

[54] **APPARATUS FOR GUIDING THE EDGES OF WEBS IN PHOTOGRAPHIC COPYING APPARATUS OR THE LIKE**

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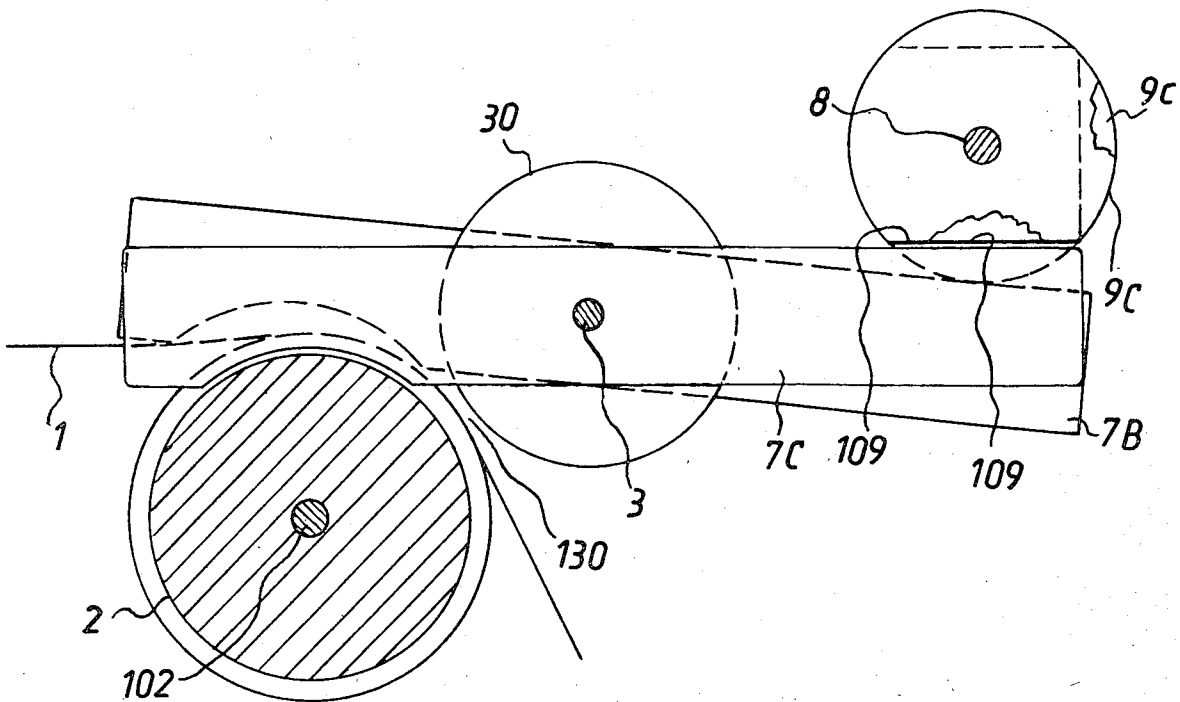
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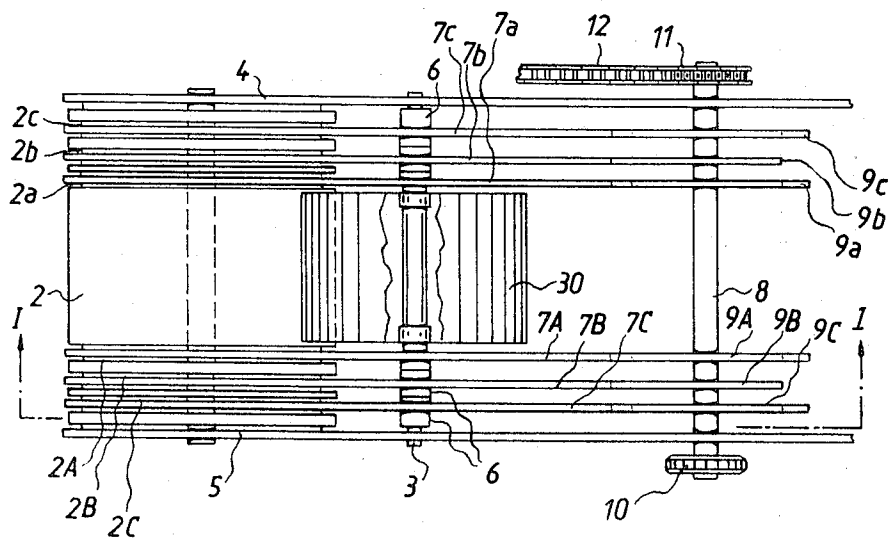
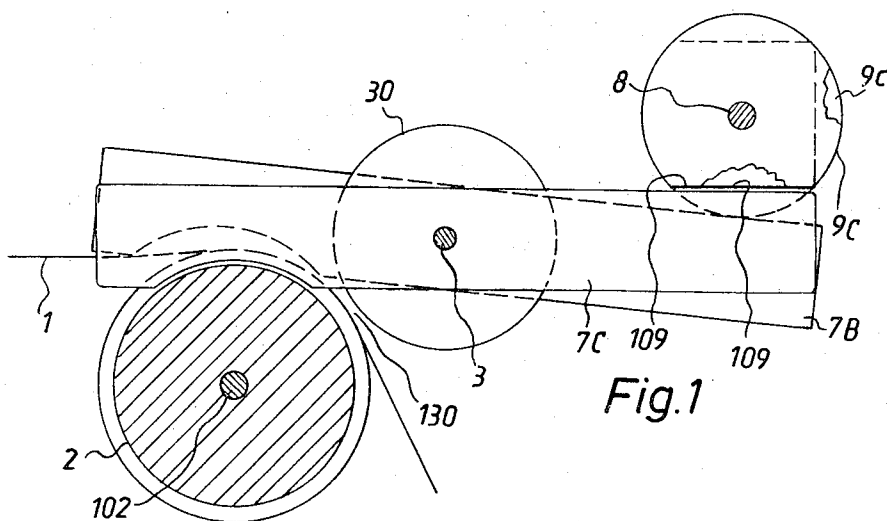
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[57] **ABSTRACT**

Apparatus for guiding the edges of webs having different widths in photographic copying machines has a roller provided with two sets of circumferential grooves and two groups of plate-like guide members which are pivotable about a common axis by means of cams provided on a camshaft so that they extend into or are withdrawn from the corresponding grooves of the roller. By moving a pair of guide members (one guide member of each pair belongs to one group and the other guide member of each pair belong to the other group) into the respective grooves, the operator provides for a web of given width a path wherein the edges of the web of such width are contacted by the respective guide members and are properly guided during transport past the exposure station of the copying machine or past another station where the web must be guided with a high degree of accuracy against lateral movement.

14 Claims, 2 Drawing Figures





APPARATUS FOR GUIDING THE EDGES OF WEBS IN PHOTOGRAPHIC COPYING APPARATUS OR THE LIKE

BACKGROUND OF THE INVENTION

The present invention relates to apparatus for guiding the edges of webs or strips in photographic apparatus or the like, and more particularly to improvements in apparatus which can be used to properly guide the edges of webs having different widths. Such webs are often used as carriers of layers of photosensitive material in photographic roll copying machines which make differently dimensioned prints from exposed and developed originals.

It is already known to guide the edges of webs having different widths by resorting to an apparatus wherein two guide members are movable sideways to increase or reduce the distance therebetween and wherein the guide members are further pivotable so as to enter into or to be moved out of selected grooves of a guide roller. In this way, the guide members can be moved to positions in which they can properly guide the edges of webs having different widths. A drawback of such apparatus is that each change in setup takes up too much time because the guide members must be pivoted as well as moved sideways whenever a web having a first width is replaced or followed by a web having a different second width. Furthermore, the apparatus must be provided with rather complex devices for arresting the guide members in selected positions at a desired distance from each other.

SUMMARY OF THE INVENTION

An object of the invention is to provide a novel and improved apparatus which can be used to guide the edges of webs having different widths and which can be rapidly and conveniently converted by unskilled or semiskilled operators so that it can properly guide the edges of a fresh web which follows a web of different width.

Another object of the invention is to provide an apparatus which can properly guide any practical number of webs having different widths and which can be coupled with one or more similar apparatus so that a change in setup of one apparatus automatically results in a similar adjustment of each other apparatus.

A further object of the invention is to provide the apparatus with novel and improved guide members for the edges of webs having different widths and with novel and improved actuating means for such guide members.

An additional object of the invention is to provide a simple, compact, inexpensive and rugged apparatus which can be installed in existing photographic printing or like machines to constitute a superior substitute for conventional web guiding apparatus.

The invention is embodied in an apparatus for guiding the edges or marginal portions of webs having different widths, particularly for guiding the edges of webs which constitute carriers for layers of photosensitive material and are moved lengthwise (normally in stepwise fashion) in a photographic copying machine. The apparatus comprises a plurality of pairs of guide members which preferably resemble thin plates or panels made of sheet metal or the like. At least one guide member of each pair is movable (for example, pivot-

able) between an inoperative position and an operative position in which the guide members of the respective pair are spaced apart a predetermined distance equal to or approximating one of the aforementioned different widths and in which the guide members of the respective pair define a portion of a path for and flank the edges of a web of corresponding width. The apparatus further comprises a system of cams or other suitable actuating means for moving the movable guide members between operative and inoperative positions.

In accordance with a presently preferred embodiment of the invention, the guide members of each pair are movable simultaneously between operative and inoperative positions. This insures that the center line of a preceding web coincides with the center line of the next-following web even if the width of the next-following web differs from the width of the preceding web. Furthermore, such construction simplifies the task of the operator during a change of setup.

The novel features which are considered as characteristic of the invention are set forth in particular in the appended claims. The improved web guiding apparatus itself, however, both as to its construction and its mode of operation, together with additional features and advantages thereof, will be best understood upon perusal of the following detailed description of certain specific embodiments with reference to the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a vertical sectional view of a web guiding apparatus which embodies the invention and is capable of guiding webs having four different widths, the section being taken along the line I-I of FIG. 2, as seen in the direction of arrows; and

FIG. 2 is a plan view of the apparatus shown in FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The web guiding apparatus of FIGS. 1 and 2 comprises a rotary roller-shaped guide element 2 for a web 1 of selected width which web may constitute a flexible carrier for a layer of photosensitive material and is assumed to be transported lengthwise in a photographic roll copying machine of known design. As a rule, a substantial length of a web having a predetermined width is stored in a photographic copying machine in the form of a roll and the web is withdrawn from the roll in stepwise fashion so that it is at a standstill when a portion of the photosensitive layer thereon is exposed to light which has passed through an original. The web portion with exposed photosensitive material thereon is collected by a takeup reel. The apparatus which embodies the roller 2 is assumed to be installed in the region of a gate or window surrounding that portion of the layer of photosensitive material which is being exposed to light. In such region the web 1 must be guided with a high degree of accuracy to thereby insure that the exposed portions of the photosensitive layer are located exactly midway between the two edges. A photographic roll copying machine can be provided with two or more apparatus which are installed therein for the purpose of properly guiding the edges of a web 1 during transport from the supply roll to the takeup reel.

Problems arise when a web having a first width is followed by a web having a different (greater or lesser)

second width. It is then necessary to adjust each web guiding apparatus in such a way that it can properly guide the freshly introduced web, especially in the region of the gate or window, i.e., at the exposure station. The change in setup must be achieved within a short interval of time, and the thus adjusted apparatus must be capable of guiding the fresh web with the same degree of accuracy as the preceding web of different width.

The roller 2 can constitute an idler roller which is rotatable with or about the axis of a shaft 102. The periphery of the roller 2 is provided with two groups or sets of narrow circumferential recesses or grooves, and each such group may comprise two, three or more grooves. In the embodiment of FIGS. 1 and 2, the roller 2 is provided with a first set of three grooves 2a, 2b, 2c adjacent to one axial end thereof and with a group of three grooves 2A, 2B, 2C adjacent to the other axial end. The distance between the grooves 2a, 2A equals or approximates the width of a narrower web or strip which is to be processed in the photographic copying machine, the distance between the grooves 2b, 2B equals or approximates the width of a somewhat wider web, and the distance between the grooves 2c, 2C equals or approximates the width of a web whose width exceeds the distance between the grooves 2b, 2B. The grooves 2a-2A, 2b-2B and 2c-2C are respectively mirror symmetrical to each other with reference to a plane which is normal to the axis of the shaft 102 and is located midway between the axial ends of the roller 2. Thus, the distance between the grooves 2c, 2b, 2a and the upper end of the roller 2, as viewed in FIG. 2, respectively equals the distance between the grooves 2C, 2B, 2A and the lower axial end of the roller 2.

The roller 2 is mounted adjacent to a presser roller 30 which is rotatable with or about the fixed axis of a shaft 3 and defines with the central portion of the roller 2 (between the grooves 2a, 2A) a narrow passage 130 through which a web of any selected width must pass from the respective supply roll toward the takeup reel.

The end portions of the shaft 3 for the presser roller 30 are mounted in two stationary plate-like frame members 4, 5 which are adjacent to the respective axial ends of the roller 2 and can further serve as supports for the shaft 102. Those portions of the shaft 3 which extend between the roller 30 and the frame members 4, 5 carry sleeve-like distancing elements 6 which separate from each other groups of plate-like movable guide members made of sheet metal or the like. One group includes three guide members 7a, 7b, 7c and the other group includes three guide members 7A, 7B, 7C. The distances between the guide members 7a-7A, 7b-7B, 7c-7C respectively equal or approximate the distances between the grooves 2a-2A, 2b-2B, 2c-2C. The guide members 7a-7c, and/or 7A-7C are pivotable about the axis of the shaft 3 between inoperative positions in which their left-hand portions or arms are raised above and are thus spaced apart from the periphery of the roller 2, and operative positions in which their left-hand portions or arms extend in part into the similarly reference grooves of the roller 2. For example, when the guide members 7a, 7A assume their operative positions, they extend into the grooves 2a, 2A and are ready to engage the respective edges of a narrow web 1 which is being advanced to move lengthwise through the passage 130 and along the upper portion

of the peripheral surface of the roller 2, or in the opposite direction.

When the guide members 7b, 7B are pivoted to their operative positions, they extend into the grooves 2b, 2B and are ready to engage the respective edges of a wider web. Analogously, by moving the guide members 7c, 7C to their operative positions, the apparatus is ready to properly center a still wider web 1. The arrangement is preferably such that all of the guide members 7a-7c, 7A-7C can be moved simultaneously to their inoperative positions whereby the apparatus is ready to guide a web of maximum width, namely, a web whose width equals or approximates the distance between the frame members 4, 5 which then constitute two auxiliary guide members adapted to engage the respective edges of a web of maximum width.

The distancing elements 6 are preferably rotatable on the shaft 3 for the presser roller 30 and guide members 7a-7c and 7A-7C. The left-hand arms of the guide members 7a-7c and 7A-7C are preferably heavier than their right-hand arms so that, in the absence of an obstruction in the path of pivotal movement of the right-hand arm, each guide member tends to assume its operative position under the action of gravity. It is also possible to provide helical springs or other suitable resilient elements which permanently bias the movable guide members 7a-7c and 7A-7C to their operative positions. The axial length of the presser roller 30 is selected in such a way that this roller cannot interfere with pivotal movements of the guide members. As shown in FIG. 2, the pressure roller 30 is spaced apart from and is located midway between the innermost guide members 7a, 7A.

The actuating means for moving the guide members 7a-7c and 7A-7C between their operative and inoperative positions (and more particularly for moving selected pairs of guide members 7a-7A, 7b-7B, 7c-7C to their inoperative positions) comprises an indexible camshaft 8 which carries six cams 9a-9c, 9A-9C, one for each of the guide members 7a-7c, 7A-7C. Each cam resembles a disk having a flat 109 and the flats 109 of the cams 9a-9A, 9b-9B, 9c-9C are respectively aligned with each other so that, when two aligned flats 109 assume the angular positions shown in FIG. 1 by solid lines, the respective movable guide members (9c, 9C) are permitted to assume their operative positions by gravity. The camshaft 8 is assumed to be indexible between four different angular positions including a first angular position in which the guide members 7a, 7A are allowed to assume their operative positions, a second angular position in which the guide members 7b, 7B are free to assume their operative positions, a third angular position in which the guide members 7c, 7C are free to assume their operative positions, and a fourth angular position in which all of the guide members 7a-7c, and 7A-7C assume their inoperative positions so that the auxiliary guide members or frame members 4, 5 can guide the edges of a web having a maximum width.

The means for indexing the camshaft 8 comprises a handwheel 10 which can be rotated by hand and is preferably provided with a pointer (not shown) movable along a suitable scale or dial provided with graduations indicating the four different angular positions of the camshaft. If desired, the camshaft 8 can be indexed automatically, for example, by means of a motion transmitting mechanism which detects the width of a freshly inserted supply of convoluted web. The cam-

shaft 8 is rotatably mounted in the frame members 4, 5 so that its axis extends in parallelism with the axes of the shafts 102 and 3.

FIG. 2 further shows a sprocket wheel 11 which is fixed to one end of the camshaft 8 and can drive an endless chain 12 serving to transmit torque to one or more additional camshafts (not shown) forming part of additional apparatus for guiding webs of different widths. Thus, by properly selecting the angular position of the camshaft 8 by means of the handwheel 10, an operator can simultaneously properly select the angular position(s) of one or more additional camshafts so that each of two or more apparatus is properly adjusted in response to manipulation of the handwheel 10. The chain 12 is preferably tensioned by a spring-biased sprocket wheel (not shown). It is clear that the means for transmitting torque from the camshaft 8 to one or more additional camshafts may comprise a toothed pulley and a toothed belt, a train of mating gears or any other device which is capable of indexing the additional camshaft or camshafts in exact synchronism with the illustrated camshaft 8.

The number of pairs of movable guide members may be increased or reduced, depending on the number of webs of different widths which are to be processed in the machine which embodies the improved web guiding apparatus. It is also within the purview of the invention to omit the guide members 7a-7c or 7A-7C and to use only the guide members 7A-7C or 7a-7c in combination with auxiliary guide members 4 and 5. For example, the members 4, 5 may be used to guide the edges of a web of maximum width; the members 7c, 5 can be used to guide the edges of a slightly narrower web; the members 7b, 5 can be used to guide a still narrower web; and the members 7b, 5 can be used to guide the edges of a slightly narrower web; and the members 7a, 5 can be used to guide a narrowest web. The camshaft then carries only three cams, namely, the cams 9a, 9b and 9c. The arrangement with pairs of movable guide members is preferred at this time because each web having a width less than the distance between the frame members 4, 5 is caused to move midway between the axial ends of the roller 2.

The operation is as follows:

When a roll of web 1 having a given width is installed in the photographic copying machine, the handwheel 10 is rotated to index the camshaft 8 so that the corresponding cams (e.g., the cams 9c, 9C) allow the associated guide members (7c, 7C) to assume their operative positions under the action of gravity (the left-hand arms of the guide members 7c, 7C then respectively extend into the grooves 2c, 2C of the roller 2). The leader of the web 1 is thereupon introduced into the passage 130 and between the guide members 7c, 7C which engage the respective edges of the web and hold it against appreciable lateral movement. The convex peripheral surfaces of the other cams (9a, 9b, 9A, 9B) then engage the right-hand arms of the respective guide members 7a, 7b, 7A, 7B and prevent such guide members from leaving their inoperative positions.

The indexing of the camshaft 8 by way of the handwheel 10 results in indexing of the camshaft or camshafts which receive torque from the sprocket wheel 11 and chain 12. Thus, an adjustment of the illustrated web guiding apparatus automatically entails a similar adjustment of each additional web guiding apparatus which is operatively connected with the camshaft 8.

This reduces the length of intervals which are needed for adjustment of the web guiding apparatus and also reduces the likelihood of improper adjustment because the attendant must pay attention only once, i.e., while changing the angular position of the handwheel 10.

It is clear that the improved apparatus is susceptible of many additional modifications without departing from the spirit of the invention. For example, the actuating means can be designed in such a way that the movable guide members are reciprocable (rather than pivotable) between their operative and inoperative positions. This can be achieved by installing each movable guide member in suitable ways and by employing springs which bias the guide members against the respective cams. When the camshaft is indexed, selected pairs of the guide members move lengthwise from inoperative to operative positions while the remaining movable guide members remain in or are caused to assume their inoperative positions. Furthermore, the roller 2 can be omitted and the left-hand arm of each movable guide member 7a-7c, 7A-7C can be provided with a wedge-like or otherwise configured end portion adapted to enter a suitable recess in a flat guide element which replaces the roller 2. It is equally possible to construct each movable guide member in the form of a one-armed lever and to place the camshaft 8 with the cams thereon at a level above the roller 2, as viewed in FIG. 1. The actuating means then further comprises springs which bias the guide members against the respective cams.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can, by applying current knowledge, readily adapt it for various applications without omitting features which fairly constitute essential characteristics of the generic and specific aspects of my contribution to the art and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the claims.

What is claimed as new and desired to be protected by Letters Patent is set forth in the appended claims:

1. In an apparatus for guiding the edges of elongated webs having different widths, particularly for guiding the edges of webs which constitute carriers for layers of photosensitive material and are moved lengthwise in a photographic copying apparatus, a combination comprising a plurality of pairs of guide members, the guide members of each of said pairs being movable between an inoperative position and an operative position in which latter position the guide members of the respective pair are spaced apart a predetermined distance equal to or approximating one of said different widths and in which latter position the guide members of the respective pair define a path for and flank the edges of a web of corresponding width; and actuating means for moving selected pairs of guide members between said operative and inoperative positions.

2. A combination as defined in claim 1, wherein all of said movable guide members are pivotable between the respective operative and inoperative positions about a common pivot axis normal to the respective path.

3. A combination as defined in claim 2, wherein said actuating means comprises a cam for each of said guide members and means for moving said cams to thereby move the respective pairs of guide members between said operative and inoperative positions.

4. A combination as defined in claim 3, wherein said means for moving said cams comprises a single camshaft for all of said cams.

5. A combination as defined in claim 1, further comprising a roller-shaped guide element for webs of different widths, said guide element having a peripheral surface provided with recesses, one for each of said guide members and each guide member having a portion extending into the respective recess in the operative position thereof.

6. A combination as defined in claim 5, further comprising a roller-shaped presser member adjacent to said guide element and defining therewith a passage through which the webs of different widths pass while the edges of such webs are guided by the respective pairs of guide members.

7. A combination as defined in claim 1, wherein said movable guide members are pivotable between said operative and inoperative positions thereof about a common pivot axis and said actuating means comprises a rotary camshaft and a plurality of cams mounted on said camshaft, one for each of said guide members, said camshaft being indexible to a plurality of angular positions in each of which a different pair of said cams maintains the respective guide members in the operative position thereof.

8. A combination as defined in claim 7, wherein said actuating means further comprises indexing means for moving said camshaft between said plurality of angular positions.

9. A combination as defined in claim 7, further comprising torque transmitting means receiving motion from said camshaft and arranged to rotate the camshaft for at least one additional apparatus in synchronism with rotation of said first mentioned camshaft.

10. A combination as defined in claim 1, wherein said actuating means is operative to simultaneously maintain all of said guide members in the operative positions thereof.

11. A combination as defined in claim 1, wherein both guide members of each of said pairs are movable

simultaneously between operative and inoperative positions.

12. A combination as defined in claim 11, further comprising a pair of auxiliary guide members defining a path whose width exceeds the greatest of said predetermined distances.

13. A combination as defined in claim 12, further comprising means for movably securing said first mentioned guide members to said auxiliary guide members so that said first mentioned guide members are disposed between said auxiliary guide members.

14. In an apparatus for guiding the edges of elongated webs having different widths, particularly for guiding the edges of webs which constitute carriers for layers of photosensitive material and are moved lengthwise in a photographic copying apparatus, a combination comprising a plurality of pairs of guide members, at least one guide member of each of said pairs being movable between an inoperative position and an operative position in which latter position the guide members of the respective pair are spaced apart a predetermined distance equal to or approximating one of said different widths and in which latter position the guide members of the respective pair define a path for and flank the edges of a web of corresponding width; actuating means for moving said movable guide members between said operative and inoperative positions; a roller-shaped guide element for webs of different widths, said guide element having a peripheral surface provided with recesses, one for each of said movable guide members and each movable guide member having a portion extending into the respective recess in the operative position thereof; and a roller-shaped presser member adjacent to said guide element and defining therewith a passage through which the webs of different widths pass while the edges of such webs are guided by the respective pairs of guide members, said movable guide members being pivotable about the axis of said presser member.

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