

June 8, 1965

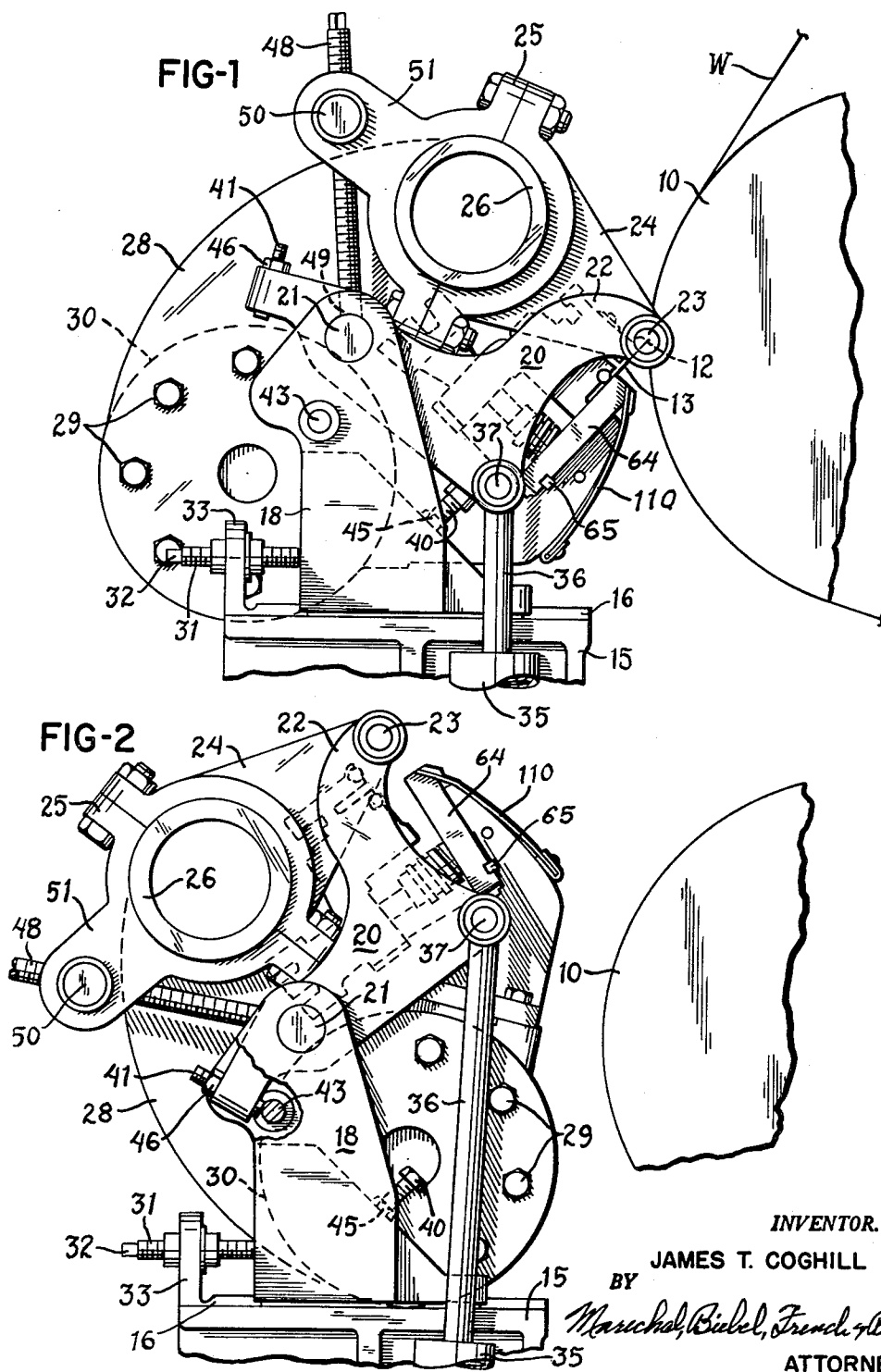
J. T. COGHILL

3,187,718

FLEXIBLE DOCTOR BLADE COATING APPARATUS

Filed May 28, 1962

2 Sheets-Sheet 1



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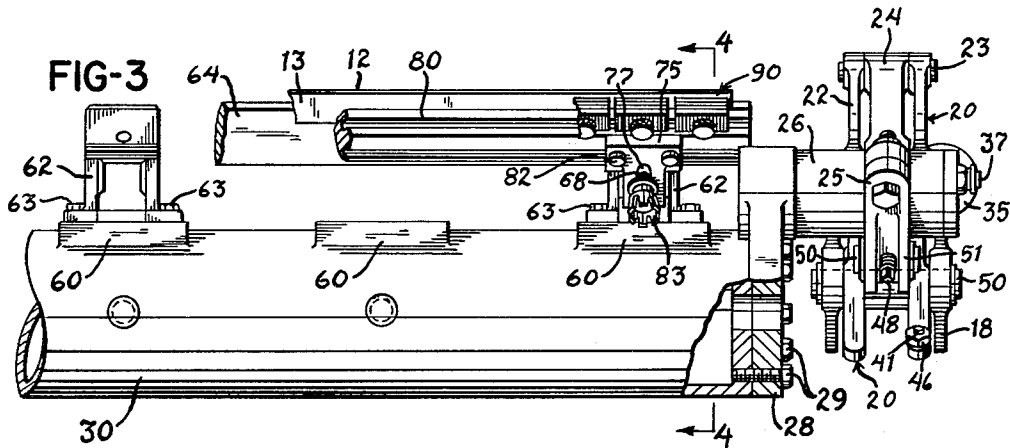
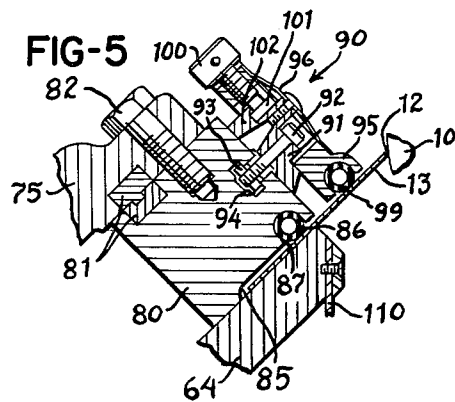
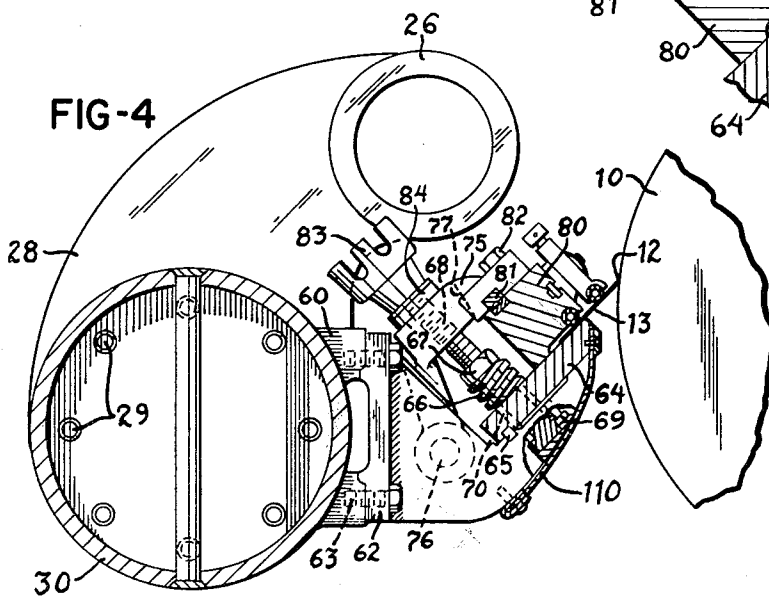
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2 Sheets-Sheet 2



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FLEXIBLE DOCTOR BLADE COATING APPARATUS

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5 Claims. (Cl. 118—126)

This invention relates to coating apparatus for web materials, and particularly to means for adjustably mounting a flexible doctor blade in conjunction with web coating apparatus.

In the coating of paper and other web materials, the web material to be coated is moved through or past a coating station where a fluent coating is applied thereon, and as or after the coated surface leaves the coating station, one of several known expedients is utilized to doctor or smooth and even the coating and regulate the thickness thereof. The present invention is directed to one of such expedients, specifically, a flexible blade of the type which is shown and described in U.S. application of Robert J. Jacobs and James T. Coghill, Serial No. 817,788, for Paper Machinery, hereinafter designated as Case A, filed June 3, 1959, now Patent No. 3,079,889, issued March 5, 1963, by the assignee of this application. In particular, the invention is directed to the combination of such a flexible doctor blade with a backing roll carrying a web having an unmeted coating thereon which is interchangeable with existing air doctor coating apparatus.

In order to achieve maximum efficiency with the use of a flexible doctor blade, it should be adjustable to vary the pressure exerted by the blade on the backing roll in order to compensate for the thickness of the various web materials which will be coated and the nature of the coatings themselves. In addition, the doctor should be retractible in its entirety to a position spaced from the backing surface so that the web may be threaded through the coating apparatus, the components of the machinery can be readily cleaned, and for emergency purposes when the web breaks and it is necessary to clear accumulated broke from the coater. It is also desirable that the flexible blade mounting apparatus include means for locally changing the pressure exerted by the blade on the web to compensate for conditions such as uneven web or blade edge, local stressing of the blade, and any other factor tending to cause an uneven coating on the web.

It is a principal object of the invention to provide coating apparatus incorporating a flexible doctor blade having a novel mounting arrangement which promotes ease and accuracy of adjustment of the blade relative to the cooperating backing roll.

Another object of the invention is to provide an improved adjustable supporting apparatus for a flexible doctor blade in conjunction with a backing surface for the purpose of doctoring a coating on a web which is moving on the backing surface.

A further object of the invention is to provide adjustable mounting apparatus for a flexible doctor blade having an edge which cooperates with a backing roll to doctor the fluent coating on a web supported by the roll, which apparatus will adjust the blade angularly about its working edge as well as toward and away from the roll, retract the blade to a position spaced from the roll for servicing of the apparatus and the feeding of material therethrough, provide for local adjustment of the pressure exerted by the blade on the roll, and be interchangeable with existing air doctor coating apparatus.

Additional objects and advantages of the invention will be apparent from the following description, the accompanying drawings and the appended claims.

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In the drawings—

FIG. 1 is an end view of the apparatus utilized to mount the flexible blade;

FIG. 2 is a view similar to FIG. 1 but illustrating the apparatus in a retracted position;

FIG. 3 is a plan view showing the apparatus for mounting and adjusting the flexible blade;

FIG. 4 is a sectional view essentially along the line 4—4 of FIG. 3; and

FIG. 5 is an enlarged fragment of FIG. 4.

Referring to the drawings, which illustrate a preferred embodiment of the invention, FIG. 1 shows a portion of a machine for coating paper including a backing roll 10 having a web W of paper or other material with an uneven fluent coating moving therewith past the edge 12 of a flexible blade 13 to be doctored thereby. In particular, the flexible blade 13 is of the type shown and described in Case A. As will be understood, the blade 13 itself is adjustably held by the coater head assembly, a cross-section of which is shown in FIG. 4, which assembly is supported on each side of the paper coating machine for bodily and angular adjustment with respect to the backing roll 10 by side assemblies, shown best in FIGS. 1—2.

Each side assembly includes a horizontal supporting bracket 15 fixed to the main frame member, not shown, of the coating machine. On the top of the bracket 15 is a track 16 having a carriage 18 slidably mounted thereon for horizontal movement back and forth with respect to the roll 10. The uppermost end of the carriage 18 is split and has a bracket 20 pivotally connected thereto by a pin 21 for swinging movement between the positions shown in FIGS. 1 and 2. This bracket 20 includes a forked portion 22 which extends toward the roll 10 and carries a pivot pin 23 for pivotally mounting one end of a two-piece arm 24—25 which forms a clamp for a stub-shaft 26. The shaft 26 projects from and is rigidly secured to one end of an arm 28 having its other end secured by screws 29 to one end of the torque tube 30 which forms the main support for the blade holder assembly.

The entire side assembly and hence, the blade holder assembly, can be moved horizontally toward and away from the roll 10 by sliding the carriages 18 along the tracks 16. The desired horizontal position of each carriage 18 on its track 16 is adjusted and maintained by a screw 31 which may have a squared end 32 to receive an adjusting wrench, and which engages the carriage 18 and is threaded through the upwardly extending bracket 33.

A cylinder 35 which is mounted on the frame of the machine has its piston rod 36 connected to the bracket 20 by a pin 37 thereby enabling the cylinder 35 to rotate the bracket 20 about the pin 21 to and from a retracted position, as shown in FIG. 2, with respect to the roll 10. Adjustable stop screws 40 and 41 limit the clockwise and counterclockwise movement, respectively, of the bracket 20. Screw 41 contacts the pin 43 which extends horizontally across the split portion of the carriage 18, as shown in FIG. 2 while screw 40 merely engages the bracket 20 near pin 37. By loosening the lock nuts 45 and 46 and turning the stop screws 40 and 41, respectively, the latter can be extended or withdrawn thereby correspondingly changing the limits of movement of the bracket 20.

Adjustment of the relative angular positions of the bracket 20 and the arm 24—25 is accomplished by a screw member 48 which has one end 49 journaled in the pin 21 while the main body thereof is threaded through the cross-pin 50 extending through the ears 51 of the arm. Each of the above described movements can be made separately and independently of the position and/or adjustments of the other components. The above described side assembly is generally similar to that described in R. W. Phelps

U.S. Patent No. 2,981,224, for Adjustable Mounting for Air Doctor, issued April 25, 1961, to the assignee of this application, and the hereinafter described blade holder assembly is interchangeable with the air doctor apparatus disclosed therein.

As already noted, the blade holder assembly includes and is carried by the torque tube 30, which has longitudinally spaced lugs 60 welded thereon along its entire length, each having a yoke-shaped bracket 62 mounted thereon by bolts 63. A continuous supporting bar 64 extends along the entire width of roll 10 and is positioned by keys 65 on the brackets 62 and clamped in position by the springs 66 which are mounted between the nuts 67 on studs 68 and the bar 64. Each stud 68 is rigidly secured at its lower end to the associated bracket 62, for example, by means of press fitting and a locking dowel 69. The bar 64 has an enlarged hole 70 for each stud 68 so that it can slide on the brackets 62 to compensate for expansion.

A hinge member 75 is pivotally mounted on a hinge pin 76 which extends between the two arms of each bracket 62, and it is slotted at 77 to receive the associated stud 68 with sufficient clearance for at least 10° of hinge movement. A blade holder bar 80, like the support bar 64, is coextensive with the blade 13 and the width of the web W, and it is held in fixed relation with the hinges 75 by keys 81 and bolt 82 while the knob nut 83 and spherical washer 84 on each stud 68 clamp the bar 80 against the support bar 64.

The surface of bar 80 adjacent bar 64 is milled at 85 to form a slot into which the flexible blade 13 is inserted and held firmly by a pressure tube 86 mounted in a groove 87 in the blade holder bar 80. Prior to pressurization of tube 86, the blade 13 must be accurately positioned with respect to bar 64, and for preferred operation the blade edge 12 should be aligned with the axis of pivot pin 23 so that angular movement of arm 20 will effect angular movement of the blade 13 without substantially changing the relative position of its edge 12 and the roll 10. Such positioning can be effected by any means which will accomplish this result, and it is recommended to use the gauge mechanism disclosed in my copending U.S. application Serial No. 58,080, filed September 23, 1960.

Blade adjuster assemblies 90 (see FIG. 5) provide for local adjustment of the blade 13 and are mounted side by side across the entire width of the blade holder bar 80. Each assembly 90 includes a base member 91 which is rigidly mounted by a through bolt 92 which engages a mating clamp 93 in the T-shaped slot 94 in bar 80. Each of the assemblies 90 also includes a tube holder 95 reciprocally secured on base member 91 by the leaf spring 96 and has a groove at its forward end for receiving a resilient pressure tube 99 extending the length of the blade 13. Each of the members 95 moves with respect to its supporting base member 91 under the control of a screw 100 which threadably engages the member 95 and is provided with an inner head 101 received in a forked portion 102 of the base member 91 for effecting movement toward and away from the blade 13 to adjust the pressure exerted by the tube 99 on the blade 13 and correspondingly to vary the pressure exerted by that particular section of the blade 13 toward engagement with the backing roll 10. In this manner, local adjustment of the blade 13 can be made across the width of the web W to compensate for wear, web unevenness, local stressing, etc. The blade adjuster assemblies 90 are shown as constructed in my copending U.S. application Serial No. 136,367, filed September 6, 1961, now Patent No. 3,131,092, issued April 28, 1964.

The blade 13 may be easily removed by relieving the pressure on tubes 86 and 99, releasing each of the knob nuts 83, and rotating each hinge member 75 with the attached blade holder bar 80 to an inactive position, as shown by the broken lines in FIG. 2. An apron 110 is mounted between the bar 64 and bracket 62 to prevent the

excess coating material removed from the web by the blade 13 from seeping between the components of the assembly and to provide a smooth surface over which it can travel before dropping off.

The above described preferred embodiment of the invention makes it possible to move the flexible blade 13 toward and away from the backing roll 10 and also to effect angular adjustment of the blade with respect to the roll without disturbing the relationship between the blade edge and the roll. The entire coater assembly can be automatically moved to a retracted position to provide for maintenance of the machine without changing the relative working positions of the parts, and tube adjuster assemblies are provided for compensating for any local variations which cause an uneven coating.

While a backing roll 10 has been shown and described, it is within the scope of the invention that other equivalent backing surfaces will be used, for example, a stationary flat member having the web sliding thereover. The latter arrangement is particularly suitable for coating heavy paper and cardboard. Suffice to say that any expedient which provides support for the rear side of the web without causing the web to break or tear can be utilized with the invention.

While the form of apparatus herein described constitutes a preferred embodiment of the invention, it is to be understood that the invention is not limited to this precise form of apparatus, and that changes may be made therein without departing from the scope of the invention which is defined in the appended claims.

What is claimed is:

1. In apparatus for coating one side of a moving web including a backing surface adapted to support the other side of the web and a flexible blade having a front edge adapted to engage the web against the surface, the combination of supporting means for said blade including a carriage, means for mounting said carriage for generally horizontal movement with respect to said roll, a bracket mounted on said carriage for generally vertically pivotal movement with respect to said carriage, a supporting arm, means forming a pivotal connection between one end of said arm and said bracket on an axis substantially coinciding with said front edge, a main supporting member secured to the other end of said arm parallel to and substantially coextensive with said blade, a plurality of spaced mounting units on said supporting member between said supporting member and the roll, a support bar secured to said units and being coextensive with said supporting member, hinge means on each of said units, a hinge bar coextensive with said blade secured to and movable with said hinge means to and from a working position wherein said hinge bar engages said support bar along substantially the entire length thereof to clamp said blade in position, a plurality of individual adjuster assemblies mounted side-by-side along the length of said hinge bar for varying locally the pressure exerted by said blade toward said surface, adjustment means for selectively adjusting said carriage in a horizontal direction with respect to said roll and said bracket with respect to said carriage to vary the relative positions of said front edge and said roll, and means for effecting controlled pivoted movement of said arm with respect to said bracket to vary the angular relation of said arm and said bracket to effect a corresponding change in the angle of impingement between said roll and said blade.

2. In apparatus for coating one side of a moving web including a backing surface adapted to support the other side of the web and a flexible blade having a front edge adapted to engage the web against the surface, the combination of supporting means for said blade including a carriage, means for mounting said carriage for generally horizontal movement with respect to said roll, a bracket mounted on said carriage for pivotal movement with respect to said carriage and away from the roll, a supporting arm having a pivotal connection between one end of

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said arm and said bracket on an axis substantially coinciding with said front edge, a main supporting member secured to the other end of said arm parallel to and substantially coextensive with said blade, a support bar on said supporting member and being coextensive with said supporting member, hinge means on said supporting member, a hinge bar coextensive with said blade secured to and movable with said hinge means to and from a working position wherein said hinge bar engages said support bar along substantially the entire length thereof to clamp said blade in position, first actuator means for selectively adjusting said carriage in a horizontal direction toward and away from said roll, second actuator means for pivoting said bracket with respect to said carriage to move said main supporting member between an active position cooperating with the roll and a retracted position spaced from the roll, and means for effecting controlled pivoted movement of said arm with respect to said bracket to vary the angle of impingement between said blade and said roll without changing the relative positions of said front edge and said roll.

3. In apparatus for coating one side of a moving web including a backing surface adapted to support the other side of the web and a flexible blade having a front edge adapted to engage the web against the surface, the combination of supporting means for said blade including frame means, a bracket mounted on said frame means for generally vertical movement with respect thereto, a supporting arm, means forming a pivotal connection between one end of said arm and said bracket on an axis substantially coinciding with said front edge, a main supporting member secured to the other end of said arm parallel to and substantially coextensive with said blade, a plurality of spaced mounting units on said supporting member, a support bar secured to said units and coextensive with said supporting member, hinge means on each of said units, a hinge bar coextensive with said blade secured to and movable with said hinge means to and from a working position wherein said hinge bar clamps said blade in position on said support bar, means on said hinge bar for locally varying the pressure exerted by said blade toward said surface, means for selectively adjusting said bracket with respect to said frame means to vary the relative positions of said front edge and said roll, and means for effecting controlled movement of said arm on said pivot axis to vary the angle of impingement between said blade and the roll without changing substantially the relative positions therebetween said front edge and said roll.

4. In apparatus for coating one side of a moving web including a backing surface adapted to support the other side of the web and a flexible blade having a front edge adapted to engage the web against the surface, the combination of frame means, a main supporting member secured to said frame means by separate support assemblies disposed at each end of said supporting member, each said support assembly including a bracket movably mounted on said frame means with a supporting arm having a pivotal connection between one end of said arm and said bracket on an axis substantially coinciding with said front edge, said main supporting member being generally parallel to and substantially coextensive with said blade, a plurality of space mounting units on said sup-

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porting member, a support bar secured to said units coextensive with said supporting member, hinge means on each of said units, a hinge bar coextensive with said blade secured to and movable with said hinge means to and from a working position wherein said hinge bar clamps said blade in position on said support bar, means on said hinge bar for locally varying the pressure exerted by said blade toward said surface, means for selectively adjusting said bracket with respect to said frame means to vary the relative positions of said front edge and said roll, means for effecting controlled movement of said arm on said pivot axis to vary the angle of impingement between said blade and the roll without changing substantially the relative positions thereof.

5. In apparatus for coating one side of a moving web including a backing surface adapted to support the other side of the web and a flexible blade having a front edge adapted to engage the web against the surface, the combination of frame means, a main supporting member secured to said frame means by separate support assemblies disposed at each end of said supporting member, each said support assembly including a carriage adapted for movement on said frame means toward and away from the roll, each said assembly also including a bracket movably mounted on said carriage with a supporting arm having a pivotal connection between one end of said arm and bracket on an axis substantially coinciding with said front edge, said main supporting member being generally parallel to and substantially coextensive with said blade, a plurality of spaced mounting units on said supporting member, a support bar secured to said units coextensive with said supporting member, hinge means on each of said units, a hinge bar coextensive with said blade secured to and movable with said hinge means to and from a working position wherein said hinge bar clamps said blade in position on said support bar, means on said hinge bar for locally varying the pressure exerted by said blade toward said surface, means for selectively adjusting said brackets with respect to said carriages to vary the relative positions of said front edge and said roll, and means for effecting controlled movement of said arm on said pivot axis to vary the angle of impingement between said blade and the roll without changing substantially the relative positions thereof.

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