July 31, 1956 R. W. NASH 2,756,586

WEB WIDTH MEASURING DEVICE

Filed April 7, 1953

Fig. 2

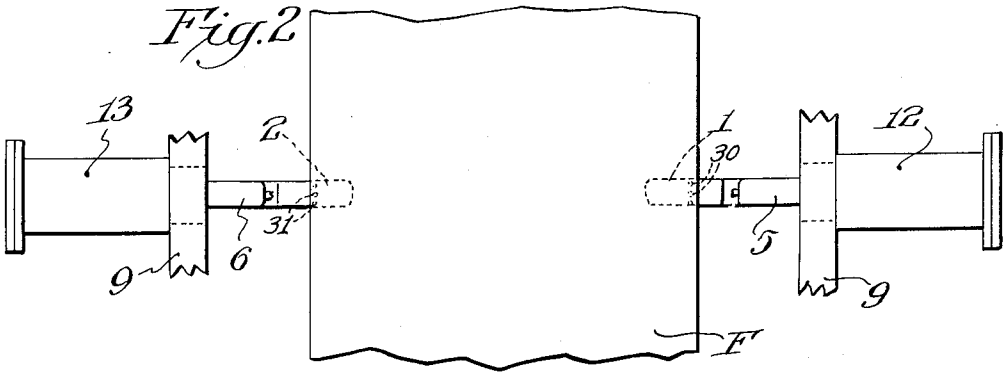
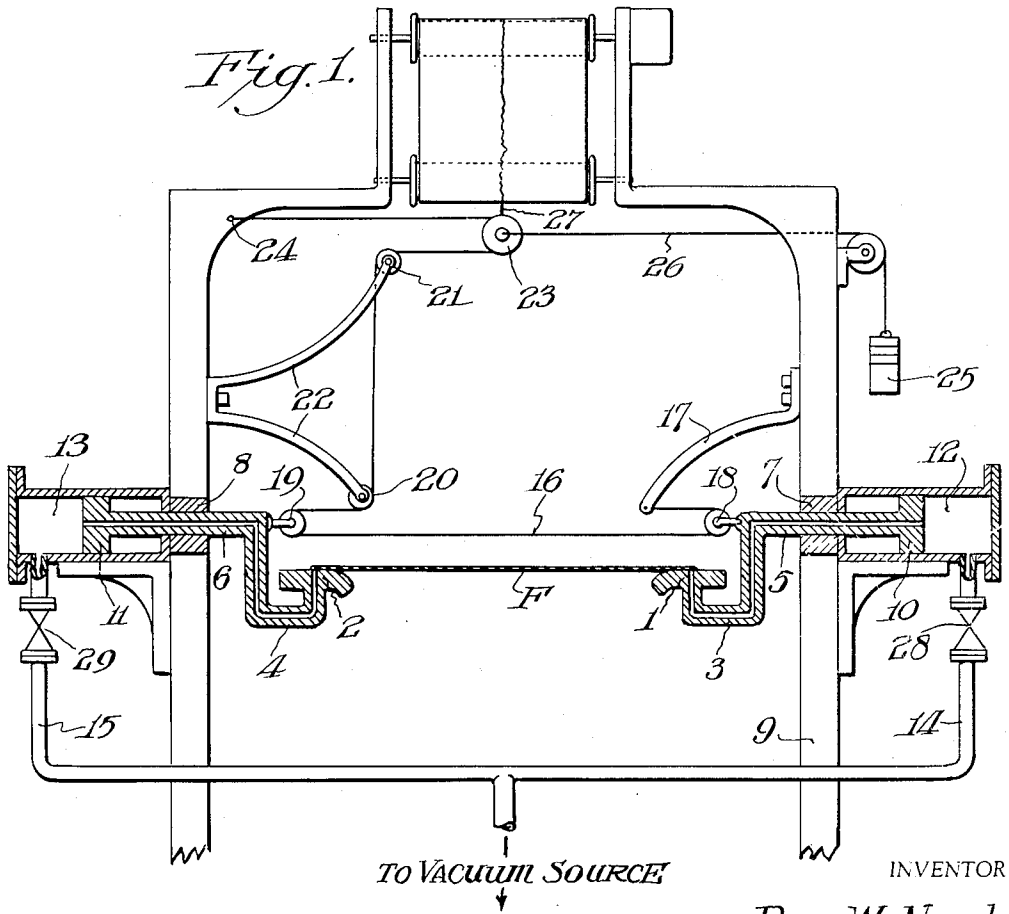


Fig. 1.



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WEB WIDTH MEASURING DEVICE

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This invention relates to the manfacture and processing of webs, and, more particularly, to means for continuously measuring the width of continuous, traveling webs.

In the manufacture and processing of webs such as paper, regenerated cellulose film, rubber hydrochloride film, etc., the web is customarily made in continuous lengths of relatively great width and the dried paper or film is wound up into large, so-called mill rolls. Then, to convert the wide web into a plurality of lesser width rolls, the web from the mill roll is generally passed through a slitting machine. To properly adjust the slitting knives of the slitting machine, particularly with respect to reducing waste incident to eliminating uneven edges or edge "beads," it is desirable to know beforehand the maximum variation in the width of the web so that the slitting knives can be set to trim off the rough, uneven edges of the mill roll with a minimum of trim waste.

Gauges for continuously measuring the width of a web heretofore employed have not always proven satisfactory, either because they do not measure web width accurately, irrespective of the unavoidable side sway of the traveling web, or because they have been complicated in construction and operation and thus commercially impractical.

The principal objective of this invention, therefore, is to provide a simple and inexpensive means for accurately, continuously and safely measuring and recording the width of a traveling web, independent of side sway, before it is wound up in roll form. This and other objectives will more clearly appear hereinafter.

These objectives are realized by the present invention, a preferred embodiment of which is schematically illustrated in the accompanying drawing wherein:

Figure 1 is a front elevation, partly in section; and

Figure 2 is a top plan view of the scanning nozzle assembly.

Referring to the drawing, F denotes a traveling continuous web of film, paper, or the like, to be measured. Oppositely disposed at the running edges of the film are identical enclosed chambers or scanning nozzles **1** and **2**, each provided with an aligned series of accurately sized orifices **30** and **31** spaced crosswise of the chamber, and mounted on arms **3** and **4** for movement with piston rods **5** and **6**, each rod in turn being mounted for reciprocal movement in bearings **7** and **8** provided in machine frame **9**. The piston rods are actuated by pistons **10** and **11** fitted in vacuum cylinders **12** and **13** which are also attached to the frame **9** and which are connected to a common vacuum source (not shown) through lines **14** and **15** and valves **28** and **29**, respectively. The arms **3** and **4**, piston rods **5** and **6**, and pistons **10** and **11**, are suitably drilled to provide communicating channels connecting each nozzle with the vacuum cylinder associated therewith. A cable **16**, of fixed length, is anchored at one end to a support member **17** fixed to the machine frame. The cable then passes in turn around pulleys **18** and **19** attached to piston rods **5** and **6**, respectively, around pulleys **20** and **21** mounted on a bracket **22** fixed to the machine frame, around a floating recorder pulley

23, and the end of the cable anchored to the machine frame at **24**. The pull exerted on the pulley **23** is countered by a weight **25**, of approximately 10 pounds, attached to the shaft of the pulley **23** by cable **26**. A marking device **27** on pulley **23** is in contact with a continuously moving chart (of conventional design) so that lateral movement of the pulley, reflecting differential movement of the scanning nozzles, is suitably recorded on the chart.

The operation of the arrangement described is as follows: The vacuum is adjusted to each cylinder by valves **28** and **29** so that nozzles **1** and **2** will move toward each other when the holes **30** and **31** in the nozzles are substantially uncovered and will move away from each other when the holes are substantially covered. With the vacuum thus adjusted, and the web running in the machine, should the traveling web increase in width at the point of measurement with a consequent lateral shift of the running edge(s) of the web, the holes in the nozzle(s) will be closed, resulting in an increase in the amount of vacuum in one or both of the cylinders, causing the piston(s) to move the nozzles outwardly from under the edge of the web, thus increasing the distance between the scanning nozzles. Coincidentally, of course, the distance between pulleys **18** and **19** increases a like distance, causing the floating pulley **23** and the attached marking device to be shifted laterally to the left. As soon as the nozzles move out so that the holes are not covered by the web, the vacuum is released in the cylinder(s) permitting the weight **25** to pull the nozzles closer together with a consequent lateral shift to the right of the marking device. Since the common axis of the holes in the nozzles is parallel with the edge of the web, a slight lateral movement of the web will cover and uncover the holes, thus causing rapid changes in vacuum, and causing the nozzles to "hunt" the edges of the web and follow it closely. In instances when the web sways but does not change in width, the nozzles will follow the film; but inasmuch as there is no differential movement of the nozzles, the length of cable therebetween will not change and the position of the floating pulley also remains unchanged.

The accuracy of the gauging device of this invention is demonstrated by the following comparative measurements obtained with the width recorder and the actual width of the web at the points measured by the invention. No deviation greater than $\pm 1/16''$ was noted between any two readings.

TABLE I

Comparison of width measurements—vacuum device and actual width

Deviation of Reading of Width Recorder from Actual Width (Inches)	Number of Rolls	Percent of Total Rolls
0	20	67
$\pm 1/32$	7	23
$\pm 1/16$	3	10
	30	100

To illustrate the performance of the width recorder when measuring a web with instantaneous variation in width, the following measurements were made on a web that had been purposely made with extreme, periodic, instantaneous variations in width. The close correlation between the variation measured with the width recorder and the actual width change is indicative of the response and accuracy that can be attained when measuring web width with the subject invention even when rapid changes in width exist.

TABLE II

Width recorder vs. actual width at instantaneous variation

Maximum Variation on Width Recorder	Maximum Variation in Actual Width
Avg. 19/16"–13/16"	19/16"

It is to be understood, of course, that the preferred embodiment specifically described is for purposes of illustration and that wide variation and changes may be made in the structural details without departing from the scope of the invention. Thus, any convenient expedient may be employed to cause the scanning nozzles to follow the width changes in the web. For example, the nozzles may be moved by means of reversible electric motors controlled by a switch actuated by a pneumatic bellows operatively associated with, and responsive to a change in the degree of vacuum in the nozzles. Similarly, in place of the cable arrangement and indicator shown, adjustable springs, each anchored at one end to the piston rods and connected at the other to a marking device, could be employed to counter the action of the vacuum actuated pistons. Likewise, hydraulic and/or electrical means responsive to the differential movement (i . e., position) of the scanning nozzles may be employed to register such movement.

From the foregoing, it is evident that the use of this invention makes it possible to slit webs with a much narrower trim being removed from each edge, and hence less trim waste, than is possible with other width measuring devices since this invention measures and records the running width within 1/16". Moreover, the device

of this invention is much more economical to build than any others currently in use.

I claim:

1. A device for gauging the width of traveling continuous web comprising in combination two scanning nozzles oppositely disposed to contact a traveling continuous web adjacent the edges thereof, each of said nozzles having a plurality of orifices arranged in position to be partly covered by said web, pneumatic shifting means operative to independently move said nozzles in a direction transverse to the direction of travel of the web, a source of vacuum connected with said nozzles and said shifting means for maintaining a reduced pressure sufficient to maintain said shifting means in a state of balance while said orifices are covered to a predetermined extent, and to actuate said shifting means and thus move said nozzles in accordance with a change in pressure caused by a change in the extent to which said orifices are covered by reason of a change in the width of the web, and means for registering the differential movement of said nozzles.

2. The device of claim 1 wherein the pneumatic shifting means comprises a cylinder, a piston therein connected to a piston rod operatively associated with each nozzle.

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