Jan. 11, 1949. M. O. BASSETT 2,458,926

WEB SCANNING DEVICE

Filed March 12, 1948

Fig. 1.

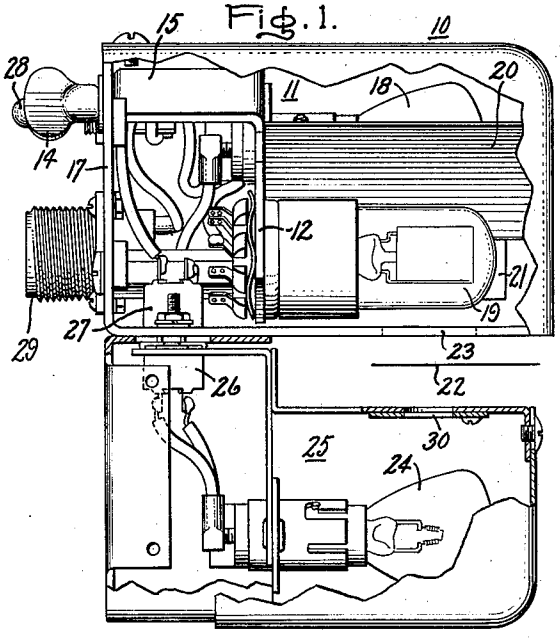


Fig. 2.

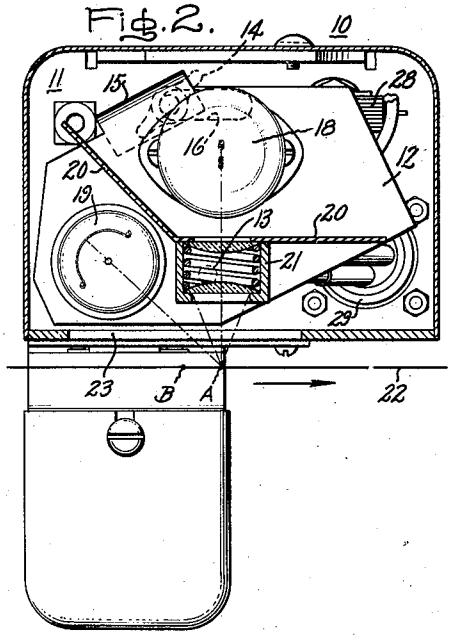
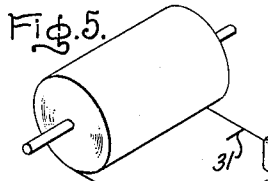


Fig. 5.



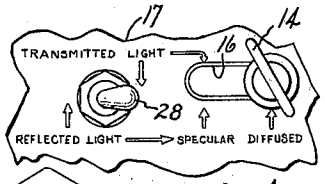


Fig. 4.

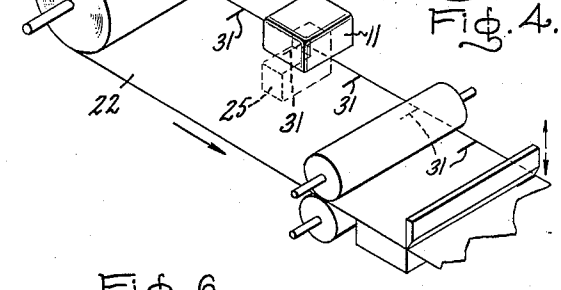


Fig. 3.

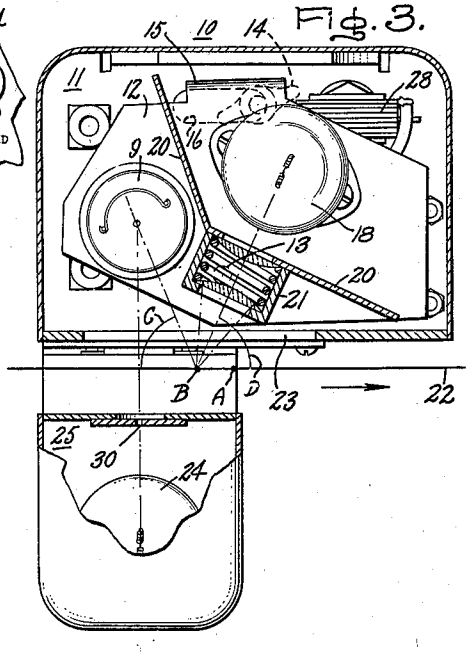
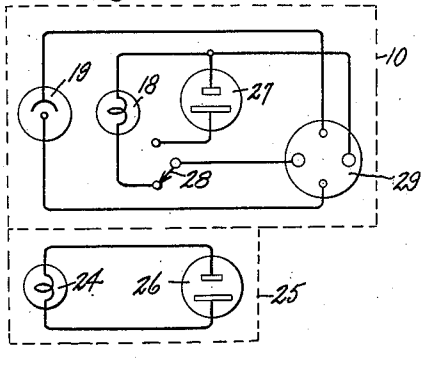


Fig. 6.



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WEB SCANNING DEVICE

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Application March 12, 1948, Serial No. 14,433

5 Claims. (Cl. 250—41.5)

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My invention relates to web scanning devices utilized in connection with a continuously moving web and is related, more particularly, to such devices utilizing light sensitive means responsive to light reflected from or transmitted through such continuously moving web.

A principal object of my invention is to provide an improved device of the type described which requires very simple manipulation thereof to accomplish scanning of a continuously moving web by specularly or diffusely reflected light from said moving web.

Another object is to provide an improved device of the type described which is economical to manufacture and is adapted to be operated by personnel having a minimum of skill.

In general, my invention comprises an enclosure which supports within it a pivotal chassis. Mounted on the chassis are a lamp and a photoelectric tube separated by a partition to keep the direct rays of the lamp from entering the proto-electric tube. The light from the lamp is directed through a lens system secured to the partition to provide a sharply focused area or spot of light on a moving web. As arranged, the movement of the chassis moves the locus of the focal point of light along an arc between selected positions so as to provide either diffuse or specular reflection of said light from the moving web. The point of pivot is so disposed with respect to the moving web that the light image incident on the web is in substantial focus at either the diffuse or specular position.

The advantage of the above recited arrangement of my invention is in providing a relatively fixed enclosure, and without disturbing the position of this enclosure with respect to the web being scanned, provide a change from diffuse reflection to specular or back as desired. This is accomplished by rotating the chassis through a predetermined arc and causing the spot of light incident on the moving web to shift along said arc between predetermined points so as to alter the angle of reflection with respect to the moving web.

The above objects and other advantages of my invention will be better understood from the following description and accompanying drawing in which Fig. 1 is a side view of an embodiment of my invention with the enclosures broken away to illustrate the arrangement of the components therein; Fig. 2 is a front view of my device with the upper enclosure in cross section to illustrate the cooperative arrangement of components for operation of the device when utilized for diffusely reflected light; Fig. 3 is a second front view with

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the upper and a portion of the lower enclosures in cross section to illustrate the utilization of my device for transmitted or specularly reflected light; Fig. 4 illustrates the utilization of suitable indicia for indicating the operating positions of my device; Fig. 5 depicts a simplified perspective view illustrating the application of my device for scanning a moving web; and Fig. 6 is a schematic diagram showing the electrical connections of my device.

In the description to follow, the term "web" is defined as any flat sheet or ribbon material such as paper, cellulose nitrate material (opaque or transparent), rubber sheets, metal foil, wood and the like.

The term "light-sensitive device" includes such devices as photoelectric tubes of the soft or gas-filled types, electron-multiplier types, bolometers, photolytic cells, selenium cells, and like devices.

Referring to the drawing, my scanning head 10 comprises an enclosure 11 containing a movable chassis 12 arranged to pivot about a point 13 as shown in Figs. 2 and 3.

Movement of the chassis 12 is accomplished by manipulation of a thumb screw 14 attached to an extended portion 15 of the chassis, the thumb screw passing through a slot 16 provided for this purpose in the front portion 17 of the enclosure 11. Fig. 4 is a fragmentary view of the portion 17 with suitable operating indicia inscribed thereon.

Mounted upon the chassis 12 is a light source 18, for example, a conventional automobile head light lamp. This type of light source is preferred as it approaches closer to a point source than other generally available types of illumination. A light-sensitive device, for example, a photoelectric tube 19 is mounted on the chassis 12 adjacent the light source 18.

Also mounted on the chassis 12 is an opaque partition 20 for shielding the photoelectric tube from the direct rays of the light source. Attached to the partition is a lens system 21 for focusing the light from the source 18 upon a moving web 22 adjacent which the scanning head 10 is mounted.

Attached to the scanning head 10 is a second light source 24 of the same type as 18. The light source 24 is disposed in an enclosure 25, the enclosure being secured to the scanning head 10 by means of a connection plug 26 attached to the enclosure 25 for engagement with a receptacle 27 attached to said scanning head as shown in Fig. 1.

A single-pole, double-throw switch 28 is utilized to switch the power from the light source

18 to the light source 24 or vice versa at will. A suitable source of electric current supply (not shown) is fed through a connector 29 to energize both light sources 18 and 24 and the photoelectric tube 19.

An aperture 30 is provided in the enclosure 25 so that a beam of light of proper size and shape reaches the photoelectric tube 19. It is also within the scope of my invention to utilize an adjustable aperture if so desired.

The power supply circuit is very simple, as illustrated in Fig. 6, and is one which requires a minimum of labor to assemble.

When, as shown in Fig. 5, the scanning head is suitably disposed in relation to the moving web 22 and the chassis 12 rotated to the position illustrated in Fig. 2, the light source image will appear on the web 22 at a point A. In this position, the specular light image is directed back into the lens system and only the diffuse reflection of the light image reaches the photoelectric tube. When the chassis is rotated to the position indicated in Fig. 3, the light source image is moved to a point B and in this position the specular light image is directed into the photoelectric tube, the angles C and D being equal.

It will be noted that the pivot 13 is so disposed with respect to the web 22 that the light image thereon is in substantial focus at either position A or B, the locus of the focal point being movable along the arc between the points A and B in the plane of the web 22. Preferably the movement of the light image is in a direction substantially parallel to the movement of the web 22.

The advantage of this arrangement resides in the fact that the enclosure 11 remains stationary while the change from diffuse to specular reflection is made by simply shifting the thumb screw 14 to a position over the proper indication on the front panel 17 as shown in Fig. 4. It can readily be appreciated that this arrangement requires a minimum of manipulation by an operator having a minimum of skill.

Inasmuch as the application of my device is suitable to the scanning of web composed of many and various materials, the adaptability thereof to scanning opaque materials of practically any color or surface condition will be readily appreciated.

For example, if one desires to scan a web of highly reflective material such as metal foil, the only requirement is the disposition thereon of a series of marks 31, the composition of which provide a surface appreciably less reflective than the web 22. The movable chassis 12 is then rotated by means of the thumb screw 14 to the specular position as indicated in Fig. 3. As the web moves along under the scanning head 10, as shown in Fig. 5, the light reflected from the web will be of such intensity as to cause considerable current to flow in the photoelectric tube in response thereto and when the incident light falls on the mark the amount of specularly reflected light will be greatly reduced and relatively less current will be caused to flow in the photoelectric tube.

When a rough or mat surface is scanned, the scan is changed to provide diffuse reflection of the incident light by moving the thumb screw 14 to the position shown in Fig. 2. In this position, the specularly reflected light is directed back into the lamp 18 and is lost while the diffusely reflected light is directed into the photoelectric tube 19. The mark used in connection with this form of scanning should provide a decrease in the amount of diffusely reflected light so that as the light image coincides with the mark very little or no light will reach the photoelectric tube thereby providing a similar current response in the photoelectric tube as described above.

For scanning transparent web, direct transmission of light is utilized and the web is marked with an opaque substance. The switch 28 is thrown to the right (with respect to the observer) as illustrated in Fig. 4, and the thumb screw 14 moved under the arrow to the right of the inscription "Transmitted light." This position is similar to "specular" scan. The relative position of the components for transmitted light operation is illustrated in Fig. 3.

From the foregoing, it will be readily observed that my invention provides a device simple to operate, readily adapted to the scanning of a large variety of material, compact and economical to manufacture.

The embodiment of my invention which has been illustrated and described has been selected for the purpose of setting forth the principles involved. It will be obvious that my invention may be modified to meet various conditions for different specific uses, and it is, therefore, intended to cover by the appended claims all such modifications which fall within the spirit and scope of this invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. In a photoelectric device for scanning a moving web, a pivotal support having mounted thereon a photoelectric tube and an optical system, said optical system projecting a light image on said web and comprising a light source and focusing means between said light source and said web, and means for moving said pivotal support between two predetermined positions to shift said light image on said web, said positions being such that said photoelectric tube receives diffusely reflected light in one said position and specularly reflected light in the other said position.

2. In a photoelectric device for scanning a moving web, a pivotal support having mounted thereon a photoelectric tube and an optical system, said optical system projecting a light image on said web and comprising a light source and focusing means between said light source and said web, and means for rotating said pivotal support between predetermined positions to cause movement of the light image along an arc in the plane of said moving web.

3. In a photoelectric device for scanning a moving web, a pivotal support having mounted thereon a photoelectric tube and an optical system, said optical system projecting a light image on said web and comprising a light source and focusing means between said light source and said web, and means for moving said pivotal support between two spaced-apart predetermined positions to shift said light image on said web, said position being such that said photoelectric tube receives diffusely reflected light in one position and specularly reflected light in the other position, said pivotal support being so disposed with respect to said web that said light image is in focus on said web in either of said positions.

4. In a photoelectric device for scanning a moving web, a pivotal support, a partition of opaque material mounted on said support, an optical system projecting a light image on said web and comprising a light source secured to said support on one side of said partition, focusing means secured to said partition intermedi-

ate said light source and moving web, a light sensitive device secured to said support on the other side of said partition, and means for rotating said pivotal support between predetermined positions to cause movement of the light image along an arc in the plane of said moving web.

5. In a photoelectric device for scanning a moving web, a pivotal support having mounted thereon a photoelectric tube and an optical system, said optical system projecting a light image on one side of said web and comprising a light source and focusing means between said light

source and said web, a second light source arranged to project a light image through said web from the other side thereof, and means for moving said pivotal support between predetermined spaced-apart positions relative to said web, said photoelectric tube receiving directly transmitted light in one position and reflected light in the other position.

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(No references cited.)