This invention relates to a new surface decorating method and apparatus, and particularly to the decoration of parts having relatively raised (as cylindrically convex) surfaces. Examples of parts or elements adapted to be decorated, as contemplated by the present invention, are: sheet metal e. g. moldings and doors and window frame members for use in buildings; instrument boards and header panels, rails, etc. for use in automobiles—and moldings etc. for office and household furniture. The above indicates the general object.

A specific object is to provide an improved surface-decorating method and apparatus, by which decorative e. g. imprints may be more effectively applied to articles of considerable convexity or concavity or both without substantial distortion of the design or pattern, notwithstanding the fluidity of the decorating medium.

Another object is to provide a novel surface decorating apparatus, having improved operating characteristics when embodied either in a power-driven machine or hand imprinter arrangement, as will later be shown.

Other objects of the invention will become apparent from the following description relating to the accompanying illustrations of preferred embodiments thereof.

In the drawing, which is largely diagrammatic,

Fig. 1 is a side elevation of a set of printing members constituting an exemplary arrangement for a power-driven machine embodying the invention; Fig. 2 is a fragmentary sectional view, taken as indicated at 22 on Fig. 1; Fig. 3 is a detail sectional view corresponding to the lower portion of Fig. 2, and showing the relationship of a flexible imprinting member thereof to work having a convex surface to be decorated; Fig. 4 is a view similar to Fig. 3, showing one form of auxiliary means for locally urging portions of the imprinting member toward the work.

Applying decorative imprints to work having raised, or relatively raised and indented, surface effects by means of a flexible belt, is already known. The present invention is particularly distinguished from such prior knowledge in that it contemplates supporting the belt at the general region of printing contact, but at points which are out of alignment with the relatively raised portion or portions of the work.

Referring to Figs. 1 and 2, a pattern cylinder is shown at 1, adapted to be supported as on a shaft 2, and to carry the desired pattern, say an etched intaglio surface enclosing the cylinder or covering any desired portion of it. Parts 3 and 4 are rotary members adapted to be supported as on shafts 5 and 6, respectively, said members being as shown in the form of indent 7 or flanged pulleys (spool shaped). These form guides and supports for the flexible printing member which is in the form of an endless belt 8. The inner surfaces of the belt are supported, as will be hereinafter described on the guiding and supporting pulleys, and the outer surface of the belt effects the printing, preferably acting as an offset element in connection with a separate design or pattern surface, as on the cylinder 1.

The work W contacts with the printing surface of the belt opposite the pulley 4, and the work may be carried to printing position on a conveyor or equivalent device 10. A suitable platen 12 having a shaft 13 is shown as disposed directly opposite the pulley 4, so as to hold the work in the desired contact relationship to the belt at the zone of printing contact.

It is to be understood that suitable frame members are provided to carry the supporting shafts above mentioned and whatever auxiliary parts are necessary to complete the machine, these parts being omitted from the drawing of this modification in order to more clearly illustrate the more essential subject matter hereof.

Assuming that the mechanism illustrated is for intaglio printing, the cylinder 1 is provided with a suitable doctor arrangement 15 of any suitable character, and likewise with ink or graining paste applying mechanism diagrammatically indicated at 16.

The flexible belt 8 is formed of material such as will provide high flexibility, tensile strength and sufficient tackiness of surface to enable it to transfer the pigment pattern from the cylinder 1, to the work. The belt may be composed principally of gum material such as congealed glue and glycerine composition, or any other highly suitable material which is found suitable in the printing art, as a transfer or offset material. It may also be additionally reinforced, as will be presently shown.

The spool-shaped pulley 3 has a generally cy- lindrical surface 21 and frustrum-conical flanges 20. The inner surfaces of the belt are formed complementary to the cylindrical and conical surfaces of the pulley 3. The belt is thus of truncated V shape in transverse section and, in addition, it may have continuous discontinuously directed lateral flange portions 22a overlying the outer perimetral surfaces of the pulley flanges 20, which, as shown, are cylindrical.

The pulley 4 may be formed similarly to the 55
pulley 3 insofar as the flanges 24 are concerned, so as to fit the side surfaces of the belt, but the central portion 23 (also cylindrical, as shown) is made smaller in diameter so that this central portion does not normally contact with the adjacent surface 20 of the belt. This relationship of the belt surfaces to the surfaces of the pulley 23 may be greatly modified, depending largely on the shape of the work to be decorated.

It is assumed that the shafts 5, 6 and 13 have appropriate adjustments, whereby they may be separated and brought together in suitable fashion to effect the proper tension on the belt and contact with the work; and it will be seen that the belt, where it passes about the pulley 3, is maintained undistorted (surface cylindrical), whereas the belt is free to become distorted where it passes about the pulley 4. This provides the desired uniform pressure for contact with the etched pattern surface on the cylinder 1, and an appropriate surface for contact with a suitable cleaner (scraper e.g. 25), provided with appropriate ancillary equipment, such as reciprocator, trough, etc. (not shown).

With the above described arrangement, the color material may be applied to the pattern surface by rotation of the roll in the direction of the arrow thereon to the doctor blade e.g. 15 and the design transferred to the outer surface of the belt 8, at 30. Assuming the shaft 6 is suitably driven, as indicated by the arrow on the pulley 3, the color is then carried to the work, transferred thereto, and any excess color material remaining on the belt is scraped off by the cleaning apparatus at 25.

In order to strengthen the belt and enhance traction between the belt and the flanges of the driving and guiding pulleys, it is preferred to reinforce the converging side surfaces of the belt, as by inlays 32, of suitable rubber stock and/or fabric or cord, as well known in rubber tire building. This provides a strengthened, wear-resisting and traction affording element for contact with the converging flanges of the pulley 3, and insures that the belt will not slip at the flanges 24 and the pulley 4. The reinforcements arranged, as shown, do not in any way stiffen the intermediate body of transfer material, hence the latter is entirely free to conform to the work.

The extensions of the belt at 32 overlying the perimetral surfaces of the pulley flanges are useful in providing edge supports for the belt on the pulley 4, if due to considerable distortion of the belt by the work driving and guiding pulleys at 32 tend to draw away from the complementary flange surfaces of the pulley. These extensions also deter the passage of ink or graining paste to the traction surfaces of the belt by increasing the path of travel of such fluid material in order for it to get to the traction surfaces.

Assuming the work W as shown in Fig. 3 comprises a rolled section of sheet metal having a cylindrically convex top portion a and underhanging flanges b, this will ordinarily be supported on a strip (as 10) conforming to its underside to the plate. The plate (and/or the supporting strip preferably supports the transfer material laterally from the work, as indicated in broken lines). It will be noted that the transfer material of the belt has ample opportunity to yield with reference to the higher surfaces of the work while at the same time lateral pressure on the belt by the flanges 24 will cause the material to hug the sides or relatively receding surfaces of the work and transfer the pattern thereon.

This occurs with practically no distortion of the image or pattern offset by the outer belt surface since the belt is not locally stretched as in ordinary methods.

Referring to Fig. 4, the work W in this illustration has a series of raised ribs at c separated by indented trough portions d. In the event of work of this character, auxiliary means may be used to advantage in the space between the inside surface of the composition belt and the reduced diameter portions 23 to buttress the composition material opposite the relatively receding or trough-portions of the work. Such means may comprise axially adjustable rings 37 on the shaft 6 e.g. arranged to be positioned from points at respective sides of the machine frame, as by shifting collars 38 arranged to move the rings to the desired positions with respect to the indented areas of the work. The shaft 6 may be hollow and provided with inside shaft elements 39 and connected with the rings and shaft collars by suitable cross pins 37' and 38' adapted to move in appropriate slots in the shaft. The particular form of buttressing means shown is by way of example only.

I claim:

1. Surface-decorating apparatus, comprising rotary supporting members on transversely spaced axes, a flexible endless belt carried on said members and having a surface adapted to transfer a color design to a piece of work by rolling contact therewith, characterized by one of the members having means progressively buttressing the web of the belt at a region out of operative alignment with the work whereby a portion of the material is progressively urged laterally toward the work.

2. Surface decorating apparatus for work having relatively raised and receding surfaces to be decorated, comprising a flexible endless belt having a normally flat outer surface, means to support one stretch of the belt over substantially its entire inside surface for application of a color design from a planar or cylindrical pattern member to the opposite outside surface, and means supporting another stretch of the belt from laterally spaced portions only of its inside surface so that the intermediate unsupported portions of the belt may more readily yield to conform to the work.

3. A surface decorating apparatus comprising a flexible endless gum belt of truncated V-shaped cross-section, means to support a stretch of the belt by substantially continuously engaging the converging and intermediate inside surfaces thereof for application of a pigment design to the opposite surface of the belt at said stretch, and means to support a different stretch of the belt by engagement with the converging side surface, exclusive of at least a portion of the intermediate inside surfaces, for transfer of the design to the work.

4. Work decorating apparatus comprising a pair of pulleys and an endless yielding elastic generally flat transfer belt embracing the same and having inwardly converging sides, one of the pulleys having surfaces engaging the inside surface of the belt to relatively non-yieldingly support its outer surface, the other pulley engaging only the converging side surfaces of the belt so that intermediate transverse stretches of the belt may yield in contact with the work.

5. Work decorating apparatus comprising a pair of pulleys, one having flanges, and an endless transfer belt of yieldable elastic material
embracing the pulleys, one of the pulleys having a supporting surface engaging the inside of the belt in a manner to exert substantially uniform outward pressure on it, the other pulley engaging the belt only by means of said flanges.

6. Surface decorating apparatus comprising in combination a flexible endless belt of material suitable to effect a color transfer, said belt having generally parallel inner and outer surfaces and relatively converging side or edge surfaces, pulleys to support the belt in contact with a pattern member and in contact with the work, respectively, one of said pulleys being arranged to engage said flat inner surface for substantially its entire extent crosswise of the belt, the other of said pulleys being arranged to engage the converging surfaces to guide the belt while in contact with the work without supporting it opposite the work.

7. Surface decorating apparatus comprising an endless belt of flexible transfer material, means to drive the belt, and means to guide the same while in contact with the work, said belt having a strip of material of relatively high frictional characteristics associated therewith at a surface thereof adapted to contact with the driving means.

8. Surface decorating apparatus comprising a belt of flexible transfer material, a roller having flanges adapted to guide the belt in contact with the work, and means having relatively high frictional characteristics reinforcing the surfaces of the belt which contact with said flanges.

9. Work decorating apparatus comprising transversely spaced guides, a flexible transfer belt passing around both guides and adjustable means operatively interposed between the belt and one of the guides to locally apply outward pressure on the belt in a predetermined relationship to the work.

10. Work decorating apparatus comprising a plurality of guides and an endless belt of flexible transfer material supported thereon, one of the guides being arranged to exert pressure on the inside surface of the belt in a manner to facilitate the application of a design in color to the outside of the belt, as from a flat pattern plate or a cylinder, and the other in a manner to facilitate transfer of the color from the belt to work having relatively raised and receding surface effects, and means oppositely arranged on one of said guides to locally increase the operating contact pressure of the belt on the work in selected regions of the same.

11. Apparatus for decorating surfaces of elongated articles, comprising an elongated band having flexible elastic transfer material on one side of it, means supporting the opposite side of the band adjacent its edge portions only, and means for supporting the work for movement longitudinally of itself and longitudinally of the band in rolling contact with color material on the unsupported region of the band.

12. Apparatus for decorating work having relatively raised and receding surfaces to be decorated, comprising a flexible endless belt of yielding elastic material, means for applying a pattern of decorating material to the outside surface of the belt, means for locally supporting the inside surface of the belt over an area thereof coextensive with the pattern, and means for locally supporting the inside surface of the belt generally opposite the work, but at regions out of alignment, laterally of the belt, with the relatively raised area of the work.

13. In apparatus for decorating work having relatively raised and receding surfaces to be decorated, a flexible endless belt having elastic transfer material on one side, and means for locally supporting the opposite side at the active decorating zone of the belt only in regions spaced from each other transversely of the belt, lying on opposite sides of the relatively raised surface of the work and out of alignment therewith.

GUIDO vON WEBERN.
EDWARD WILLIAM HAMANT.