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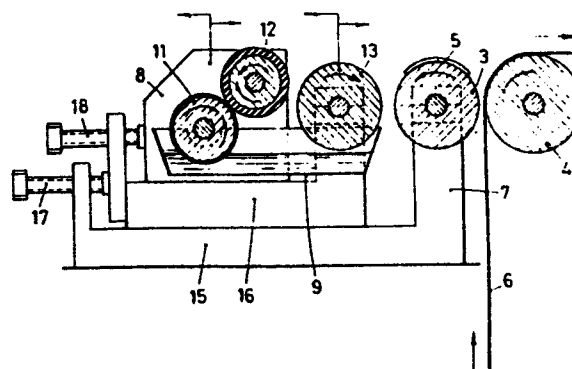
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54 Inking system for flexography printing plates.

57 Inking system for flexography printing plates, for the inking of curved printing plates assembled on the carrying roller placed between an inking roller assembly and a backup roller, characterized in that it comprises an inking roller assembly in which a first roller has a reticulated surface serving the aim to pick up the ink from a container in which said first roller is partially submerged, said first roller engaging in tangency the surface of the second roller, which is soft in its surface, having the possibility of adjusting the pressure in the tangency point of both rollers which are mounted on the same displaceable support which carries as well the third roller of the assembly, which surface is smooth.

FIG. 3



INKING SYSTEM FOR FLEXOGRAPHY PRINTING PLATES

This invention refers to a new system developed for the inking of flexography printing plates, aimed at the printing of labels and other patterns or drawings by flexography.

Some systems are already known for the inking of printing sheets in flexography printing machines. Flexography printing is used for the printing of a flexible strip made out of cellulosic materials, clear plastic, translucent or non transparent material. The printing system usually comprises, mainly for half-tone areas, a rubber roller which periphery is partially submerged within the ink of a container; a second roller with reticulated surface which is aimed at the transfer of the ink; and a third roller carrying the curved printing plate. A final roller serves as back up for resisting the printing pressure, serving as a support for the flexible strip to be printed. The two first rollers are supported on a moving body by means of its respective shafts. Such moving body is displaceable in relation with the roller carrying the printing plate, by means of a screw mechanism which produces the contact of the surface of the reticulated roller with the surface of the curved printing plate.

For half-tone printing a first roller with reticulated surface is used (transfer roller) as well as a second roller carrying the curved printing plate and the back up roller which are assembled in a similar way as the above explained, the same as the moving body carrying the container for the ink, which displacement may be regulated by a screw mechanism. In this case, instead of a rubber roller, a doctor blade, associated to the reticulated transfer roller, separates the excess ink from the surface of the transfer roller, with the aim that the surface of such roller may transfer on the curved printing plate only the quantity of ink which is strictly necessary for the printing.

In both of the succinctly described embodiments the transfer roller has a reticulated surface.

According to the present invention the inking system for a flexography printing plate is characterized, among other aspects, by the use of a new set of rollers among which a smooth operative roller assembled between the transfer roller and the printing plate carrying roller, as will be explained below.

For the better understanding of the invention a non limitative embodiment has been shown in the enclosed drawings, for the inking of curved flexography printing plates.

In the drawings:

Figure 1 shows a conventional inking device which is usually employed for the printing of half-tone areas.

Figure 2 shows a conventional device for flexography printing of reticulated areas.

Figure 3 shows a preferred embodiment of the present invention.

Figure 4 shows another embodiment of the present invention.

In the conventional flexography printing systems for mono-tone areas, according to figure 1, a first roller -1- features a soft surface made out of rubber or another soft material; the second roller -2- has a reticulated surface acting as an ink transfer roller; a third roller -3- carries the curved printing plate -5- and the last roller -4- serves as back up and at the same time it receives the flexible strip -6- to be printed. All of the four mentioned rollers have horizontal and parallel shafts carried by the corresponding supports, of which only support -7- for roller -3- has been represented. Roller -1- is partially submerged within the ink of container -9- being in tangency with reticulated transfer roller -2- to which a layer of ink is transferred to be conveyed by said second roller to the curved printing plate -5-. The pressure between printing rollers -1- and -2- may be regulated to the adequate value. Those rollers are supported on box like body -8- which carries container -9- and is displaceable by means of a screw -10- with respect to support -7- to allow bringing roller -2- as close as necessary to roller -3- for the inking of the curved printing plate -5- under the most adequate pressure.

In the case of half-tone printing, in the embodiment shown in figure 2 a doctor blade -14- is used consisting mainly in a laminar element with a straight edge in tangency to the surface of the reticulated roller -19- which is submerged within the ink of container -9-

The inking system according to the present invention is shown in figures 3 and 4 which show the roller set consisting of an operative roller -13-, featuring a smooth surface and aimed at the transfer of the ink, being assembled between the body -8- including rollers -11- and -12- and the printing plate carrying roller -3-, with the specific functions which will be explained here below, to obtain the objectives of the invention.

According to figure 3 roller -11-, with a reticulated surface, is partially submerged within the ink of container -9- its surface contacting rollers -12-. Such surface is made out of rubber or other kind of soft and smooth material having the role of intermediate transfer roller. The metallic smooth roller -13- which is the third roller of the inking roller set, is a transfer roller. Its surface is

preferably formed by a smooth and hard material, for example a ceramic material. This smooth roller -13- may have the same periphery length than roller -3- including printing plate -5- or it may have a different peripheral length.

Rollers -3-, carrying printing plate -5- as well as back up roller -4- are equivalent to rollers -3- and -4- of the previous embodiments corresponding to the state of the art, and their roles are also identical.

The regulation system for the various rollers, to obtain the necessary pressure between the confronted surfaces of the same, works as follows: in the first place the pressure between roller -11- and roller -12- is regulated and afterwards, by means of a screw system or similar mechanism -18- pressure is exerted on the assembly formed by those two first rollers, the surface of roller -12- establishing contact against roller -13-. Subsequently, by means of screw mechanism -17- or a similar mechanism, the assembly of rollers -11-, -12- and -13- is applied against plate -5- supported by roller -3-. The common support for the three first rollers has the reference -16-

The synchronization of the rollers, i.e. the adjustment of their respective velocities, is carried out in the following way: roller -13- is driven by means of a gear wheel fastened to its shaft. It meshes with a second gear wheel assembled on the shaft of roller -3-. The aim is that the peripheral velocity of roller -13- may coincide, for the same peripheral length, with the peripheral velocity of printing plate -5- carried by roller -3-. The roller -12- may be driven by roller -13- by means of a system of variable speed pulleys or any other suitable system allowing to make the peripheral velocity of roller -12- equivalent to peripheral velocity of roller -13-. However, said peripheral velocities could also be different. The adjustment of the peripheral velocity of roller -12- (the same, higher or lower than peripheral velocity of roller -13-) is carried out in this case without stopping the machine.

The driving of roller -12- may be carried out as well by means of a mechanism which is separate from roller -13- (for instance, by means of hydraulic variable speed motor or an adjustable velocity electric motor).

It is also possible, once determined the ideal speed ratio between rollers -12- and -13-, to drive the first one by means of gear wheels which drive roller -13- by means of a second driving device coupled on the shaft of said roller. The ratio between the diameters of the gear wheels and the diameters of the two rollers will be given by the ratio which has to be maintained between the peripheral speeds of both rollers. The adequate speed ratio may be adjusted by means of various gear wheel combinations. In this case the change of the gear wheels is carried out with the machine stopped.

For any of the above mentioned driving systems or after its modification, it is foreseen that roller -12- may turn in opposite direction to roller -13-, with the possibility of setting up different peripheral speed relations between them.

The same considerations as above may be made for rollers -12- and -11-.

With the aim of preventing the drying of the ink layer on the surfaces of the rollers in case of stopping the printing machine, the possibility has been provided that rollers -11-, -12- and -13- may continue to turn independently of the driving or idling of the rest of mechanisms of the machine.

In the embodiment shown in figure 4 rollers -11-, -12- and -13- are assembled on the same displaceable support. In this embodiment, which constitutes a simplification in comparison to figure 4, the roller -13- would be in principle the same.

The regulation of the ink layer on the surfaces of the rollers is made in the following way. Taking into account the viscosity of the ink, the thickness of the ink layer on the surface of the smooth roller -13- is adjusted in its uniformity and thickness (quantity of ink) by the following variables:

- a) the number of stripes (vases) per centimeter of the reticulated roller -11-,
- b) the type of the reticulated surface for roller -11-,
- c) the pressures exerted on rollers -11- and -12-,
- d) the pressures exerted between rollers -11- and -12- against roller -13-,
- e) the peripheral speed ratio of roller -11- to roller -12-, which velocities may be the same or different,
- f) the peripheral velocity ratioe between roller -12- and roller -13-, which velocity may the same or different,
- g) the sense of rotation of roller -12- with respect to the sense of rotation of roller -13- (the same or opposite direction). The change in the rotation direction of roller -12- will entail the change in the sense of rotation of roller -11-.

The advantages obtained by the arrangement of rollers as above described consist in the possibility to regulate the quantity of ink on the printing plate, this being an essential fact in a flexography printing system to obtain a high quality printing. The layer of ink on the printing plate must be uniform and the thickness must be adequate for

each case. The quality of the printing will be higher when increasing the possibility to regulate both variables (uniformity and thickness of the ink layer).

Moreover, the possibility to apply to the printing plate thinner and more regular ink layers than those allowed by the presently known printing systems will permit the printing with finer reticulations in the printing plates, given the fact that the biggest difficulty for printing with denser reticulations, characterized by many stripes per centimeter, consists in the excess of ink on the printing plate, which has side effect the covering of the spaces defined by the stripes of the reticulation.

The system shown in figure 2, which corresponds to a usual procedure for flexography printing in half tones, makes use as above stated, of a doctor blade to remove the excess of ink on the surface of the reticulated roller submerged in the ink. After the action of the doctor blade, only the necessary quantity of ink remains on the reticulated surface of the roller, for its transfer to the printing plate. However, this system has a number of limitations, mainly:

a) the number of stripes per centimeter to be used with the reticulated surface. The most modern rollers do not exceed 160 lines per centimeter.

b) The high cost of a reticulated roller with a high number of lines.

c) The unavoidable wear of the reticulated rollers as a result of the doctor blade action, as it must exert some pressure against the surface of the roller.

d) The high maintenance costs as a consequence of the need to prepare the reticulated rollers worn out by the action of the doctor blade.

e) The change in behaviour and results after changing the worn out rollers for a new set of rollers. It must be taken into account that, for instance in a six colour flexography printing machine, the wear of the reticulated rollers is not the same for every unit or colour, which brings substantial additional problems.

f) Given the fact that the only regulation variable is the number of stripes per centimeter in the reticulated roller, to adjust the necessary quantity of ink, a number of rollers with different reticulation or number of lines per centimeter must be provided, with the result of a substantial increase in the costs of purchase.

g) The fact that the roller for the transfer of the ink to the printing plate consists in a reticulated roller, having therefore small recesses which act as containing vases for

the ink, entails that the surface of said roller is not completely uniform in spite of the fact that the number of lines per centimeter may be high. Therefore, the printing plate takes the ink from a roller which surface is not uniform and for this reason the ink layer applied on the printing plate is not uniform.

h) When taking the ink from a reticulated roller, in the printing of half tones, there is the possibility of the "moire" effect as a consequence of the register, in all of the printing plate or in a part of the same, of the reticulation of the printing plate with the one of the reticulated roller. This is a problem with a difficult solution, because it is practically impossible to completely eliminate such inconvenience.

In many cases, once the reticulated roller has been chosen to apparently carry out the adequate printing, the work will not proceed correctly due to the "moire" effect in all of the printing plate or in a part of the same. In this case a new reticulated roller has to be put to work to avoid such effect, although said new roller may not be the optimal to apply the necessary quantity of ink.

The above inconveniences will be solved by the present invention for the following reasons:

a) The roller -13- for the ink transfer to the printing plate is smooth in its surface, this being the reason why all the inconveniences from the use of reticulated transfer rollers will disappear. The layers of ink will be much more uniform than with a reticulated roller, increasing the quality of the printing. Finer ink layers may be applied as compared with the reticulated rollers this enabling a printing of finer half tones with that type of roller. Given the fact that the transfer rollers is smooth in its surface, i.e.: without reticulation, no "moire" effect will appear.

b) The reticulated roller -11- which is the first one of the roller assembly has in the present case as unique aim, the transfer of a well distributed ink layer on roller -12-. For this reason it is not necessary for it to have a high density (100 lines per centimeter will be sufficient) and therefore, the cost of the roller will be lower.

c) The supression of a doctor blade to act on the surface of the roller which is submerged in the ink body, increases the wear life of the reticulation, this entailing lower maintenance cost.

d) The possibility to regulate the ink layer applied to the printing plate will be practically limitless as a consequence of the above explained possibility of regulation of the ink layer. This means a possibility to regulate the quantity of ink easily applied on the printing plate without

the need to assemble none of the elements of the printing unit as it is presently necessary, for instance, with the use of reticulated rollers, according to the present state of the art. Therefore the manoeuvring is made easier and the regulation possibilities are much higher and the necessary time for the set up is lower.

e) Due to the possibility to regulate the quantity of ink to be applied to the printing plate, this regulation will be stepless, this allowing the position adjustment of the necessary quantity of ink according to the requirements of each kind of printing work.

f) Given the possibility that the peripheral length of the smooth transfer roller -13- is the same that the peripheral length of printing plate carrying roller -3-, including the printing plate, when desired, the printing plate may take the ink from the same area of the transfer roller. This allows to increase the precision in the application of the ink.

Claims:

1.- Inking system for flexography printing plates, for the inking of curved printing plates assembled on the carrying roller placed between an inking roller assembly and a back up roller, characterized in that it comprises an inking roller assembly in which a first roller has a reticulated surface serving the aim to pick up the ink from a container in which said first roller is partially submerged, said first roller engaging in tangency the surface of the second roller, which is soft in its surface, having the possibility of adjusting the pressure in the tangency point of both rollers which are mounted on the same displaceable support which carries as well the third roller of the assembly, which surface is smooth.

2.- Inking system for flexography printing plates, according to claim 1, characterized in that the third roller, which has a smooth and hard surface, is aimed at the transport of an ink layer of adjustable thickness to the printing plate carrying roller, being both rollers in tangency to each other.

3.- Inking system for flexography printing plates, according to any of the above claims, characterized in that the third smooth roller is assembled on a support which may be displaced in relation to the support for the other two inking rollers of the inking roller assembly.

4.- Inking system for flexography printing plates, according to any of the above claims, characterized in that the peripheral length of the smooth and hard inking roller coincides with the peripheral length of the printing plate carrying roller including the printing plate.

FIG. 1

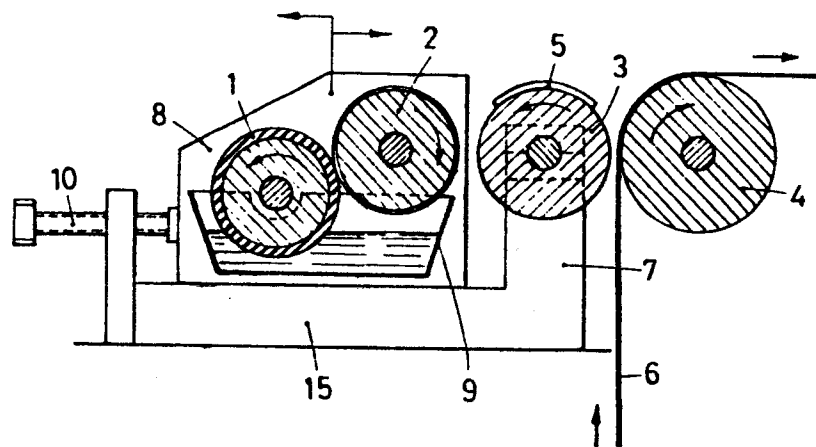


FIG. 2

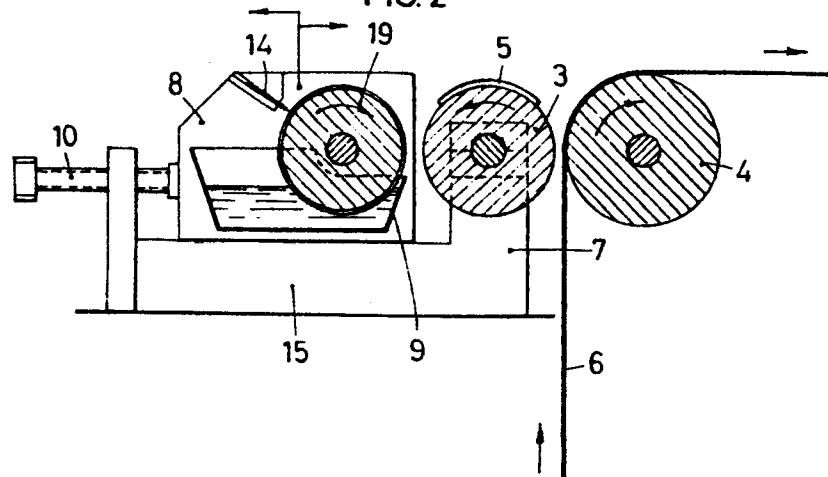


FIG. 3

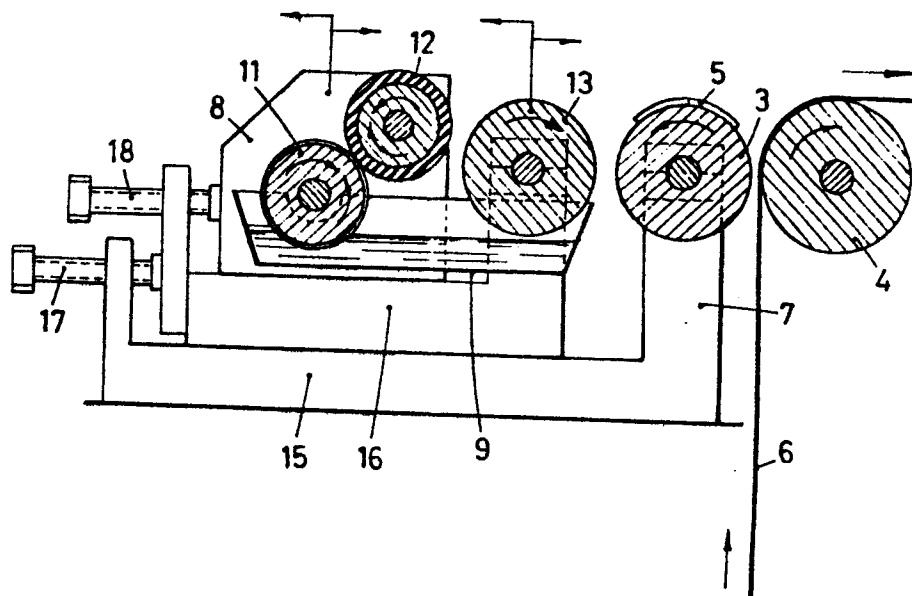


FIG. 4

