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PATENT SPECIFICATION

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(54) SURFACE COVERING FOR PRINTING PRESS CYLINDER

(71) We, HEIDELBERGER DRUCKMASCHINEN AKTIEN-GESELLSCHAFT, a body corporate organised under the laws of Germany of 69 Heidelberg, Alte Eppelheimer Strasse 15—21, Germany, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The invention relates to surface coverings for sheet-supporting surfaces of rotary printing presses, for example counter-pressure cylinders or sheet transfer cylinders in obverse and reverse rotary printing presses.

In order to prevent the building up or accumulation of ink on the envelope surface of a counter-pressure cylinder in contact with the freshly printed side of the sheet, it is known from U.S. Patent Specification 2,011,181 to provide the reverse printing cylinder with a coating which consists of a fabric or paper upon which small grains are fixed. The grains have an elongate form. They are distributed over the surface and are arranged so that their major axes extend normally to the surface of the fabric or paper web. They are attached to the fabric or the paper by glueing at one of their ends. The domes or tips of the grains brace, during the reverse printing, the side of the sheet which was printed during obverse printing.

It is a disadvantage of this known device that the rough lining of the counter-pressure cylinder is difficult to wash. Furthermore, neither paper, fabric nor the adhesive used to retain the grains is resistant to such chemicals as are used for activating the printing plate. The consequence is frequent exchanging of the known lining, which leads to a considerable prolonging of the stand-still time of the printing press. Although the known lining provided with grains for counter-pressure

cylinders may still be appropriately useful on letter-press machines, it is unsuitable for use on off-set printing presses owing to the felting of the rubber blanket, because the support of the grains tends to expand. This yielding of the lining of the counter-pressure cylinder may be the cause of mackling, and, in the case of multicolour printing, of curtailing faults. The dropping out of loosened grains is also a danger.

According to German Patent Specification No. 1,258,873, it is known to cover counter-pressure cylinders and sheet transfer cylinders with an aluminium sheet which has been granulated, anodized, sand-blasted or treated in some other manner in order to obtain a superficial roughness; but this alone has not eliminated the smudging and the transfer of ink. It is therefore proposed, in German Specification No. 1,258,873 to manufacture the envelope surface of a counter-pressure cylinder or sheet transfer cylinder itself, or an aluminium leaf associated with the same, as an ink repelling chromium surface and to make the latter additionally rough, the roughness lying between 2 to 7.5 μm (R.M.S.). This roughness serves to reduce the supporting envelope surface of the cylinder.

The roughness of the chromium layer is produced by a treatment of the surface of the support, onto which the chromium is applied as a thin layer. For example, the roughness may be generated by sandblasting. In this case, as measurements of the surface roughness values demonstrate, different points of support which are not predeterminable in their geometrical conformation occur locally in the support surface, which come into being due to heterogeneous surface density, differences in hardness or differences in the blasting grain. During the subsequent chromium plating of the treated support surface, the uneven support or bearing surfaces previously produced are accurately modelled, so that the different

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support surfaces produced during sand-blasting, their height differences and irregular construction and distribution are present in the finished cylinder envelope surface.

The locally different structure of the envelope surface leads, especially in the case of screen work, to correspondingly varying repulsion behaviour, and when a plurality of items are printed on one sheet it is visible as a definite difference in quality within an impression. Furthermore, more particularly with thin papers, for high standard multi-colour printing of the obverse such an uneven envelope surface of the counter-pressure cylinder is similarly prejudicial to quality, because the impression turns out partly varied due to uneven support during the printing operation.

It is the aim of the invention, by using geometrically defined supporting fractions, to develop an envelope surface for counterpressure cylinders and sheet transfer cylinders which builds up little or no ink and which forms a uniform foundation for the entire depression so that a uniform quality of printing is guaranteed. The envelope surface is intended to be wear-resistant and it must be resistant to chemicals, more particularly those used for washing and activating the printing plate.

According to the present invention there is provided an impression cylinder for a rotary printing press, said cylinder having a surface covering which is composed of a chemically resistant durable and hard metal or plastics material in the form of an irregular but statistically uniform distribution of domes of equal height so as to prevent ink build up on the domes as a result of contact of the domes with a printed surface.

The invention also includes a sheet supporting envelope surface of a cylinder of a rotary printing press, comprising a sheet of a chemically resistant, durable and hard metal or plastics material having its sheet supporting surface in the form of an irregular but statistically uniform distribution of domes of equal height so as to prevent ink build up on the domes as a result of contact of the domes with a printed surface.

The hard, durable material from which the sheet is made is a chemically resistant and wear-resistant material, e.g. a metal. By manufacturing the entire envelope surface from such a material primarily ensures that, in spite of the chemicals used by the off-set method, and even when processing rough papers, no unproductive time and additional costs are incurred. A particular advantage of a metal plate is that it forms an incompressible and practically

inexpansible foundation for the elevated support surface portions. This property is of particular importance for the standpoint of the felting process in the off-set method. A yielding foundation would mackle and make curtailing faults possible in the case of multi-colour printing.

The uniform distribution and arrangement at equal height of the domes associated unyieldingly with their support makes possible an impression of uniform quality. Spherical domes have been found in numerous experiments to be the optimally favourable construction of the supporting surfaces because they build up little ink, but quickly re-surrender the ink taken up. Furthermore they possess the advantage that under increasing contact pressure they constitute a support surface which becomes rapidly and symmetrically enlarged and does not harm the impression or the sheet. Such an envelope surface shows little wear and is easy to clean.

A rubber printing blanket has in fact already become known from German Patent Specification Nos. 831845 and 848833, in the surface of which rounded glass bodies or bodies of other solid substances are embedded. This known rubber printing blanket is however not suitable for use in off-set and multi-colour printing; for example, in the case of convertible multi-colour-off-set sheet printing presses it behaves differently in the obverse printing adjustment due to its expansibility and its compressibility, than the smooth impression cylinder of the other printing units. The result is mackling or a variation in the impression. In this case, for multi-colour obverse printing the printing blanket would have to be exchanged for a lining of the same thickness, whereby the standstill time would be increased, apart from the difficulty of making available a lining of this thickness with the required precision and hardness. Furthermore, a considerable relationship between printing quality and contact pressure results.

A further disadvantage arises in the use of the known rubber printing blanket due to the increasing electro-static charging compared to bright impression cylinders. Thus e.g. the electro-static charging is not only increased, but the dissipation of the charge is actually prevented due to the insulation.

Lastly, an ink repellent sheet is mentioned as a lining for sheet transfer cylinders in US Patent Specification No. 3,126,826, which consists of a paper-like or cloth-like support with small glass beads embedded in rubber thereon. Here again the insulation of the sheet transfer cylinder is a disadvantage. Furthermore, this lining cannot be used on counter-pressure

cylinders for the same reasons as the above mentioned rubber printing blankets.

Preferably the domes are formed as a materially integral part of a nickel foil which may be fixed directly or through the intermediary of a clamping device onto the cylinder. Nickel is incompressible, wear-resistant and also electrically conductive, as compared to the rubber blanket. In experiments, nickel has proved to be extraordinarily resistant, compared to chromium, with regard to chemicals used in the off-set method. The nickel foil can be manufactured by the known method of electro-plate moulding and be glued onto the relevant cylinder.

High stability is necessary in order that the nickel foil may also be fixed to supporting discs, such as are used in the construction of e.g. sheet transfer cylinders or delivery cylinders. Advantageously therefore, the nickel foil is copper-backed. Instead of this the nickel foil could also be clamped with e.g. an aluminium plate behind it.

The invention is more fully explained in the following description of a preferred embodiment thereof which is made with reference to the accompanying drawing, wherein;

Figure 1 shows a section through a surface covering according to the invention,

Figure 2 shows on a larger scale a section of the sheet supporting envelope surface of the covering in plan,

Figure 3 shows schematically an obverse and reverse printing press with three sheet transfer cylinders in the obverse printing sheet run,

Figure 4 shows the same diagram, but in the obverse and reverse printing sheet run, and

Figure 5 shows schematically an obverse and reverse printing press, the impression and sheet guide cylinders of which exhibit a double diameter.

The foil 1 illustrated in Fig. 1, consists of nickel and has a thickness 2 of 0.15 mm. The supporting surface portions of its surface are constructed as spherical domes 3 which have a diameter 4 of 0.1 mm. The spherical domes 3 are of equal height. The height 5 in this exemplary embodiment is 0.02 mm. The spherical domes 3 are arranged distributed at least statistically uniformly over the surface of the nickel foil 1. The mean distance 6 between the centres of two adjacent spherical domes 3, as may be seen from Fig. 2, is approximately 0.12 mm. The above stated dimensions may be modified upwards or downwards according to requirements. Thus, for example, a nickel foil with a thickness of 0.3 mm can also be manufactured by the known method

of electro-plate moulding. The dimensions mentioned are therefore to be understood only in the sense of an explanation, but not in the sense of limitation.

The nickel foil 1 may be fixed on the cylinder by means of a suitable clamping device or directly—e.g. by glueing. Because its supporting surface portions consist of individual identical spherical domes 3, the acceptance of printing ink from the wet impression and the surrender of the locally accepted printing ink to the next impression is the same across the entire sheet supporting envelope surface and thus provides a guarantee of equal quality of all image parts or items. Due to the small thickness of the nickel foil 1, there is also the possibility for particularly high standards in obverse printing to operate with the smooth ground impression cylinder in that the thin nickel foil is simply removed. The slight difference in diameter can immediately be compensated.

Figs. 3 to 5 show the convenient mode of using the nickel foil 1. Figs. 3 and 4 show schematically a sheet of offset printing press which exhibits two printing units 10 and 11. Of these the printing unit 10 comprises the plate cylinder 12, the rubber cylinder 13 and the impression cylinder 14, and the printing unit 11 comprises the plate cylinder 15, the rubber cylinder 16 and the impression cylinder 17. The two printing units 10 and 11 are connected by the sheet transfer cylinder 18, the accumulator cylinder 19 and the turning cylinder 20. In the obverse printing adjustment according to Fig. 3, of this sheet printing press, the sheet transfer cylinder 18 and the turning cylinder 20 each carry a nickel foil 1 according to the invention. This is because both cylinders 18 and 20 support the sheet by the side freshly printed for the printing unit 10.

The sheet 21 receives the first impression, the so-called obverse impression, in the printing unit 10 on the impression cylinder 14 from the rubber cylinder 13. The sheet transfer cylinder 18 takes over the printed sheet, the freshly printed side being supported by the envelope surface of the nickel foil 1. The sheet transfer cylinder 18 transfers the sheet 21 to the accumulator cylinder 19, against which the unprinted side of the sheet comes into contact. Only on the turning cylinder 20 does the freshly printed side of the sheet 21 again come into contact with the envelope surface of the cylinder 20, and for this reason, as already mentioned hereinbefore, a nickel foil 1 is likewise clamped on this cylinder. The sheet 21 then receives a further impression, the second impression, on the already printed side,

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from the rubber cylinder 16 in the printing unit 11.

When this off-set printing press is converted for obverse and reverse printing according to Fig. 4, inter alia the nickel foil 1 is removed from the turning cylinder 20 and clamped onto the impression cylinder 17. After the conversion of the machine is complete, the sheet 21 is likewise printed on one side (obverse) by the rubber cylinder 13 in the printing unit 10 and is passed on by the sheet transfer cylinder 18 covered with a nickel foil 1 to the accumulator cylinder 19. Here, by virtue of a turning device, not shown, the rear edge of the sheet 21 is accepted by the turning cylinder 20, so that the unprinted side of the sheet 21 also comes into contact with the turning cylinder 20. Only after the sheet 21 has been received by the impression cylinder 17 of the second printing unit 11 is the previously printed side of the sheet 21 braced against the envelope surface of the counter-pressure cylinder 17, which is therefore covered with a nickel foil 1.

The off-set obverse and reverse printing press illustrated schematically in Fig. 5 differs from that previously described in that the two impression cylinders 14 and 17 exhibit twice the diameter of the plate and rubber cylinders 12 and 13 and 15 and 16 respectively. Also the two printing units 10 and 11 are connected solely by a sheet transfer cylinder 22 constructed as a sheet turning cylinder. The sheet 21 receives its first impression, the obverse impression, on the front side of the sheet, in the first printing unit 10 by the rubber cylinder 13 provided with an image by the plate cylinder 12. The sheet transfer cylinder 22 grips the freshly printed sheet 21 by its rear edge and transfers it turned—i.e. with the rear edge of the sheet forward—to the printing unit 11. The sheet 21 therefore rests upon the impression cylinder 17 with its printed front side against the envelope surface. Because the impression cylinder 17 exhibits twice the diameter of the remaining printing unit cylinders 15, 16, it has two sheet supporting envelope surfaces, both of which are provided with a nickel foil 1. Now, in the second printing unit 11, the sheet 21 receives an impression on the reverse side, the so-called perfection. For this purpose the printed sheet is supported by its still freshly printed front side against the nickel foil 1. By virtue of the construction of the nickel foil 1 according to the invention, the first impression, the so-called prime, is not impaired in quality during this second printing operation.

The invention is in no way restricted to the exemplary embodiment illustrated. For example, a variation of the nickel foil is conceivable in that, instead of the construction of the spherical domes by means of electro-plate moulding, small balls of another solid chemically resistant metal or plastics material are embedded uniformly distributed in the nickel as solid support. There is also the possibility to replace the nickel foil by a similarly structured plastics foil with high modulus of elasticity.

WHAT WE CLAIM IS:—

1. An impression cylinder for a rotary printing press, said cylinder having a surface covering which is composed of a chemically resistant durable and hard metal or plastics material in the form of an irregular but statistically uniform distribution of domes of equal height so as to prevent ink build up on the domes as a result of contact of the domes with a printed surface.

2. A sheet supporting envelope surface of a cylinder of a rotary printing press, comprising a sheet of a chemically resistant, durable and hard metal or plastics material having its sheet supporting surface in the form of an irregular but statistically uniform distribution of domes of equal height so as to prevent ink build up on the domes as a result of contact of the domes with a printed surface.

3. A surface according to either one of claims 1 and 2, wherein the domes have diameters of 0.1 mm and heights of 0.02 mm, the mean distance between the centres of adjacent domes is 0.12 mm.

4. A surface according to claim 2, wherein the domes are formed integrally with the sheet.

5. A surface according to claim 2, wherein the sheet comprises a nickel foil.

6. A surface according to claim 2, wherein the sheet comprises a copper-backed nickel foil.

7. A sheet supporting envelope surface for a cylinder of a rotary printing press substantially as hereinbefore described with reference to the accompanying drawings.

8. An impression cylinder having a surface covering the cylinder being substantially as herein described with reference to the accompanying drawings.

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2. A sheet supporting envelope surface of a cylinder of a rotary printing press, comprising a sheet of a chemically resistant, durable and hard metal or plastics material having its sheet supporting surface in the form of an irregular but statistically uniform distribution of domes of equal height so as to prevent ink build up on the domes as a result of contact of the domes with a printed surface.

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