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Lotte

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[54] **RESILIENTLY SUPPORTED AIR BLADDER FOR BIASING SQUEEGEES**

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[30] **Foreign Application Priority Data**

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[51] **Int. Cl.** **B41f 15/42;** B41f 15/44

[58] **Field of Search** 101/119, 120, 115, 116, 101/152, 169, 350, 363, 123, 124

[56] **References Cited**

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[57] **ABSTRACT**

In a machine of substantial width for printing on paper or fabrics with a rotary screen or an impression cylinder, the doctor blade which distributes the ink is applied against the screen or cylinder by means of a pneumatic bladder applied against a flexible strip which is attached to the blade-holder. The flexible strip compensates for pressure differences caused by the deflection to which the blade-holder is subjected when the machine is in operation.

5 Claims, 3 Drawing Figures

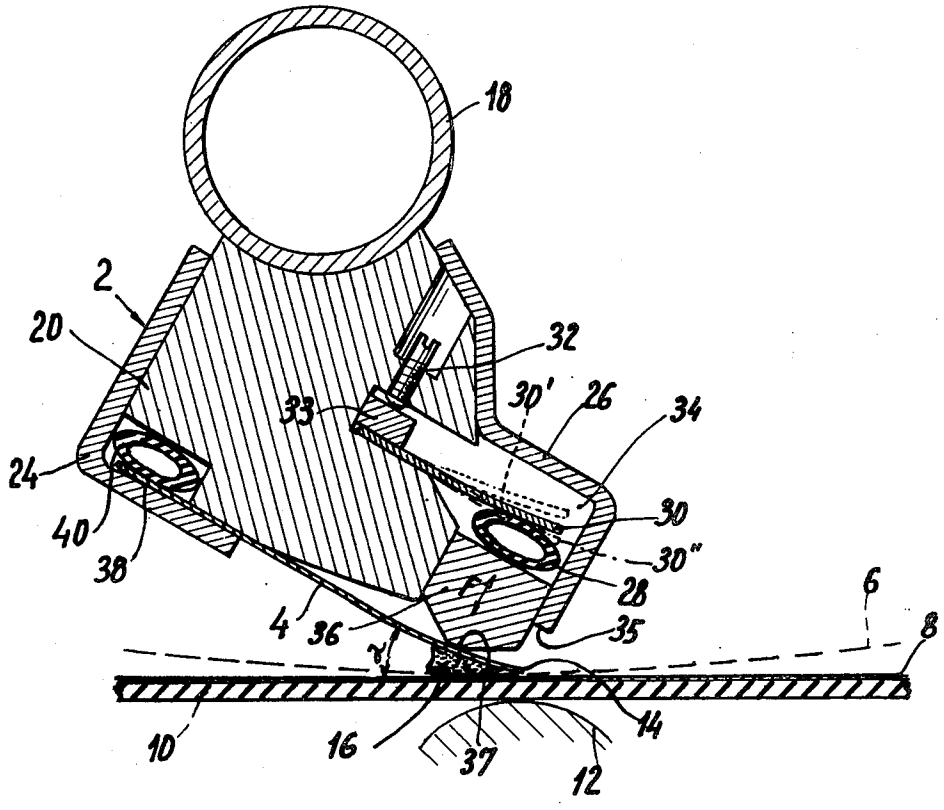


FIG.1

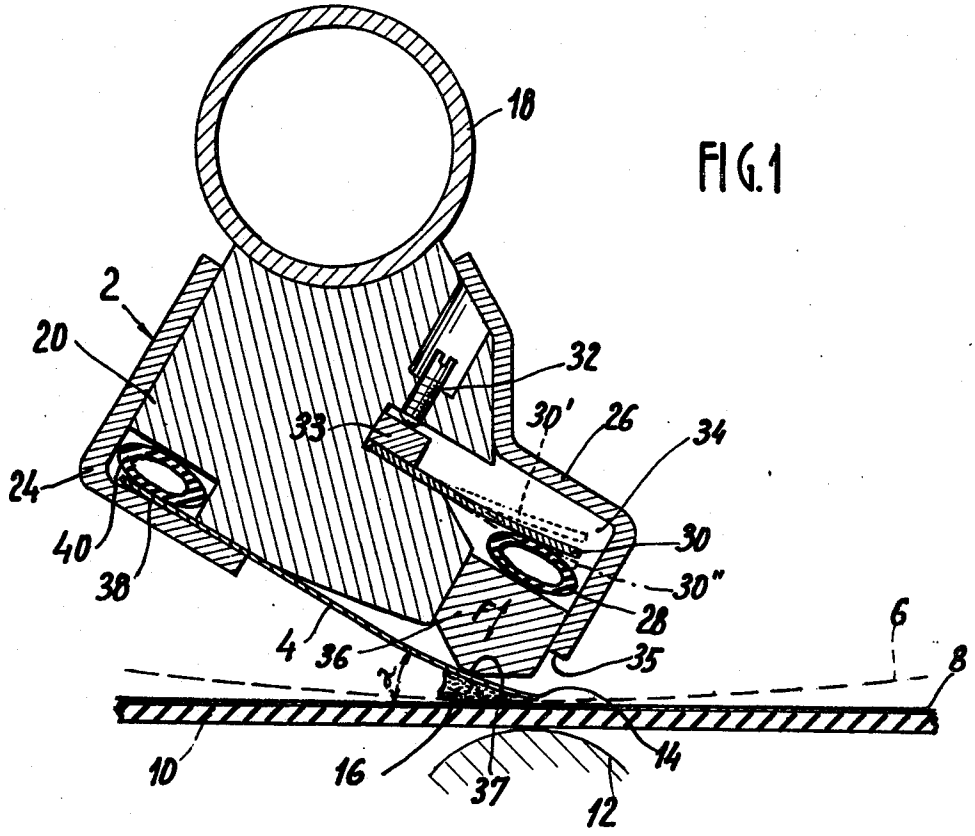


FIG.3

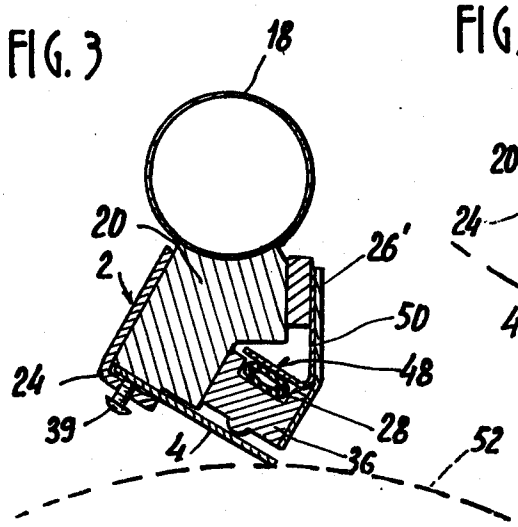
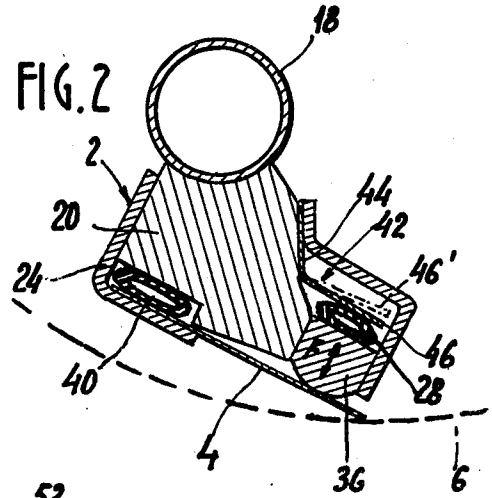


FIG.2



RESILIENTLY SUPPORTED AIR BLADDER FOR BIASING SQUEEGEES

BACKGROUND OF THE INVENTION

This invention relates to a doctor-blade system for screen printing machines, especially machines for printing materials in web form such as woven fabrics or papers by means of rotary screens, although other applications may be contemplated.

PRIOR ART

It is known that in some machines of this type, the ink is distributed and applied through the screen by means of a wiping blade or so-called doctor blade which usually consists of a strip of flexible materials, with the free edge of the strip being applied against the surface of the screen, for example, against a generating line of a cylindrical screen.

The edge of the doctor blade which is opposite to its free edge is clamped in a support or doctor blade holder comprising at least one bar which is placed transversely to the direction of feed of the material to be printed and is held in position at its extremities by means of stationary supports which are adjustable for height and mounted on both sides of the frame of the machine.

In printing machines of substantial width which are now in most general use, difficulties arise from the need to obtain a constant pressure of application of the doctor blade over the entire width of the fabric. Although it is endeavored to endow the blade-holder with the maximum degree of rigidity, the holder is in fact supported only at both ends and is subjected to deflection which is not negligible, with the result that the pressure applied by the doctor blade against the screen in the central portion is lower than in the edge portions. This results in irregularities in printing.

One of the means commonly employed up to the present time for the purpose of overcoming this disadvantage while at the same time permitting easy adjustment of the pressure applied by the doctor blade against the screen consists in interposing a pneumatic bladder between the blade-holder and the doctor blade itself in proximity to the free edge of this latter, with the bladder being constituted by an inflatable tube, the pressure of which can be adjusted.

However, in the case of machines of very substantial width and/or in the case of high blade-application pressures, the above-mentioned expedient has proved to be inadequate and unequal printing zones are still observed.

OBJECT AND SUMMARY OF THE INVENTION

The object of this invention is to solve the problem discussed in the foregoing.

The invention is directed to a doctor-blade system for a screen printing machine of the type aforesaid, that is to say which comprises a blade-holder, a doctor blade constituted by a thin flexible strip which is attached to said blade-holder at the edge opposite to the free wiping edge and a pneumatic pressure bladder which is interposed between the blade-holder and the doctor blade in the vicinity of the free edge of said blade in order that a predetermined pressure may be applied by said free edge against the screen, said doctor-blade system being distinguished by the fact that said pneumatic pressure bladder is brought to bear against the blade-holder by means of at least one intermediate bending-compensation bearing member having at least one portion which is capable of elastic displacement in response to the bending deformations to which the blade-holder is subjected.

In a preferred embodiment of the invention, the blade-holder is placed within a rotary cylindrical screen.

In yet another preferred embodiment of the invention, the intermediate bending-compensation bearing member is constituted by a flat resilient metallic strip which is disposed longitudinally within the blade-holder and one edge of which is rigidly fixed to the said blade-holder while the opposite edge which serves as a bearing surface for the pneumatic bladder is capable of elastic displacement as a result of bending of said strip within a cavity formed in the blade-holder.

By virtue of the presence of the flexible intermediate member which is interposed between the pneumatic bladder and the blade-holder, the deflection to which the blade-holder is subjected can be compensated for by the elastic deformation of the intermediate member, with the result that the free edge of the doctor blade can be applied against the screen with a constant pressure over the entire length of said blade.

In an alternative form of construction, the intermediate bearing member is constituted by a resilient metallic sectional strip, one flange of which is rigidly fixed to the blade-holder and the other flange of which is capable of elastic displacement when the blade-holder undergoes deflection and serves as a bearing surface for the pneumatic bladder.

A clearer understanding of the invention will be gained from a perusal of the following specification in which a number of embodiments of the invention are described, reference being made to the accompanying drawings which are given without any limitation being implied, and in which:

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a sectional view of one embodiment of a doctor-blade system in accordance with the invention; and

FIGS. **2** and **3** are sectional views of two further embodiments of the invention.

DETAILED DESCRIPTION OF THE EMBODIMENTS

The doctor-blade system shown in FIG. **1** essentially comprises a doctor blade holder **2** and a doctor blade **4.** The blade-holder passes within the interior of a rotary screen **6** which is in contact with a web **8** of material to be printed which consists of either fabric or paper, with the web **8** being displaced by a belt **10** which passes over carrier rollers **12.**

A free edge **14** of the blade **4** distributes ink **16** over the surface of the screen **6**; the ink passes through the screen and is then deposited on the fabric or paper **8** to be printed.

The blade-holder **2** constitutes a frame which is intended to be endowed with maximum rigidity in order to reduce the amount of deflection to which said frame is subjected during operation. In fact, said blade-holder can have a length of the order of 2.4 to 4 meters and is supported only at both ends externally of the cylindrical screen.

In the example which is illustrated in the drawings, the blade-holder **2** comprises a tube **18** to which is welded a longitudinal member or spacer block **20,** with the degree of rigidity being further increased by means of angle-bars or sectional members **24** and **26.**

In accordance with standard practice, the pressure of application of the free edge **14** of the doctor blade **4** is adjusted by means of a pneumatic bladder **28** consisting of a tube of rubber or like material which can be inflated to a greater or lesser extent by means of a compressed air source.

In accordance with the invention, the bladder **28** is not directly applied against a rigid portion of the blade-holder but against a flexible intermediate member which, in the case of FIG. **1,** is constituted by a flexible metallic strip **30.** One of the edges of said strip **30** is rigidly fixed within the blade-holder, for example, by means of a clamping-screw **32** with the interposition of a packing-strip **33.** The opposite edge of the flexible strip **30** against which the bladder **28** is applied is therefore free to bend elastically between positions **30'** and **30''** which are shown in broken lines in FIG. **1,** with the distance between these end positions having been exaggerated for the sake of enhanced clarity of the drawing.

These bending movements of the flexible strip **30** can be carried out freely by virtue of the fact that the free edge portion of the strip is located within a cavity **34** of the blade-holder.

When the doctor-blade system is in operation on the printing machine, the blade-holder undergoes a certain degree of deflection. In consequence, any given point of the blade-holder such as extremity **35** of the sectional member **26,** for example, is located at a greater distance from the free edge **14** of the doctor blade **4** in the central portion of said blade than in the vicinity of the extremities. In spite of this difference, it is desirable to ensure not only that the free edge **14** of the doctor blade remains rectilinear but also that the pressure of application of this latter against the screen is the same over the entire length of said blade.

In the inoperative state, the intermediate bearing member **30** occupies the position **30''**, for example; under the action of deflection of the blade-holder, said member will take up a higher position such as the position **30,** for example, in the central portion of the blade-holder and an even higher position such as the position **30'**, for example, near the ends of the blade-holder. It is therefore apparent that, in spite of the deflection to which the blade-holder is subjected, the bladder **28** will receive from the strip **30** a substantially constant bearing reaction over the entire length of the doctor blade **4** and that said blade will consequently be applied against the screen with a pressure which is substantially constant over the entire length of the free edge **14** of the doctor blade.

There is thus obtained a more uniform distribution of the ink than in the past. It can be mentioned, by way of example, that good results are obtained by means of a system in accordance with the invention when the doctor blade is a stainless steel blade having a thickness of approximately 0.1 mm.

In some embodiments, the bladder **28** can bear directly against the doctor blade **4** but, as shown in FIG. **1,** it is more advantageous to interpose a shoe **36** which is capable of sliding within the blade-holder in a direction F when the bladder **28** is inflated or deflated and which is applied against the doctor blade **4** by means of a narrow surface in the form of a ridge or rib **37.**

A edge **38** of the doctor blade **4** which is opposite to the free edge **14** is secured to the blade-holder by any usual means such as screws **39** (shown only in FIG. **3**) which serve to clamp the blade **4** against the portion of the blade-holder. However, it is more advantageous to employ instead of screws, a pneumatic locking bladder **40** (FIG. **2**) which, in the inflated state, locks the blade **4** against the angle-bar **24** of the blade-holder or against any other equivalent portion of said blade-holder. By virtue of this arrangement, positioning and removal of the blade can be performed very rapidly without entailing any need to tighten or slacken-off screws.

Moreover, since no external clamping member projects beneath the blade-holder, it is possible to reduce the angle α of application of the doctor blade against the screen, which may prove advantageous for printing certain types of materials.

There is shown in FIG. **2** an alternative embodiment comprising a number of elements which are identical with those of FIG. **1** and are designated by the same reference numerals. In this alternative embodiment, the flexible bearing member against which the pneumatic bladder **28** is applied is no longer constituted by a flat strip but by a sectional strip **42,** one flange **44** of which is attached to the blade-holder and rigidly fixed to this latter. The second flange **46** of the sectional strip absorbs the bearing reaction transmitted by the bladder while bending to a greater or lesser extent, thereby compensating for irregularities of pressure resulting from deflection of the blade-holder.

In the alternative embodiment of FIG. **3,** the flexible bearing member of the bladder **28** is also constituted by a sectional strip **48** but in this case the flange **50** of the sectional strip which is rigidly fixed to the blade-holder is secured to an external face of this latter, for example to the sectional member **26'** and no longer towards the interior of the blade-holder. The operation is identical with that of the embodiment described earlier.

Although the foregoing description makes reference primarily to doctor blades for screen printing machines, it is readily apparent that doctor blades in accordance with the invention could cooperate with impression cylinders such as a cylinder **52** shown in FIG. **3** instead of screens.

Moreover, doctor blades of this type can be employed not only in the field of printing on paper or fabrics but also for all coating operations.

We claim:

1. An apparatus for use with a printing machine having a screen, comprising

an elongated doctor-holder,

a doctor including an elongated strip of thin flexible material having one longitudinal securing marginal portion secured in said doctor-holder and an opposite longitudinal free wiping marginal portion to be operably engaged against the screen of said printing machine,

an elongated pneumatic pressure bladder longitudinally disposed in said doctor-holder and having an operating face operably contacting said doctor intermediate said marginal portions of said doctor adjacent said wiping marginal portion and an oppositely directed backing face, and

an intermediate bearing member interposed between said backing face of said bladder and said doctor-holder, and wherein said intermediate bearing member includes

a further elongated flexible metallic strip longitudinally disposed in said doctor-holder, said further strip having one longitudinal marginal portion rigidly secured in said doctor-holder and an opposite longitudinal marginal free portion, said backing face of said bladder bearing on said further strip between said two marginal portions and adjacent said free marginal portion of said further strip under stressed, bent condition of said further strip,

whereby said operably engaged portion of said doctor is applied against the screen with a constant pressure over the entire length of said doctor.

2. The apparatus as claimed in claim **1** in which said further strip is a sectional angle strip.

3. The apparatus as claimed in claim **1** in which an elongated shoe is longitudinally arranged in said doctor-holder between said operating face of said bladder and said free marginal portion of said doctor.

4. The apparatus as claimed in claim **1** in which said doctor-holder is provided with a longitudinal recess having a supporting face and an opposite backing face, said securing marginal portion of said doctor being engaged in said recess against said supporting face thereof, and a further elongated penumatic bladder longitudinally arranged in said recess between said backing face thereof and said securing marginal portion of said doctor.

5. A doctor-blade system according to claim **1**, wherein the doctor is fabricated from a strip of steel and especially stainless steel having a thickness of approximately 1/10 mm.

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