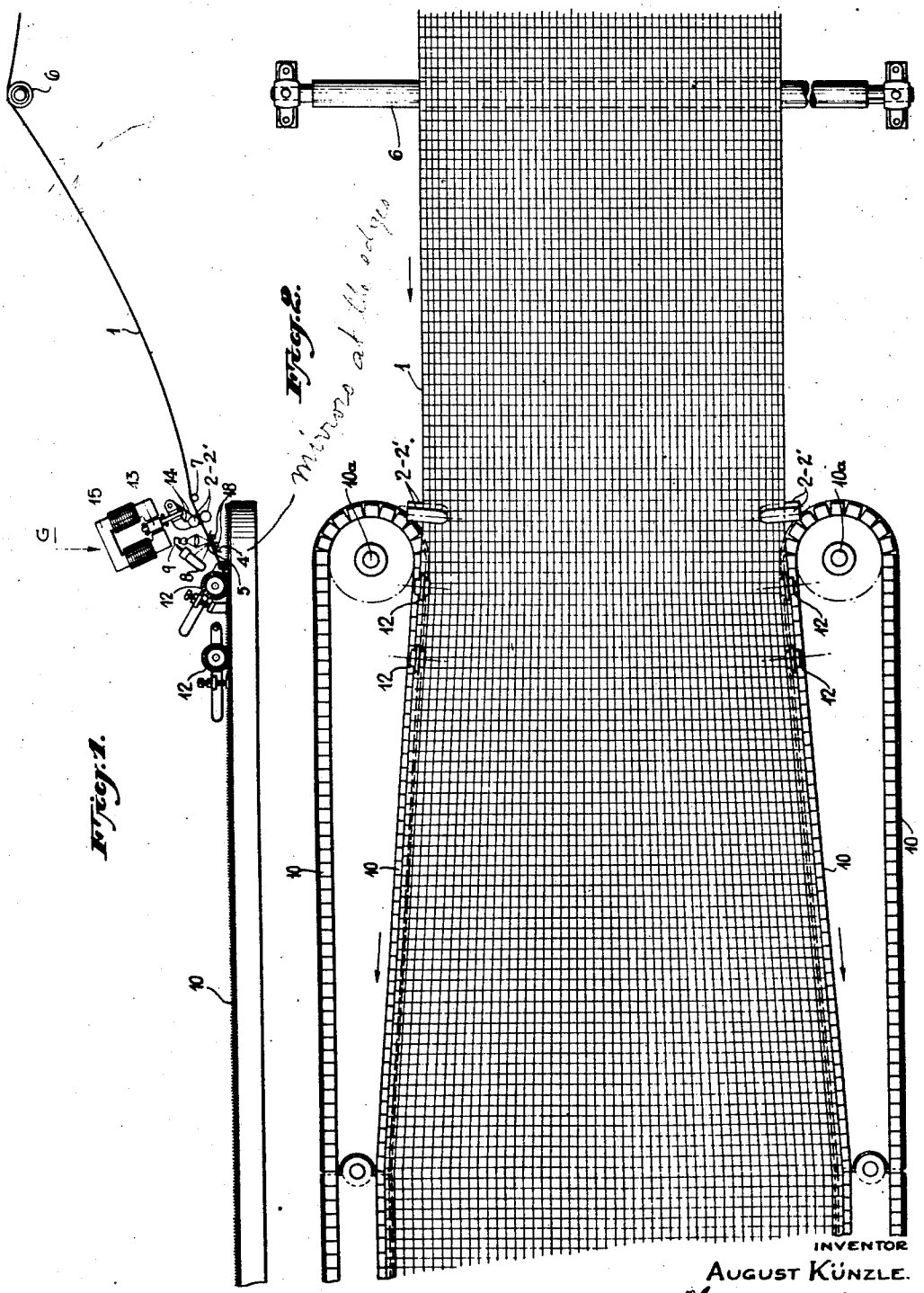
Oct. 12, 1948. A. KÜNZLE 2,451,343

WEB GUIDING DEVICE, PARTICULARLY FOR TENTERING FRAMES

Filed March 1, 1946 5 Sheets-Sheet 1




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WEB GUIDING DEVICE, PARTICULARLY FOR TENTERING FRAMES

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Fig. 3.

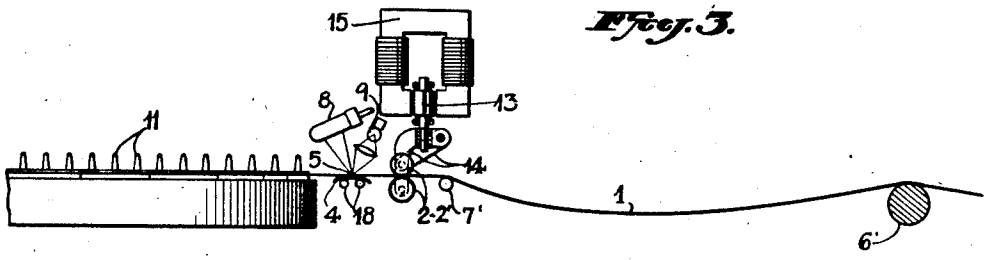



Fig. 4.

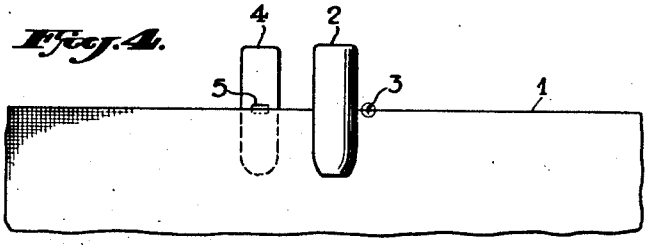



Fig. 5.

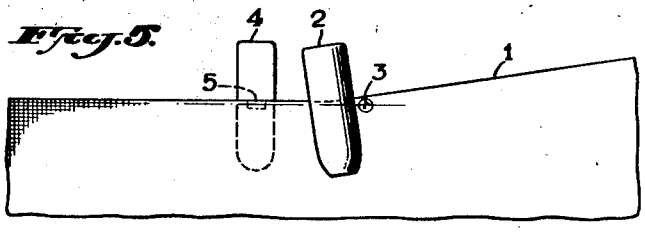
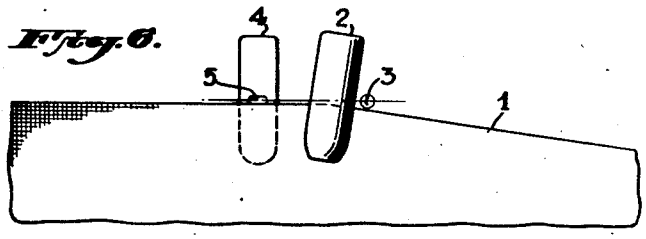



Fig. 6.



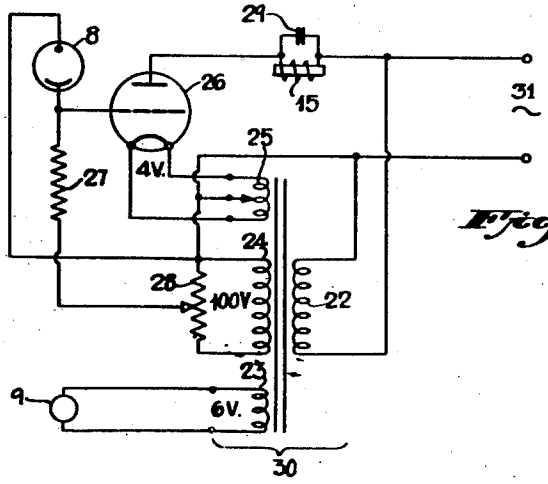




Fig. 14.

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WEB GUIDING DEVICE, PARTICULARLY FOR TENTERING FRAMES

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Fig. 7.

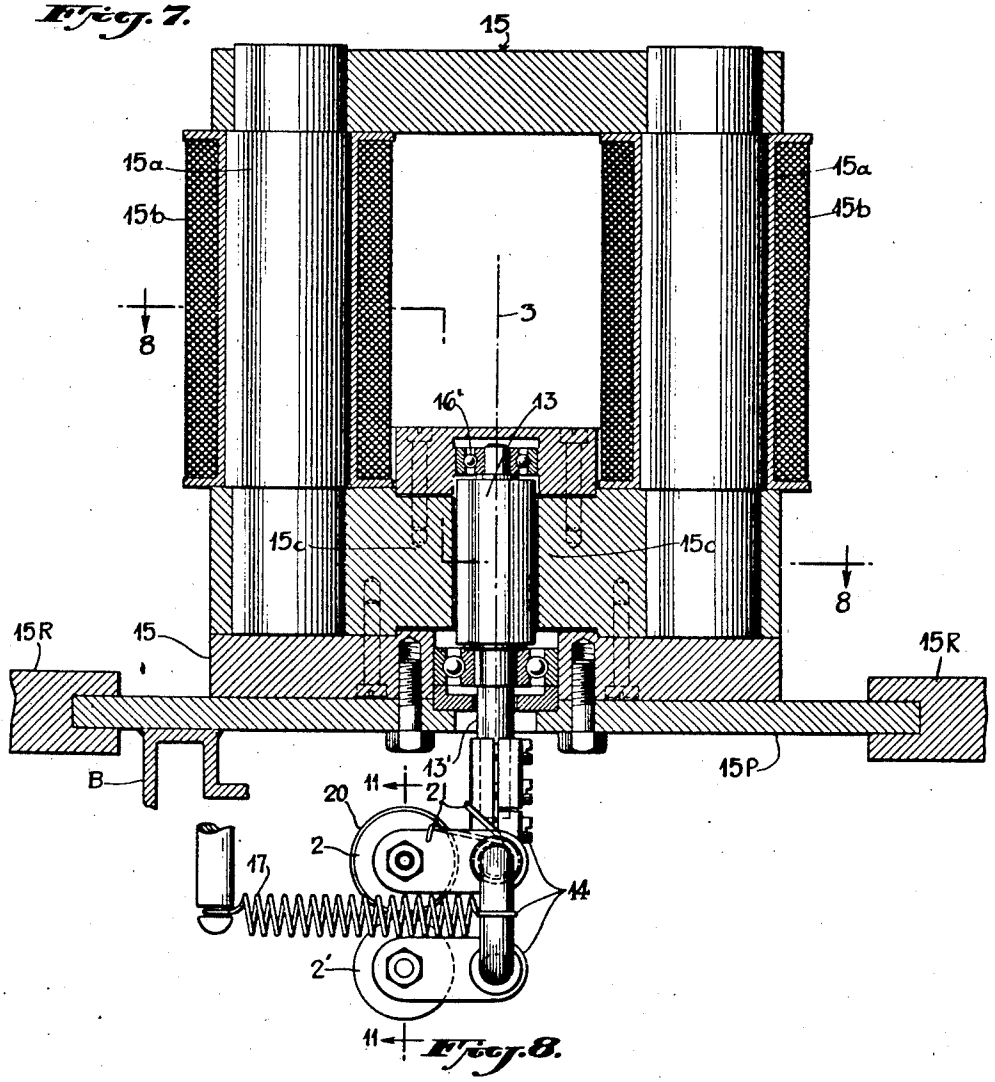
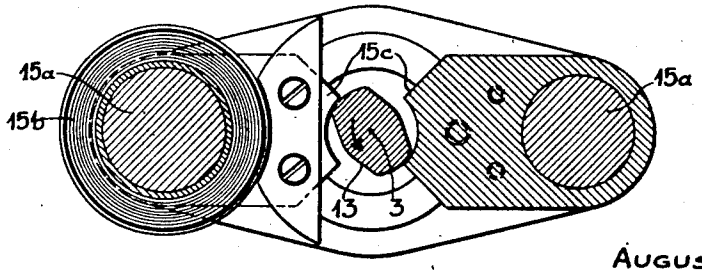



Fig. 8.




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WEB GUIDING DEVICE, PARTICULARLY FOR TENTERING FRAMES

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Fig. 9.

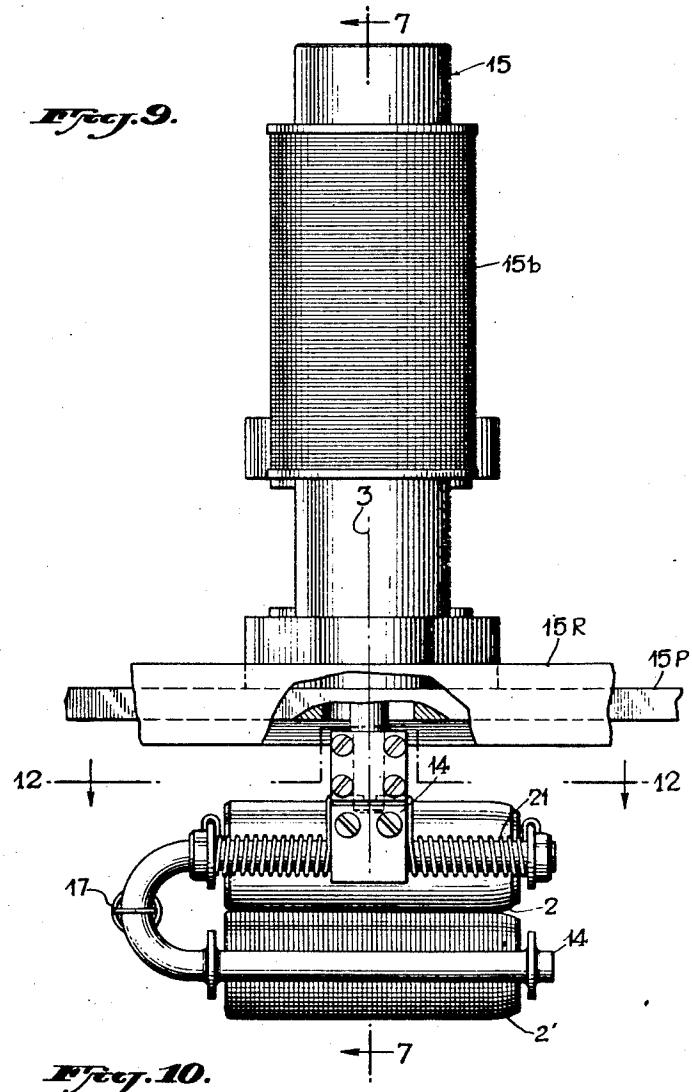
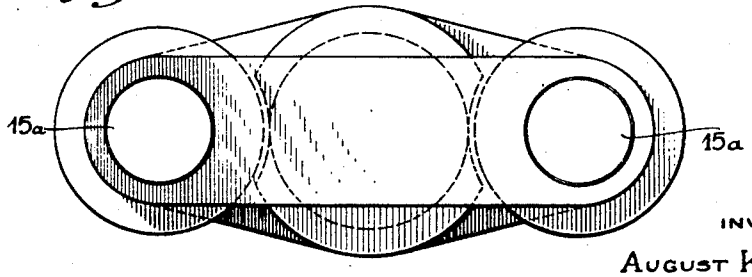



Fig. 10.




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WEB GUIDING DEVICE, PARTICULARLY FOR TENTERING FRAMES

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Fig. 11

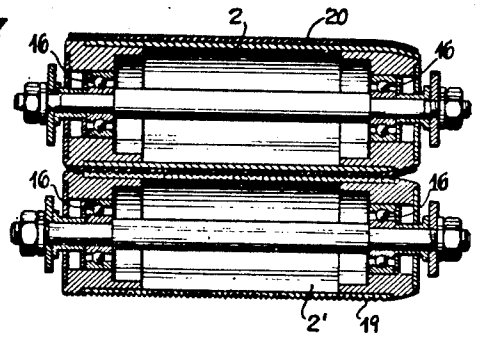



Fig. 12.

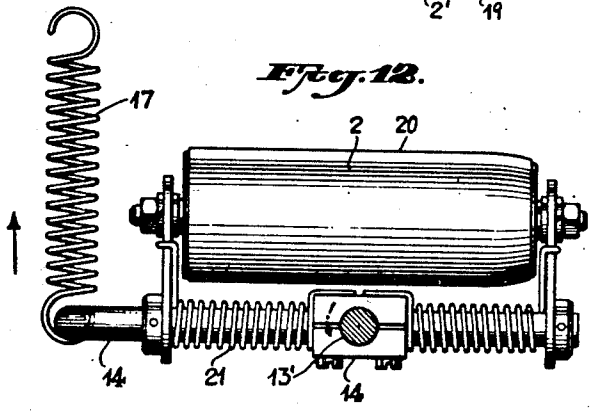



Fig. 13.

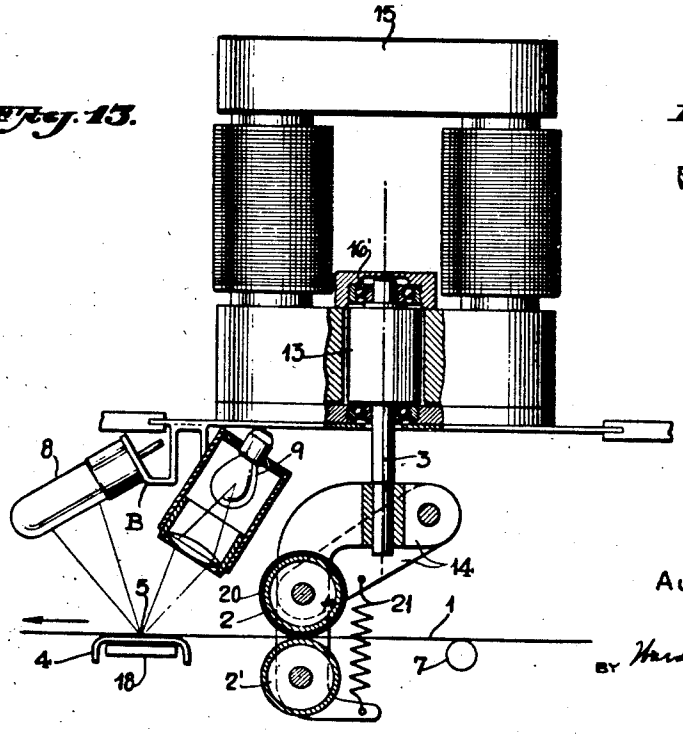
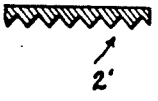



Fig. 11a




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Patented Oct. 12, 1948

2,451,343

# UNITED STATES PATENT OFFICE

2,451,343

## WEB GUIDING DEVICE, PARTICULARLY FOR TENTERING FRAMES

August Künzle, Wattwil, Switzerland, assignor to Heberlein Patent Corporation, New York, N. Y., a corporation of New York

Application March 1, 1946, Serial No. 651,242
In Switzerland March 5, 1945

9 Claims. (Cl. 26—57)

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This invention relates to apparatus for operating upon textile or the like webs of material and has to do more particularly with such apparatus wherein means is employed for holding such web adjacent its respectively opposite longitudinal edges while conducting it in a longitudinal direction. More specifically, the invention has to do with apparatus operable to laterally adjust or direct the marginal edge into proper alignment with such holding and conducting means in order that the web in its progressive longitudinal travel may be uniformly and accurately engaged along its longitudinal marginal edges by said holding and conducting means. In numerous textile operations means are well-known for holding textile webs and conducting them through suitable processing, finishing or the like stages, such for example as so-called stretching frames which may be either tentering or non-tentering in operation, and the particular type of holding means may be either so-called needle chains or clamp chains or the like well-known to those skilled in this art.

Heretofore in introducing the web into apparatus of this character the necessary relative adjustment between the holding and conducting means and the respective edges of the web has been effected by laterally adjusting the engaging position of the input ends of the laterally spaced conducting means, such as pin or clamp chains, under the control of feelers or the like control means. In other words, in accordance with prior practice the holding and conducting means, such as the pin or clamp chains were adjusted laterally at their entering ends so as to be brought to the laterally varying positions occupied by the sinuous edge of the web, such as the selvage of a textile fabric. This prior method has the disadvantage that although the feelers or other control means reacted with sufficient rapidity, the transmission of such reaction into movement of the holding and conducting means relative to the selvage edge was impeded and was not effected with sufficient rapidity by reasons of the inertia of the considerable mass or by lost motion inherent in the numerous moving parts. For such reason the entering of fabrics with a sinuous or other unsatisfactory border into holding and conducting means such as pin or clamp chains, was not possible, particularly when such fabrics were introduced in a tension-free condition.

An object of the invention is to provide an effective and dependable apparatus having the desired characteristics and obviating the above-mentioned disadvantages.

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Another object of the invention is to provide quickly acting apparatus for entering fabric in tentering frames and the like, whether supplied with pin or clip chains.

Another object of the invention is to provide apparatus for laterally guiding the edges of a longitudinally traveling web of fabric or the like flexible material to conducting or holding means disposed in fixed lateral position at respective marginal edges of said web.

A further object of the invention is to provide apparatus which is readily adjustable to different web widths and can be regulated for varying the rapidity of responsiveness.

Further and more specific objects, features and advantages will more clearly appear from the detailed description given below taken in connection with the accompanying drawings which form a part of this specification.

Referring to the drawings:

Fig. 1 is a somewhat diagrammatic side elevational view of an embodiment of the invention utilizing pin chains;

Fig. 2 is a plan view of the embodiment shown in Fig. 1 from which certain parts are omitted for clarity;

Fig. 3 is a view similar to Fig. 1 but showing the use of clamp chains;

Figs. 4 and 5 and 6 are somewhat diagrammatic plan views showing the relative adjustment of certain parts under different conditions of the web feed;

Fig. 7 is a side elevational view, partly in section, of a rotary magnet and operatively connected guide rollers shown in Figs. 1–3;

Fig. 8 is a cross-sectional view, taken along the line 8—8 of Fig. 7, showing further details of the said magnet;

Fig. 9 is a side elevation of the device shown in Fig. 7 viewed from the outer side;

Fig. 10 is a top plan view of the said device shown in Figs. 7 and 9;

Fig. 11 is a sectional view taken at 11—11 of Fig. 7 showing further details of the guide rollers;

Fig. 11a is a somewhat enlarged sectional view of a portion of the shell of the bottom roller of Fig. 11 showing the corrugated periphery;

Fig. 12 is a sectional view taken at 12—12 of Fig. 9 showing further details of the mounting for the rollers;

Fig. 13 is a somewhat diagrammatic side elevational view showing the relative position of certain of the parts shown in preceding figures; and

Fig. 14 is an electrical circuit diagram for the magnet and photo-electric control therefor.

Referring now particularly to Figs. 1 and 2: 1 designates a fabric web being fed forward in the direction indicated by the arrows and passing over an idle roller 6, a guide bar 7, and thence into engagement with suitable holding and feeding means such as the pin chain units 10 which at their entrance end pass around suitable carrier wheels journaled as at 10a and the chains are suitably driven in the direction indicated. The chain units may either be in the form of needle or clamp chains. In Figs. 1 and 2 pin chains are shown and pin pressure brushes such as 12 are provided for urging the fabric margin, such as the selvage edges, into piercing engagement with the needles in a well-known manner. It is noted that the journals 10a are set in a predetermined fixed position of adjustment so as to provide the desired fixed lateral spacing of the input chain ends for a given width and character of fabric; in contra-distinction to the usual practice of adjusting the input ends toward or away from the fabric path to engage the sinuous edges. This invention contemplates adjusting the guiding means for the edges so as to enter the edges in proper register with the relatively fixed chain feed intake, in the manner now to be described.

A pair of guide units, each designated in its entirety as G, are disposed in close proximity to the inlet ends of the feed chains 10 and are spaced laterally in suitable adjusted position, commensurate with the width of fabric being handled. Each of the guide units G in the present embodiment comprises a pair of cooperating freely rotatable rollers 2—2', between which the edge of the fabric is engaged. The rollers (Fig. 11) are freely mounted, as on ball bearings 16, for rotating about substantially parallel axes and are supported on a frame 14 (Figs. 7, 9 and 12) which is mounted for pivotal movement about a torque axis 3 (see also Figs. 4–6) normal to the axes of the rollers and to the path of travel of the fabric web. One of the rollers of each pair, such as the bottom roll 2', is provided with a corrugated periphery 19 (Fig. 11a) and the other, such as the top roll 2, is provided with a relatively smooth rubber or the like resilient covering 20 (see also Fig. 11). The roll 2 is journaled on rigid arms pivoted on said frame 14 and urged into cooperative gripping relation with the roll 2' by torsion springs such as 21 (Fig. 12). The holder frame 14 and rollers 2—2' and their mountings are purposely kept to a light weight, for example, about 150 grams. The frame 14 carries rigidly secured thereto a vertically extending axle shaft 13' concentric with the axis 3 (Fig. 9) and provided with an integral armature portion 13 which is preferably of general oval cross-section. Shaft 13' is suitably journaled in radial and axial thrust ball bearings such as 16' secured in the frame of an electro-magnet designated in general as 15 and having pole pieces 15a, cooperatively associated coils 15b, and pole ends 15c spaced apart laterally to provide a gap in which is disposed the armature 13. The pole ends 15c are preferably tapered inwardly (Fig. 8) transversely, so as to provide a concentrated flux field, and are preferably provided with concave faces concentric to corresponding convex segments of said armature. The direction of angular movement of the armature 13 (Fig. 8) under magnet influence is anti-clockwise. A counter-torque spring 17 (Figs. 7, 9 and 12) urges the frame 14 and pair of rolls 2—2' in a clockwise (Fig. 8) angular direction about the axis 3 (Fig. 12), i. e., opposite to that in which it is moved by the electro-magnet 15. The guide units G are suitably mounted for adjustable lateral movement toward and away from the path of fabric travel, so as to set the rolls 2—2' in proper relation to the selvage edges of the fabric. For example (Fig. 7), the magnet 15 is provided with a frame plate 15P slidably mounted in suitable guide rails 15R.

*Photoelectric control*

Photo-electric control units for the respective guide units G each comprise (Figs. 1, 7 and 13) a light projector 9 and a P. E. cell 8 mounted as a unit and adjustable in a direction parallel to the movement of the guide units G, such as by a suitable supporting bracket B (Figs. 7 and 13) carried by the plate 15P, to thereby slidingly adjust the control unit into registered position relative to the fabric edge. The light projector 9 and P. E. cell 8 are so arranged that a spot of light 5 (Figs. 4–6 and 13) from the projector is directed into operative position on the P. E. cell 8 and the path of the selvedge edge traverses the beam of light so that the P. E. cell is under the influence of the selvage. As will be seen (Figs. 4–6) the spot of light 5 and the torque axis of guide rollers 2—2' are centered on a line defining the desired path of travel of a fabric edge. Preferably mirrors, such as 4, are disposed in fixed position beneath the respective fabric edges in proper alignment with the guide units G and control units 8—9 and are so placed that the spot 5 is half under and half beyond the desired position of the fabric edge relative to the chains 10 at their input ends. The use of mirrors insures proper definition of the light spot at the fabric plane and reflector thereof to said photoelectric cell. To prevent moisture condensation on the mirrors 4 suitable heating elements 18 are preferably employed. The projector 9 provides suitable means for adjusting the size of the light spot 5, such as by adjusting the projector lens in the manner well-known to those skilled in the art. This variation in the size of the spot is a feature of the invention which provides a facile way of varying the rapidity of response to the control unit.

*Electric circuit*

Referring more particularly to Fig. 14: a transformer designated in general as 30 is provided with a primary winding 22, connected to a suitable source of electricity 31, and secondary windings 23, 24 and 25 for furnishing 6 v., 100 v. and 4 v. respectively. The winding 23 furnishes current to the lamp of the projector 9; the winding 24 is connected to a potentiometer 28 which supplies voltage to the grid of a triode 26 and the winding 25 supplies voltage to the cathode filament of the triode 26. A resistance 27 of about 10 megohms is interposed in one of the branches of the grid circuit and the photoelectric cell 8 is interposed in the other of said branches. The anode of the triode 26 is connected to one end of the winding of electromagnet 15 whose other end is connected to one branch of the power line from source 31. A condenser 29 of about 30 microfarads is in circuit across the winding of electromagnet 15. It will thus be seen that anodic current is furnished for energizing the electromagnet 15 in accordance with the activation of photo-electric cell 8 according to the degree of interception of the activating light beam by the traversing edge of fabric 1.

In accordance with the preferred form of the invention the current required to operate the electro-magnet 15 is relatively weak, i. e., about 50 to 100 milliamperes, but with the form of electro-magnetic means utilized the torsional movement is sufficiently large to introduce fabrics under considerable tension.

*Operation*

With the guide units G and associated photoelectric cell controls disposed in the manner above described the two sets of roller pairs will grip the respective opposite marginal edges of the fabric f and each roller pair will be operable to swivel about its torque axis 3 which is normal to the path of fabric travel. The rollers being fully rotatable about their axes will permit the fabric to be freely drawn therebetween in the direction of web travel but due to the gripping action and enhanced by the corrugated periphery of the lower roller and resilient surface of the other roller the fabric will be so held against lateral or angular movement relative to the rollers that its path is readily controllable by angular movement of the rollers.

In the first instance the guide rollers of respective guide units (Figs. 1 and 2) will be assumed to be in a neutral position corresponding to that shown in Fig. 4 for one side of the fabric. In this position the web edges lie on the desired lines of feed and pass through the center of respective light spots 5. Assuming, now, that the edge of the fabric web f lies outside of the desired path of travel as determined by the setting of feed chains 11, then the edge will approach the corresponding guide rollers in the manner shown in Fig. 5. At first the web edge will cover the light spot, or at least reduce the exposed area, thereby eliminating or reducing the P. E. cell activation and a corresponding diminution of current flow through magnet coil 15b of that unit and reduction in magnetic torque. This will result in actuation of the unit G, under the influence of spring 17, to angularly move the guide rollers about their swivel axis 3 to the angle shown in Fig. 5 and this in turn will guide or direct the web edge in the desired or neutral line of travel. Conversely, if the edge lies inside the desired path of travel, the rollers 2—2' adjacent that edge will be angularly moved about their torque axis 3 to the position shown in Fig. 6; due to the increase in P. E. cell activation causing corresponding increase in current supplied to energize magnet 15 and increase in magnetic torque sufficient to partially or fully overcome the countertorque of spring 17.

It will be noted that the position of balance between the torque of the magnet 15 and countertorque spring 17 makes it possible to use only one light spot and associated photoelectric cell adjacent each fabric edge, and hence provides a greatly simplified apparatus. In addition, this arrangement provides an extremely sensitive control. Furthermore, the fixed input feed throat of the chains such as 11 (for a given width of fabric) in addition to permitting sensitiveness of adjustment due to the elimination of undesirable inertia and lost motion of moving parts, eliminates continuous movement of chains 11 which would be required if the chains were adjusted laterally toward the fabric edge as in the prior devices.

In contradistinction to devices already known, it is possible to obtain with the apparatus according to their invention a sufficiently large deflection in about 1/50 part of a second, whereby very considerable sinuosities of the border are contacted for entering the fabric into the pin or clamp chain without tension. This result is achieved more particularly by the small masses of the transmitting members, a swivelling pair of rollers that grip the border of the fabric and enter the same and which only possess a weight of 150 gms. including the holder.

The apparatus according to the invention is furthermore adjustable in an excellent manner during the running of the machine, because it is connected to a photoelectric control, operated by a spot of light on the selvage, the position of which (Fig. 7), as by sliding the plate 15p in the guide rails 15r, can be conveniently altered during the working of the machine. Thereby the depth, i. e., the distance inwardly from the edge, to which the pins are pressed in the fabric, can be regulated as desired during operation.

A further advantage of the apparatus, according to the invention, is afforded by the possibility to influence the smoothness of the regulation by the size of the spot of light on the selvage. The feelers of the entering devices hitherto in use only permit the change-over from the forward to the reverse running or vice versa of the adjusting motor of the inlet field, but do not allow any control of the speed in the adjustment of the selvage to the inlet field. In contradistinction thereto, the apparatus according to the invention allows the regulation of the speed of the adjustment in high degree by the employment of a spot of light as a feeling device, which is covered or uncovered by the selvage. By such means the size of the spot effects the rapidity of the responsiveness of the adjustment. The larger the spot is, the more gradual is the adjustment. This is effected at the cost of the accuracy, because with a large spot the deviations of the entering edge and the corresponding deviation in the position of the engagement thereof by the pins is increased.

Having thus described my invention with particularity in connection with certain preferred forms thereof, it will be obvious to those skilled in the art, after understanding my invention, that other changes and modifications may be made without departing from the spirit and scope of the invention, and I aim in the appended claims to cover such changes and modifications as are within the scope of the invention.

What I claim is:

1. In apparatus for controlling the lateral alignment of a marginal edge of a longitudinally traveling web of textile fabric or the like flexible material, the combination of a pair of rotatable guide rollers constructed and arranged to grip said marginal edge therebetween and pivotally mounted for angular movement about a torque axis substantially normal to said web travel, electro-magnetic motive means exerting a continuous torque force when energized, for progressively angularly moving said rollers in one direction only about their torque axis to any desired torque position within the range of movement, a counter-torque spring urging said rollers in an opposite direction of angular movement, and photoelectric means for controlling said motive means, said photoelectric control means comprising a photoelectric cell and means for projecting a beam of light across the path of travel of said web edge and onto said photoelectric cell said electro-magnetic motive means and photoelectric cell control means being so con-

structed and arranged that the angular movement of said pair of guide rollers about said torque axis increases proportionately with the increasing deviation of fabric from its desired course.

2. In apparatus for controlling the lateral alignment of a marginal edge of a longitudinally traveling web of textile fabric or the like flexible material relative to margin engageable means such as a feed chain or a tenter frame, the combination of a pair of freely rotatable guide rollers constructed and arranged to grip said marginal edge therebetween and pivotally mounted for angular movement about a torque axis substantially normal to said web travel, said rollers being mounted for lateral adjustment movement toward and away from the path of travel of said margin engageable means, electromagnetic motive means exerting a continuous torque force when energized, for progressively angularly moving said rollers in one direction only about their torque axis to any desired torque position within the range of movement, a counter-torque spring urging said rollers in an opposite direction of angular movement, and photoelectric means for controlling said motive means, said photoelectric control means comprising a photoelectric cell and means for projecting a beam of light across the path of the edge of said web in alignment with said margin engageable means and onto said photoelectric cell said electro-magnetic motive means and photoelectric cell control means being so constructed and arranged that the angular movement of said pair of guide rollers about said torque axis increases proportionately with the increasing deviation of fabric from its desired course.

3. In apparatus for controlling the lateral alignment of a marginal edge of a longitudinally traveling web of textile fabric or the like flexible material, the combination of a pair of rotatable guide rollers constructed and arranged to grip said marginal edge therebetween and pivotally mounted for angular movement about a torque axis, substantially normal to said web travel, electro-magnetic motive means exerting a continuous torque force when energized, for progressively angularly moving said rollers in one direction only about their torque axis to any desired torque position within the range of movement, a counter-torque spring urging said rollers in an opposite direction of angular movement, and photoelectric means for controlling said motive means, said photoelectric control means comprising a photoelectric cell and means for projecting a beam of light across the path of travel of said web edge and onto said photoelectric cell, said projector including means for adjusting the cross-sectional size of said light beam in the plane of travel of said web, said electro-magnetic motive means and photoelectric cell control means being so constructed and arranged that the angular movement of said pair of guide rollers about said torque axis increases proportionately with the increasing deviation of fabric from its desired course.

4. In apparatus for controlling the lateral alignment of a marginal edge of a longitudinally traveling web of textile fabric or the like flexible material, the combination of a pair of rotatable guide rollers constructed and arranged to grip said marginal edge therebetween and pivotally mounted for angular movement about a torque axis substantially normal to said web travel, electro-magnetic motive means exerting a continuous torque force when energized, for progressively angularly moving said rollers in one direction only about their torque axis to any desider torque position within the range of movement, a counter-torque spring urging said rollers in an opposite direction of angular movement and photoelectric means for controlling said motive means, said photoelectric control means comprising a photoelectric cell and means for projecting a beam of light across the path of and in register with one edge of a traveling web to be aligned, and a reflecting surface in fixed position contiguous said plane of travel and interposed in the light path between said projector and cell said electro-magnet motive means and photoelectric cell control means being so constructed and arranged that the angular movement of said pair of guide rollers about said torque axis increases proportionately with the increasing deviation of fabric from its desired course.



5. In apparatus for controlling the lateral alignment of a marginal edge of a longitudinally traveling web of textile fabric or the like flexible material, the combination of a pair of rotatable guide rollers constructed and arranged to grip said marginal edge therebetween and pivotally mounted for angular movement about a torque axis substantially normal to said web travel, electro-magnetic motive means exerting a continuous torque force when energized, for progressively angularly moving said rollers in one direction only about their torque axis to any desired torque position within the range of movement, a counter-torque spring urging said rollers in an opposite direction of angular movement, and photoelectric means for controlling said motive means, said photoelectric control means comprising a photoelectric cell and a light projector mounted for simultaneous movement toward and away from said path of travel of said marginal edge, said cell and projector being so constructed and arranged that light from said projector to said cell is intercepted by said path of travel to an extent commensurate with the degree of alignment control of an edge of fabric relative to its path of travel said electro-magnetic motive means and photoelectric cell control means being so constructed and arranged that the angular movement of said pair of guide rollers about said torque axis increases proportionately with the increasing deviation of fabric from its desired course.

6. In apparatus for guiding the edge of a traveling web of textile fabric or the like flexible material, the combination of an electromotive means comprising pole ends spaced apart to provide an armature gap and a soft iron armature disposed in said gap and mounted for angular movement about a torque axis, said sole ends being tapered laterally toward their inner ends and presenting faces relatively narrow in lateral extent and relatively long in a direction substantially parallel to said torque axis, said armature being of generally oval cross-section with its greatest diameter slightly less than the space between said pole faces, a pair of rotatable guide rollers resiliently urged towards each other for engaging a web of material to be guided thereby and mounted for angular motion about an axis of revolution substantially normal to their axes of rotation, said guide rollers being drivingly connected to said armature for angular movement thereby in one direction about said axis of revolution, a counter-torque spring urging said rollers and armature in an opposite direction of an-

gular movement about said axis of revolution, and photoelectric means including a photoelectric cell for controlling said motive means and a light source for activating said cell, said light source and cell being so disposed relative to each other and to the desired path of travel of a fabric edge that the beam of light from said light source to said cell is traversed by the said fabric edge.

7. In apparatus for guiding the edge of a traveling web of textile fabric or the like flexible material, the combination of electromotive means comprising pole ends spaced apart to provide an armature gap and an armature disposed in said gap and mounted for angular movement in one direction only about a torque axis, a pair of guide rollers resiliently urged towards each other for engaging a web of material to be guided thereby and rotatable about axes substantially normal to said torque axis, said guide rollers being drivingly connected to said armature for angular movement thereby in said one direction, a counter-torque spring urging said rollers and armature in an opposite direction of angular movement and photoelectric means including a photoelectric cell for controlling said motive means and a light source for activating said cell, said light source and cell being so disposed relative to each other and to the desired path of travel of a fabric edge that the beam of light from said light source to said cell is traversed by the said fabric edge.

8. In apparatus for controlling the lateral alignment of a marginal edge of a longitudinally traveling web of textile fabric or the like flexible material, the combination of a pair of freely rotatable guide rollers constructed and arranged to grip said marginal edge therebetween and pivotally mounted for angular movement about a torque axis substantially normal to said web travel, electro-magnetic motive means for angularly moving said rollers in one direction only about their torque axis, a counter-torque spring urging said rollers in an opposite direction of angular movement about said torque axis an electrical circuit comprising a thermionic valve for supplying anodic current to said electro-magnetic motive means and a photo-electric cell for controlling said anodic current, and means for projecting a beam of light across the path of travel of said web edge and onto said photoelectric cell, to thereby align an edge of said traveling web in



accordance with its degree of interception of said light beam.

9. Apparatus for operating upon textile or the like flexible webs, comprising web conducting mechanism having laterally spaced margin engageable means providing a fixed entrance width, two pairs of freely rotatable guide rollers constructed and arranged to grip opposed marginal edges of said web adjacent the entrance to said web conducting means, each pair of said guide rollers being pivotally mounted for angular movement about a torque axis substantially normal to said web travel, a pair of electro-magnetic motive means exerting a continuous torque force when energized and drivingly connected to respective of said pairs of rollers for progressively angularly moving the same in one direction only about their torque axes, a pair of counter-torque springs urging respective of said pairs of rollers in an opposite direction of movement about respective of said torque axes, and photoelectric means operatively connected to respective of said motive means for controlling the same, said photoelectric means each comprising a photoelectric cell and means for projecting a beam of light across the path of travel of its corresponding web margin and onto its corresponding photoelectric cell.

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