Dec. 25, 1962 S. S. DAVIS 3,069,921

WEB CONTROL MEANS

Filed March 10, 1961 5 Sheets-Sheet 1

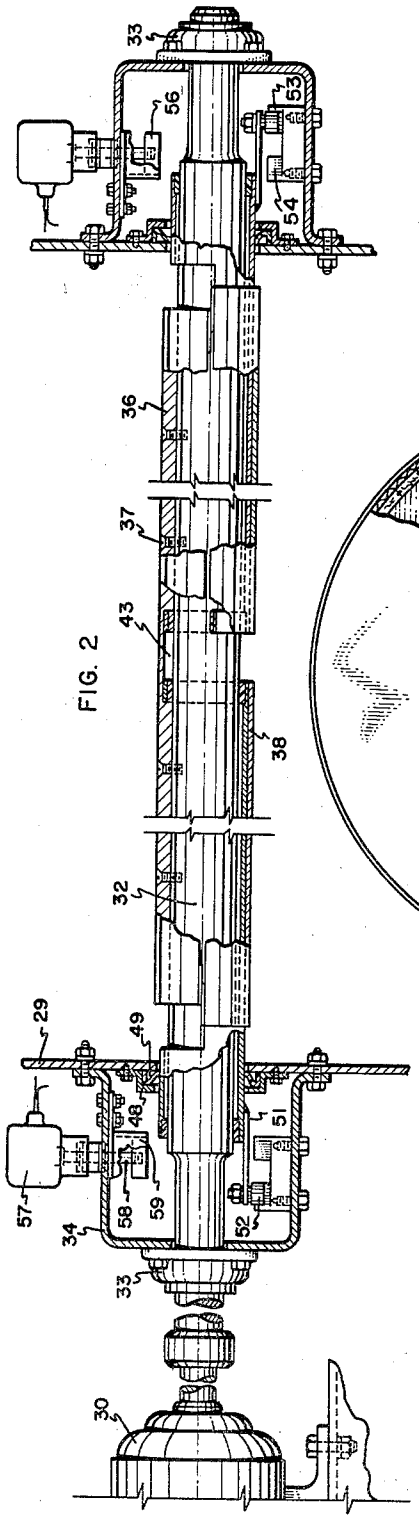


FIG. 2

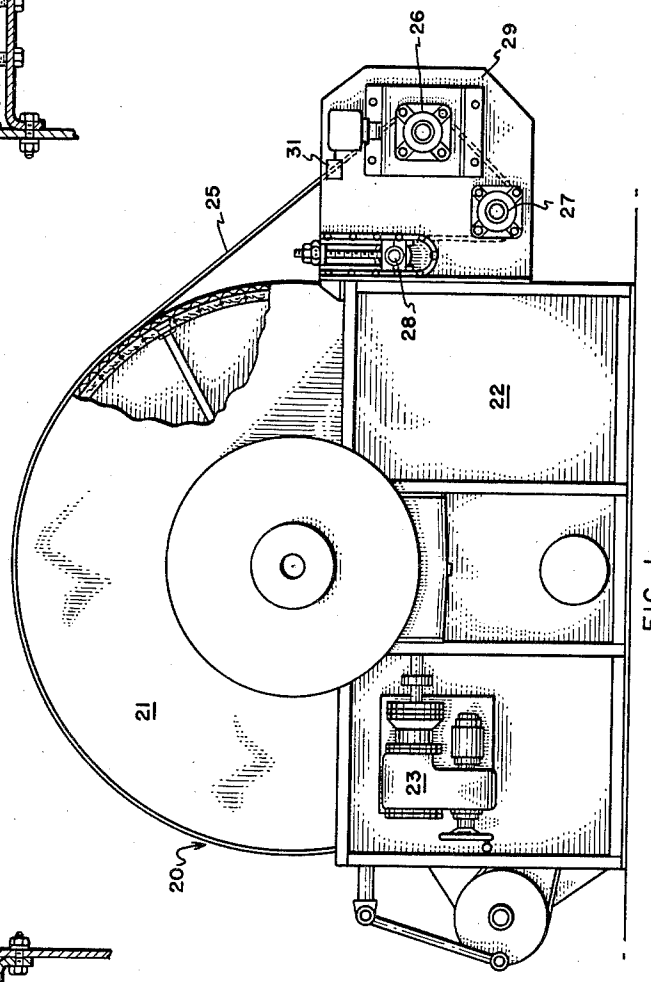


FIG. 1

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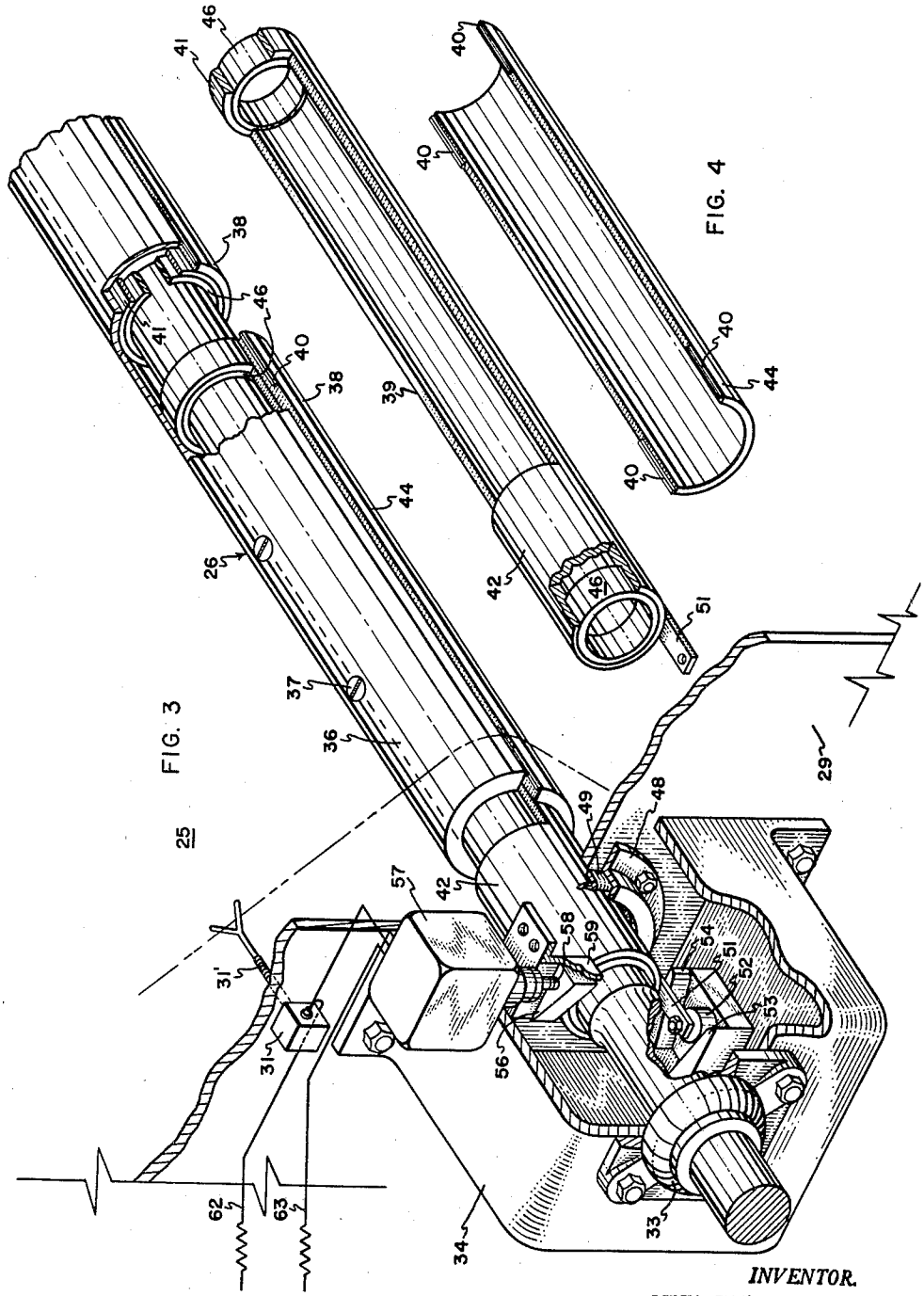


FIG. 3

FIG. 4

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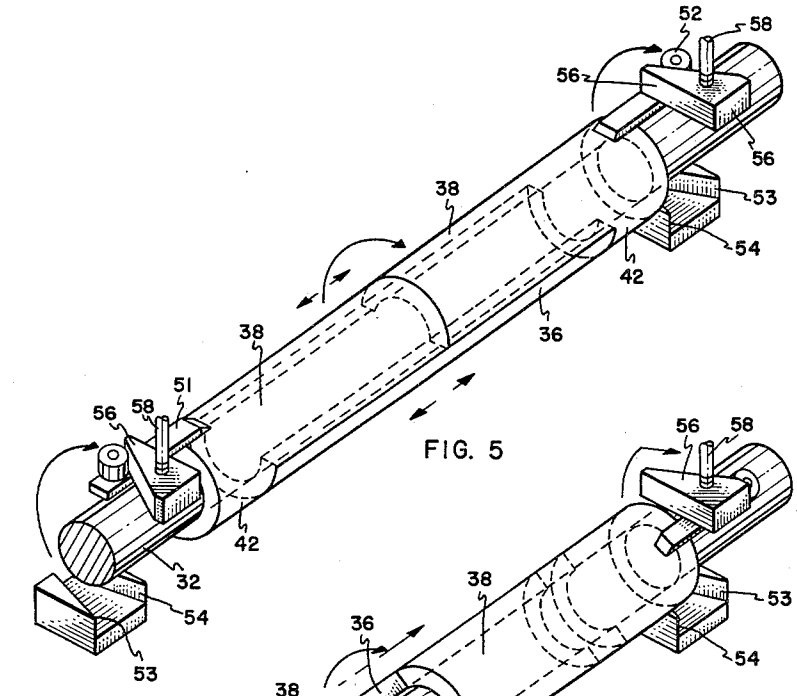


FIG. 5

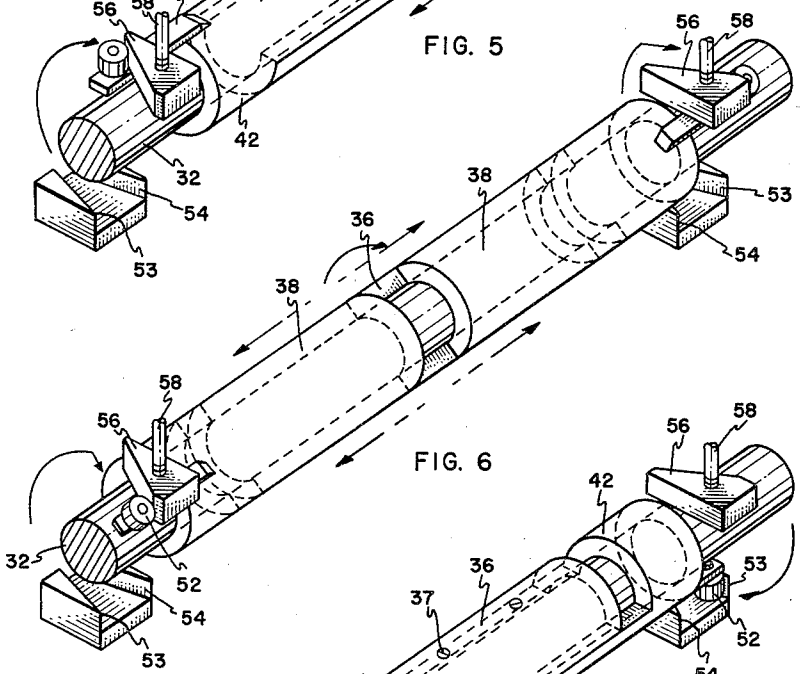
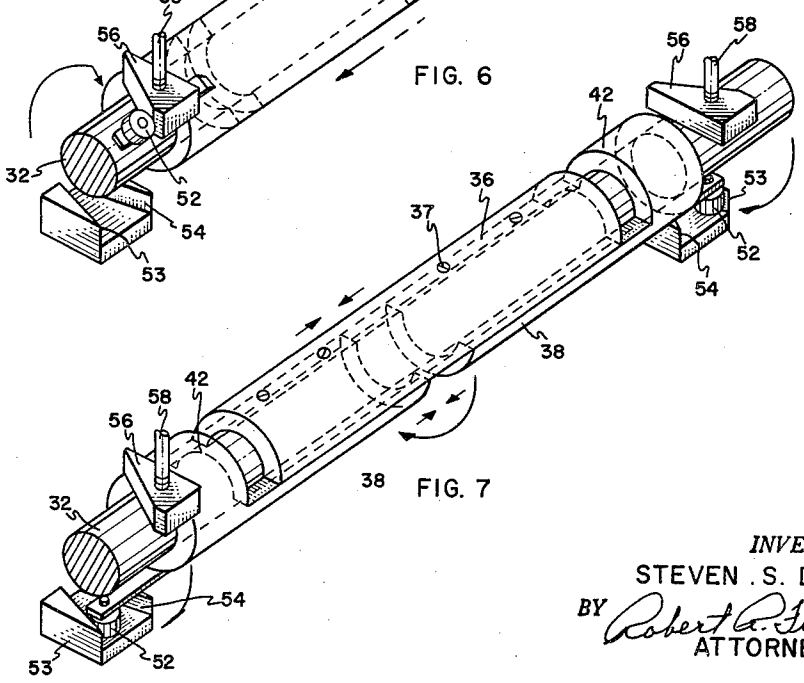


FIG. 6



38 FIG. 7

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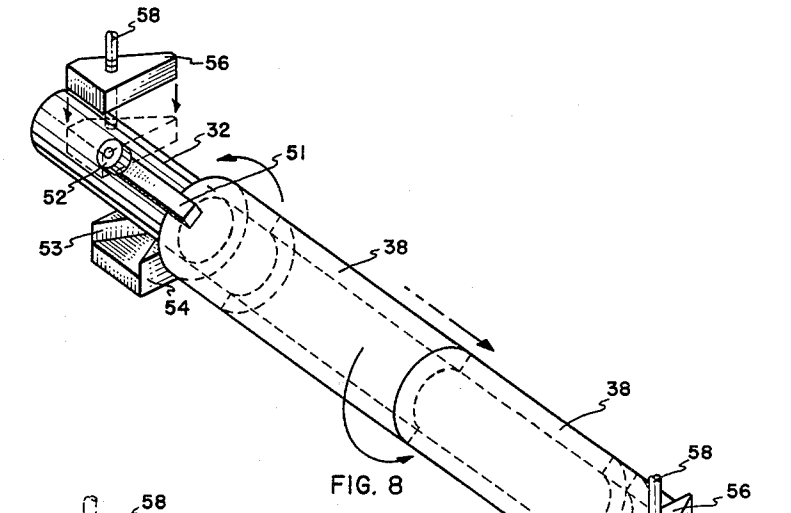


FIG. 8

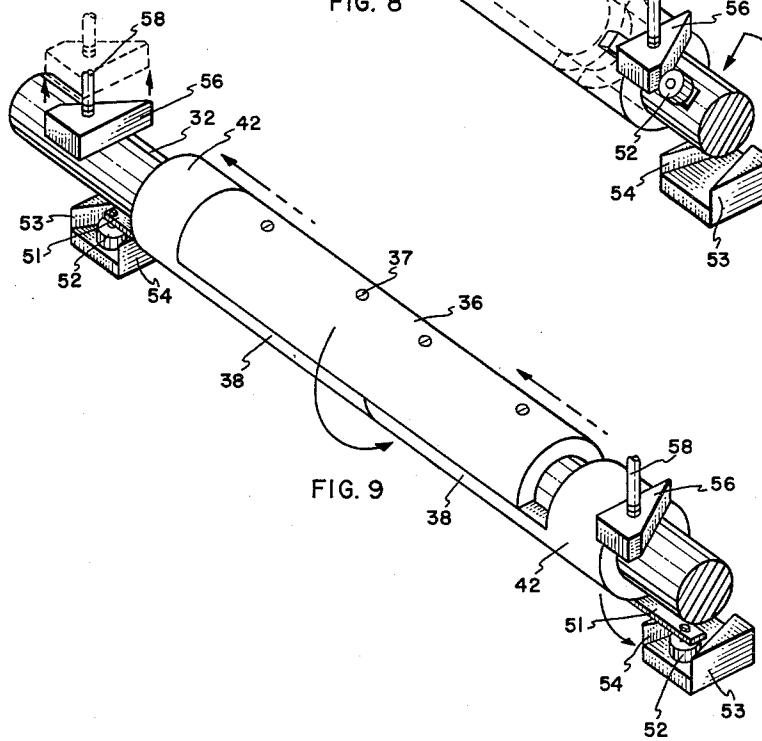


FIG. 9

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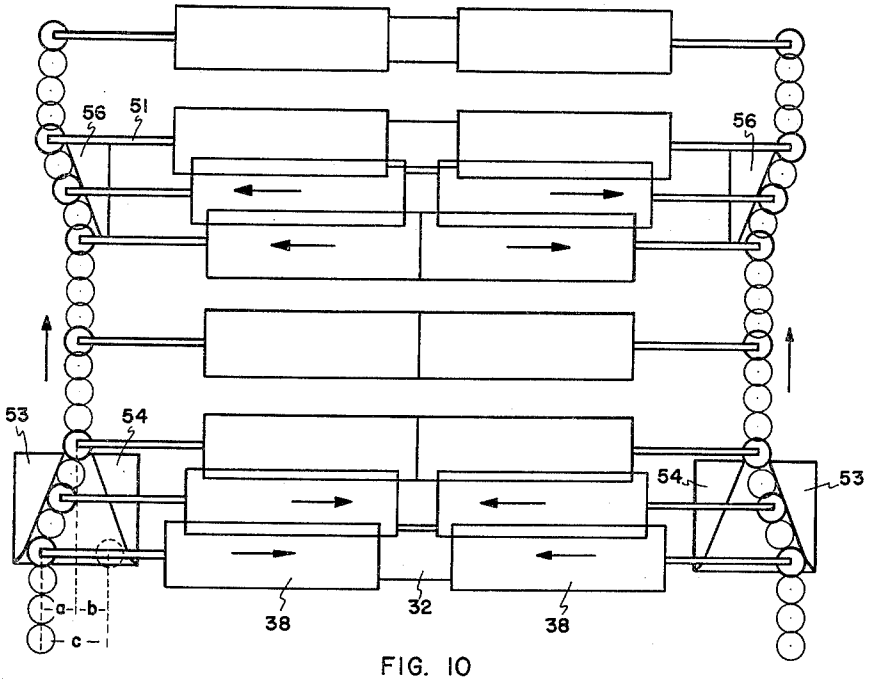


FIG. 10

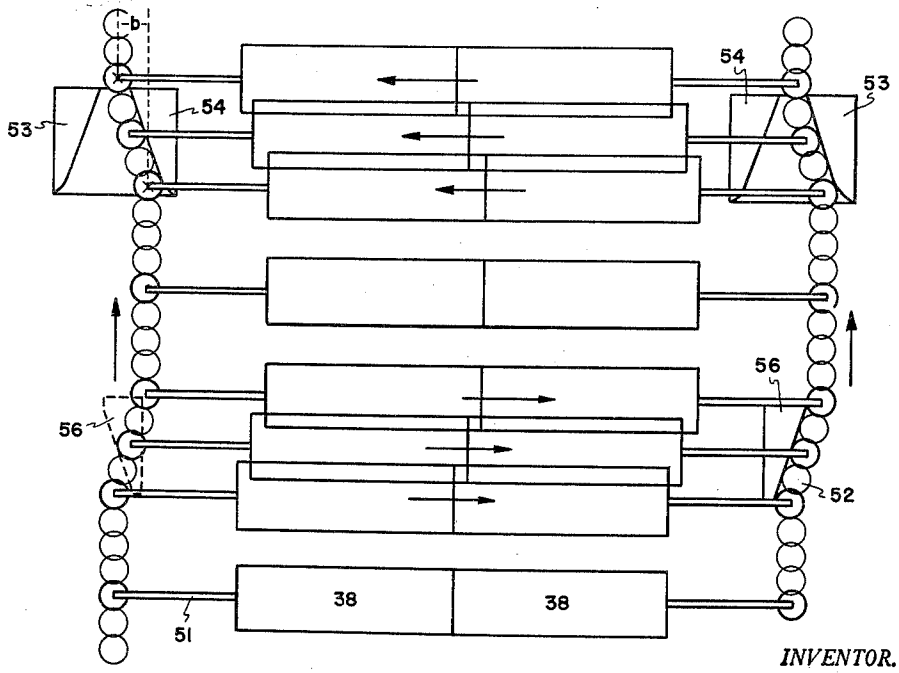


FIG. 11

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United States Patent Office 3,069,921 Patented Dec. 25, 1962

3,069,921
WEB CONTROL MEANS

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Filed Mar. 10, 1961, Ser. No. 94,833
5 Claims. (Cl. 74—241)

This invention relates to improvements in web control means and in particular to means for maintaining proper alignment of endless webs and/or for smoothing such endless webs.

It is a principal object of the present invention to provide web control means for automatically maintaining the alignment of a traveling filter medium and for smoothing the filter medium as it passes over the web control means.

In general, the present invention comprises a web control roll including a pair of slide members providing elongated axially aligned sectorial surface portions of said roll and mounted for rotation with said roll and for sliding movement longitudinally of the axis thereof, slide control elements adjacent each end of the roll to effect longitudinal sliding movement of the slide members as the slide members rotate into and out of contact with the web to be controlled, whereby to maintain the web in proper alignment and to maintain the web wrinkle-free.

In order that the invention may be more readily understood and carried into effect, reference is made to the accompanying drawings and their description, which are offered by way of example only and are not to be taken in limitation of the invention, the scope of which is defined by the appended claims rather than by the preceding description.

In such drawings:

FIG. 1 is a side elevational view of an endless web vacuum drum filter embodying the invention.

FIG. 2 is a front, partially sectional, view of the aligning mechanism of the invention as utilized in the filter of FIG. 1.

FIG. 3 is an isometric view, partially cut away, of a portion of the mechanism shown in FIG. 2.

FIG. 4 is a partial isometric view further illustrating constructional details of the mechanism shown in FIG. 3.

FIGS. 5, 6 and 7 are isometric views illustrating the sequence of operation of the mechanism during one phase of operation.

FIGS. 8 and 9 are isometric views illustrating the sequence of operation of elements of the mechanism during a separate phase of operation.

FIG. 10 is a diagrammatic sketch further illustrating the sequence of operation shown in FIGS. 5, 6 and 7.

FIG. 11 is a sketch showing by diagram the sequence of operation illustrated in FIGS. 8 and 9.

In FIG. 1 there is shown a filter, generally designated 20, which comprises a drum 21 suitably journalled for rotation through a slurry tank 22 and driven by suitable speed reducing drive means 23.

Trained to pass over the drum is a filter medium in the form of an endless web 25 which passes around the drum thence around a spaced apart aligning roll 26 and finally, in the embodiment shown, over an idler roll 27 and return roll 28. These rolls together serve the multiple purposes of maintaining controlled tension on the web, maintaining the web in proper alignment and feeding it tangentially back onto the drum. The rolls 26, 27 and 28 are suitably journalled for rotation between extending plates 29 of the tank 22. Normally, all rolls are mounted as idler rolls driven only by friction of the web passing thereover. However, where more positive

control of the idler roll speed is desired a suitable motor 30 (FIG. 2) may be provided.

Operation of rotary vacuum drum filters is well known hence further description thereof is unnecessary.

In order to sense lateral deviation of the web from the true centered position on the drum, there is provided a sensing mechanism 31 which operates in known fashion to sense lateral movement of the belt and relay a signal to the operative mechanism of the aligning roll 26, all as hereinafter described in more detail.

FIGS. 2 and 3 are respectively sectional and isometric views of the aligning roll 26 showing its structure and its operative cooperating parts forming the combined web aligning and smoothing mechanism.

The roll 26 is mounted on a shaft 32 journalled for rotation in suitable bearings 33 mounted on the outer walls of housing 34.

The roll itself is built up from a fixed hemi-cyclindrical section 36, suitably secured to the shaft as by screws 37, and axially moveable semi-cylindrical roll sections 38.

As illustrated in FIGS. 3 and 4, the moveable roll sections 38 each comprises an inner section 39 that is fitted to be axially moveable on the shaft 32 by means of integral end rings or collars 41 and 42. The end ring 41 at the inner end of the section fits inside the fixed hemi-cylindrical portion 36 and a cut out section 43 is provided inside the fixed section to accommodate limited axial movement of the slidable sections. Fitted in any suitable manner on the outside of the inner section 39 is an outer jacket 44 which has an outside diameter equal to that of the fixed section 36 so the two portions together present a substantially continuous cylindrical surface.

To facilitate axial sliding and at the same time provide guiding support for the slidable members 38, there are provided bearings 46 inside the collars 41 and 42 and surrounding the shaft 32. Desirably such bearings are made of Teflon or other self lubricating material. Bearing plates 40 are also affixed to the edges of the outer jacket 39 to facilitate relative movement between the fixed and slidable hemi-cyclindrical sections.

A housing 34 is provided to support the bearings and sealingly enclose the hereinafter described cams which effect axial sliding of the roll sections. Such housing is sealed at the point where the sliding collar 42 passes through the plate 29 by means of a sealing assembly 48 which clamps a flexible sealing member 49 of suitable material against the surface of the collar.

The embodiment illustrated utilizes two moveable sections 38 each of which is actuated by an identical set of cam and cam followers. Therefore, a description of one such set will suffice to describe both.

Each slideable section 38 has fastened to its end collar 42 inside the housing, an arm 51 to which is attached a cam follower roller 52. There are also provided in the housing two fixed cams 53 and 54 and a retractable cam 56. Of these, fixed cam 53 is a return cam for effecting inward axial movement of the roll sections to a center or neutral position. Fixed cam 54 is also a return cam for moving the roll section in the opposite direction (i.e., outwardly) to the center or neutral position when it has been displaced inwardly beyond the neutral position. Thus, the fixed cams 53 and 54 may be respectively called inward and outward acting centering cams since they act to move the slideable roll sections to the centered or neutral position. The retractable cam 56 effects outward roll shifting from the center to the spread or maximum outward position. Hence it may be called a spreader cam.

The fixed cams are mounted on one side of the housing and the retractable cam is mounted on the opposite side.

The retractable cam 56 is mounted to be selectively moved in and out of the path of the cam follower 52. Such mounting is accomplished by means of a solenoid 57 and its plunger 58 on which is mounted the cam 56. To secure the cam against twisting there is provided a guide channel 59.

The structure illustrated performs the two primary functions of web smoothing and aligning. The web aligning operation, which is continuous during normal operation, to maintain it wrinkle-free, as illustrated in FIGS. 5–7, is accomplished by means of the inward acting centering cams 53 and spreader cam 56.

In FIG. 5 the axially slideable rolls 38 are shown in the maximum inward or neutral position with their inner end edges close together. As the shaft 32 and roll sections 36 and 38 rotate the cam follower 52, contacts the cam 56 and rides thereon to pull the slideable section 38 outwardly. This occurs when the section is in contact with the web surface. Since there are two such sections 38 and they are simultaneously acted upon by identical cams to move in opposite directions, there is a spreading or smoothing action applied to the web.

As rotation continues, the axially slideable roll sections move out of contact with the web surface and the cam follower 52 comes into contact with the fixed return cam 53 which forces the section inwardly to the centered or neutral position. As rotation continues, the cycle is repeated. There is thus provided a continuous positive spreading action operative on the web surface to smooth wrinkles therefrom.

The sequence of operation thus described is further illustrated in FIG. 10 in which cam follower and shiftable roll movements are diagrammatically shown.

For purposes of clarity, the cams have been laid out in a single plane and the cam follower illustrated as traveling in such plane.

In FIG. 10, viewing from bottom to top, the rolls are first shown in a spread position. As cam followers 52 move into engagement with inward centering cams 53, both roll sections are simultaneously moved toward the center or neutral position. The axial distance traveled by each section during such move is the distance indicated on the sketch. Once having reached the neutral or center position no further axial travel is accomplished until the cam follower comes into engagement with the spreader cam 56 which effects simultaneous outward movement of both roll sections a distance *a*.

Referring briefly to FIG. 11 and a'so to the dotted cam follower shown in FIG. 10 it will be noted that provision is made for inward movement of the slideable roll sections to a point beyond the center by a distance *b*. This is the additional travel undergone by the roll sections during aligning action as hereinafter explained in connection with FIGS. 8, 9 and 11. The distance *a* is substantially equal to the distance *b* since that travel is dictated by the fixed cams.

As noted, the sequence of operation just described is normal and is continuous during normal operation when the web is in alignment.

If the web deviates laterally, the camming action is automatically changed in response to such deviation to effect realignment of the web. The manner in which this is accomplished is illustrated in FIGS. 8, 9 and 11.

Lateral web deviation is read by the motion sensing elements 31 which in turn closes an internal switch thereby energizing the solenoid at one end of the roll to retract the spreading cam 56 to an inoperative position out of the path of the cam follower 52. This is illustrated in FIGS. 8, 9 and 11.

With cam 56 inoperative at one end, the slideable roll section served by such cam is free to float with web movement. As the roll rotates, cam follower 52 at the opposite end comes into engagement with the still operative cam 56 at such end and is pulled outwardly (FIG. 8) since the opposite section is free to float, there is no opposing action hence friction between the moveable section and the web surface moves the belt laterally. As rotation continues, the roll sections disengage from the web surface and are both moved in the same direction toward the neutral position when the cam followers engage fixed centering or neutral position cams 52 and 54 respectively (FIG. 9). In this instance, the floating section is acted upon by the outward acting cam 54 which pulls it toward the center or neutral position and the active moveable section is acted upon by the inward acting fixed cam 53 at the opposite end which pushes it toward the center. The net result is a return of both sections to the centered or neutral position.

The left hand spreading cam 56 is shown in dotted lines to indicate that it is inoperative by virtue of having been moved from the path of the cam follower. As previously noted this frees one of the slideable roll sections, so that, under tension of the web, it will float and follow the other roll section as it moves the web.

As the cam follower engages the spreading cam 56 on the right side, which is still in the operative position, the slideable sections move to the right, the right hand section being positively moved by camming action and the left hand section being pulled along.

The result of moving the floating section with the positively actuated section is to pull the former past the centered position a maximum distance *b*. It is to accommodate this additional displacement that the fixed or outward spreading cam 54 is employed and it will be noted that such cam is mounted to engage the cam follower at this extreme position and return it to the neutral or centered position.

So long as the sensing element indicates the web to be out of alignment, the aligning cycle continues. When the web is aligned it disengages the sensing element whereupon the switch opens, the solenoid is de-energized and spreading cam 56 is returned to its normal operative position, and the previously described spreading cycle is re-established.

The circuitry for actuating the aligning system described above, is extremely simple and is shown in a very simplified form in FIG. 3. The solenoid 57 is normally de-energized and in the extended operative position as shown, the spreader cam 56 in the path of the cam follower. Two usual direct current power lines 62 and 63 are provided, one of which, 63, leads directly to the solenoid and the other passes through the sensing element 31. A suitable normally open switch, not shown, is housed in the sensing element and is mounted to be closed upon deflection of the sensing element arm 31′ by the traveling web 25. Closing of the switch energizes the solenoid to retract the cam to an inoperative position out of the path of the cam follower. An identical circuit is provided adjacent the other end of the roll.

From the foregoing it is apparent that the invention presents a novel and highly useful arrangement for maintaining proper alignment and/or smoothing of travelling webs, in which alignment is effected by axially aligned arcuate roll sections actuated in response to web deviation to shift in a corrective direction when in contact with the web and in the opposite direction when out of contact therewith; and web smoothing is effected by simultaneous outward shifting of the arcuate sections when in contact with the web and inward shifting when out of contact. The arcuate sections are such that each defines a portion of a cylindrical surface, but collectively they define a substantially complete cylindrical roll.

It is thus made possible to effect both aligning and smoothing by a single structure that is simple of construction and operative and which does not result in any longitudinal stretching of the web during such action.

This is a continuation-in-part of my earlier application Serial No. 752,459, filed August 1, 1958 entitled "Web Aligning Means."

I claim:

1. A web aligning roll comprising a pair of slide members providing elongated axially aligned sectorial surface portions of said roll and mounted for rotation with said roll and for outwardly and inwardly sliding movement longitudinally of the axis thereof, first slide control elements separately operable on each one of said pair of slide members to effect simultaneous outward longitudinal sliding movement of said slide members as they rotate into contact with the web to be aligned, and means for blocking operation of said slide control elements on a selected one of said slide members as the latter rotates into contact with the web to be aligned.

2. A web aligning roll comprising a pair of slide members providing elongated axially aligned sectorial surface portions of said roll and mounted for rotation with said roll and for outwardly and inwardly sliding movement longitudinally of the axis thereof, slide control elements engaging said slide members to effect simultaneous outward longitudinal shifting thereof as they rotate into contact with the web to be aligned, and means for disengaging said slide control elements from a selected one of said slide members to limit outward longitudinal shifting of said slide member as it rotates into contact with said web.

3. A web control roll comprising axle means for said roll, a pair of elongated axially aligned arcuate slide members carried by said axle means and mounted for axially sliding movement thereon, a plurality of arcuately spaced slide control elements for each of said pair of slide members, means carried by each of said slide members engageable with its corresponding slide control elements to effect longitudinal sliding movement of said slide members as said slide members rotate into and out of contact with a web to be controlled, sensing means for sensing lateral deviation of a web passing over said roll, and means responsive to said sensing means for withdrawing a selected one of said slide control elements from engagement with its corresponding slide member.

4. A web control roll assembly comprising, axle means, a plurality of elongated arcuate members carried by said axle means each of said members forming a portion only of a cylindrical surface and all of said members collectively forming a substantially continuous rotatable cylindrical roll surface; said arcuate members including a pair of axially aligned slide members mounted for independent longitudinal sliding movement on said axle means, a pair of arcuately spaced slide control cams mounted adjacent each end of said axle means, a cam follower on each of said slide members engageable successively with said arcuately spaced cams upon rotation of said slide members into and out of contact with the web to be controlled, a first one of said cams of each pair being adapted upon engagement by one of said cam followers to move the corresponding slide member toward the end of said axle means when said slide member is rotated into contact with the web to be controlled and the second of said cams of each pair being adapted upon engagement by said cam follower to move said slide member in an opposite direction when said slide member is rotated out of contact with said web, sensing means for sensing lateral deviation of the web, means responsive to said sensing means and having mounted thereon a first one of each of said pair of cams whereby said cam is selectively movable into and out of the path of said cam follower in response to deviation of the web, and additional slide control slide means mounted adjacent said second cam of each pair of cams and effective upon engagement by one of said cam followers to move the corresponding slide member toward the end of said axial means.

5. A web aligning roll comprising a pair of slide members providing elongated axially aligned sectorial surface portions of said roll and mounted for rotation therewith and for outwardly and inwardly sliding movement longitudinally of the axis thereof, slide control elements engaging said slide members to effect simultaneous outward longitudinal shifting thereof as they rotate into contact with the web to be aligned, sensing means for sensing lateral displacement of a web passing over said roll, and means associated with said slide control elements and responsive to said sensing means to effect disengagement of said slide control elements from a selected one of said members as said slide member rotates into contact with said web.

References Cited in the file of this patent

UNITED STATES PATENTS

1,275,368	Benoit	Aug. 13, 1918
2,752,151	Levine	June 26, 1956