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54 Inking arrangement for printing machines.

57 An inking arrangement for printing machines in which ink is supplied to the plate surface by means of ink form rollers (5). The inking arrangement comprises a roller train constituted of a plurality of rollers (2,3,4,5) each having its surface layer made of a single non-metallic material (S) or a mixed material containing a non-metallic material as a base material (T), the rollers (2,3,4,5) being successively arranged in contact with or in close proximity to each other. Thus, it is possible to obtain an excellent ink transfer condition and hence possible to prevent occurrence of the roller stripping phenomenon, which is likely to occur in an offset printing process, for example.

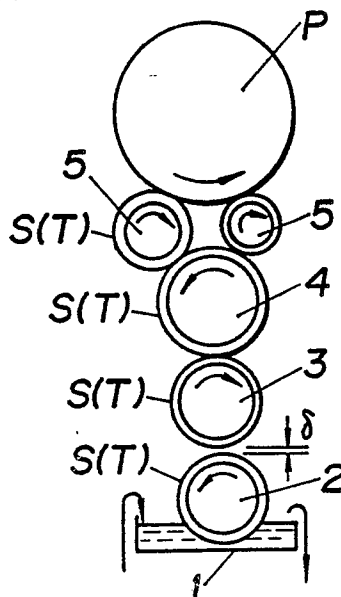


FIG. 2

Xerox Copy Centre

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Inking Arrangement for Printing Machines

The present invention relates to an inking device for use in printing machines and, more particularly, to an inking arrangement in which ink is supplied to the printing plate surface by means of ink form rollers.

A typical conventional inking arrangement in which ink is supplied to the plate surface by means of ink form rollers comprises two different types of rollers which are alternately disposed in contact with or in
 5 close proximity to each other, one of the two types being a metallic roller having an outer peripheral surface made of a metallic material, and the other being a rubber roller having an outer peripheral surface made of a rubber material. For example, see A Guide to Printing Machines, by Akitoshi Watanabe, Publishing Section of Printing Society, first impression/first edition, July 1, 1985, lines 1-2, page 40.

The above-described prior art suffers, however, from the following problems.

10 The ink receiving ability of the metallic roller having an outer peripheral surface made of a metallic material may deteriorate during the printing operation, resulting in an insufficient supply of ink to the printing surface. Deterioration of the ink receiving ability leads to a roller stripping phenomenon wherein the metallic outer peripheral surface of the roller becomes exposed due to a failure in the transfer of ink.

15 It is a primary object of the present invention to provide an inking arrangement for printing machines which is free from the above-described problems of the prior art.

Accordingly the present invention provides an inking device for printing machines which device comprises a roller train consisting of a plurality of rollers arranged in close proximity to each other characterised in that the surface layer of each of the rollers comprises a non-metallic material.

In a first embodiment of the invention at least two of the rollers are arranged in contact with each other.

20 In a second embodiment of the invention the non-metallic material is an oleophilic material, which may be a resin or synthetic resin.

In another embodiment of the invention, the non-metallic material includes minute hollow bodies and/or a powder of a hard material. The minute hollow bodies may be microballoons, microspheres, hollow bubbles or synthetic foam. Minute hollow bodies at the surface of the surface layer are preferably open
 25 such that ink can be retained in the hollow portion. The hard material may be a metallic or ceramic material.

The rollers constituting the roller train in the inking arrangement rotate in their respective directions, i.e., alternate rollers rotate in the same direction, to supply ink by a successive ink transfer operation from an ink furnishing device to a printing plate fitted to the outer peripheral surface of a plate cylinder.

30 Since the surface layer of each roller is made of either a non-metallic material which has excellent ink receiving ability or a mixed material containing such a non-metallic material as a base material, it is possible to obtain an excellent ink transfer condition and hence possible to prevent the occurrence of the roller stripping phenomenon, which is likely to occur, for example, in offset printing process.

For a better understanding of the invention and to show how the same may be carried into effect, reference will now be made, by way of example only, to the following drawings, in which like reference
 35 numerals denote like elements, and of which:

Figs. 1(a) to 1(e) are schematic views of inking arrangements for printing machines of the present invention which have various ink furnishing devices, respectively;

Fig. 2 is a schematic view showing a modification to a roller train arrangement of the inking arrangement for printing machines of the present invention; and

40 Figs. 3(a) to 3(g) are schematic views of inking arrangements for printing machines of the present invention which have various blades, respectively.

Embodiments of the present invention will be described below in detail with reference to the accompanying drawings.

Referring to Figs. 1 to 3, the inking arrangement according to the present invention comprises an ink
 45 furnishing device 1 and a roller train consisting of an ink fountain roller 2, a second roller 3, a first roller 4 and ink form rollers 5 which are arranged in succession so as to rotate while being in contact with the neighbouring rollers at their respective outer peripheral surfaces.

The ink fountain roller 2 is supplied with ink from the ink furnishing device 1. The second roller 3 is supplied with ink from the ink fountain roller 2 and transfers the ink to the first roller 4. The first roller 4
 50 transfers the ink to two ink form rollers 5, 5 which are juxtaposed to each other. The ink form rollers 5, 5 rotate while being in contact at their outer peripheral surfaces with a printing plate fitted to the outer peripheral surface of a plate cylinder P, thereby transferring the ink supplied from the first roller 4 to the printing plate fitted on the plate cylinder P.

Figs. 1(a) to 1(e) show examples of inking arrangements having various ink furnishing devices 1, respectively.

The ink furnishing device 1 shown in Fig. 1(a) is an ink fountain. The ink furnishing devices 1 shown in Figs. 1(b) and 1(e) are ink fountains in each of which at least a part of the opening thereof is divided by the ink fountain roller 2. The ink furnishing device 1 shown in Fig. 1(c) is an ink discharge body. The ink furnishing device 1 shown in Fig. 1(d) is an ink rail having an ink pump IP.

Each of the rollers, i.e., the ink fountain roller 2, the second roller 3, the first roller 4 and the ink form rollers 5, has either a surface layer S made of a non-metallic material or a surface layer T made of a mixed material containing a non-metallic material as a base material. Table 1 below shows possible combinations of two different types of rollers, that is, the one type having the surface layer S and the other type having the surface layer T, to constitute a roller train.

The above-mentioned non-metallic material preferably has an excellent ink receiving ability, and when the ink used is an oil-based one, the non-metallic material is preferably oleophilic and oil-resistant. Examples of non-metallic materials usable in the present invention include synthetic resins such as urethane resins, nitrile butadiene rubber (NBR) and polychloroprene rubber (CR) and resins such as natural rubber (NR) and such like.

Table 1

	Ink fountain roller	Second roller	First roller	Ink form rollers
a	S	S	S	S
b	T	S	S	S
c	S	T	S	S
d	S	S	T	S
e	S	S	S	T
f	T	T	S	S
g	T	S	T	S
h	T	S	S	T
i	T	T	T	S
j	T	T	S	T
k	T	T	T	T
l	S	T	T	S
m	S	T	S	T
n	S	T	T	T
o	S	S	T	T
p	T	S	T	T

An example of the above-mentioned mixed material that contains a non-metallic material as a base material is a composition formed by substantially uniformly dispersing and mixing, singly or in combination of more than one material, minute hollow bodies and/or the powder of a hard material in a urethane resin. The minute hollow bodies are generally called microballoons, microspheres, hollow bubbles, or synthetic foam. It is possible to use minute hollow bodies which have a particle diameter in the range of about 5 μ m to about 300 μ m, at least. As to the powder of a hard material, it is possible to use a ceramic or metallic powder having a particle diameter in the range of about 1 μ m to about 100 μ m, at least. The size and mixing ratio of components of the mixed material may be chosen as desired.

Although in the arrangement shown in Fig. 1 the ink fountain roller 2 and the second roller 3 are in close contact with each other, these two rollers may also be disposed in close proximity to each other with a proper gap 8 provided therebetween, as shown in Fig. 2. The arrangement may also be such that the

second roller 3 is pivotally mounted so as to alternatively come into contact with the ink fountain roller 2 and the first roller 4, although this alternative arrangement is not shown.

Figs. 3(a) to 3(g) show examples of various combinations of the inking arrangement shown in Fig. 1(a) with various blades.

5 A doctor blade 6 that removes an excess of ink supplied onto the second roller 3, an ink film thickness regulating blade 7 that regulates the thickness of ink film on the ink fountain roller 2 and an ink film thickness flattening blade 8 that makes uniform the thickness of ink film on the first roller 4 are combined as required with the roller train and disposed in opposing relation to the associated rollers.

10 The inking arrangement including blades is not necessarily limited to that shown in Fig. 1(a). Blades can be applied to any of the aforementioned inking arrangements comprising various combinations of rollers.

The ink fountain roller 2, the second roller 3 and the first roller 4 in the inking arrangement may be driven by either the same driving system or individual driving means. The peripheral speeds of these rollers need not be the same.

The following is a description of the operation of the above-described inking arrangement.

15 The ink fountain roller 2, the second roller 3, the first roller 4, the ink form rollers 5, 5 and the plate cylinder P rotate in their respective directions, i.e., alternate rollers rotate in the same direction, so that the ink which is supplied from the ink furnishing device 1 to the ink fountain roller 2 is effectively transferred from the roller 2 to the second roller 3, the first roller 4 and the ink form rollers 5, 5 in succession with the ink film thickness being properly regulated, and it is further transferred from the ink form rollers 5, 5 to the
20 printing plate fitted on the plate cylinder P.

Since each roller has either a surface layer S made of a non-metallic material which has excellent ink receiving ability or a surface layer T made of a mixed material containing such a non-metallic material as a base material, it is possible to obtain an excellent ink transfer condition and hence possible to prevent occurrence of the roller stripping phenomenon, which is likely to occur, for example, during an offset
25 printing process.

In the case where each roller has a surface layer made of a mixed material having minute hollow bodies dispersed and mixed therein, part of the shell layer of each minute hollow body on the outer peripheral surface of the roller is removed to open the hollow portion. Accordingly, the opened hollow bodies positively
30 retain the ink transferred from the upstream side and transfer it to the downstream side. Therefore, this arrangement is even more preferable from the viewpoint of preventing failure in transfer of ink.

In the case where each roller has a surface layer made of a mixed material having the powder of a hard material dispersed and mixed therein, the hard material powder that is a component of the mixture bears the friction acting on the roller. Accordingly, if this arrangement is used when the doctor blade 6 or the ink film thickness flattening blade 7 is used in contact with the outer peripheral surface of a roller or when one or
35 more of the ink fountain roller 2, the second roller 3 and the first roller 4 are different from the rest in the peripheral speed, the wear of the outer peripheral surfaces of the rollers can be effectively suppressed. Proper selection of a hard powder material and a mixing ratio of components of the mixture makes it possible to improve the thermal conductivity and also suppress generation of heat in operation.

40 Although the present invention has been described through specific terms, it should be noted that the described embodiments are not necessarily exclusive and that various changes and modifications may be imparted thereto without departing from the scope of the invention as claimed in the appended claims. For example, either one or both of the second and first rollers 3 and 4 may be removed from the roller train and/or the number of ink form rollers 5 may be increased or reduced.

According to the present invention, each roller has either a surface layer S made of a non-metallic
45 material which has excellent ink receiving ability or a surface layer T made of a mixed material containing such a non-metallic material as a base material. Therefore, it is possible to obtain an excellent ink transfer condition and hence possible to prevent occurrence of the roller stripping phenomenon, which is likely to occur in an offset printing process, for example. Since an adequate amount of ink is supplied to the printing plate surface, it is possible to continuously obtain prints of uniform quality and also reduce spoilage.

50 Further, it is possible to obtain a roller which has surface properties adapted to each particular application and which is reasonable in cost, by properly using a non-metallic material as a main component of the roller surface layer material.

In the case where each roller has a surface layer made of a mixed material containing a non-metallic material as a base material, the ink receiving ability and ink transfer ability of the outer peripheral surface of
55 the roller can be suitably selected by properly selecting a base material and components of the mixture. In addition, by properly selecting constituent materials and mixing ratios of components of the mixture, it is possible to improve the wear resistance and thermal conductivity of the roller surface layer or add and regulate ink retaining ability with relative ease and at low cost. Accordingly, it is possible to provide an

inking arrangement free from insufficient supply of ink

Claims

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1. An inking device for printing machines which device comprises a roller train consisting of a plurality of rollers (2,3,4,5) arranged in close proximity to each other characterised in that the surface layer (S,T) of each of the rollers comprises a non-metallic material.

2. An inking device according to claim 1 wherein at least two of the rollers (2,3,4,5) are arranged in
10 contact with each other.

3. An inking device according to claim 1 or 2 wherein the non-metallic material (S,T) is an oleophilic material.

4. An inking device according to claim 1, 2 or 3 wherein the non-metallic material (S,T) is a resin or a synthetic resin.

5. An inking device according to any of claims 1 to 4 wherein the non-metallic material (S,T) is a
15 urethane resin, nitrile butadiene rubber, polychloroprene rubber or natural rubber.

6. An inking device according to any preceding claim wherein the non-metallic material (T) includes minute hollow bodies.

7. An inking device according to claim 6 wherein the minute hollow bodies are microballoons,
20 microspheres, hollow bubbles or synthetic foam.

8. An inking device according to claim 6 or 7 wherein the minute hollow bodies have a diameter within the range 5µm to 300µm.

9. An inking device according to claim 6, 7 or 8 wherein the minute hollow bodies at the surface of the surface layer are open such that ink is retained in the hollow portion.

10. An inking device according to any preceding claim wherein the non-metallic material (T) includes a
25 powder of a hard material.

11. An inking device according to claim 10 wherein the hard material is a ceramic or metallic material.

12. An inking device according to claim 10 or 11 wherein the particle size of the powder is within the
range 1µm to 100µm.

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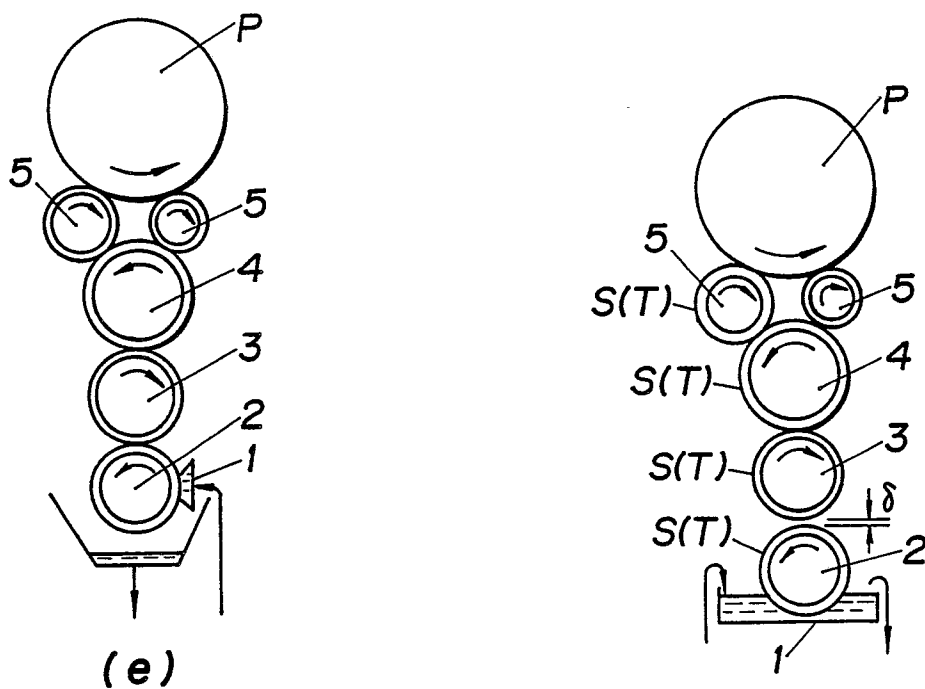
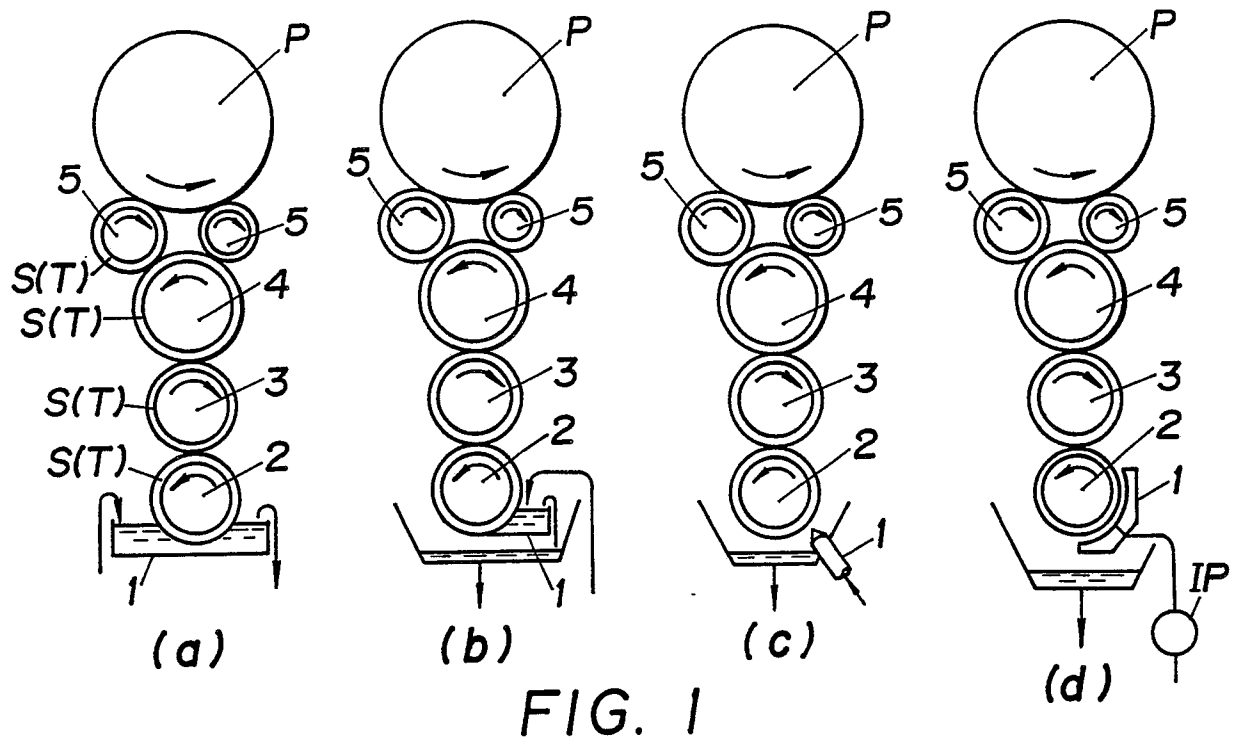


FIG. 2

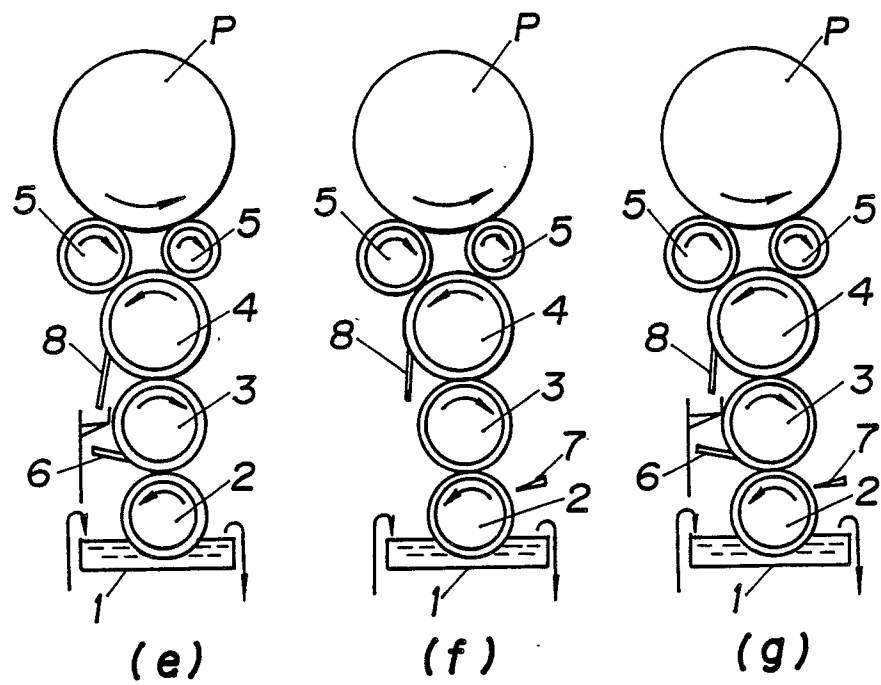
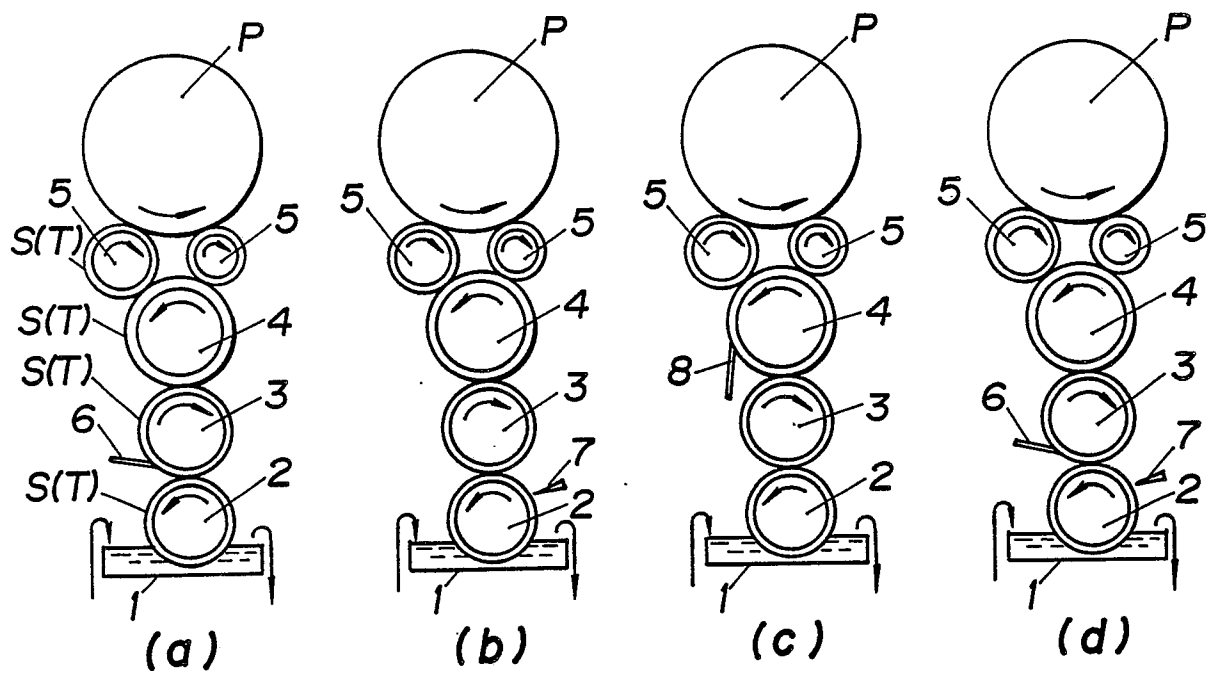


FIG. 3