeler may be adjusted to a datum or neutral position which is substantially coincident with the lateral edge of the web when the web is being properly fed forwardly. If the feeler is displaced in either direction from its neutral position by transverse motion of the web, means is actuated by the feeler to shift the feeding roll along the direction of its longitudinal axis whereby the lateral edge of the web is again brought to the neutral position of the feeler.

Other objects and advantages of my invention will be apparent from the accompanying drawings and following detail description. In the drawings, Fig. 1 is a side elevational view of a device comprising the concepts of my invention.

Fig. 2 is a top plan view of the device shown in Fig. 1.

Fig. 3 is a transverse sectional view taken on line 3-3 of Fig. 1.

Fig. 4 is a sectional view taken on line 4-4 of Fig. 2.

Fig. 5 is a sectional view taken on line 5-5 of Fig. 1.

Fig. 6 is a sectional view taken on line 6-6 of Fig. 1.

Fig. 7 is a sectional view taken on line 7-7 of Fig. 1.

Fig. 8 is a wiring diagram of the device shown in Figs. 1 and 2.

Fig. 9 is a side elevational view of a slight modification of my invention.

Fig. 10 is a detailed view of the feeler and reversing switch used in conjunction with the device shown in Fig. 9.

Referring in detail to the drawings, with particular reference to Figs. 1 and 2, 1 indicates a suitable support upon which the mechanism comprising my invention may be mounted. Standard 2 may be mounted upon support 1 and carries bearing 3a at its upper end. A shaft 4 may be journaled in bearing 3, said shaft being adapted to carry a roll 3' of paper, fabric or like flexible web-like material, shaft 4 being supported at its opposite end in a bearing (not shown) similar to bearing 3.

Shaft 4 may carry chuck 5 which may be rigidly mounted upon said shaft by means of set screw 6, chuck 5 being frusto-conical in shape and being adapted to extend into the hollow interior of roll 3. A similar chuck (not shown) may be positioned on shaft 4 at the opposite end of roll 3'. Chucks 5 are removable from shaft 4 and said shaft, in turn, is removable from bearings 3 whereby roll 3' may be mounted upon or removed from the shaft.

The roll mounting assembly hereinbefore described is conventional and in itself comprises no part of my novel concept. Assemblies of this type are used where it is desired to feed a web 7 from roll 3' to a machine or other device (not shown) which is adapted to operate upon the continuously fed web. For example, web 7 may be passed to a printing press, a coating machine, a saturant, a sizer, or web 7 may be simply unwound from roll 3' and rewound to form a new roll (not shown). As is usually the case, roll 3' is initially wound with little or no regard to keeping its lateral edges in alignment. This, of course, results in a roll having outwardly and inwardly extending conical ends or the plane of

the ends may be otherwise irregular. Obviously, if a web is drawn from a roll of this type, the lateral edges of the web will either progressively shift transversely to the direction of travel of the web in case the roll has conical ends or the line traced by the lateral edges of the web during unwinding will shift irregularly in a transverse direction. This results in, at least, great difficulty in feeding the web since the same would very likely tear or crease and in some cases it would be substantially impossible to feed from such a roll without rewinding the same to true-up its ends.

To combat this difficulty, shaft 4 upon which the feeding roll is mounted is designed to slide longitudinally in bearings 3 and means has heretofore been provided whereby an operator may shift said shaft to maintain the advancing web in alignment. This, of course, necessitates the constant attendance of an operator and reduces the economy of the operation. Moreover, being dependent upon the human equation, breakages of the web are not infrequent due to inattentiveness or lack of skill of the operator.

As a feature of my invention I provide a mechanism for maintaining the lateral edges of an advancing web in substantial alignment with the device or roll to which the web is feeding without the necessity of manual attendance. The mechanism for accomplishing this result comprises in part a feeler device, indicated generally at 8 in Fig. 5.

An angle member 9 may be mounted upon the upper portion of standard 2 and may carry an arm 10 positioned at substantially right angles to the angle member, said arm being provided with a longitudinal slot 11. An upright 12 may be secured to arm 10 and may be adjustably positioned with respect to said arm. The upright 12 may be provided with a plurality of threaded apertures 13 which are adapted to receive screw 14. Screw 14 may be provided with head or collar 15 to which hand wheel 16 may be rigidly affixed. To mount upright 12 upon arm 10, screw 14 may be passed through slot 11 and may be threadedly engaged in one of the threaded apertures 13 provided in upright 12. It can readily be seen that by the provision of slot 11, and apertures 13, upright 12 may be disposed at a plurality of suitable positions with respect to a lateral edge of web 7, being fed from roll 3'.

Upright 12 may be curved forwardly and may terminate at its end in bearing 17. A shaft 18 may be rotatably positioned in bearing 17 and may carry at one end arm 19 which, in turn, may carry palm 20. If desired, a counterbalance 21 may be mounted upon the opposite end of shaft 18. However, it may be found, usually depending upon the weight of web 7 and/or the weight of palm 20, that a counterbalance for the palm 20 will be unnecessary. In view of the fact that palm 20 will be swung or displaced by the lateral shifting of the web 7, it is desirable that bearing 17 be of a low friction type such as a ball bearing or the like.

Upright 12, as shown in Figs. 1 and 2, is positioned adjacent the path of travel of one of the lateral edges of web 7 and palm 20 is adapted to be maintained in contact with said edge by means of coil spring 22 disposed upon shaft 18, spring 22 being anchored at one end upon the collar of counterbalance 21 and bearing at its opposite end upon an arm 24.

Arm 24 may be loosely mounted upon shaft 18 and the collar of said arm is provided with a

slot 22'. A pin 23' is mounted upon shaft 18 and is adapted to contact the ends of slot 22'. The end of arm 24 carries electrical contacts 25 and 26. A U-shaped member 27 may be mounted upon upright 12, each leg of the U carrying adjustable electrical contacts 27 and 28.

Upright 12 may be positioned upon arm 10 in such relationship with respect to the desired path of travel of the lateral edge of web 7, that arm 24 is disposed midway between contacts 27 and 28. In this position neither of the contacts 25 or 26 carried by arm 24 are contiguous with contacts 27 or 28 respectively. This position of palm 20 and arm 24 will be hereinafter referred to as the neutral position. As can readily be seen, if web 7 shifts transversely, palm 20 and arm 19 will swing one direction or the other depending upon the direction that said web shifts. When this swinging action occurs, arm 24 is permitted to swing bringing either contacts 25 and 27 together, or contacts 26 and 28 together. When contacts 25 and 27 are connected, an electric circuit is completed which, together with mechanism to be hereinafter described, shifts shaft 4 longitudinally. Upon the shifting of shaft 4 roll 3' and, hence web 7, will be shifted. This shifting action causes palm 20, which follows the lateral edge of the web, to swing thereby swinging arm 24 to its neutral position. When contacts 26 and 28 are connected, shaft 4 is moved in the opposite direction until arm 24 is again brought to its neutral position.

By means of the lost motion arrangement between arm 24 and shaft 18, palm 20 may be moved an appreciable distance by web 7 after arm 24 has made contact and, consequently, when web 7 moves inwardly toward palm 20, said palm being resiliently urged will not crush the edges of the web.

A frame 29 may be mounted upon support 1, said frame having bearings 30 and 31 carried at each end thereof. A screw 32 may be positioned in bearings 30 and 31 and may be keyed thereto by means of key 33 whereby rotation of said screw is prevented. However, screw 32 is provided with an elongated keyway 34 whereby said screw may move axially within the bearings.

Within frame 29 screw 32 may be surrounded by collars 35 and 36 and a ratchet wheel 37 may be mounted upon said screw between the adjacent ends of collars 35 and 36, said ratchet being threadedly associated with the screw. The arrangement is such that rotation of ratchet wheel 37 will impart axial movement to screw 32.

A platform 38 may be mounted upon frame 29 and may support an electric motor 39. A pinion 40 may be mounted upon the motor shaft 41 and may engage with gear 42. Gear 42 may be mounted upon shaft 43 which may be journaled in bearing 44 which, in turn, is supported upon platform 38. The forward end of shaft 43 may terminate in plate 45 which may be provided with a diametrically disposed slot 46. A bar 47 may be positioned in slot 46, said bar being provided with slot 48. Bar 47 may be secured to plate 45 by means of cap screw 49 which passes through slot 48. By this arrangement bar 47 may be adjusted transversely with respect to plate 45. A pin 50 may be positioned upon plate 47 and link 51 may be pivotally mounted upon said pin. The arrangement is such that pin 50 forms an eccentric, the eccentricity of which may be adjusted by moving bar 47 in slot 46.

The opposite end of link 51 may be pivotally connected to U-shaped member 52 having de-

pending arms 53 and 54, said arms being adapted to be positioned respectively on each side of the ratchet wheel 37. At 55 the pivotal juncture of the U-shaped member 52 and link 51, link 56 may be connected, the opposite end of said link being pivotally mounted upon platform 38 as at 57.

The arrangement is such that when motor 39 is energized, pinion 40 drives gear 42 thereby reducing the angular velocity of shaft 43. As shaft 43 rotates, the U-shaped member 52 oscillates or reciprocates in a substantially vertical direction, the lateral motion of the U-shaped member being controlled by the anchored link 56. It can readily be seen that the motion of the member 52 is not truly vertical but takes place along the arc described by the radius or anchoring link 56.

Pawls 58 and 59 may be mounted respectively upon the ends of arms 54 and 53, said pawls being disposed at an angle to said arms. The pawls 58 and 59, in addition, are adjustable toward or away from ratchet wheel 37. As will be hereinafter more fully described, when palm 20 and arm 24 are in their neutral position, in other words, when web 7 is running true, member 52 merely oscillates or reciprocates along the arc hereinbefore described. In this normal or neutral position, pawls 58 and 59 do not contact ratchet wheel 37 and, consequently, no motion of screw 32 takes place. However, when contacts 25 and 27 are connected or when contacts 26 and 28 are connected, mechanism, to be hereinafter described, displaces member 54 in one direction or the other, whereby either pawl 58 or pawl 59 contacts and engages with teeth 60 or 61 formed on the opposite peripheral faces of pawl 37. When this action occurs the reciprocating motion of member 52 moves ratchet wheel in one direction or the other a distance proportionate to the throw of the eccentric mounted upon shaft 43 and in this manner screw 32 is moved axially in one direction or the other.

An extension 62 may be mounted upon frame 29 and solenoids 63 and 64 may be mounted upon the upper face of said extension by means of angle members 65 and 66 respectively. An armature 67 may be pivotally mounted upon extension 62 as at 68, the opposite ends of said armature being disposed adjacent the magnetic coils of solenoids 63 and 64. An arm 69 may be rigidly connected to armature 67, said arm at its opposite end being pivotally connected to link 70. Link 70 at its opposite end may be pivotally connected to arm 53 of the U-shaped member 52.

Referring particularly to Fig. 8, a wiring diagram of the device shown in Figs. 1 and 2 is illustrated and will be described in conjunction with the operation of the device.

71 indicates diagrammatically a source of electric current which, in the present instance, is described as being a source of alternating current. Leads 72 and 73 connect the terminals 71 to motor 39. Leads 72 and 73 may be respectively connected to leads 75 and 76 which, in turn, are connected to the primary coil of a transformer 77. The secondary coil of said transformer terminates in leads 78 and 79, lead 78 being connected to contacts 25 and 26 mounted upon arm 24. Contact 28 is connected to solenoid 64. Contact 27 is connected to solenoid 63. Lead 79 comprising the opposite side of the secondary coil of the transformer 77 is connected to both solenoids 63 and 64.

The arrangement is such that when web 7 shifts inwardly toward palm 20, arm 24 is rocked in such

a manner as to bring contacts 26 and 28 together. This action completes the circuit through solenoid 64 thereby causing arm 67 to rock in a clockwise direction as viewed in Fig. 2. Arm 67 in so rocking pulls link 70, which, being connected to member 52, swings said member about the pivot 55 and brings pawl 58 into operative relationship with respect to ratchet teeth 60. Upon member 52 reciprocating upwardly ratchet wheel 37 is moved upwardly as viewed in Fig. 1 and screw 32 is moved to the right as viewed in Figs. 1 and 4. If the web 7 shifts transversely away from palm 20, spring 22 causes said palm to follow and remain in contact with the lateral edge of said web and, consequently, contacts 25 and 27 are connected thereby energizing solenoid 63. When said solenoid is energized, armature 67 is rocked in a counter-clockwise direction as viewed in Fig. 2 and link 70 is pushed whereby pawl 59 is brought into operative contact with ratchet teeth 61. Upon the downward reciprocation of member 52, ratchet wheel 37 is moved downwardly as viewed in Figs. 1 and 4 and screw 32 is consequently moved axially to the left as viewed in Figs. 1 and 4.

An arm 85 is swingably mounted upon the end of screw 32. The opposite end of said arm is provided with a semi-cylindrical recess 86 being defined at each end by semi-annular flanges 87. Shaft 4 immediately opposite arm 85 carries an integral annular flange or bead 88, the arrangement being such that arm 85 may be rocked upon screw 32 and the annular flange or bead 88 may register with the semi-cylindrical recess 86, the flange 88 being confined at each of its sides by the semi-annular flanges 87.

Consequently, it can readily be seen that when shaft 32 shifts axially either to the right or left, arm 85 forming a rigid connection between screw 32 and shaft 4, said latter shaft is also moved in unison with the movement of screw 32, and in this manner roll 3' will be moved axially. Hence, the movement of shaft 4 in a direction along its axis takes place in response to variations in the position of palm 20.

It can readily be seen that inasmuch as arm 24 tends to occupy a central position between contacts 27 and 28 and if said arm so shifts as to connect contacts 25 and 27 or contacts 26 and 28, the degree of tolerance determining the alignment of the lateral edge of the web 7 is dependent upon the clearance between contacts 25 and 27, and 26 and 28, when arm 24 is in its neutral position.

A sleeve 89 may be rigidly mounted upon an end of screw 32. Said sleeve may be connected rigidly to rod 90 which may terminate in its opposite end in a looped portion 91. Arm 69 which is connected to armature 67 is positioned within the loop formed at the end of the arm 90. A plurality of registering apertures 92 may be provided in the upper and lower sides of loop 91 and pins 93 may be positioned within said apertures.

In the operation of this portion of the device it can readily be seen that when screw 32 shifts axially in one direction or the other, one of the pins 93, depending upon the direction of the shift of the screw 32, will be brought into relatively close proximity to arm 69. Consequently, if screw 32 shifts an abnormal distance either to the right or left, arm 69 will be stopped by one of the pins 93 adjacent to said arm and, consequently, that solenoid, either 63 or 64, which is energized by the movement of palm 20, will be prevented from rocking armature 67 and, consequently, member 75

52 will be maintained in its normal or neutral position and will merely oscillate or reciprocate without moving ratchet wheel 37.

The device comprising looped portion 91 serves as a safety device to prevent abnormal shifting of screw 32 and by the provision of a plurality of apertures 92, the maximum distance through which screw 32 may shift can be varied.

A housing 94 may be mounted upon the rear portion of frame 29 and may be adapted to carry a friction material 95. A coil spring 96 may be positioned within housing 94 and may serve to urge the friction material 95 into contact with the periphery of ratchet wheel 37. By this means wheel 37 is prevented from spinning or moving except when being positively propelled by one or the other of the pawls carried by arms 53 and 54.

Although ratchet wheel 37 is rotated in one direction or the other, only when the lateral edge of web 7 shifts to the right or left away from its neutral position, motor 39 operates continuously during the entire time that roll 3' is being unwound.

Referring particularly to Figs. 9 and 10, a slight modification of my invention is illustrated. The device may be mounted upon support 1' and may comprise a feeding roll assembly similar to that described in conjunction with the device shown in Figs. 1 and 2. For the sake of simplicity and clearness of description, the roll assembly will be designated, without further description, with primed numerals corresponding to the numerals referring to similar parts in the device shown in Figs. 1 and 2.

In this form of my invention the feeler mechanism 8' may comprise a reversing switch having terminals 25', 26', 27', 28', 29' and 30'. The reversing switch is of conventional construction that is, terminals 27' and 30' are connected together and terminals 28' and 29' are connected together.

A frame 31' may be mounted upon the support 1' and may carry at its upper portion a motor 32'. Motor 32' may be connected to a suitable source of electric current through the reversing switch hereinbefore described. The terminals 25' and 26' being connected to the source of electric current and the terminals 27', 28' and 29' and 30' being connected to motor 32'. A pinion 33' may be mounted upon the shaft 34' of motor 32', said pinion being engageable with gear 35' mounted upon shaft 36' which may be journaled in frame 31'. A rack 37' may be slidably positioned within guides 38', said guides being carried by frame 31'. An arm 39' may be swingably mounted at the end of rack 37' and may engage with shaft 4' in a manner similar to the engagement of arm 85 with shaft 4.

In the operation of this form of my invention, palm 20' similar to palm 20 is adapted to be maintained in contact with the lateral edge of the web. If the web shifts transversely, palm 20' will be displaced in one direction or the other depending upon the direction of the shift of the web. If the web shifts inwardly toward palm 20', terminals 25' and 26' will respectively contact terminals 27' and 28' thereby completing the electrical circuit to motor 32', driving said motor in one direction. As can readily be seen, when motor 32' is energized, rack 37' will be moved longitudinally within guides 38' and, consequently, shaft 4' will be displaced. In the instance described above, motor 32' will run in a direction which is adapted to shift shaft 4' to the right as viewed in Fig. 9 thereby bringing arm 24' into its neutral position

and breaking the motor circuit. If the web shifts away from palm 20', terminals 25' and 26' will respectively contact terminals 29' and 30' and the motor 32' will then be driven in an opposite direction, namely, a direction which is adapted to move shaft 4' inwardly toward palm 20'. As in the device shown in Figs. 1 and 2, the shifting of shaft 4' will take place only in response to completion of the circuit through the reversing switch and motor 32' will be operated only when shaft 4' is to be displaced. It is to be understood, of course, that if motor 39 or 32' requires too much current for the usual make and break switch, a suitable relay arrangement is contemplated. The use of relays is not shown or described since the same will be understood by those skilled in the art.

Although a direct connection is shown between screw 32 and shaft 4 and rack 37' and shaft 4', reference being had to arms 85 and 39', it is to be understood that screw 32' or rack 37' may be connected to shaft 4 or 4' respectively through a system of levers (not shown). In this manner the rate of motion of axial displacement of shaft 4 or 4' may be increased or diminished, as desired, and motors 39 or 32' having desired power capacities may thus be used.

It is apparent that herein is provided a device which will automatically maintain a continually advancing flexible web in substantially constant edge alignment. The device is simple in operation and can be manufactured economically and when the desired initial alignment of the web is once determined and arms 24 or 24' are set in a neutral position, no further manual attendance is necessary.

I claim as my invention:

1. A device for maintaining the lateral edge of a continuously advancing flexible web fed from a roll in substantially constant alignment which comprises in combination, rotatable means for supporting said roll, said means being movable to move said roll axially, a feeler mechanism disposed adjacent a lateral edge of said advancing web and movable with transverse movement of said web, an electric switch actuated by movement of said feeler mechanism to complete an electric circuit, a pair of solenoids connected in said electric circuit, an armature disposed adjacent the cores of said solenoids and movable when one of said solenoids is energized, a continuously oscillating U-shaped member carrying oppositely disposed pawls, a ratchet wheel positioned within said U-shaped member between said pawls, said ratchet wheel having oppositely inclined ratchet teeth on each face thereof, means including a screw connecting said ratchet wheel and rotatable roll supporting means whereby said supporting means is moved to axially move said roll when one of said pawls engages and turns the ratchet wheel, one of said pawls being brought into engagement with said ratchet wheel when one of the solenoids is energized.

2. A device for maintaining the lateral edge of a continuously advancing flexible web fed from a roll in substantially constant alignment which comprises in combination, rotatable means for supporting said roll, said means being movable to move said roll axially, a feeler mechanism disposed adjacent a lateral edge of said advancing web and movable with transverse movement of said web, an electric switch actuated by movement of said feeler mechanism to complete an electric circuit, a solenoid connected in said electric circuit, an armature disposed adjacent the

core of said solenoid and movable when said solenoid is energized, a continuously oscillating pawl, a ratchet wheel positioned adjacent said pawl, means including a screw connecting said ratchet wheel and rotatable roll supporting means whereby said supporting means is moved to axially move said roll when the pawl engages and turns the ratchet wheel, said pawl being brought into engagement with said ratchet wheel when the solenoid is energized, and means carried by said screw for preventing movement of said armature in response to the energization of said solenoid to prevent excessive axial movement of said roll.

3. A device for maintaining the lateral edge of a continuously advancing flexible web fed from a roll in substantially constant alignment which comprises in combination, rotatable means for supporting said roll, said means being movable to move said roll axially, a feeler mechanism disposed adjacent a lateral edge of said advancing

web and movable with transverse movement of said web, an electric switch actuated by movement of said feeler mechanism to complete an electric circuit, a pair of solenoids connected in said electric circuit, an armature disposed between the cores of said solenoids and movable when one of said solenoids is energized, a continuously oscillating U-shaped member carrying oppositely disposed pawls, a ratchet wheel positioned within said U-shaped member between said pawls, said ratchet wheel having oppositely inclined ratchet teeth on each face thereof, means including an axially movable screw connecting said ratchet wheel and rotatable roll supporting means whereby said supporting means is moved to axially move said roll when one of said pawls engages and turns the ratchet wheel, one of said pawls being brought into engagement with said ratchet wheel when one of the solenoids is energized.

WILLIAM C. NASH.