Oct. 9, 1962 H. W. FAEBER ETAL 3,057,327

BLADE CONTROLLING DEVICE FOR COATING APPARATUS

Filed March 4, 1959 2 Sheets-Sheet 1

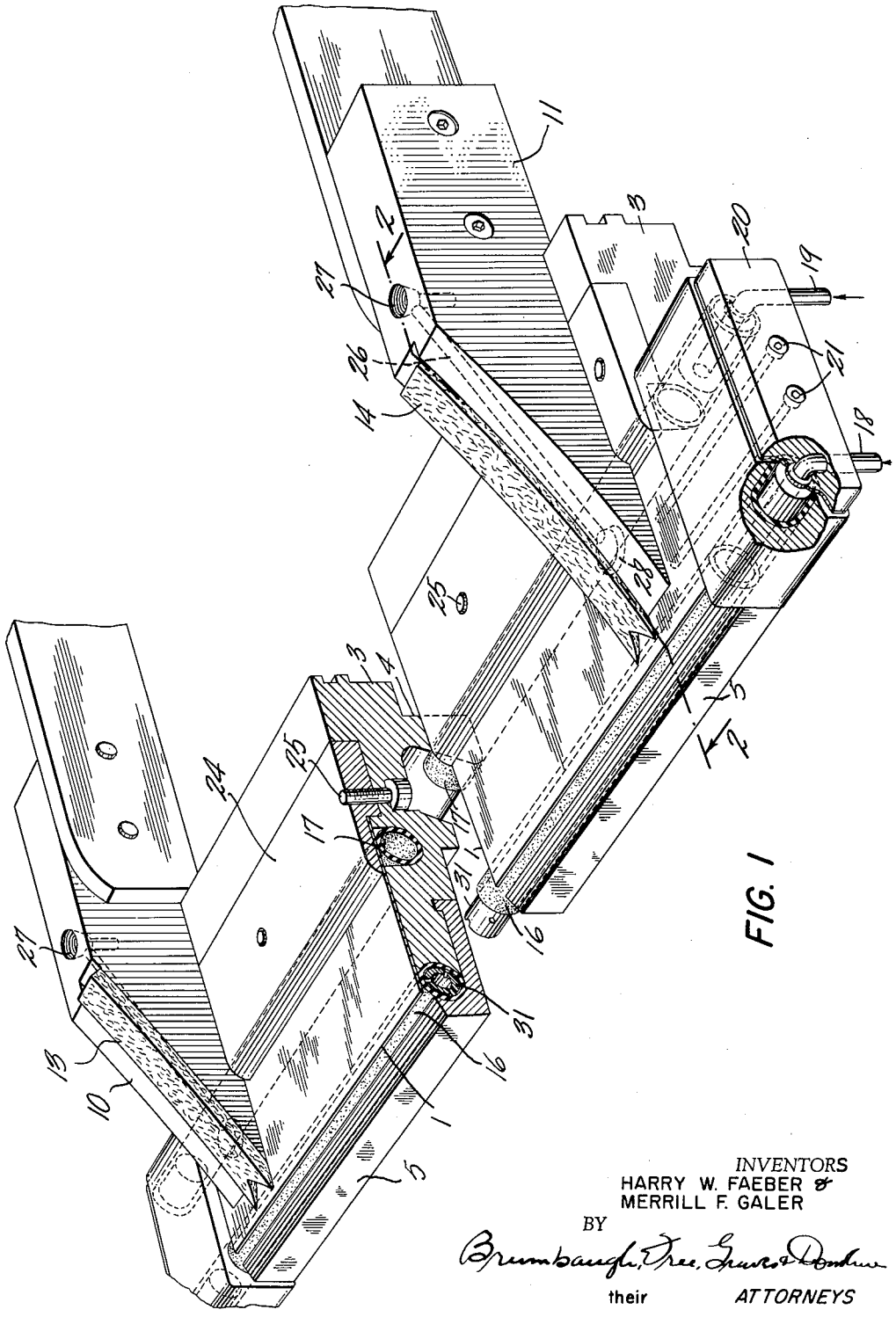


FIG. 1

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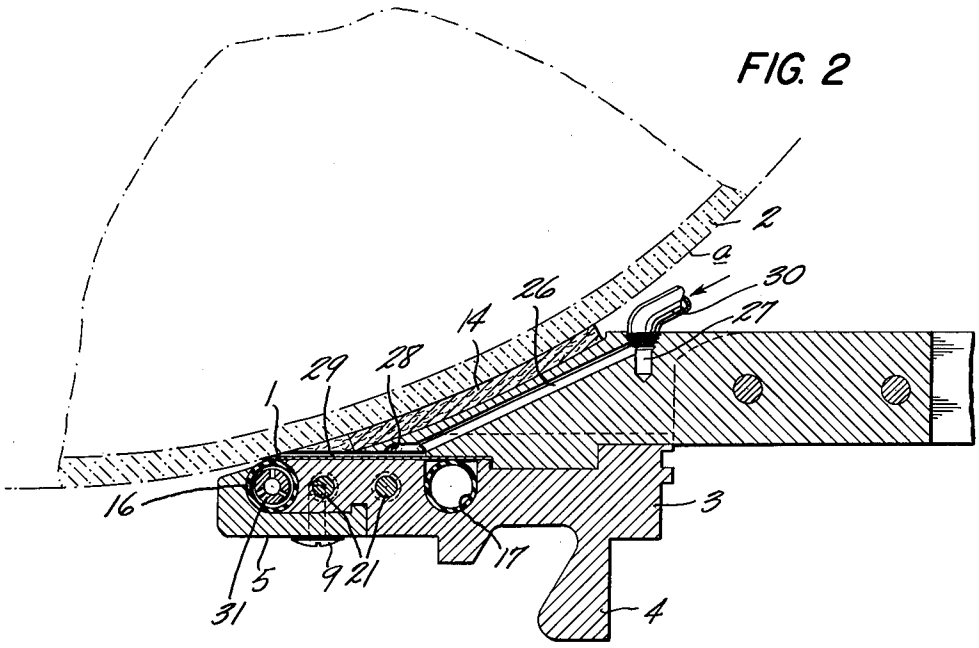
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FIG. 2



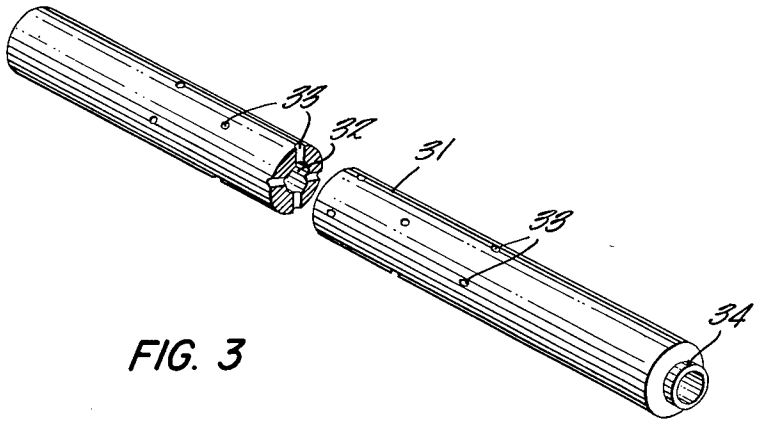


FIG. 3

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BLADE CONTROLLING DEVICE FOR COATING APPARATUS

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6 Claims. (Cl. 118—413)

This invention relates to improvements in coating machines in which a blade cooperates with the outer surface of a rotatable cylinder in coating a fluent material on the surface of a web or sheet in contact with the rotatable cylinder.

In machines of this general organization, the character and quality of the coating action of the blade is influenced by a number of factors, including among others, the position and lockup of the blade, the force exerted by the blade against the surface on which the fluent material is to be applied, and the uniformity of that force along the entire length of the blade. Therefore, these factors must be taken into consideration in the design of a suitable blade clamping apparatus for such machines.

Heretofore, blade clamping apparatus has been proposed for coating machines in which a tube inflated by fluid pressure exerts a force against the blade to urge the blade into pressure contact with the surface on which the fluent material is to be spread by the blade. While blade clamping apparatus embodying this feature has generally proven satisfactory, problems have been encountered in handling, installing and straightening the inflatable tubes and in insuring even distribution of pressure throughout the length thereof. The problems of installing and straightening the tubes to insure that they exert a relatively uniform pressure throughout the entire length of the blade are even more pronounced when the more flexible inflatable tubes are used, particularly those supplied in rolled form, since they tend to retain a curl.

The present invention provides an improved blade clamping apparatus in which the aforementioned problems are eliminated by the provision of a stiffened inflatable tube. More particularly, the blade clamping apparatus of the present invention includes an inflatable tube containing a rigid insert therein which extends substantially the entire length of the tube, or at least that portion of the tube which acts against the blade. This stiffened or reinforced tube is maintained in relatively straight condition even when uninflated, so that it is readily handled and installed in the blade clamping apparatus. Furthermore, even when the tube is inflated at a relatively low pressure, the straight condition of the tube tends to produce a uniform pressure on the blade throughout the entire length of the blade.

A further feature of the present invention is that the rigid insert can be provided with a system of passages through which the fluid pressure can be introduced into the inflatable tube to insure uniform distribution of the fluid pressure throughout the length of the tube.

For a complete understanding of the present invention, reference may be made to the detailed description which follows, and to the accompanying drawings, in which:

FIGURE 1 is a perspective view of a blade clamping apparatus embodying the present invention with the central portion of the blade clamping apparatus broken away so as to afford a cross-sectional view;

FIGURE 2 is a side sectional elevation of the blade clamping apparatus taken substantially along the line 2—2 of FIGURE 1, looking in the direction of the arrows; and

FIGURE 3 is an enlarged perspective view of the rigid insert removed from the inflatable tube.

The blade clamping apparatus of the present invention

is applicable to a coating machine, for example, of the type described in the copending application of Harry W. Faeber, Serial No. 676,553, filed August 6, 1957. In this machine, a coating material is applied to and spread evenly on the surface of a web or sheet *a* (see FIGURE 2 by a coating blade **1** as the web or sheet passes between the blade and a rotatable cylinder **2**. The coating blade **1**, made of highly resilient steel, is supported by a blade holder assembly which includes a support member **3** having a depending leg **4** formed integrally therewith by means of which the blade holder assembly is locked to a pivotal frame (not shown) of the coating machine.

The support member **3** is equipped with a piece **5** which interlocks with the support member **3** and is affixed thereto by screws **9**. For all practical purposes, the piece **5** when thus assembled is an integral part of the blade holder assembly.

The blade holder assembly also includes a pair of spaced-apart side walls **10** and **11** which cooperate to guide the flow of the coating material to the coating blade **1** for application to the web or sheet in contact with the rotatable cylinder **2**. The upper forward edges of the side walls **10** and **11** are concavely curved in substantially complementary fashion to the curvature of the cylinder **2**. An effective seal is provided between the side walls and the cylinder by the felt pads **13** and **14**, which are attached to the curved edges of the end walls **10** and **11**, respectively.

The coating blade **1** is supported above a flat upper surface of the blade holder. When the blade is properly positioned upon the blade supporting surface, the coating edge thereof extends beyond the supporting surface so as to overlie a recess containing an inflatable tube **16**. This recess is defined by opposed concave surfaces of the support member **3** and the piece **5**. The rear or clamped portion of the coating blade, that is, the region adjacent the edge which is opposite the coating edge, overlies another recess in the upper surface of the blade holder which accommodates an inflatable tube **17**. The inflatable tubes **16** and **17** extend substantially the entire length of the blade holder assembly, beyond the ends of the coating blade.

The inflatable tubes each communicate with a source of fluid under pressure at one or both ends. In the embodiment shown, the inflatable tubes **16** and **17** are closed at one end and connected to the conduits **18** and **19**, respectively, at the other end through passages in a block **20** which is affixed by screws **21** to the end of the blade holder assembly. Although not shown in the drawings, separate provision is made for regulating the fluid pressure within each of the conduits **18** and **19**.

A clamp **24**, affixed by a series of screws **25** to the member **3** of the blade holder assembly, has an operative edge which overlies the upper surface of the rear portion of the blade **1**, frictionally locking the blade to the blade holder assembly. The clamp **24** is recessed within a groove of the blade holder assembly so that the upper surface of the clamp **24** forms a continuation of the surface of the blade holder assembly over which the coating material flows. The forward edge of the clamp **24** extends beyond the front wall of the recess which accommodates the inflatable tube **17** so that when the pressure within the inflatable tube **17** is increased the tube will tend to deform by flattening itself against the underside of the blade **1**. This pressure urges the blade against the underside of the clamp **24**. Since the tube **17** is in contact with the underside of the blade **1** throughout the entire length of the blade, its exerts a relatively uniform vibration-free clamping action along the entire length of the blade.

The side walls **10** and **11** are affixed to and carried by opposite ends of the clamp **24**. Accordingly, the extreme ends of the blade lie underneath the forward ends of the

side walls **10** and **11**, to prevent seepage of the coating material through this clearance. Fluid seals are established by introducing a fluid under pressure therein. Toward this end, each of the side walls **10** and **11** are provided with a passage **26** (see FIGURE 2) having an inlet port **27** in the upper edge of each of the side walls and a discharge opening **28** at the lower end which communicates with the space **29** between the upper surface of the blade and the underside of the forward end of the respective sidewall. The inlet port is connected to a fluid under pressure by a conduit **30**, and this fluid is supplied to the space **29** to keep the space free of coating material. In effect, the fluid pressure serves as a fluid barrier or end dam for the coating material. The fluid supplied to this space may be a relatively viscous liquid, such as a heavy grease, or it may be a gaseous phase fluid, such as air.

The tube **16**, when inflated, deflects the unclamped coating edge of the blade upwardly toward the rotatable cylinder **2** to control the pressure engagement of the coating blade with the surface to be coated. This, in turn, determines the thickness of the coating which remains on the surface to be coated after the surface has been subjected to the wiping action of the blade.

The inflatable tube **16** accommodates therein a straight, rigid insert **31** which facilitates handling of the tube before and during installation and maintains the tube **16** in straight condition adjacent the coating blade even before inflation or when inflated at low pressure. Although a solid rod can be used as the insert, in the embodiment shown in FIGURE 3 the insert is of tubular shape having a network of passages therethrough which helps distribute the fluid pressure uniformly throughout the length of the tube **16**. More specifically, the tubular insert **31** has as axial pasage **32** extending therethrough and a plurality of uniformly spaced radial passages **33** leading from the axial passage **32** to the outer surface thereof. The inlet end of the axial passage **32** is formed by an annular hub **34** which extends from one end of the tubular insert beyond the end of the inflatable tube to permit it to be plugged into a complementary opening of the block **20**, establishing a tight fit. In this way, the conduit **18** is connected to the interior of the inflatable tube **16** through the axial passage **32** of the rigid insert **31** and the radial passages **33** thereof, while at the same time the insert is supported within the center of the recess which accommodates the inflatable tube without support from the surface which defines the recess between the ends of the tube. Of course, provision may be made for supporting the insert **31** at the opposite end, as well.

In order to permit effective control to be exercised over the deflection of the blade, it is desirable to use a tube made of relatively flexible material such as a thin gauge neoprene. The inflatable tube **17** may be made of the same material. Thus, in the uninflated condition of tube **16**, the rigid insert serves as a stiffener or reinforcement for the tube to maintain it in a substantially straight condition. Upon inflation, the tube tends to become flattened against the blade throughout the entire length of the blade, producing a uniform pressure on the blade.

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

We claim:

1. A clamping apparatus for a blade which cooperates with the outer surface of a rotatable cylinder in spreading a fluent material comprising a holder for the blade, a blade carried by the holder, means for clamping the blade remote from the coating edge thereof, means defining an elongated recess within the blade holder in proximity to the coating edge of the blade, an elongated inflatable tube accommodated within the recess and extending the entire length of the coating edge of the blade, said inflatable tube being in communication with a source of fluid under pressure, and a straight rigid insert within the inflatable tube and extending substantially the entire length of the inflatable tube for maintaining the inflatable tube properly positioned within the length of the recess.

2. A clamping apparatus as set forth in claim 1 in which the rigid insert includes a main passage therein which extends substantially the entire length of the insert and a plurality of passages throughout the length of the tube connecting the interior of the tube with the main passage.

3. A clamping apparatus as set forth in claim 2 in which the inflatable tube is closed at one end and therigid insert extends beyond the end of the inflatable tube at the other end.

4. A clamping apparatus as set forth in claim 3 including a coupling containing a passage therethrough into which the exposed end of the rigid insert is plugged in tight fitting relationship.

5. A clamping apparatus as set forth in claim 1 including means defining a recess within the blade holder adjacent the side of the blade opposite the clamping means and extending substantially the entire length of the blade remote from the operative edge of the blade, said clamping means overlying said recess and an inflatable tube accommodated within the recess, said inflatable tube being in communication with a source of fluid under pressure, said tube when inflated flattening against the side of the blade opposite the clamp to produce a uniform clamping action on the blade throughout its length.

6. A clamping apparatus for a blade which cooperates with the outer surface of a rotatable cylinder in spreading a fluent material comprising a holder for the blade having a surface for receiving the blade in contact therewith, a blade carried by the holder in contact with said surface, means for clamping the portion of the blade remote from the coating edge thereof against the supporting surface, thereby permitting the unclamped coating edge of the blade to be deflected, means defining a recess within said holder in proximity to the coating edge of the blade, an inflatable tube within said recess and extending substantially the entire length of the coating edge of the blade, said inflatable tube being in communication with a source of fluid under pressure, a straight, rigid insert within the inflatable tube extending substantially the entire length of the coating edge of the blade, and means for supporting the rigid tube within said recess out of contact with the surface defining the recess.

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