

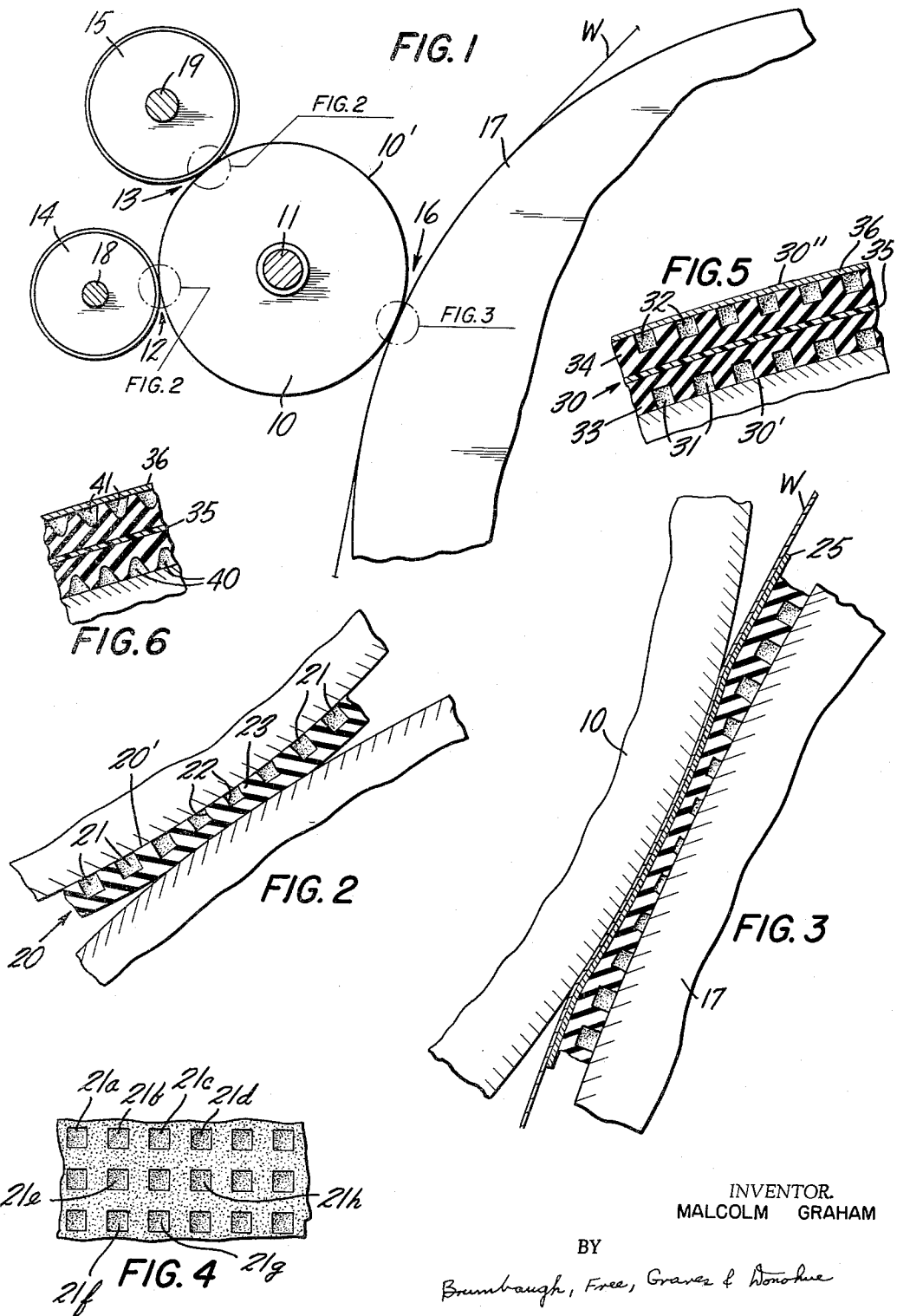
April 12, 1966

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3,245,345

PRINTING APPARATUS AND METHODS

Filed June 4, 1963



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3,245,345

PRINTING APPARATUS AND METHODS

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Filed June 4, 1963, Ser. No. 285,325

7 Claims. (Cl. 101-407)

This invention relates to printing and, more particularly, to novel and highly-effective printing-press packings and printing methods facilitating printing with lighter pressures than are required in conventional printing apparatus and without make-ready.

A disadvantage of some conventional printing-press packings is that they have a pronounced tendency to spread the paper web around the individual printing dots as they pass through the printing nip, so that the printing dots make enlarged impressions of indefinite outline; a disadvantage of others is that they acquire as a permanent stamp or mold the surface characteristics of the printing plate after a number of revolutions of the plate and impression cylinders.

Conventional solid rubber printing-press packings, for example, are so seriously deficient as to have little commercial importance. In particular, they bulge around the elevated printing dots, forcing the paper web down the slopes of the dots and into the valleys or depressions between the dots. This phenomenon is due to the nature of rubber, which, while readily deformable, is substantially incompressible, bulging in one place when depressed in another. Two results of the behavior of conventional rubber printing-press packings are that the paper web is wrinkled and that it picks up ink from portions of the plate not intended to produce an impression.

Though superior to conventional rubber printing-press packings, conventional fibrous printing-press packings such as tympan, for another example, have the disadvantage that the fibers are not highly resilient and that they are displaced under the repeated impact of the printing dots during successive revolutions of the plate and impression cylinders. The impressions made on the paper web by the printing dots during successive revolutions of the plate and impression cylinders become gradually lighter because of the reduced pressure by the packing in opposition to the dots. This reduces the contrast in the printed matter, giving it a "washed-out" appearance.

All conventional printing-press packings have the further disadvantage that, in high-quality printing, they require make-ready to produce an adequate impression on large areas intended to be solidly inked.

An object of the present invention is to remedy the problems outlined above. In particular, an object of the invention is to provide a printing-press packing which neither spreads the web around the individual printing dots to an appreciable extent nor becomes permanently impressed or stamped by the printing plate.

Another object of the invention is to provide a printing-press packing which obviates make-ready, which facilitates the production of printings of a given quality with lighter printing pressures, which facilitates transfer to and from form rolls of ink films substantially free of spurious patterns, and which facilitates printing economy by increasing the interval during which a printing press can be continuously run.

These and other objects are attained in accordance with the invention by a printing-press packing which is both resilient and compressible. Resiliency and compressibility are provided by composing the printing-press packing of a deformable material which is substantially impervious to air and which defines therein a plurality of cavities. The material is preferably nonfibrous, and

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the cavities are small—comparable in diameter to the distance between adjacent highlight dots.

For an understanding of further aspects of the invention, reference may be made to the following detailed description of three representative embodiments thereof and to the accompanying figures in the drawing, of which:

FIG. 1 is a simplified schematic end elevational view of a portion of a printing press adapted to employ a printing-press packing constructed in accordance with the invention;

FIGS. 2 and 3 are greatly enlarged elevational sections of the portions of FIG. 1 labeled "FIG. 2" and "FIG. 3," respectively, showing in detail two embodiments of a printing-press packing constructed in accordance with the invention;

FIG. 4 is an inside view, on the same scale as FIGS. 2 and 3, of the printing-press packings of FIGS. 2 and 3;

FIG. 5 is an elevational section of a third representative embodiment of a printing-press packing constructed in accordance with the invention; and

FIG. 6 is an elevational section of another representative embodiment of a printing-press packing constructed in accordance with the invention.

In the following detailed description of several representative embodiments of the invention, the novel printing-press packing is shown as mounted on the form rolls and impression cylinder of a particular rotary letter press. Workmen skilled in the art will understand, however, that the printing-press packing of the invention is equally adapted for use on other types of letter presses including platen presses, on offset presses, and elsewhere in the printing art. The term "printing-press packing" as used herein is thus not defined narrowly, as it is sometimes defined, to mean only a covering for an impression cylinder, but is defined broadly to include not only a covering for an impression cylinder but also, in all its other uses in the printing art, the novel structure herein described and illustrated.

FIG. 1 shows a printing member such as a plate roll 10 rotatably mounted on a shaft 11 and forming nips 12 and 13 with impression members such as form rolls 14 and 15, respectively, and a nip 16 with an impression member such as an impression cylinder 17. The form rolls 14 and 15 are rotatably mounted on shafts 18 and 19, respectively, and the impression cylinder 17 is also rotatably mounted on a shaft (not shown).

The cylindrical surfaces of the form rolls 14 and 15 pick up a film of printing ink from a source (not shown) which may include other rolls and an ink bath. The cylindrical printing surface 10' of the plate roll 10 carries a printing plate (not shown) having elevated printing dots arranged in a pattern to make the desired printing impression, and the plate picks up a film of printing ink from the form rolls 14 and 15. A blank paper web W passes from a source (not shown) through the nip 16, where it receives an impression from the plate roll 10 corresponding to the pattern of the printing dots on the plate. The web W then passes to other apparatus (not shown) for further processing.

Mounted on the form rolls 14 and 15, the printing-press packing of the invention provides quiescent surfaces for transferring ink films to and from the form rolls 14 and 15 in such a manner that there is no spurious pattern to the film of ink deposited on the plate roll 10. Conventional rubber form roll covers are deformed axially and circumferentially by the plate at the nip between the form rolls and the plate roll. The deformed rubber returns to its original shape at the moment the ink film is splitting between the form rolls and the plate, and this adversely affects the evenness of the film transferred to the plate. In accordance with the present invention, on the other hand, deformation of the rubber or

other material of the form roll cover (herein referred to generically, as pointed out above, as a "printing-press packing") occurs into air cells provided therein rather than on the outer surface of the form roll cover.

FIG. 2 shows in detail an embodiment of the novel printing-press packing adapted to be mounted, for example, on the form rolls 14 and 15. The printing-press packing 20 there shown is composed of a resilient, incompressible material such as rubber yet is compressible by virtue of a plurality of cavities 21 formed therein to enable the rubber to bulge inwardly into the cavities 21 as shown at 22, rather than outwardly on the outer surface of the packing, as the packing 20 passes through the nips 12 and 13.

Inasmuch as the material forming the packing 20 is substantially impervious to air, the packing 20, when mounted as shown, the network of ridges 23 on the inner surface 20' of the printing-press packing 20 abutting the cylindrical surface of the form roll 14 or 15 and sealing off the cavities 21, possesses not only the resiliency inherent in the rubber but also that added by the air compressed within the mutually-isolated cavities 21 as they pass through the nips 12 and 13. Because of the resiliency of the packing, it is capable of repeatedly opposing portions of a surface such as the surface of the plate roll 10 with a pressure having a cyclical isobaric pattern substantially constant with time. That is, though imaginary lines connecting points of equal pressure during successive cycles of opposition and no opposition of a portion of the packing and a portion of the surface vary with time during any given cycle, the variation during one cycle is substantially the same as that during the preceding or following cycle.

The cavities are comparable in diameter to the distance between adjacent highlight dots and are spaced apart from one another a distance comparable to that between adjacent highlight dots, and the total number of cavities in a printing-press packing may be many thousands. In a typical case, the cavities may be cubic and measure approximately .002" to .018" on a side. The cavities may be disposed in parallel rows, the rows being spaced, preferably uniformly, apart one from another by about .002" to .018" and the cavities of a given row being spaced one from another a similar and preferably equal distance.

Any four adjacent cavities such as the cavities 21a, 21b, 21c, and 21d, or the cavities 21e, 21f, 21g, and 21h (FIG. 4), lie substantially in the same plane. That is true even when the packing 20 is mounted on the cylindrical surface of a form roll or an impression cylinder, inasmuch as the cavities are small and closely spaced apart as compared to the diameter of the roll on which the packing is mounted.

The embodiment of FIG. 3 is identical to the embodiment of FIG. 2 except in a respect pointed out in the next paragraph. The cavities of the printing press packing in the embodiment of FIG. 3 likewise make the packing both compressible and more resilient than it would otherwise be and, in particular, enable the rubber around the walls of the cavities to bulge inwardly into the cavities so that the rubber opposes the surface of the plate through the paper web with a pressure acting only on the elevations constituting the printing dots and does not bulge outwardly to wrinkle the paper web W or force it into the valleys between the printing dots. At the same time, the printing-press packing forces the web W into firm contact with all of the printing dots, regardless of their density, thereby obviating make-ready.

The inside plan of the FIG. 3 embodiment of the printing-press packing of the invention is the same as the inside plan of the FIG. 2 embodiment and is shown in FIG. 4. The embodiment of FIG. 3 differs, however, from the embodiment of FIG. 2 in that the embodiment of FIG. 3 comprises a sheet 25 of conventional tympan. The sheet 25 shows little tendency to be permanently im-

pressed by the printing dots on the plate roll 10, because the printing-press packing resiliently cushions it. The sheet 25 may of course be omitted.

FIG. 5 shows a third embodiment of a printing-press packing constructed in accordance with the invention. The printing-press packing 30 shown in FIG. 5 has two pluralities of cavities 31 and 32 each adjacent to a side of the packing. The cavities are adjacent to the inner side 30' of the packing, while the cavities 32 are adjacent to the outer side 30".

The printing-press packing 30 comprises two layers or sheets 33 and 34 each similar to the printing-press packing 20 and a substantially unstretchable sheet 35 formed of a material such as polyethylene terephthalate, a plastic sold by the E. I. du Pont de Nemours & Co. under the trademark "Mylar." The sheet 35 is secured to the smooth sides of the layers 33 and 34 and defines a third layer substantially midway between and parallel to the inner and outer surfaces 30', 30" of the packing 30 and hence midway between and parallel to the surface on which the packing is mounted and a sheet 36 of a conventional tympan which may be mounted as shown on the layer 34.

The embodiment of the invention shown in FIG. 6 is identical to that shown in FIG. 5 except that the cavities 40 and 41 of FIG. 6 are conoidal rather than cubic and the separation between cavities is less than the separation shown by way of example in FIGURE 5.

There is thus provided in accordance with the invention a novel and highly-effective printing-press packing facilitating printing with reduced pressure and without make-ready. The printing-press packing of the invention remedies the chief problems of conventional printing-press packings, neither forcing the paper web around the printing dots nor becoming permanently stamped by the dots. As a result, the printing-press packing of the invention outlasts conventional commercial printing-press packings, thereby reducing printing-press "down time" and making possible substantial printing economies.

Many modifications within the spirit and scope of the invention of the representative embodiments described and illustrated herein will readily occur to workmen skilled in the art. For example, the locations of the cavities may be varied. In particular, the cavities may be spaced apart from both the inner and outer surfaces of the packing, and the cavities 31 and 32 (FIG. 5) and 40 and 41 (FIG. 6) need not be in the directly-opposed relation shown but may be staggered with respect to each other. Further, one or more additional layers may be added to the layers shown in FIGS. 5 and 6.

Accordingly, the invention is to be construed as covering all the embodiments thereof which fall within the scope of the appended claims.

I claim:

1. A printing press comprising, in combination, a printing-press packing and an impression member and a printing member opposable to each other, the printing member being formed with highlight dots and the impression member having a surface mounting said printing-press packing, the packing including a sheet of non-fibrous deformable material substantially impervious to air and defining therein a plurality of cavities comparable in diameter to the distance between adjacent highlight dots and spaced apart from each other a distance comparable to that between adjacent highlight dots, and the cavities being on the side of the packing adjacent to said surface.

2. A printing press as set forth in claim 1 in which said cavities number in the thousands, any four adjacent ones of said cavities lying substantially in the same plane.

3. A printing press as set forth in claim 1 in which the packing further includes (a) a substantially unstretchable sheet secured to said sheet of nonfibrous deformable material on the side of said sheet of nonfibrous deformable material opposite said surface, (b) a second sheet

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of non-fibrous deformable material substantially impervious to air secured to said substantially unstretchable sheet on the side of said substantially unstretchable sheet opposite said surface and defining therein a second plurality of cavities comparable in diameter to the distance between adjacent highlight dots and spaced apart from each other a distance comparable to that between adjacent highlight dots, said second plurality of cavities being disposed on the side of said second sheet of nonfibrous deformable material opposite said surface, and (c) a sheet of tympan secured to said second sheet of non-fibrous deformable material on the side of said second sheet of nonfibrous deformable material opposite said surface.

4. A printing press as set forth in claim 3 in which said substantially unstretchable sheet is formed of polyethylene terephthalate.

5. A printing press as set forth in claim 3 in which said substantially unstretchable sheet is substantially mid-

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way between and parallel to said surface and said sheet of tympan.

6. A printing press as set forth in claim 3 in which said cavities are substantially cubic.

7. A printing press as set forth in claim 3 in which said cavities are substantially conoidal.

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