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F. A. SUNDERHAUF ET AL

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ROLL APPARATUS FOR LOCALIZED EMBOSSED

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Fig. 1

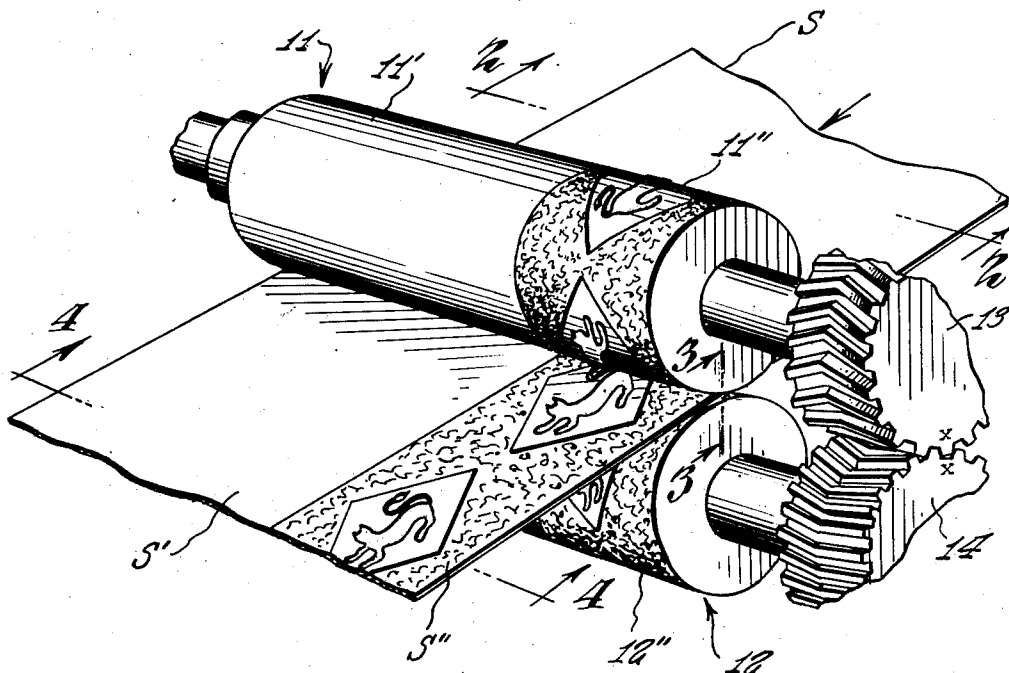


Fig. 2



Fig. 3

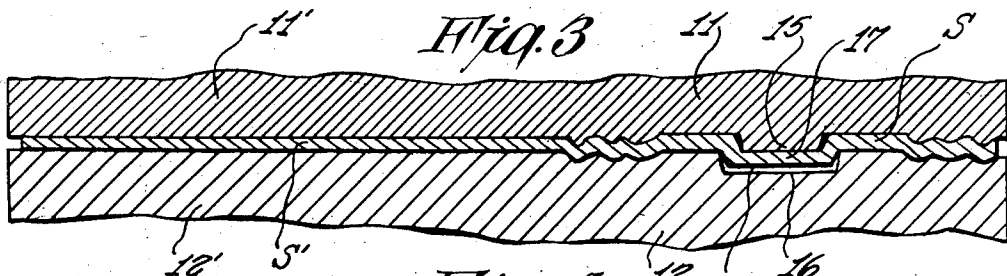
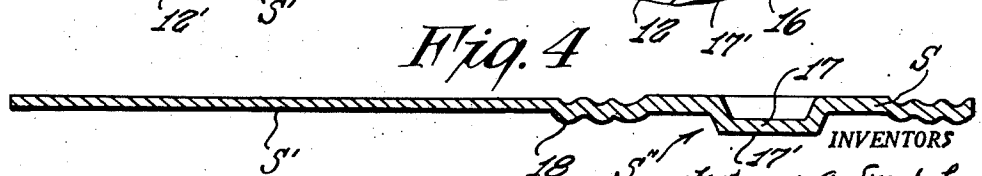


Fig. 4



INVENTORS
Frederick A. Sunderhauf
BY James C. O'Hear
Attorney

UNITED STATES PATENT OFFICE

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ROLL APPARATUS FOR LOCALIZED
EMBOSSINGFrederick A. Sunderhauf, Summit, and James C.
O'Hear, Union, N. J.

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3 Claims. (Cl. 101—23)

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This invention relates to the art of roll embossing wherein a sheet of material is provided with an embossed or raised design by being passed between a pair of embossing rolls and, more particularly, to a novel method and apparatus for roll embossing only a localized area or longitudinal portion of the sheet material.

Heretofore it was not feasible to roll emboss only a portion of a continuous sheet of material. That is, the methods and apparatus of the prior art could be employed only for embossing the entire area of the sheet since past attempts to emboss solely localized areas of the sheet would invariably result in the sheet being wrinkled, torn and otherwise defective.

We have discovered that when it is attempted to employ conventional embossing rolls for localized embossing, such wrinkles and distortions occur due to the fact that the embossing of the localized area causes the latter to be elongated in a direction along the path of travel of the sheet material whereas the remaining unembossed area of the sheet retains its original length.

It is, therefore, a primary object of the present invention to provide a novel method and apparatus for roll embossing solely localized areas or longitudinal portions of the sheet to be embossed, wherein the unembossed areas of the sheet are reduced in thickness and elongated simultaneously with and to the same extent of the elongation that occurs in the localized embossed area as a result of the embossing thereof, thereby preventing any difference in length between the embossed and unembossed areas of the sheet so as to avoid wrinkles, and other distortions therein. This novel and highly advantageous result enables, for the first time in the art of roll embossing, a sheet to be embossed at only a local longitudinal area or portion thereof since the wrinkles and other defects inherent in the prior art methods and apparatus were so prevalent as to preclude, heretofore, the practice of localized embossing by rolls.

This elongation of the unembossed area simultaneously with the embossing of the localized area is obtained by providing the rolls with rolling or reducing surface areas which roll the unembossed area of the sheet therebetween so as to reduce its thickness and thereby elongate the unembossed area in the direction of the path of travel of the sheet. By experiment the extent of elongation that the particular embossing operation will produce in a given material of a certain thickness can be measured, and from this the desired elongation of the unembossed area

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and hence its desired reduction of thickness and also the proper distance between the rolling or reducing non-embossing surfaces of the two rolls can be determined.

Another important and novel feature of the present invention resides in the discovery that considerably improved results are obtained by maintaining a clearance space between the raised parts of the design embossed on the sheet and the bottoms and sides of the embossing recesses in one of the embossing rolls. That is, the embossing recesses of one roll are formed deeper and wider than the corresponding embossing projections on the other roll, whereby when the projections press parts of the sheet into the recesses these parts remain out of contact with the bottoms and sides of the recesses, thereby preventing gripping, tearing and distorting the embossed sheet area and also reducing wear on the rolls when the latter are employed for embossing sheet metal. Furthermore, by maintaining the raised parts of the embossed design out of contact with one of the rolls, these parts are not "worked" and hence retain their original color and texture, thereby providing the raised parts with a dull surface contrasting with the relatively smooth, shiny surface of the non-raised parts of the embossed design, this contrast resulting in a distinctive pleasing appearance of the embossed sheet.

In the drawing wherein is illustrated one embodiment of the invention:

Fig. 1 is a perspective view of a pair of embossing rolls constructed in accordance with the present invention and showing a sheet of material being passed through the rolls so as to emboss only a localized longitudinal strip area of the sheet;

Fig. 2 is a sectional view of the sheet material before being passed through the embossing rolls and taken substantially on the line 2—2 of Fig. 1;

Fig. 3 is a transverse sectional view taken on a plane through the axes of the rolls as indicated by the line 3—3 of Fig. 1, and shows to an exaggerated extent the clearance space between a raised or embossed portion of the sheet and the bottoms and sides of the corresponding embossing recess in the lower roll; and

Fig. 4 is a transverse sectional view of the embossed sheet after it has passed through the rolls and taken on the line 4—4 of Fig. 1.

Referring first to Fig. 1, the reference numerals 11, 12 indicate a pair of embossing rolls which are rotatable mounted within an embossing apparatus (not shown). The manner of mounting

the rolls and drivingly rotating them is well known and need not be described, except to state that the rolls 11, 12 are provided with gears 13, 14 which maintain them in proper synchronized angular orientation with respect to each other. The gears 13, 14 may each be provided with an indicator mark as at X, these marks being brought into adjacent alignment whenever the rolls are brought together after having been moved apart, whereby each element of the embossing surface of one roll will always co-act with the same corresponding element on the embossing surface of the other roll.

The reference letter S indicates the work piece or sheet of material which is to be passed between the rolls 11, 12 so as to undergo a localized embossing operation. By "localized embossing" is meant the forming of an embossed or raised pattern or design on a longitudinal area of the sheet S, the remaining area of the sheet S being unembossed. More particularly, it will be seen in Fig. 1 that the left-hand strip or area S' of the sheet S remains unembossed after passing through the rolls 11, 12, the right-hand area S'' being subjected to the localized embossing operation.

In order to perform this localized embossing operation on the right-hand sheet area S'', the exterior surfaces of the rolls 11, 12 are provided with embossing surfaces 11', 12'' at their right-hand portions, the remaining portions of the rolls 11, 12 being devoid of embossing projections or recesses. As best seen in Fig. 3, the embossing surface of the upper roll 11 comprises a plurality of embossing projections 15, each of which co-acts with a corresponding embossing recess 16 in the embossing surface of the lower roll 12, so as to raise or emboss a portion 17 of the sheet S.

It should be noted that each of the embossing recesses 16 is wider and deeper than its corresponding embossing projection 15. This provides a clearance space between the raised portion 17 of the sheet S and the bottoms and sides of the embossing recesses of one of the rolls, whereby gripping, tearing and distortion of the embossed sheet areas during the embossing operation is prevented. Furthermore, when the material of the sheet S is metal, this provision for clearance considerably reduces wear and breakdown of the rolls.

It will be noted that the surface 17' of the raised portion 17 of the sheet S remains out of contact with the lower roll 12, whereas the remaining portions of the sheet S contact the lower roll 12 and hence are "worked" thereby. This results in the surface 17' of the raised portion 17 retaining its original color and texture, this usually being a comparatively dull surface contrasting with the relatively smooth, shiny surface of the nonraised, worked parts of the embossed design. This contrast between the shiny nonraised parts and the relatively dull surface of the unworked raised parts of the embossed design imparts a distinctive appearance to the embossed sheet.

The embossing operation on the sheet area S'' results in the latter being elongated in the direction of the path of travel of the sheet S through the rolls 11, 12, this path of travel being indicated by the arrow in Fig. 1. I have discovered that the unembossed area S' must be elongated simultaneously with and to the same extent as the elongation of the embossed area S'' if wrinkles and other distortions of the sheet S are to be avoided. This elongation of the unembossed area S' is pro-

vided by the rolling or reducing portions 11', 12' of the rolls 11, 12, it being noted that these rolling portions comprise the remaining surface areas of the rolls to the left of the embossing surfaces 11'', 12''.

As shown in Fig. 2, the sheet S is of uniform thickness before being passed through the rolls. However, during the localized embossing operation of the sheet area S'', the unembossed sheet area S' is reduced in thickness by the rolling portions 11', 12' of the rolls, as shown in Figs. 3 and 4. This reduction in thickness must be of a predetermined extent which will cause the unembossed area S' to be elongated in a longitudinal direction to the same extent that the embossed area S'' is elongated as a result of being "worked" by the embossing operation. Since it is contemplated that the method and apparatus of the present invention be applied to the embossing of various types of sheet material, including textile fabric, paper, metal and plastic, no definite data can be given as to the necessary reduction of thickness of the unembossed area S'. However, it will be obvious that by simple experiment with the particular material to be embossed, there can be readily determined the elongation resulting from the embossing of the sheet area S'' and hence also the necessary elongation of the unembossed area S' that must be produced by the rolling portions 11', 12' of the rolls.

The wavy configurations 18 of the sheet S, as shown in Figs. 3 and 4, are produced by conventional coining elements on the embossing surfaces 11'', 12'' of the rolls, this coining operation occurring simultaneously with the above noted embossing and rolling operations.

It is to be understood that the specific apparatus and method shown in the drawing and described in the specification are intended to be merely illustrative of one of the many forms which the invention may take in practice and are not intended to limit the scope of the invention, the latter being delineated in the appended claims. The term "sheet" includes, of course, strip material in any desired width and length.

Having described our invention, what we claim and desire to secure by Letters Patent is as follows:

1. An apparatus for roller embossing a localized area of continuous sheet material, said apparatus comprising a pair of rolls, means for rotatably mounting said rolls, and drive means for rotating the rolls, each of said rolls being provided with a pattern for embossing a longitudinal area of a sheet of material passed between the rolls, means for reducing the thickness of the remaining unembossed area of said sheet so as to elongate said remaining area to the same extent as the elongation resulting from the embossing thereof of said embossed longitudinal sheet area, a surface area of one of said rolls being provided with embossing projections and the surface area of the other of said rolls being provided with recesses each receiving a respective one of said projections, the clearance distance between the outermost face of each of said projections and the bottom of its respective recess being greater than the clearance distances between the other opposite adjacent non-embossing portions of the rolls, whereby a clearance space is provided between the sheet material being embossed and the bottoms of the recesses.

2. An apparatus for roller embossing continuously localized areas of a continuously mov-

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ing sheet, said apparatus comprising a pair of rolls, means for rotatably mounting said rolls, and drive means for rotating the rolls, each of said rolls being provided with a pattern for embossing longitudinal areas on said moving sheet 5
 passed between said rolls, means for reducing the thickness of the remaining unembossed area of said sheet so as to elongate said remaining area to the same extent as the elongation result- 10
 ing from the embossing thereof of said embossed longitudinal sheet area, a surface area of one of said rolls being provided with embossing pro-
 jections and the surface area of the other of said rolls being provided with recesses each re- 15
 ceiving a respective one of said projections, the clearance distance between the outermost face of each of said projections and the bottom of its
 respective recess being greater than the clear- 20
 ance distances between the other opposite ad-
 jacent non-embossing portions of the rolls, whereby a clearance space is provided between
 the sheet material being embossed and the bot-
 toms of the recesses, the clearance distances be-
 tween the sides of the projections and the respec- 25
 tive opposite adjacent sides of the recesses be-
 ing greater than the clearance distances between
 the other opposite adjacent non-embossing por-
 tions of the rolls, whereby a clearance space is
 provided between the sheet material being em-
 bossed and the sides of the recesses.

3. An apparatus for roller embossing con-
 tinuously localized areas of a continuously mov-
 ing sheet, said apparatus comprising a pair of
 rolls, means for rotatably mounting said rolls,
 and drive means for rotating the rolls, each of
 said rolls being provided with a pattern for em-

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bossing longitudinal areas on said moving sheet
 passed between said rolls, means for reducing
 the thickness of the remaining unembossed area
 of said sheet so as to elongate said remaining
 area to the same extent as the elongation result-
 ing from the embossing thereof of said embossed
 longitudinal sheet area, a surface area of one
 of said rolls being provided with embossing
 projections having a horizontal flat surfaces and
 the surface area of the other of said rolls being
 provided with recesses each adapted for receiv-
 ing a respective one of the projection flat sur-
 faces in contacting relationship, the clearance
 distances between the sides of the projections
 and the respective opposite adjacent sides of the
 recesses being greater than the clearance dis-
 tances between the other opposite adjacent non-
 embossing portions of the rolls, whereby a clear-
 ance space is provided between the sheet ma-
 terial being embossed and the sides of the
 recesses.

FREDERICK A. SUNDERHAUF.
 JAMES C. O'HEAR.

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