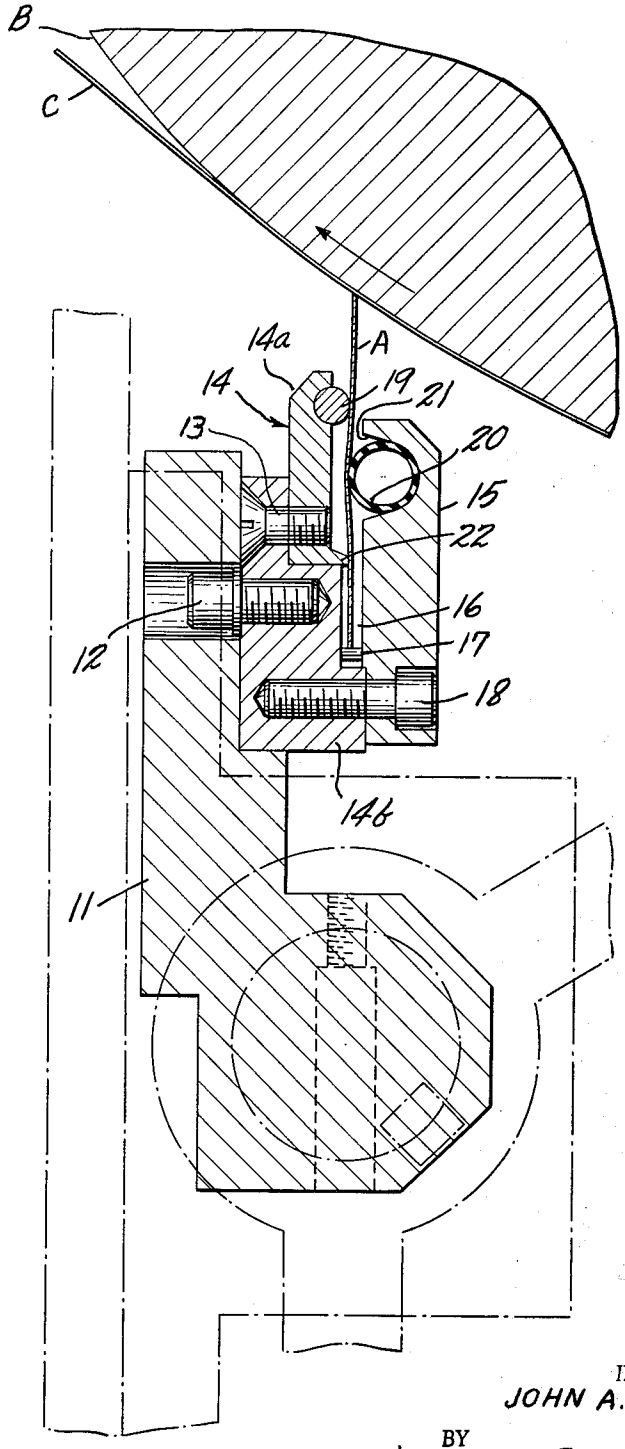
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BLADE HOLDING APPARATUS

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BLADE HOLDING APPARATUS

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This invention relates to a novel blade holder for maintaining a resilient blade in the desired operative relationship with a rotatable cylinder. Although the invention is particularly applicable to web coating machines and will be described herein in that particular application, nevertheless, the invention may also be applicable to other types of machines, such as for use as a doctor blade holder in a printing press.

It has always been recognized as important in coating machines that the resilient coating blade be properly positioned with respect to the rotating backup cylinder for the web on which the coating is to be applied by the blade. In many conventional coating machines, the setting and lockup of the coating blade in the blade holder is a tedious and time-consuming task which involves the steps of properly orienting the coating blade in the blade holder and then locking it therein by use of mechanical clamps with the attendant danger that the blade might be displaced in the process, necessitating that the lockup operation be repeated in its entirety. This tedious and time-consuming task was greatly simplified in a blade holder described and claimed in U.S. Letters Patent to Faeber et al., No. 3,057,327, in which blade holder an inflatable tube is substituted for mechanical clamps so that when the blade is properly adjusted in the blade holder it can be inflated to lock up the blade instantly, thereby minimizing the danger that it may become displaced within the holder during the lockup operation, and another inflatable tube is provided to control the loading of the blade against the backup cylinder.

Another improved blade holder is described and claimed in the pending patent application of Galer et al., Serial No. 119,431, filed June 26 1961, wherein it is recognized that the rigid manner in which coating blades are locked by mechanical clamps does not afford adequate control over the blade and, furthermore, that it may produce irregularities in the blade, such as ripples and other defects, which show up as imperfections in the coating film. To overcome these difficulties, the improved blade holder described therein afforded limited freedom of movement to the blade while still maintaining it in proper orientation and alignment with the backup cylinder.

The blade-holding apparatus of the present invention represents a still further significant advance in the art of web coating in that it embodies the combined advantages of the blade holders discussed above, as well as other advantages, in a novel and simplified structure in which provision is made for quickly and firmly supporting the blade in the desired registered position with the backup cylinder without the use of blade distorting clamps. Toward this end, in the blade holder of the present invention, the blade is accommodated in a slot which is somewhat wider than the thickness of the blade with the coating edge of the blade projecting beyond the slot and in alignment with the backup cylinder. The blade is held firmly in operative position with the backup cylinder by the cooperation of a fulcrum, preferably rigid, which engages the blade along a line parallel with and in proximity to the coating edge of the blade and pressure-actuated means which engages the opposite surface of the blade along a line or band parallel with the rigid fulcrum but more remote from the coating edge of the blade. The side of the blade opposite the pressure-actuated means is unsupported

by the blade holder between the pressure-actuated means and the rigid fulcrum, so that the force exerted by the pressure-actuated means tends to pivot the blade on the rigid fulcrum and urge the coating edge of the blade against the backup cylinder. The pressure-actuated means, therefore, not only cooperates to firmly support the blade in operative position with the backup cylinder without exerting a rigid, blade distorting, clamping action on the blade, but it influences the force with which the coating edge of the blade is loaded against the backup cylinder. In addition, by using a rigid fulcrum to load the coating edge of the blade against the backup cylinder instead of an inflatable tube, as in certain of the prior art blade holders, the rigid fulcrum, being more compact and occupying less space than an inflatable tube, can be spaced more closely to the rotatable cylinder than an inflatable tube.

For a complete understanding of the present invention, reference should be made to the detailed description which follows, and to the accompanying drawing in which the figure shows a cross-sectional side view of the blade clamping apparatus of the present invention in operative position with respect to a rotatable backup cylinder.

The blade holding apparatus of the present invention is shown in the drawing as applicable to a web coating machine of the type described in the pending application of Merrill F. Galer, Serial No. 188,426, filed April 18, 1962 and now abandoned, in which the web to be coated is fed between a rotating backup cylinder and a tank to which coating material is fed and discharged therefrom through a narrow opening defined between the web and a metering bar, and the web is then fed to a coating blade in operative relationship to the backup cylinder so that the coating blade will apply the coating uniformly on the web and remove the excess coating material therefrom. In a web coating machine of this type the coating blade is held in the blade holder in a generally vertical position. It should be understood, however, that the blade holding apparatus of the present invention is applicable to coating machines of the type described in U.S. Letters Patent to H. W. Faeber, No. 3,070,066, in which the blade holder maintains the blade in operative position with the backup cylinder at an angle inclined to the horizontal and in which the coating material is fed to the web to be coated by gravity flow across the upper surface of the coating blade.

Referring to the drawing, the blade holding assembly of the present invention, generally designated **10**, supports a coating blade A in operative relation to a rotatable backup cylinder B to apply a uniform coating on the surface of a moving web C in contact with the backup cylinder.

The blade holding assembly is mounted to a supporting member **11** by bolts **12** and the supporting member **11** is carried by a pivotal support (shown in phantom lines) which can be rotated to carry the blade holder either in a clockwise direction from a retracted position to the operative position shown in the drawing or in a counterclockwise direction to move the blade holder from the operative to the retracted position.

The blade holding assembly includes a pair of jaws **14** and **15** having opposed, spaced-apart surfaces which define a blade receiving slot **16** therebetween. The jaw **14** is made in two parts, an upper part **14***a* fixed by screws **13** to a lower part **14***b*. The lower part **14***b* is mounted to the supporting member **11** by the bolts **12**, the ends of which are threaded into the lower jaw part **14***b*. The jaw **15** is mounted by a series of threaded bolts **18** to the lower jaw part **14***b*.

The coating blade accommodated within the slot **15** engages a series of pins **17** which serves as a means of registering the bottom or back edge of the coating blade.

In the operative position of the coating blade, it is held firmly in its registered position with the coating edge loaded against the backup cylinder by the cooperation of a rigid fulcrum **19** carried by the jaw part **14***a* and a pressure actuated element **20** accommodated in a recess **21** of the jaw **15**. The rigid fulcrum, in its preferred form, is a steel rod partially recessed and affixed within the surface of the jaw part **14***a* adjacent the coating blade and in proximity to the upper end of the jaw part. The fulcrum can, of course, be made integrally with the jaw part **14***a*. The pressure-actuated element **20**, in its preferred form, is an inflatable tube which when inflated engages the side of the coating blade opposite the side engaged by the rigid fulcrum and along a line or narrow region more remote from the coating edge of the blade than the rigid fulcrum. The rigid fulcrum and the inflatable tube are in parallel relation with the coating edge of the blade in registered condition with the backup cylinder, and they engage the blade along substantially the entire effective length of the blade.

The coating blade is unsupported by the blade holder opposite the inflatable tube over a span defined between the rigid fulcrum **19** and a parallel rigid nose formation **22** of the jaw part **14***a* which also extends substantially the entire effective length of the blade. Upon inflation, the inflatable tube engages this unsupported span, and the force exerted by the inflatable tube tends to pivot the blade on the rigid fulcrum to urge the coating edge of the blade against the backup cylinder. The pressure exerted on the coating blade by the inflatable tube not only effectively and firmly supports the coating blade in operative position without the use of rigid clamps which, as described above, tend to produce irregularities in the coating blade, but controls the force exerted by the coating blade against the backup cylinder.

The invention has been shown and described in a single preferred form and by way of example, and obviously, many modifications and variations can be made therein without departing from the spirit of the invention. The invention, therefore, should not be limited to any specified form or embodiment except insofar as such limitations are expressly set forth in the appended claims.

I claim:

1. A blade holding apparatus for maintaining a blade in operative relationship with a rotatable cylinder comprising a blade holder, means defining a slot in the blade holder for accommodating the blade therein, means registering the edge of the blade within the slot to align the opposite edge with the rotatable cylinder, a rigid fulcrum adjacent one side of the blade and extending substantially the entire length of the blade in parallel relation to the aligned edge of the registered blade, the blade extending beyond the rigid fulcrum in the direction of the rotatable cylinder free of associated influencing structure, pressure actuated means adjacent the other side of the blade and extending parallel to the rigid fulcrum, the pressure actuated means engaging the blade throughout substantially the entire effective length of the blade but being spaced apart from the rigid fulcrum and more remote from the operative edge of the blade than the rigid fulcrum, and a rigid formation carried by the blade holder adjacent the same side of the blade which the rigid fulcrum engages but more remote from the operative edge of the blade than the pressure actuated means, the said rigid formation extending parallel to the rigid fulcrum along substantially the entire effective length of the blade, said rigid formation and the rigid fulcrum defining an unsupported span of the blade adjacent the side of the blade opposite the pressure actuated means, whereby a force exerted on the blade by the pressure actuated means tends to pivot the blade on the rigid fulcrum to hold the blade firmly in operative position and load the operative edge of the blade against the rotatable cylinder.

2. A blade holding apparatus as set forth in claim **1** in which the rigid fulcrum is a rounded formation which engages the blade in a straight line.

3. A blade holding apparatus as set forth in claim **1** in which the rigid fulcrum is a steel rod of substantially circular cross-section carried by the blade holder.

4. A blade holding apparatus as set forth in claim **1** in which the pressure actuated means is an inflatable tube carried in a recess of the blade holder.

5. A blade holding apparatus for maintaining a blade in operative relationship with a rotatable cylinder comprising a blade holder, means defining a slot in the blade holder for accommodating the blade therein with the operative edge aligned with the cylinder, spaced apart parallel blade engaging formations carried by the blade holder adjacent one side of the blade, said spaced apart formations defining an unsupported span of the blade therebetween, the formation in proximity to the operative edge of the blade serving as a rigid fulcrum, and the blade extending beyond the rigid fulcrum in the direction of the rotatable cylinder free of associated influencing structure, said parallel formations being parallel with the operative edge of the blade and extending substantially the entire effective length of the blade, and a blade-pivoting inflatable tube partially recessed in the blade holder adjacent the side of the blade opposite the parallel formations, said inflatable tube being parallel with the rigid formations and acting against the unsupported span of the blade intermediate the two parallel formations, whereby the pressure exerted on the blade by the inflation of the tube tends to pivot the blade on the rigid fulcrum to hold the blade securely in operative position and urge the operative edge of the blade against the rotatable cylinder.

6. A blade holding apparatus set forth in claim **5** in which the slot is upright so that the force of gravity will prevent the blade from falling out of the slot when the blade is in inoperative position and out of pressure engagement with the rotatable cylinder.

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