

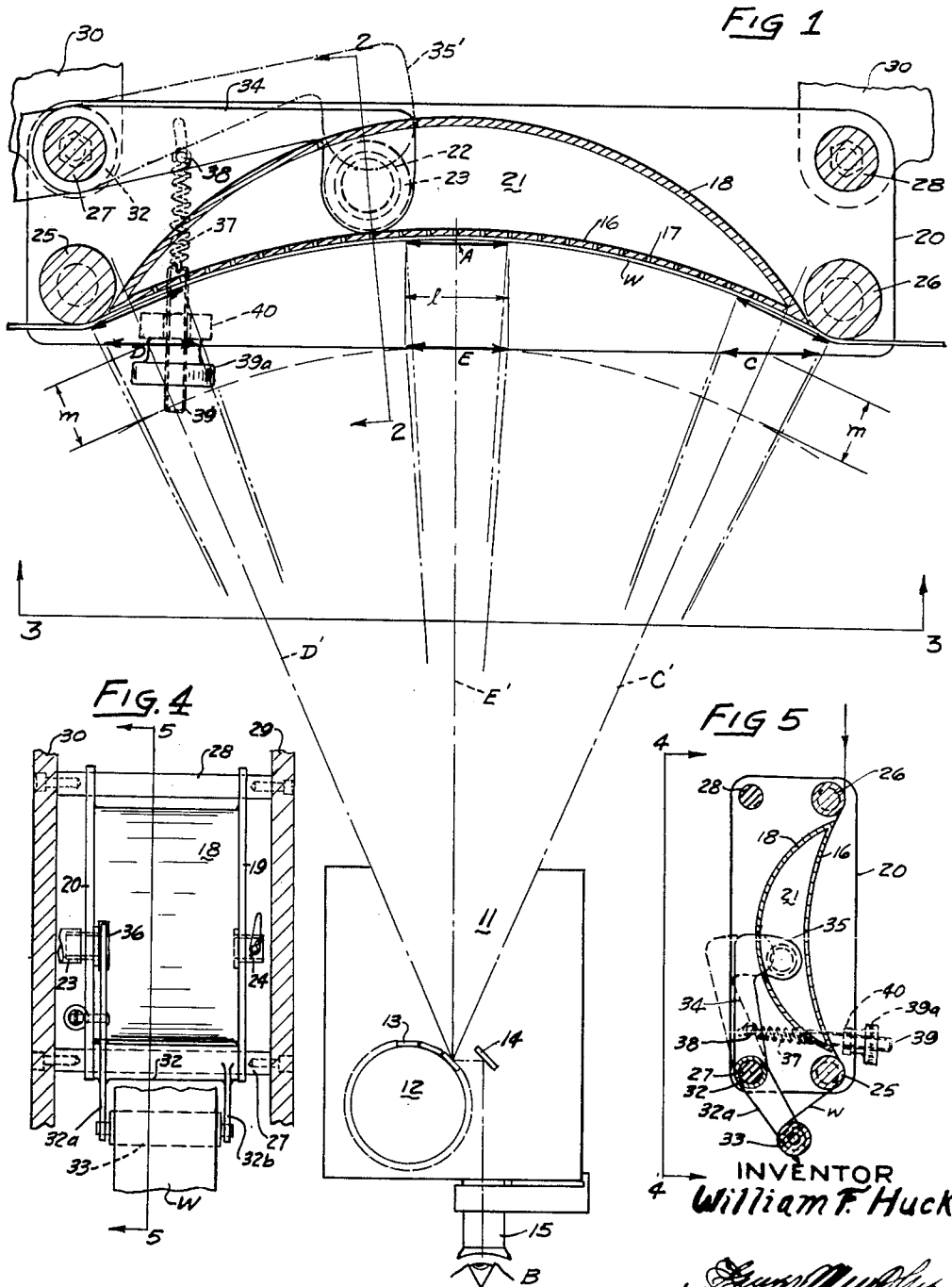
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IN PRINTING MACHINES AND THE LIKE

2,746,749

Filed Oct. 16, 1950

2 Sheets-Sheet 1



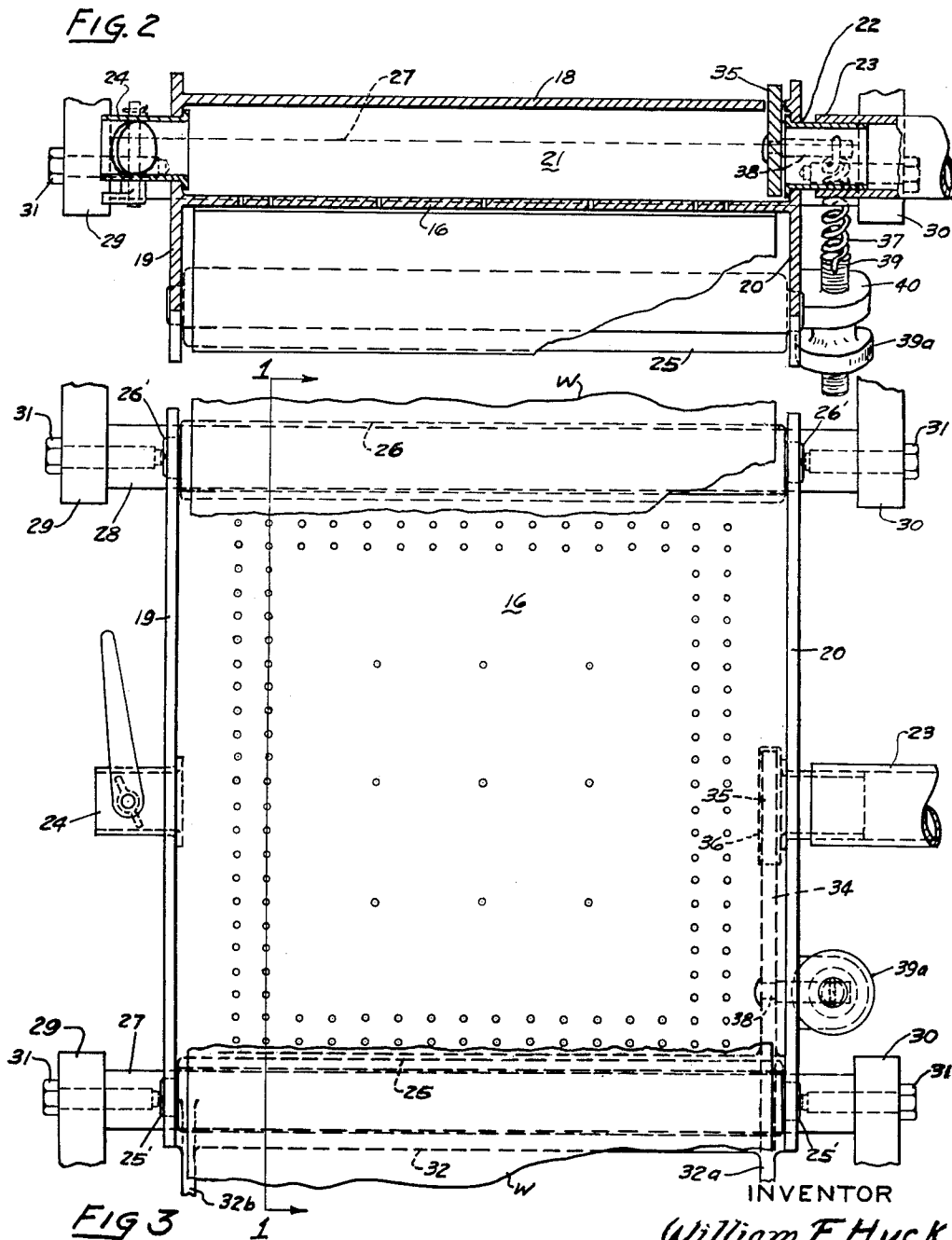
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1

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MEANS FOR SCANNING TRAVELING WEBS IN PRINTING MACHINES AND THE LIKE

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4 Claims. (Cl. 271-2.1)

This invention relates, in general to means adapted to facilitate the scanning of the surface of a moving object, such as a web of paper or cloth, traveling through a printing machine, in order to determine the quality and accuracy of the characters printed thereon.

An object of the invention is to provide means whereby the characters on a web of paper or cloth may be inspected while the web is moving at comparatively high speed, and in such wise as to obviate the distortion of view hitherto experienced in existing devices for this purpose.

Another object of the invention is to provide a device of the kind indicated, of comparatively simple design and rugged construction, and especially adapted to guide a predetermined portion of a moving web into a path having a curvature coordinated with optical scanning means, whereby the latter may present an apparent stationary and distortionless view of the characters on the web.

Other objects and advantages of the invention residing in the design, construction, combination and arrangement of parts will appear more fully hereinafter.

In the printing industry, it is of importance to maintain an unbroken continuity of movement of a traveling web, while being printed. If the final product is delivered in sheet form or as a folded product, then the operator may inspect individual samples taken from the press delivery and adjust the press to conform to the desired excellence of the finished product. However, when web material is employed and this is being rewound into rolls, such inspection is impossible. If the movement of the traveling web is comparatively slow, visual inspection is possible since the eyes of the observer can follow a spot on the web. With appreciably higher speeds, this is practically impossible, and since slowing of the web is uneconomical and generally not feasible because of various factors that enter into the process, the necessity for means permitting the web to be accurately inspected while traveling at high speed, will be readily understood.

At the present time, in order to maintain unbroken continuity of web movement while being printed, optical means are employed that are mechanically coupled to the printing machine and effective to project impressions from the surface of a web traveling through the machine at comparatively high speed in a straight line, and to the eye of an observer in such wise as to convey the impression that the web is motionless. The effect, thus produced, roughly corresponds to that produced by stroboscopic means.

In existing optical devices provided for the scanning purpose indicated, a serious disadvantage obtains in that, while the straight portion of the traveling web is being scanned, apparent variations of size and movement of the characters on the web take place continuously during each cycle, as will be explained more fully hereinafter. These apparent variations of size and movement render difficult, if not impossible, accurate determination of the correctness of alignment, size and desired

2

quality of impression of the characters on the traveling web. The difficulty indicated is accentuated when optical magnifying devices that require careful focussing are employed.

In accordance with an important feature of the invention, means are provided to maintain a predetermined section of a traveling web in an arcuate path so that the distance of any point on the said arcuate portion from the observer, its angular velocity with respect to the lines of sight to the optical reflecting means, and its length in the direction of web travel, will be constant. Apparent motion of the printed characters on the web is prevented and the said characters are projected uniformly to the eye and as though motionless. As a consequence of this, lack of uniformity of printing, deviations in alignment, etc., may be discerned with the same facility as though the traveling web were motionless.

Referring now to the drawings:

Figure 1 is a sectional view, taken on line 1-1 of Fig. 3, as seen in the direction of the arrows, of a device conforming to the precepts of the invention and having a scanning device operatively coupled thereto; and showing in dot and dash lines the relative position of a web when moving in a conventional straight path as compared to the arcuate path of the web provided by the present invention, as shown in full lines;

Fig. 2 is a transverse sectional view, taken on line 2-2 of Figure 1 and as seen in the direction of the arrows;

Fig. 3 is an elevational view, as seen on the line and in the direction of the arrows 3-3 of Figure 1;

Fig. 4 is an elevational view on a reduced scale, taken on line 4-4 of Fig. 5 and as seen in the direction of the arrows; and

Fig. 5 is a sectional view, taken on line 5-5 of Fig. 4 and as seen in the direction of the arrows.

In the drawings depicting a preferred form of the invention, a scanning device of conventional design and indicated generally at 11, comprises a rotatable drum 12 having a polygonal periphery to which a series of mirrors 13 are secured uniformly, each mirror extending the full length of the drum and presenting in combination with the other mirrors, a substantially continuous polygonal reflecting surface on the circumference of the said drum.

Located in coaxing proximity to the polygonal reflecting mirrors of the drum 12 is an oscillatable mirror 14 which is mechanically coupled to the printing machine by means (not shown) and which is adapted to receive images reflected successively from the series of individual mirrors 13 and then project these images, one at a time, through an optical magnifying glass 15 to an observer at "B."

Inspection of Figure 1 will disclose that an object on a web "W" moving in a straight path, from right to left, as from "C" to "D," may be seen by the observer at "B," as indicated in dot and dash lines; the different angular positions assumed by the sectional mirrors 13, as they revolve with the drum 12, being coordinated with by the oscillatable mirror 14.

The oscillatable mirror 14 is turned by means (not shown) of conventional design, in such wise as to maintain an angle of approximately 45 degrees to a revolving mirror 13, as it begins to receive the light-reflected images from the surface of the traveling web, so that an effective scanning range over an area having a length "l" as limited by arrows on the straight portion of the web, may be covered. This length "l," it will be understood, extends from the point "C" where the range of the scanning device begins, and thence (with rotation of the mirror-carrying drum 12) to "E" at the center; and finally to "D" at the left hand side. At the last-mentioned point, the scanning range is discontinued, while simultaneously

another mirror 13 synchronizes in its rotation with the motion of the web "W" and picks up a successive and repetitive area of the web at the initial point "C" to reenact the same cycle of projection to the observer at "B."

The scanning device 11, being adjustable, is adapted to maintain any desired portion of a repetitive area of the web within the eye of the observer, it being understood that the distance "E'" may be varied by adjusting the position of the scanning device towards or from the web.

Before describing in detail the features forming the subject matter of the present invention, and in order to understand its advantages over existing devices that scan a web traveling in a straight path, it is to be noted that in the last-mentioned case, the length of an area on the web "W," as indicated in heavy lines (each terminated by two arrows), varies under observation as it moves from C' to D'. As it enters the scanning range at "C," the length of the line of sight C' to the point C from any given mirror 13, is greater than the length of sight E' to the center E by a distance denoted by "m."

Similarly, along the line of sight D', the distance to the point "D" at the right hand side, will be longer than to the center point "E" by the same distance "m." As a corollary to this, the relative size of the object area on the web "W" will appear larger at the center point "E" (shortest distance from the mirror in instant use) and smaller at points "C" and "D" by reason of the greater distance of the latter from the observer and also by the optically-reducing effects of the inclined angle of view in the latter positions, as is obvious. Furthermore, the angular velocity of the lines of sight C' and D' about mirrors 13, following points "C" and "D" which are moving with uniform velocity along the straight path of the web, will be less than that along the line of sight following point E' in the center of the range.

The defects noted above, which are inherent in any method of scanning a web or object in a straight path, by optical rectifying means of the kind noted, will combine to cause:

1st. An apparent motion of the object toward, and then away from the observer, as the object moves from "C" to "D."

2d. The length of the object to apparently increase and then decrease.

3d. An apparent motion resulting from the different angular velocities of the lines of sight and tending to be in the direction of web travel during its passage from "C" to "E" and then in the opposite direction of web travel from "E" (Center) to "D."

These effects combine to render close observation of a traveling web difficult and practically impossible when sharp focussing with a magnifying eyepiece is employed.

Reverting to the drawings and in accordance with this invention, means are provided to assure an arcuate path for a predetermined portion of the web "W" passing through a printing machine, a portion of the framework of which is shown. The means include an arcuately configured plate 16 which is foraminated, as at 17, and secured in spaced relation to an opposed solid arcuate plate 18. A pair of oblong side plates 19 and 20 join the foraminated and solid plates 16, 17 and form therewith an arcuate-shaped inclosure or chamber 21 which is suitable for evacuation, as hereinafter described. The side plate 20 is provided with an opening 22 accommodating a conduit 23 fastened thereto, while the plate 19 has a manually-adjustable bleed valve 24 that may be operated to control the volume of air that may enter the vacuum chamber 21.

Web-guiding rollers 25, 26 are supported by their journals 25' and 26' in the side plates 19 and 20. This construction is supported by a pair of bars 27, 28 which pass through side plates 19 and 20. The bars 27, 28 are fastened to portions of the frame of the printing machine, as at 29, 30, by screw bolts 31.

The bar or shaft 27 carries a sleeve 32 extending be-

tween the side plates 19 and 20, and having lever extensions 32a, 32b which are apertured adjacent their ends to operatively accommodate a roller 33 around which the web "W" passes in the direction of the arrows, as best shown in Figs. 4 and 5. Opposite to the extension 32a on the same sleeve 32, an arm 34 stretches and terminates in a gate plate 35 which is movable to cover the opening 22 in side plate 20, the said gate plate passing through a slot 36 in the solid plate 18 in order to permit free angular movement of the arm 34 about the bar 27.

A spring 37 has one end fast to a pin 38 riveted to the arm 34 and passing through an opening 39 in plate 20. The other end of the spring 37 is secured to an adjacent end of a screw 39 passing through a lug 40 on the outside of plate 20. The screw 39 has an operating handle 39a which may be manipulated to adjust the tension of spring 37.

The operation of the device may be summarized as follows:

A section of a web "W" passing through the printing machine is engaged by rollers 25 and 26 that are supported on the side plates 19 and 20 of the vacuum chamber 21.

Assuming the printing machine is in operation and that the chamber 21 is being evacuated by means of suitable vacuum-creating means (not shown) connected to the said chamber via conduit 23, the web "W" will be thrust against the arcuate foraminated plate 16, thus closing the perforations in same and permitting the rapid evacuation of the chamber 21. This will cause atmospheric pressure to press the web against the concave face of the plate 16.

As best shown in Figure 1, it will be observed that the path of the web "W" is maintained in a line of sight that is equidistant from the observer at "B," since the points "C," "A" and "D" are the same distance from the individual mirror 13 in instant use. It follows, therefore, that the distance of the object from the observer, its length in the direction of web travel, and the angular velocity of the lines of sight about the mirror 13 will be constant. As a consequence, the objections noted above with respect to the existing method of scanning a rectilinearly traveling section of a web, will be obviated by the present construction and method.

In further accordance with the invention and since the web "W," as customarily, must operate under tension that varies with width, strength, speed, etc., of the said web, it is essential to provide means for regulating the degree of vacuum so that, in all cases, sufficient, but not excessive, pressure may be applied to thrust the web against the foraminated plate 16. Variations of the vacuum pressure desired while the web is passing through the machine and over plate 16, may be effected by manual actuation of the bleed valve 24.

As the web "W" passes over the rollers 25 and 26, its tension will tend to rotate the arms 34 and 32 in a counterclockwise direction and against the normal tension of the spring 37. It will now be understood that increase of web tension will cause gate valve 35 to move to a position that may be indicated, by way of example, by dot and dash lines, as at 35'. This movement of the gate valve 35 will temporarily enlarge the opening 22 and thereby increase the suction or vacuum within the chamber 21. This increased suction, in turn, will increase the pressure of the web against the perforated plate and the holding force or friction to the passage of the web "W" will correspondingly increase.

It is to be understood that the invention is susceptible to some modification and change without departing from the spirit or essential attributes thereof, and it is therefore desired that the present embodiment be considered in all respects as illustrative and not restrictive, reference being had to the appended claims rather than to the foregoing description to indicate the scope of the invention.

What I claim as new and desire to secure by Letters Patent is:

1. In a machine for operating on a traveling web,

5

web-guiding means arranged on the machine and having a foraminated concave surface against which a traveling web is held, a suction chamber connected to and communicating with said web-guiding means, said chamber having a fluid-admittance opening, a valve member connected to the suction chamber, movable with respect thereto in response to variations in tension in said traveling web and constructed and adapted to form a variable closure for said opening, and an element extending from said valve member and engaging the traveling web, whereby the suction in said chamber is increased in response to an increase in tension of said traveling web.

2. In a machine for operating on a traveling web, web-guiding means arranged on the machine and having a foraminated arcuate surface against which a traveling web is held, a suction chamber connected to and communicating with said web-guiding means, said chamber having a fluid-admittance opening, a valve member rockably mounted on the suction chamber and effective to control the size of said opening, and means engaging the traveling web, movable in response to a change in tension therein and connected to the valve member, whereby the suction in said chamber is increased in response to an increase in tension of said traveling web.

3. In a machine for operating on a traveling web, web-guiding means arranged on the machine and having a foraminated concave surface against which portions of a traveling web are engaged, a suction chamber connected to and communicating with the web-guiding means, instrumentalities connected to and effective for varying the

6

degree of suction within the chamber, means on said instrumentalities engaging the traveling web and movable in response to variations in tension thereof, and a manually-operable bleed valve mounted on the chamber and effective for preventing excessive suction therein.

4. In a machine for operating on a traveling web, web-guiding means arranged on the machine and having a foraminated arcuate surface against which portions of a traveling web are engaged, a suction chamber connected and communicating with the web-guiding means, fluid-admittance means arranged on the chamber, valve means mounted on the chamber and movable relative thereto in response to variations in tension of said traveling web and effective for regulating said fluid-admittance means, and a member extending from said valve means and engaging the traveling web, whereby the suction in said chamber is increased in response to an increase in tension in said traveling web.

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