July 1, 1952 L. C. NIELD 2,601,713

WEB GUIDING DEVICE

Filed July 22, 1947 4 Sheets-Sheet 1

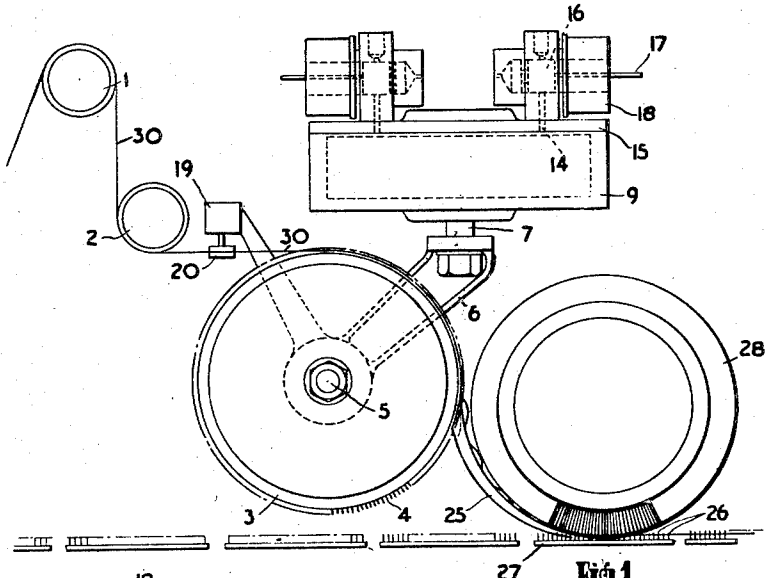


Fig. 1.

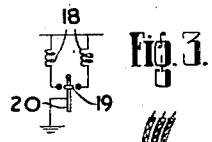


Fig. 3.

Fig. 2.

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July 1, 1952 L. C. NIELD 2,601,713

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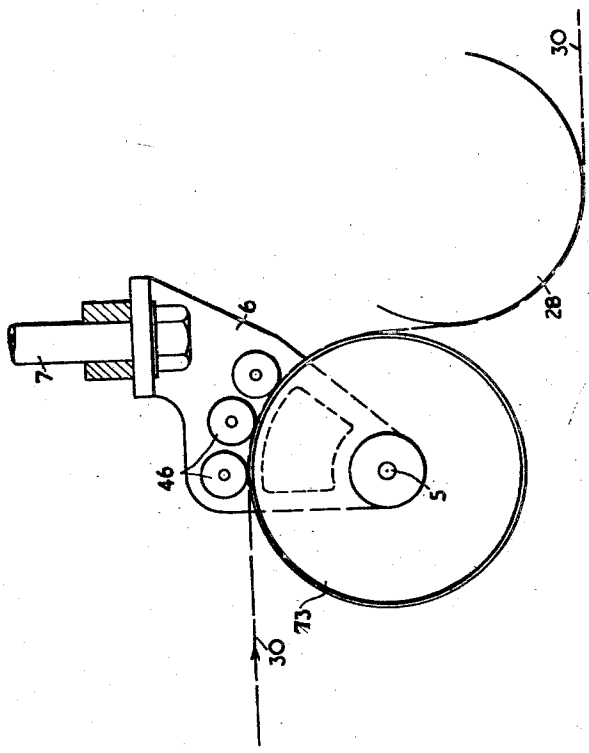


Fig. 5.

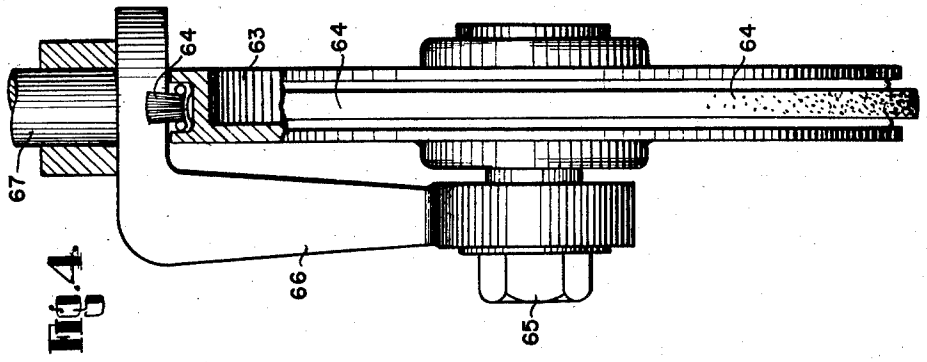


Fig. 4.

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July 1, 1952 L. C. NIELD 2,601,713

WEB GUIDING DEVICE

Filed July 22, 1947 4 Sheets-Sheet 3

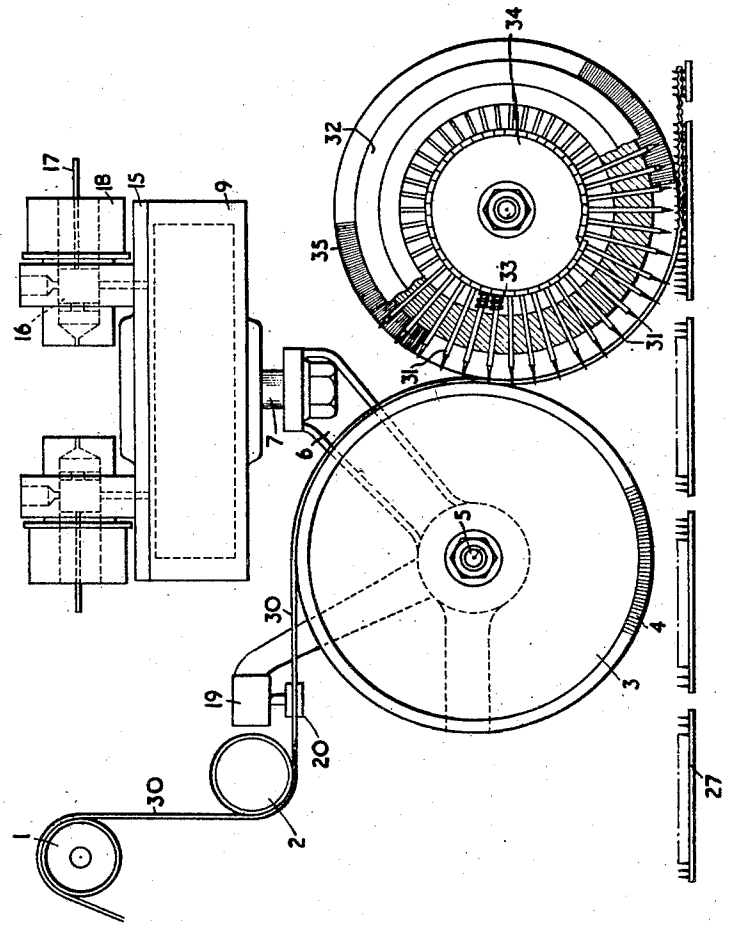


Fig. 5.

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WEB GUIDING DEVICE

Filed July 22, 1947 4 Sheets-Sheet 4

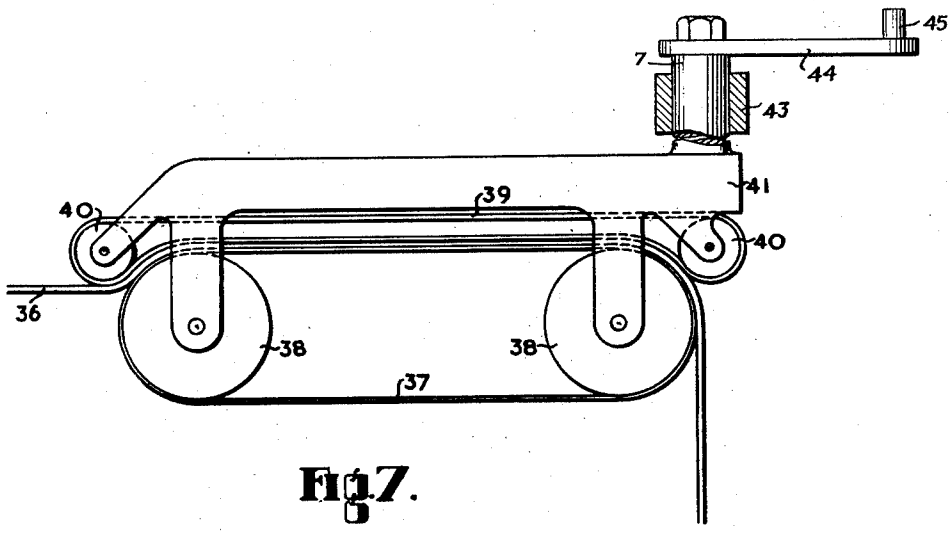


Fig. 7.

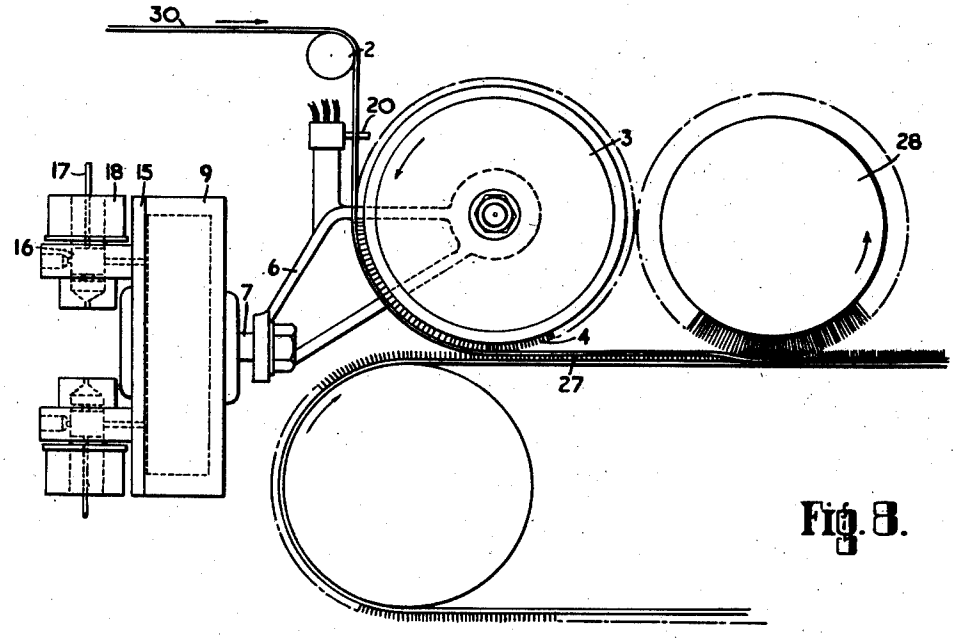


Fig. 8.

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Patented July 1, 1952 2,601,713

UNITED STATES PATENT OFFICE

2,601,713

WEB GUIDING DEVICE

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Application July 22, 1947, Serial No. 762,664
In Great Britain August 1, 1941

Section 1, Public Law 690, August 8, 1946
Patent expires August 1, 1961

20 Claims. (Cl. 26—57)

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The present invention relates to an improved web guiding device and is a continuation-in-part of my application Serial No. 651,358, filed March 1, 1946, now abandoned.

One object of the present invention is to insure the accurate feeding of a band or web of, for example, cloth to the pins of a pair of stenter chains.

An object of this invention is to provide a guiding device where no uneven strain is applied to one side of the web as compared with the other.

Another object of the invention is to maintain constant the points in space at which the web leaves the guiding device.

According to this invention a band or web is guided by an element in contact over a curved surface with a narrow area at the edge of the web which is maintained parallel to said edge by deflection about an axis fixed in space at right angles to the axis of said curved surface, meeting the surface of the web at a tangent at the point of its disengagement from the curved surface of the guide element, and disposed on the line of desired run of said edge, by a control operated by said edge previous to its engagement with said element.

The guiding member, such as a wheel or endless band, controlling the deflection of the band or web is mounted to pivot about an axis which is in line with or substantially in line with the point of disengagement of the web with the said wheel or endless band. If only one guiding member is used, it may be necessary to make provision to prevent one edge lagging behind the other by virtue of one edge having to pass through a greater distance over the guiding member than the other edge not passing over a guiding member.

Usually, however, a pair of such guiding members is provided, preferably working independently, which engage with the two edges of a web, for example the selvedges of a web of cloth, and are deflected by controls cooperating with the two edges of the web. The guiding member will be usually in the form of a wheel having pins, or having a surface of material having a high coefficient of friction, but might consist of a pair of wheels connected by a chain provided with pins or again an endless band of frictional material.

The operation and control of the deflection of the guide wheel may be by mechanical, pneumatic, fluid or electrical means, or operation may be by one and control by another.

The invention is further described with reference to the accompanying drawings, in which:

Figure 1 is a side elevation of one form of construction,

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Figure 2 is a corresponding plan view,

Figure 3 is a diagram,

Figure 4 shows a modified form of construction of guide element,

Figure 5 is a diagrammatic side view of another form of construction,

Figure 6 is a side elevational view partially in section of a guide device, being a modification of that shown in Figures 1 and 2,

Figure 7 is a diagrammatic side view of still another form of construction, and

Figure 8 is a further diagrammatic side view of a further alternative form of construction.

The web of cloth or other material **30** passes over the usual take up rollers **1**, **2**, Figs. 1 and 2, and preferably both selvedges are then engaged by guide wheels **3** preferably made of a light material such as aluminium and provided with pins **4**, preferably about $\frac{1}{16}$'' long, which wheels are revolvable about a spindle **5** carried on a caster bracket **6** mounted on a spindle **7**. This spindle **7** has keyed to it a vane **8** adapted to be displaced by air pressure to one side or other of the central position, shown in Figure 2, in the cylinder **9**, which cylinder has a pair of radial walls **10**, **11**, each provided with an inlet port **12**, **13** respectively, directly connected to the controlled pressure air receiver, whilst outlet ports **14** are formed in the cover **15** of the cylinder. These outlet ports are controlled by slide valves **16**, Fig. 1, the valve rods **17** of which each carry an armature disposed within a solenoid coil **18**, Figs. 1 and 3, the circuit of which is completed by a switch **19** closed whenever a finger or spade **20** is deflected by the selvedge of the cloth. The finger or spade is maintained in contact with the selvedges by means of a spring (not shown).

The valve rods **17**, Fig. 1, are further connected by link mechanism (not shown) to the spindle **21** of a cam **22**, Fig. 2, adapted by mechanical, electrical, pneumatic or fluid action to lift a brake shoe **23** against the pressure of springs (not shown) away from cylindrical segment **24** on the piston vane **8**. This brake shoe is sufficiently long to allow the vane to rotate through 45° on either side of its mean position without passing out of reach of the point where the braking action is applied.

The cloth passes over an arc of wheel **3**, preferably this arc is 90° but may be less.

The cloth passing from the guide wheel **3**, Fig. 1, may be stripped therefrom by means of a stripper **25** and then impressed upon the pins **26** of the stenter chains **27** by a rotating brush wheel **28**, known per se.

In certain cases it may be desirable to feed the cloth at a greater or less peripheral speed

than the speed of the stenter chain, and for this purpose the feed wheel 3 may be driven by any suitable known means, at an adjustable rate of speed.

In operation, with the vane 8 in the position shown in Figure 2 the guide wheel 3 will lie in a central position, as shown, parallel with the sides of the stenter chain 27, Fig. 1. Should, however, the cloth become deflected to one side or the other, then the spades in contact with both selvedge edges will operate switches 19 to cause air pressure on one or other side of the vane 8 to fall, the simultaneous release of the brake 23 allowing this vane to be deflected and the pin wheel 3 to take up a position at an angle to the side line of the stenter chain, maintaining the edge of the cloth in predetermined disposition relative to these chains. As soon as the vane 8 has taken up its new position the circuit of the switch 19 is broken since the switch will have returned to the original position relative to the spade, and the brake shoe 23 released to lock the segment 24 and thus prevent "hunting."

It is important in this device that the distance from the axis of the spindle 7, about which the guide wheel can swing, to the point of contact of the selvedge with the spade should be as near as possible to that from the axis to the initial point of engagement of the selvedge with the guide wheel. This ensures that a given lateral movement of the selvedge will cause an exactly equal lateral movement of the initial point of engagement of the selvedge with the guide wheel in the same direction.

It is important to note that the web is deflected by the two guiding devices about a pair of points fixed in space, which two points will normally be disposed at the intersection of the axes of the spindles 7 with the surface of the web as it leaves the peripheries of the guide wheels 3 or equivalent element, or where only one guide wheel is used, one of the said two points will be so disposed. The web therefore leaves the guiding device at points which remain fixed, which disposition allows subsequent machine parts, such as stenter chains, to be aligned thereto.

As the moving parts of this device are very light it will operate on very low air pressure.

The control for the said wheel 3 may, however, be of any desired known type. The wheel may be displaced about the axis of the spindle 7 according to the displacement of the selvedge edge or selvedge edges of the cloth from a predetermined path by the interception of a light beam directed upon the field of a photoelectric cell by the edge of the cloth, through electronic apparatus operating a split field motor by a finger or spade engaging with the edge of the cloth, by air jets masked by the edge of the cloth, or such similar means.

It is obvious, of course, that, instead of a stenter of the pin type, a stenter of the clip type may be used, and that this invention may be used to guide webs of material into other machines than stenters.

Since, as has been mentioned, all the pins on this guiding device can be short, they do not leave obvious perforations in the cloth selvedges. These perforations are therefore no serious disadvantage even if the cloth has been applied to two sets of pins. When the cloth has been applied to a pin stenter the stenter pin marks will be those most easily visible even if the guiding pin marks can be seen at all.

An over-feed of the cloth 30 to the stenter chains, is particularly useful in shrinking processes. Where, however, the cloth is fed to the stenter chains at the same peripheral speed as the movement of these, or by a wheel interposed between guide wheel 3 and brush wheel 28 as described above, it may be found that no stripping device 25 is necessary. The cloth can also be fed at less than the peripheral speed of the stenter chains.

The guide wheel 63 (Fig. 4), functioning similarly to the wheel 3 (Fig. 1), is of greater diameter than width, as may be seen from Fig. 4, and may have a friction surface which may be either felt or emery cloth, or again a plurality of bristles 64, which bristles may either be natural fibre, made of a synthetic resin or other mouldable plastic material, or metal wires similar to the well known card clothing used in textile carding engines. This wheel 63, having a surface of bristles or wires, rotates about a fixed spindle 65 carried on a bracket 66 on a shaft 67 displaceable about a vertical axis, to guide the fabric web.

Where the guide wheel 73, similar to the wheel 3 of Figure 1, has a surface of frictional material the web of fabric or other material may be held upon this surface by an endless band or plurality of small wheels 46 as shown in Figure 5.

An alternative guiding arrangement, taken by way of example, is shown in connection with Fig. 6 where the web of cloth or other material passing from the guide wheel 3, the surface 4 of which consists of wire carding, or bristles, or the like material having a high coefficient of friction, is transferred to pins 31 radially displaceable in a wheel 32 against springs 33 by reason of the rotation of the wheel 32 relatively to a stationary cam 34. These pins 31 penetrate the cloth fabric and also the yielding surface 4 of wire carding or bristles or the like material covering the wheel 3. The pins 31 can retract to release the fabric impaled upon them at a point in their travel about the centre of the wheel 32 where the continuation of the path during which the web is engaged by said pins intersects the locus of the points of the stenter pins on chains 27. By this means whenever an overfeed of the web on to the stenter pins is effected by arranging that the peripheral speed of the wheel 3 is greater than the peripheral speed of the stenter chains 27 then the web is impaled on the stenter pins, in known manner, in small loops between adjacent pins 31 to allow for subsequent shrinkage of the web. This pin wheel 32 may have a set of bristles 35 on either side of the pins 31 serving to push the web 30 on to the pins of the stenter chain 27.

It is to be noted that the distance through which the web or band has to travel round the periphery of wheel 3 is only slightly less than the distance the web travels from the control spade along the same path.

In the further modification shown diagrammatically in Fig. 7, the fabric web 30 is deflected from its rectilinear path, passing over an endless band 37 of frictional material such as felt of narrower width than the diameter of the guide rolls 38 and may further be held upon the surface of this band 37 by means of a second band 39 having a frictional surface guided over narrow wheels 40, the narrow wheels 38 and 40 being carried by a frame 41 mounted on a spindle 42 disposed in line with the point of disengagement of the web from the endless band 37 and carried in bearings 43. This spindle 42 is located relatively to the vertical tangent of the following

wheel **38** as required in the previous apparatus. This spindle **42** may be provided with a crank arm **44** and crank pin **45** by which it may be deflected about the said axis for the guiding of the fabric.

It is not essential that the axis of the spindle be vertical; in the arrangement shown in Figure 8 the guide wheel **3** is deflected about a horizontal axis, and the fabric web **30** is directly laid on the pins of the stenter **27**, the brush wheel **28** serving to impale the fabric on the pins of the stenter. A cam wheel such as **32**, Figure 6, can be substituted for the wheel **28**. Further, the guide wheel **3** in this construction also may if desired be driven at a greater peripheral speed than the linear speed of the stenter **27**.

The machines made according to this invention are of very simple construction and consequently have a low cost, are easy to apply to existing stenter machines, and are unlikely to give mechanical trouble during use. Furthermore, the small and light moving parts have small inertia to rapid movement and to stoppage after movement. The machines can combine guiding with over or under feeding during which there is little danger of loss of over or under feed due to the web slipping.

I declare that what I claim is:

1. A guiding device for travelling webs, consisting of a guiding element including a curved surface, a pivotal support for said guiding element disposed on an axis substantially in line with the place of disengagement of the web from said curved surface and lying in the plane of the web after it leaves said curved surface, a vane connected to said pivotal support, a housing enclosing said vane and having fluid pressure inlet and outlet connections, and control means operated by an edge of the web to control the fluid pressure displacement of said vane.

2. A guiding device for travelling webs, consisting of a guiding element including a curved surface, a pivotal support for said guiding element disposed on an axis substantially in line with the place of disengagement of the web from said curved surface and lying in the plane of the web after it leaves said curved surface, a vane connected to said pivotal support, a housing enclosing said vane and having fluid pressure inlet and outlet connections, control means operated by an edge of the web to control the fluid pressure displacement of said vane, and means to brake said vane during such time as said control means is not in operation.

3. A guiding device for travelling webs, consisting of a guiding element including a curved surface, a pivotal support for said guiding element disposed on an axis substantially in line with the place of disengagement of the web from said curved surface and lying in the plane of the web after it leaves said curved surface, a vane connected to said pivotal support, a housing enclosing said vane and having fluid pressure inlet and outlet connections, valves on said fluid pressure connections, electromagnets for operating said valves, switch means controlling the circuit of said electromagnets, and control means operated by an edge of the web for controlling said switch means.

4. The method of guiding a web of material to bring an edge thereof into a path lying in a predetermined plane which comprises constraining a narrow area of said web at said edge to travel in an arcuate path, leading said web from said arcuate path into a path at a tangent thereto and displacing the part of the web in said arcuate path by rotation about said tangent.

5. A device for guiding a web of material consisting in combination of a moving element having a surface of high coefficient of friction a part at least of which surface is curved, means to deflect the web from a rectilinear path with a narrow area at an edge thereof in frictional engagement with the curved part of said surface of said moving element, which surface does not penetrate the web, and means to swivel said moving element about an axis intersecting the point of disengagement of the web from said surface in the plane of the web as it leaves said curved part of said surface.

6. A device for guiding a web of material, consisting of a wheel having a surface of high coefficient of friction engaged around an arc of its periphery by the web along a narrow area adjacent an edge thereof alone, a pivot for said wheel the axis of which is substantially in line with the place at which the web becomes disengaged from said wheel and which lies in the plane of the web as it leaves said wheel, means to displace said wheel angularly about its pivot, and control means for said displacing means operated from an edge of the web.

7. A device for guiding a web of material, consisting of an endless moving bristle backing a part at least of which is curved, a plurality of bristles extending radially from said bristle backing the tips of said bristles forming an endless moving surface, and means to swivel said endless bristle backing about an axis substantially in line with the place at which the web becomes disengaged from a curved part of said endless moving surface and which lies in the plane of the web as it leaves said endless moving surface.

8. A guiding device for travelling webs, consisting of a guiding element, having at least part of its surface curved, which guiding element is in contact with the travelling web and moves at the same speed, a pivotal support for said guiding element disposed on an axis tangential to the place at which the web leaves contact with said curved part of said surface of said guiding element and means to displace angularly said guiding element about said pivotal support.

9. A guiding device for travelling webs, consisting of a guiding element, having at least part of its surface curved, which guiding element is in contact with the travelling web and moves at the same speed, a pivotal support for said guiding element disposed on an axis tangential to the place at which the web leaves contact with said curved part of said surface of said guiding element, means to displace angularly said guiding element about said pivotal support, and a control for said displacing means operated from the edge of the said web and disposed at a point prior to the engagement of the web with said guiding element.

10. A guiding device for travelling webs, consisting of a guide wheel which is in contact with the travelling web and moves at the same speed, a pivotal support for said guide wheel disposed on an axis tangential to the place at which the web leaves contact with the curved surface of said guide wheel and means to displace angularly said guide wheel about said pivotal support.

11. A guiding device for travelling webs, consisting of a guiding element, having at least part of its surface curved, which guiding element is in contact with the travelling web and moves at the same speed, pins on said guiding element engaging with the web along a narrow area adjacent its edge alone, a pivotal support for said guiding element disposed on an axis tangential

to the place at which the web leaves contact with said curved part of said surface of said guiding element and means to displace angularly said guiding element about said pivotal support.

12. A guiding device for travelling webs, consisting of a guiding element having at least part of its surface curved, a pivotal support for said guiding element the axis of which lies in line with the place of disengagement of the web from said curved part of said surface and lies in the plane of said web as it leaves said curved part of said surface, pins on said guiding element lying in a plane intersecting the axis of said pivotal support and engaging the web along a narrow area adjacent an edge of the web alone, and means to displace said guiding element about the axis of said pivotal support.

13. A guiding device for travelling webs, consisting of a guiding element having at least part of its surface curved, a pivotal support for said guiding element the axis of which lies in line with the place of disengagement of the web from said curved part of said surface and lies in the plane of said web as it leaves said curved part of said surface, pins on said guiding element lying in a plane intersecting the axis of said pivotal support and engaging the web along a narrow area adjacent an edge of the web alone, means to displace said guiding element about the axis of said pivotal support, and a control for said displacing means operated from an edge of the web and disposed at a point prior to the engagement of the web with said guiding element.

14. A guiding device for travelling webs, consisting of a guiding element, having at least part of its surface curved, which guiding element is in contact with the travelling web and moves at the same speed, card clothing on said guiding element engaging with the web along a narrow area adjacent its edge alone, a pivotal support for said guiding element disposed on an axis tangential to the place at which the web leaves contact with said curved part of said surface of said guiding element and means to displace angularly said guiding element about said pivotal support.

15. A guiding device for travelling webs, consisting of a guiding element having at least part of its surface curved, a pivotal support for said guiding element the axis of which lies in line with the place of disengagement of the web from said curved part of said surface and lies in the plane of said web as it leaves said curved part of said surface, card clothing on said guiding element lying in a plane intersecting the axis of said pivotal support and engaging the web along a narrow area adjacent an edge of the web alone, and means to displace said guiding element about the axis of said pivotal support.

16. A guiding device for travelling webs, consisting of a guiding element having at least part of its surface curved, a pivotal support for said guiding element the axis of which lies in line with the place of disengagement of the web from said curved part of said surface and lies in the plane of said web as it leaves said curved part of said surface, card clothing on said guiding element lying in a plane intersecting the axis of said pivotal support and engaging the web along a narrow area adjacent an edge of the web alone, means to displace said guiding element about the axis of said pivotal support, and a control for said displacing means operated from an edge of the web and disposed at a point prior to the engagement of the web with said guiding element.

17. A guiding device for travelling webs, consisting of a guiding element having at least part of its surface curved, a pivotal support for said guiding element the axis of which is disposed substantially in line with the place of disengagement of the web from said curved part of said surface and lies in the plane of the web as it leaves said curved part of said surface, means to displace angularly said guiding element about its pivotal axis, a control for said displacing means operated from the edge of said web, a stenter receiving the web from said guiding element, and means to displace the surface of said guiding element at a higher peripheral speed than the linear speed of said stenter.

18. A guiding device for travelling webs, consisting of a guiding element having at least part of its surface curved, pins on the periphery of said guiding element engaging with the web along a narrow area adjacent its edge alone, a pivotal support for said guiding element the axis of which is disposed substantially in line with the place of disengagement of the web from said curved part of said surface and lies in the plane of the web as it leaves said curved part of said surface, means to displace angularly said guiding element about its pivotal axis, a control for said displacing means operated from the edge of said web, a stenter receiving the web from said guiding element, means to displace the surface of said guiding element at a higher peripheral speed than the linear speed of said stenter, and means to strip positively the web from the pins of said guiding element.

19. A guiding device for travelling webs, consisting of a guiding element having at least part of its surface curved, pins on the periphery of said guiding element engaging with the web along a narrow area adjacent its edge alone, a pivotal support for said guiding element the axis of which is disposed substantially in line with the place of disengagement of the web from said curved part of said surface and lies in the plane of the web as it leaves said curved surface, means to displace angularly said guiding element about its pivotal axis, a control for said displacing means operated from the edge of said web, a stenter receiving upon its pins the web from said guiding element when stripped therefrom, and a rotary brush adapted to impale the web upon the pins of said stenter.

20. The method of guiding a web of material to bring an edge thereof into a path lying in a predetermined plane, which comprises constraining a narrow area of said web at said edge to travel in an arcuate path, leading said web from said arcuate path into a path at a tangent thereto, and effecting displacement of the part of the web in said arcuate path in accordance with the position of said edge before said web travels in said arcuate path, by rotation about said tangent.

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