This invention relates to the decoration of irregularly shaped plastic containers by a dry offset or relief offset process, and in particular, to a novel elastically-yieldable segmented offset blanket constructed to transfer minute design details to an irregularly shaped surface of a container without fuzzing or smearing of the design on the irregular surface of the container.

An object of this invention is to provide an elastically-yieldable offset blanket segment of a substantially greater thickness than heretofore known, whereby an inked design previously printed on a design-transfer surface of the blanket segment may be transferred with clarity and sharpness to an external wall surface of an irregularly shaped container body.

Another object of the invention is to provide an offset blanket segment constructed from elastomeric or polymeric material, such as natural or synthetic rubber, of a relatively low durometer hardness.

Still another object of this invention is to provide an offset blanket segment having a printing surface of a relatively low durometer hardness, irrespective of the durometer hardness range of the blanket segment.

Another object of this invention is to provide an offset blanket segment constructed from a plurality of laminated elastomeric or polymeric sections, each of which has a different durometer hardness than the others, and wherein at least one of said sections is an outer arcuate design-transfer section of a lesser durometer hardness than the remaining sections.

Another object of the invention is to provide an elastically-yieldable offset blanket segment of a relatively low durometer hardness, whereby embossment of the blanket segment is materially reduced and prolonged service of the blanket segment is obtained.

Another object of this invention is to provide a method of decorating a container by using a plurality of identical elastically-yieldable blanket segments having design-transfer surfaces of a relatively low durometer hardness, whereby a selected design may be transferred from a design-transfer surface to a container body with clarity and sharpness.

With the above, and other objects in view that will hereinafter appear, the nature of the invention will be more clearly understood by reference to the following detailed description, the appended claims, and the several views illustrated in the accompanying drawing:

FIGURE 1 is a diagrammatic plan view of a dry offset printing system, and shows a pair of diametrically opposed press blanket segments constructed in accordance with this invention secured to a press blanket cylinder, a relief printing plate, an ink distributing mechanism, and a container in printing contact with a design-transfer surface of one of the blanket segments.

FIGURE 2 is an enlarged fragmentary plan view with a part shown in section, of a portion of the offset printing system of FIGURE 1, and illustrates the relative thickness of a blanket segment of this invention and a foreshortened container in contact with and deforming a design-transfer portion of the blanket segment.

FIGURE 3 is an enlarged fragmentary plan view, with a part shown in section, of a press blanket cylinder and a modified blanket segment, which is similar to the blanket segment illustrated in FIGURE 2, but differs therefrom in that the blanket segment is constructed from a plurality of arcuate laminated bodies of diverse thicknesses.

FIGURE 4 is an enlarged fragmentary plan view with a part shown in section of a conventional prior art offset printing blanket cylinder and a press blanket, and illustrates the relative thinness of the press blanket and a foreshortened container in conventional, substantially non-deforming contact with a design-transfer portion of the blanket segment.

The components of a dry offset printing system constructed in accordance with this invention are diagrammatically illustrated in FIGURE 1 and include a printing press blanket cylinder 5, a pair of identical diametrically opposed offset blanket segments 6, 6, a relief printing plate 7, an ink distribution mechanism 8 and an ink fountain 10. Suitable mechanisms, well known in the prior art, are employed to effect dispensing of the ink from the ink fountain 10, through the ink distribution mechanism 8, onto a relief surface 11 of the relief printing plate 7. The relief printing plate 7 is rotated in synchronism with the cylinder 5 in a manner well known in the prior art.

As one of the blanket segments 6, 6 carried by the blanket cylinder 5 comes in contact with the relief surface 11 of the printing plate 7, the ink upon the relief surface 11, of the printing plate 7 is transferred to an arcuate design-transfer surface 12 of the blanket segment 6. The particular design or decoration transferred to the design-transfer surface 12 depends upon the particular configuration of the relief surface 11, and forms no part of this invention. Contained rotation of the blanket cylinder 5 brings the blanket segment 6 and the integral design-transfer surface 12 thereof into contact with an external wall 13 of an irregularly shaped, tapered, oblong container 14. The container 14 is moved in synchronism with the blanket cylinder 5 by a suitable mechanism (not shown), whereby the design on the design-transfer surface 12 is transferred to the external wall 13 of the container 14. The commonly assigned patent to Bozek et al. (Patent No. 3,124,065) discloses illustrative means for moving a container into contact with a printing blanket.

As is best illustrated in FIGURE 4, a conventional printing press blanket cylinder 15 includes an external peripheral surface 16. A conventional rubber offset blanket 17 is tubular in transverse cross-section, and is stretched over the blanket cylinder 15 into intimate contact with the surface 16. The conventional offset blanket 17 includes a design-transfer surface 18 and is a rubber-coated fabric structure 0.065 inch in thickness, and has a surface hardness range of 70-75 durometer as measured by a Shore durometer. Thus, a conventional offset blanket 17 is extremely hard and extremely thin, as is shown by the dimension B of FIGURE 4.

It has been found that in the offset printing of irregularly shaped containers, such as a container 20, by the conventional blanket cylinder 15 and offset blanket 17, there is a tendency for surface slippage between the container 20 and the blanket surface 18 with resultant smeared or "fuzzy" type transfer of the design to a surface 21 of the container 20.

Furthermore, the diameter of the blanket cylinder 15 in a conventional printing press (not shown) bears a predetermined relationship to the diameters of the printing plate cylinders (also not shown) of the press. In the case of a printing press for tapered, oblong containers, such as the container 20 in FIGURE 4, the diameter of the press blanket cylinder bears a fixed rela-
tionship to container handling mechanism (not shown) to provide synchronized peripheral speed of the container surface which is to be printed upon, and the surface 13 of the conventional offset blanket 17.

In accordance with this invention, as is best illustrated in FIGURE 2, the diameter of the blanket cylinder 5 has been materially reduced in comparison to the diameter of the conventional press blanket cylinder 15 shown in FIGURE 1. The thickness of the blanket segment 6 is suitably mounted on a peripheral surface 22 of the blanket cylinder 5. The thickness of the blanket segment 6 is indicated by the dimension A. The thickness A of the offset blanket segment 6 is approximately 1/2 of an inch, and in conjunction with the reduced diameter of the press blanket cylinder 5, provides a total diameter of the press cylinder 5 and blanket segment 6 substantially equivalent to the total diameter of the conventional press cylinder 15 and blanket 17 shown in FIGURE 4. Because the total diameter of the press cylinder 5 and the blanket segment 6 is substantially equal to the total diameter of the conventional press cylinder 15 and the rubber blanket 17, the press cylinder 5 and the blanket segment 6 can be used in conventional offset printing presses, without modification thereof.

Each of the offset blanket segments 6 is formed from elastomeric or polymeric material, such as natural or synthetic rubber, having a Shore durometer hardness from 15 to 40, preferably within the range from 30 to 35 durometer. The offset blanket segment 6 is substantially two-thirds softer and eight times thicker than the conventional blanket 17.

Due to the substantial thickness of the offset blanket segment 6 and the relative softness thereof, the transfer of a design from the arcuate design-transfer surface 13 to the external wall 13 of the container 14 is achieved with a clarity and sharpness of design detail hereafter attainable. Furthermore, the tendency for surface slippage between the external wall 13 of the container 14 and the design-transfer surface 12 of the blanket segment 6 is precluded, with the resultant effect that smearing or "fuzzy" type transfers of a design to the container wall 13 is avoided.

The primary reason for a sharp transfer of the design detail from the design-transfer surface 12 to the external wall 13 and the non-slip contact therebetween, is the deformation of the blanket segment 6 about the external wall 13 of the container 14 during the transfer of a design, as is best illustrated in FIGURE 2. This above-mentioned deformation results directly from the increased blanket segment thickness A and the relative softness of the blanket segment 6. As the blanket segment 6 deforms against the external wall 13 of the container 14, the design-transfer surface 12 comes into intimate contact with a substantially greater area of the external wall 13 than has heretofore been possible. Thus, the relatively thicker, softer, and deformable design-transfer surface 12 of each of the blanket segments 6, 6 precludes slippage and "fuzzy" type printing.

While it might appear that a soft, deformable design-transfer surface would decrease the clarity of a design transferred to a container because of the movement inherent in the deformation of the blanket segment 6, such is not the case. Because of the great thickness A and the relatively low durometer hardness range of the blanket segment 6, the design-transfer surface 12 deforms only to a degree whereby the transfer of a design with maximum clarity is achieved, while a deformation of a degree which would create a smeared or "fuzzy" type design is precluded.

Illustrated in FIGURE 3 is a blanket cylinder 25 and a modified offset blanket segment 26. The blanket segment 26 is suitably attached to a peripheral surface 27 of the blanket cylinder 25. The blanket segment 26 is similar to the blanket segment 6 shown in FIGURE 2, but differs therefrom in that the blanket segment 26 is constructed from a plurality of arcuate laminated sections. An inner arcuate section 28 of the blanket segment 26 is secured to the blanket cylinder 25 in a manner well known in the prior art. Overlaying and laminated to the inner arcuate section 28 is a middle arcuate section 29. Overlying and laminated to the middle arcuate section 29 is an outer arcuate design-transfer section 30 having a peripheral design-transfer surface 31. The thickness A of the blanket segment 26 shown in FIGURE 3 is substantially identical to the blanket segment thickness A of the blanket segment 6 illustrated in FIGURE 2. Furthermore, the diameter of the press blanket cylinders and the combined diameters of the press cylinder and blanket segment illustrated in FIGURES 2 and 3 are identical for the reasons hereafter mentioned.

The inner arcuate section 28, the middle arcuate section 29, and the outer design-transfer section 30 of the blanket segment 26 are made of polymeric or elastomeric material, such as synthetic or natural rubber, and each section has a different Shore durometer hardness range than any of the other sections. Preferably, the inner arcuate section 28 is the hardest, the middle arcuate section 29 is softer than the inner arcuate section 28, and the outside design-transfer section 30 is yet softer than either the middle or inner arcuate sections 29 and 28. Irrespective of the durometer hardness range of each of the individual arcuate sections 28, 29 and 30, the combined durometer hardnesses of the individual sections create a composite hardness varying between 15 to 40 durometer, but preferably within the range of 30 to 35 durometer. Thus, the blanket segment 26 is a structure having a plurality of arcuate sections of varying durometer hardness, yet achieves the desired effective range of surface hardness.

It should be apparent to one skilled in the art from the foregoing disclosure that the blanket segment thickness A may be varied and that the number of blanket segment sections, as well as their range of hardness, may also be varied within the scope of this invention. For example, the middle arcuate section 29 of the blanket segment 26 may be harder than either of the arcuate sections 28 and 30, so long as the range of effective surface hardness of the blanket segment 26 is within 15 to 40 durometer.

As is also well known to those versed in the art of offset printing, a conventional rubber offset blanket, such as the conventional offset blanket 17 shown in FIGURE 4, by removing a substantial peripheral portion of the conventional press blanket and thereafter, securing a pair of blanket segments, such as the blanket segments 6, 6, to the periphery of the press blanket cylinder in diametrically opposed relationship.

While example disclosures of blanket cylinders and associated offset blanket segments are shown herein, it is to be understood that changes in the disclosed structures and arrangements may be made without departing from the spirit and scope of the invention as defined in the appended claims.

We claim:

1. A method of transferring a design from a press blanket to the body of an irregularly shaped non-round tapered container of a surface configuration defined by
varying radii without the smearing of minute design details, the improvement comprising: inking a design upon a surface portion of a rubber press blanket mounted upon a rotating cylinder, said press blanket having a Shore durometer hardness within the range of 15 to 40 durometer, and bodily displacing and rotating the tapered surface of the container into contact with the blanket while concurrently rotating the blanket so that surface portions of different radii of said container depress different portions of said blanket in different amounts at the points of contact therebetween so as to effect the transfer of said ink design upon said container surface portions whereby slippage is precluded and the design is transferred without smearing or fuzziness to the irregular surface portions of the container.

2. A method of transferring a design from a press blanket to the body of an irregularly shaped non-round tapered container of a surface configuration defined by varying radii without the smearing of minute design details, the improvement comprising: inking a design upon a surface portion of a rubber press blanket mounted upon a rotating cylinder, said press blanket having a thickness of approximately one-half inch and a Shore durometer hardness within the range of 15 to 40 durometer, and bodily displacing and rotating the tapered surface of the container into contact with the blanket while concurrently rotating the blanket so that surface portions of different radii of said container depress different portions of said blanket in different amounts at the points of contact therebetween so as to effect the transfer of said ink design upon said container surface portions whereby slippage is precluded and the design is transferred without smearing or fuzziness to the irregular surface portions of the container.

3. A method of transferring a design from a press blanket to the body of an irregularly shaped non-round tapered container of a surface configuration defined by varying radii without the smearing of minute design details, the improvement comprising: inking a design upon a surface portion of a rubber press blanket mounted upon a rotating cylinder, said press blanket having a Shore durometer hardness within the range of 30 to 35 durometer, and bodily displacing and rotating the tapered surface of the container into contact with the blanket while concurrently rotating the blanket so that surface portions of different radii of said container depress different portions of said blanket in different amounts at the points of contact therebetween so as to effect the transfer of said ink design upon said container surface portions whereby slippage is precluded and the design is transferred without smearing or fuzziness to the irregular surface portions of the container.

4. A method of transferring a design from a press blanket to the body of an irregularly shaped non-round tapered container of a surface configuration defined by varying radii without the smearing of minute design details, the improvement comprising: inking a design upon a surface portion of a rubber press blanket mounted upon a rotating cylinder, said press blanket having a thickness of approximately one-half inch and a Shore durometer hardness within the range of 30 to 35 durometer, and bodily displacing and rotating the tapered surface of the container into contact with the blanket while concurrently rotating the blanket so that surface portions of different radii of said container depress different portions of said blanket in different amounts at the points of contact therebetween so as to effect the transfer of said ink design upon said container surface portions whereby slippage is precluded and the design is transferred without smearing or fuzziness to the irregular surface portions of the container.

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