

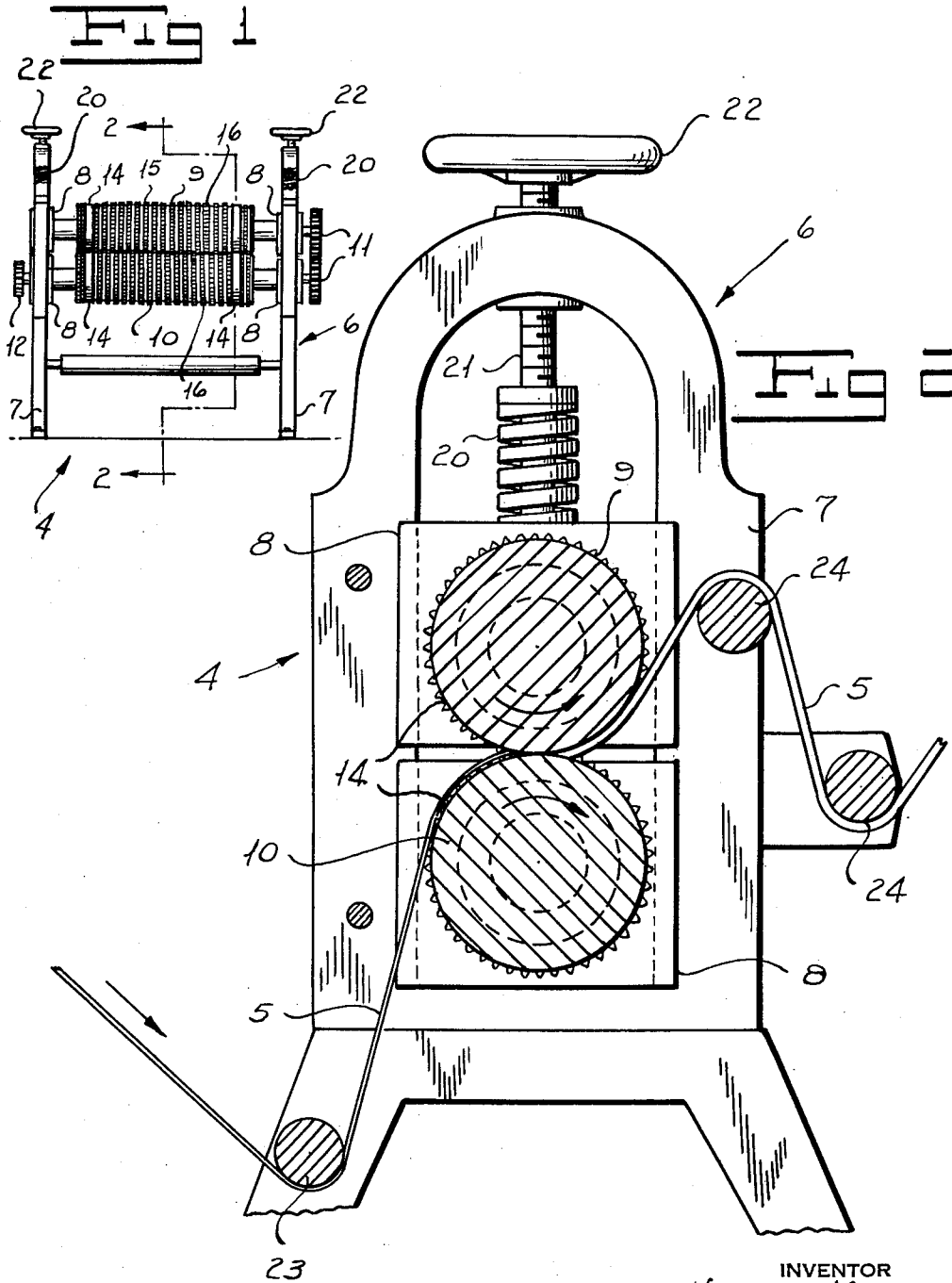
July 31, 1962

N. MARCALUS  
EMBOSSING

3,047,454

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3 Sheets-Sheet 1



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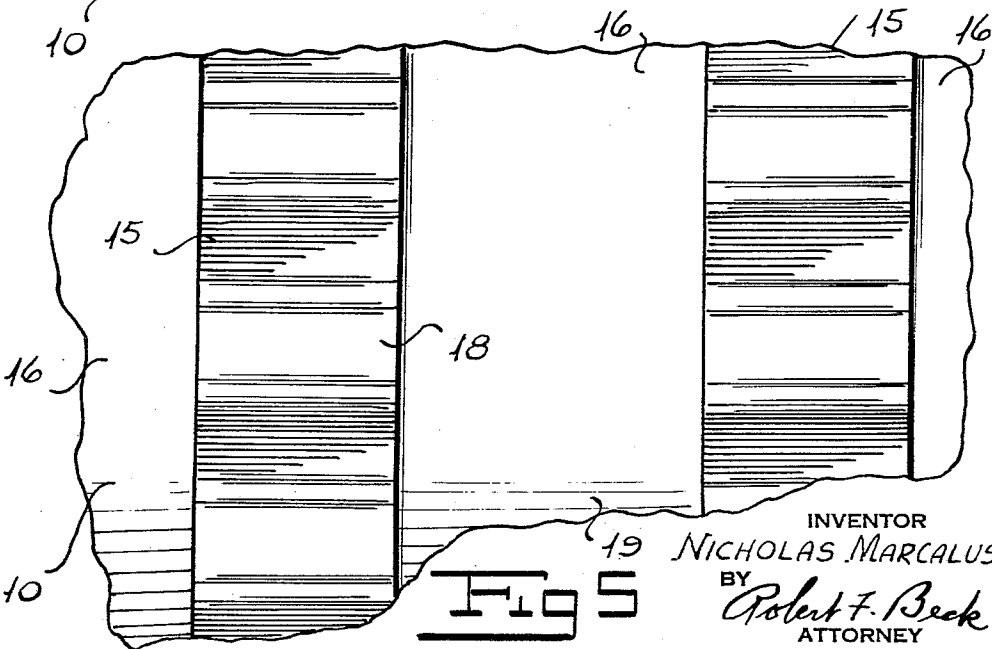
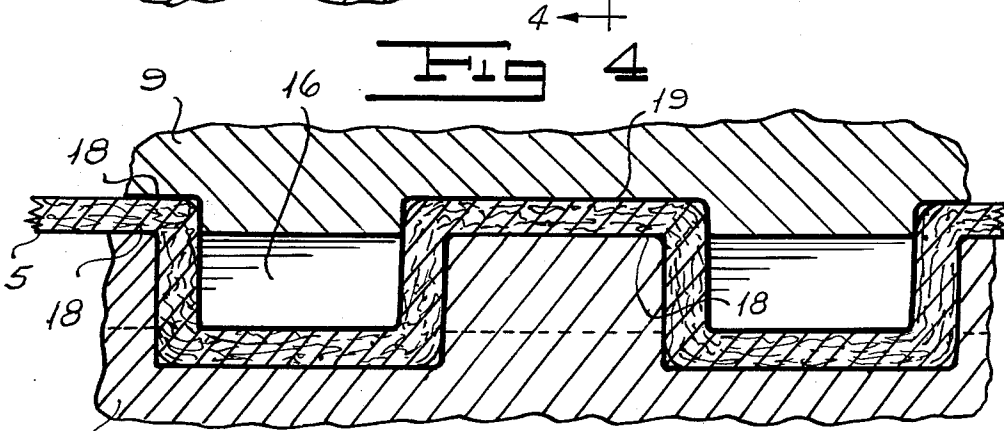
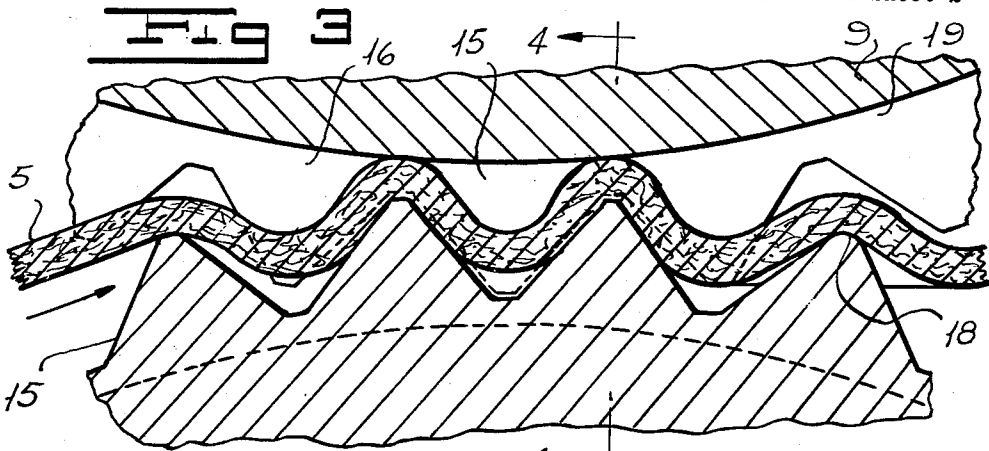
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3 Sheets-Sheet 2



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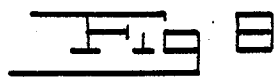
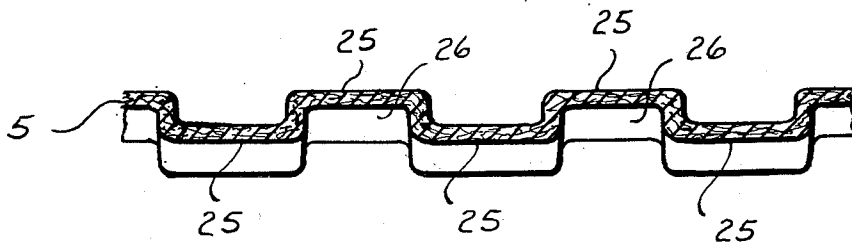
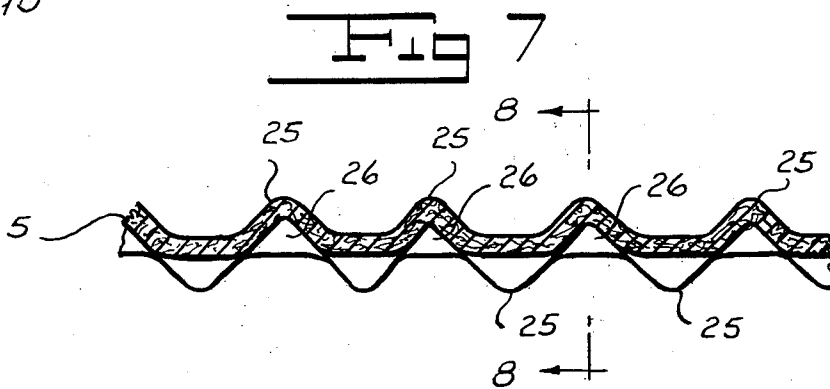
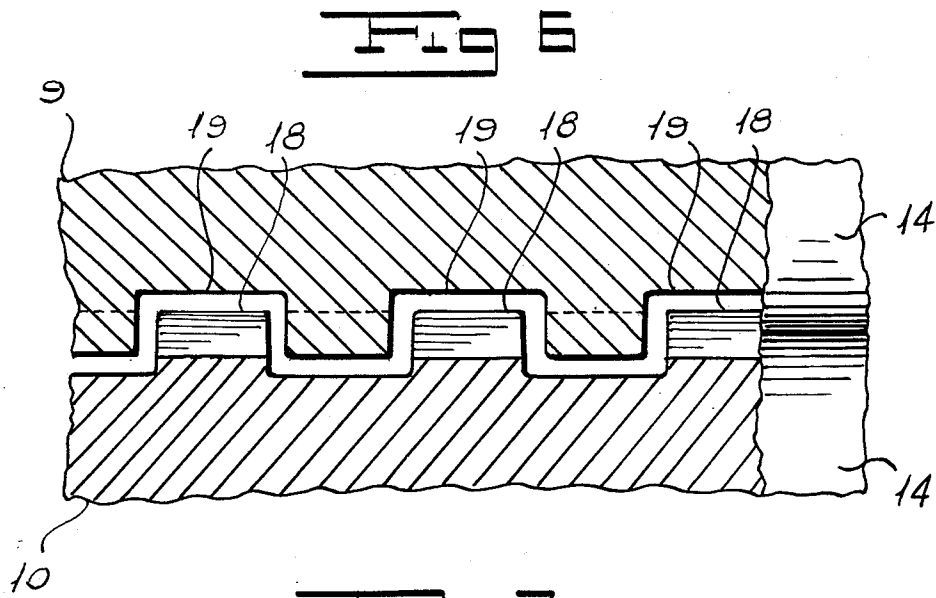
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EMBOSSING

Filed Sept. 25, 1959

3 Sheets-Sheet 3



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3,047,454  
**EMBOSSING**  
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 Filed Sept. 25, 1959, Ser. No. 842,370  
 10 Claims. (Cl. 162-117)

My invention relates to embossing and more particularly to the embossing of web material, for instance, paper and the like.

Prior art paper embossing machines are each usually equipped with a pair of embossing rolls between which is fed a web or paper for imparting an embossed design to the web as it passes between the rolls, the embossed paper being ultimately fabricated into paper products such as paper towels and the like. To impart the design to the web, one roll, termed the male roll, is provided with a pattern engraved in relief upon its circumferential surface while the other roll, known as the female roll, is formed with a mating pattern incised upon its circumferential surface for receiving the relief pattern therein and which female roll may, in some instances, be formed with a resilient surface in lieu of the incised pattern for accommodating within the surface the relief pattern during rotation of the rolls. The rolls are rotated in unison and with one being usually urged under spring tension towards and into engagement with the other with the result that paper fed therebetween is forced or compressed into the incised pattern of the design on the female roll by the relief pattern of the design on the male roll.

In many instances, the forcing or compressing of the paper into the incised pattern tends to weaken the edges of the design projections formed on the paper with the result that the paper is easily ruptured. Inasmuch as the projections thus formed are defined by relatively sharp edges and corners they tend to impart a rough or harsh touch to the skin of the user when brushed or wiped thereover. Furthermore, as only one side of the paper, thus embossed, is provided with the design in relief, the usefulness of the opposite side is limited to accumulating foreign matter or dirt within the wells or sumps formed by the projections. In the use of paper thus embossed, particularly towels, the average user, not being well versed or cognizant with respect to the differences of the design on the sides of the paper, usually haphazardly selects one side for use without gaining the attendant advantages provided by the other side.

My invention overcomes the foregoing and many other objectionable features, difficulties, and disadvantages inherent in paper products, for instance, towels embossed by the foregoing described prior art means or method, it being one of the numerous objects of my invention to provide a paper product, for example, a towel fabricated from a web and having embossed thereon a design extending outwardly from each side thereof for permitting use of either side of the product with equal efficiency and results.

Another object of my invention is to provide a product of the foregoing described character wherein the embossed design presents a relatively soft and smooth touch to the skin of the user when brushed or wiped thereover.

A further object of my invention is to provide a paper product, for instance a towel, having a design provided on each side thereof and which design is characterized by projections and wells for effecting brushing and wiping action by the projections and the accumulation of foreign matter within the wells.

A still further object of my invention is to provide an embossing apparatus equipped with embossing rolls having embossing surfaces maintained in spatiality and each formed with incised and relief patterns cooperating in spaced relation with the pattern of the other surface to

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effect imparting relief embossed design to both sides of a web fed between said rolls.

An important object of my invention is to provide an apparatus of the foregoing described character wherein the patterns of the rolls are maintained in spaced relation at all times thus substantially eliminating wear and materially increasing the life of the rolls.

Another important object of my invention is to provide embossing rolls each having an incised and relief pattern provided thereon for cooperating with each other and with said rolls being formed with spacing means for maintaining the pattern of one roll in definite preselected spaced relation with the pattern of the other roll during operation of the rolls whereby a pattern may be embossed upon both sides of a web fed between said rolls and in a uniform manner with respect to the sides.

A further important object of my invention is to provide a method of embossing a paper web or the like with a design extending outwardly from each side of the paper thus enabling either side of the paper, when fabricated into a towel or the like, to be used with equal efficiency without preselection.

A special object of my invention is to provide an embossing apparatus equipped with rolls of the foregoing described character which are simple in construction, durable in use, and efficient in operation.

With the above and other objects in view, as will hereinafter appear, the invention consists in the combination and arrangement of parts hereinafter set forth and illustrated in the accompanying drawings from which the several features of the invention and the advantages attained thereby will be readily understood by those skilled in the art.

Referring to the drawings wherein like reference characters designate like parts throughout the several views:

FIGURE 1 is an end elevation of an embossing machine equipped with my novel form of embossing rolls;

FIGURE 2 is a sectional view, on an enlarged scale, taken on the line 2-2 of FIGURE 1;

FIGURE 3 is a fragmentary transverse sectional view taken through the embossing rolls and illustrating the web or paper therebetween;

FIGURE 4 is a detail sectional view taken on the line 4-4 of FIGURE 3;

FIGURE 5 is a fragmentary plan view of one of the embossing rolls;

FIGURE 6 is a fragmentary longitudinal sectional view through the embossing rolls with the web removed to illustrate the spaced relationship of the rolls and their lands and grooves;

FIGURE 7 is a fragmentary longitudinal sectional view, on an enlarged scale, of the web or paper after being treated by the embossing rolls; and

FIGURE 8 is a sectional view taken on the line 8-8 of FIGURE 7.

In practicing my invention, as illustrated in the drawings, I provide an embossing machine 4 operable for embossing a web or sheet of suitable material, for instance, paper 5 having a substantially uniform thickness and suppleness throughout its entirety and which machine comprises a frame 6 having spaced side members 7 in which are mounted upper and lower bearing boxes 8 with the upper boxes being slidable, within the members, relative to the lower boxes. Suitable paper products, for instance towels or the like, are fabricated from the web or paper 5 when embossed and which may be formed of either a single or a plurality of layers to accord with the make-up of a preselected product. The machine is equipped with a pair of upper and lower embossing rolls 9 and 10, respectively, between which is fed the paper 5 for obtaining embossing thereon by the action of the rolls.

At their ends, the rolls are suitably journaled in the bearing boxes 8 and connected, at coincident ends, to the usual gearing 11 for effecting unitary rotation of the rolls with one roll being connected to a drive gear 12 for driving the rolls from a suitable power source (not shown). Each of the rolls is provided, at its ends, with contact, running or bearing shoulders 14 engaging coincident shoulders 14 of the adjacent roll and with an embossing zone 15 between the shoulders 14, it being understood that the paper 5 is fed between the zones 15 and inwardly of the shoulders 14 to obtain the embossing as hereinafter more fully described.

The periphery of each embossing zone 15 is provided with an embossing incised and relief pattern 16 cooperating with the pattern of the other zone 15 to impart a preselected embossed design 17 to the paper fed between the zones 15. Each of the incised and relief patterns 16 of the rolls is defined by lands and grooves 18 and 19, respectively, the grooves being of greater lengths, axially of the roll, than the lands as clearly illustrated in FIGURES 4 and 5 of the drawings.

The lands and grooves 18 and 19 are disposed in alternate relation about and lengthwise of their respective rolls with the lands of each pattern being rotated into and out of the grooves of the other pattern during operation of the machine. The addendum circles of the lands 18 are of greater diameters than those of the shoulders 14, while the latter are of greater diameters than the dedendum circles of the lands 18 whereby the shoulders 14 function to maintain the zones 15 in spaced relation as well as the lands 18 with the walls defining the grooves 19 as depicted in FIGURE 6.

The shoulders 14 of the upper and lower rolls are normally maintained in engagement with each other by means of springs 20 mounted on the side members 7 between the tops thereof and the adjacent upper bearing boxes 8, the tension of the springs being such as to urge the upper bearing boxes towards the lower bearing boxes and thus insure engagement of the shoulders. The tension of the springs are adjusted by shafts 21 threaded in the tops of the members 7 and operated by handwheels 22. The springs also function to permit upward movement of the upper boxes and roll 9 should foreign matter be inadvertently introduced between the rolls during operation thereof or the web be increased in thickness due to some defect or malfunction, thereby, permitting continued operation of the rolls without injury or jamming.

As illustrated, the web or paper 5 is fed, from a supply source, about a guide roller 23 to the embossing rolls 9 and 10 where it is embossed and thence about guide rolls 24 to suitable mechanism (not shown) for forming the embossed paper into desired products, for instance, paper towels or the like. In the present instance, and with reference to FIGURES 3 and 4 of the drawings, the alternate relation of the lands and grooves permits them to cooperate in a manner, when paper is fed between the rolls, to provide the paper 5 with a design having projections 25 extending from each side of the paper or web and which projections are formed with wells or sumps 25 for accumulating therein foreign matter when the sheet is utilized as a cleansing medium, the projections serving as wiping or brushing means.

The spacing of the embossing rolls is such as to preclude any tendency to over compress or tear the paper in forming an embossed design thereon, it being noted, in one instance and in actual reduction to practice, that paper having a fluffed or similar thickness of ten-thousandths of an inch when fed to the rolls was reduced by the rolls to a bite or defluffed thickness of approximately eight-thousandths of an inch by reason of the folding action obtained by the lands and grooves. When the paper was thus fed from the rolls it tended to assume, to a small degree, a fluffed thickness without attenuating or altering the design embossed therein.

Products formed from paper treated or embossed in

the foregoing manner obtain a deeper embossing over a greater area because the paper is not subjected to undue pressure in one direction but is merely folded away from each side of the web, and imparts a smooth and soft touch to the skin during use as distinguished from a relatively hard or harsh feel by reason of its fluffiness and suppleness. Furthermore, considerable saving is achieved by reason of the long life of the embossing rolls due to the lands not being subjected to any appreciable pressure and resultant wear caused by the compressing of paper into the grooves. By thus relieving the patterns of the rolls of any material pressure, not only is the life of the rolls considerably extended but it has been ascertained that the operation of the rolls require considerably less power and function at greater speeds.

It will be apparent that my invention provides paper products, such as towels, with an embossed design so constructed and arranged as to greatly increase and maximize the wiping, absorption, and foreign matter retaining characteristics, my construction of the embossing rolls providing a novel method and means of forming the sheet or web with the projections and wells as herein disclosed.

Without further elaboration, the foregoing will so fully explain the invention that others may, by applying current knowledge, readily adapt the same for use under various conditions of service. Moreover, it is not indispensable that all the features of the invention be used conjointly since they may be employed advantageously in various combinations and subcombinations.

It is obvious that the invention is not confined solely to the use herein disclosed in connection therewith as it may be utilized for any purpose to which it is adaptable. It is, therefore, to be understood that the invention is not limited to the specific construction as illustrated and described, as the same is only illustrative of the principles involved which are capable of extended application in various forms, and the invention comprehends all construction within the scope of the appended claims.

#### I claim:

1. An article of manufacture comprising, a relatively thin supple paper sheet capable of use as toweling and having opposite sides each formed with relatively large projections and wells adjacent and between said projections with the projections of one side constituting the walls of the wells of the other side, said walls being imperforate and of a substantially uniform thickness and suppleness throughout their entireties, said projections and wells constituting brushing and storage means capable of removing and storing foreign matter from a soiled surface when either side of said sheet is wiped over said surface.

2. An article of manufacture comprising, a supple paper sheet capable of use as toweling and having opposite sides each formed with a multiplicity of relatively large raised portions coating to define an embossed design having lands and wells, the lands of one side being spaced from each other by the wells of said one side and with the latter lands constituting the wells of the other side, each of said portions being imperforate and of a substantially uniform thickness and suppleness throughout its entirety, said designs being effective for brushing and storing foreign matter from a soiled surface when wiped over said surface.

3. Thin and supple paper capable of use as toweling and formed with a plurality of relatively large projections and wells on each side thereof, the projections and wells of each side forming the wells and projections of the other side, respectively, said projections having connecting portions intervening said projections and wells and connecting projections of one side with projections of the other side in alternate and adjacent relation and with said portions being imperforate and of a substantially uniform thickness and suppleness coinciding with said projections in their entireties.

4. Thin and supple paper capable of use as toweling and formed with a plurality of relatively large and definitely

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arranged lands and depressions in each side thereof, said lands being of an imperforate construction and having smoothly defined crest and base portions of substantially uniform thickness and suppleness and with the lands of each side forming the depressions of the other side, respectively, said base portions connecting the lands of opposite sides together in alternate and adjacent relation to define an embossed design on said paper.

5. Thin and supple paper capable of use as toweling and formed with a plurality of definitely arranged lands and depressions in each side thereof, said lands having smoothly rolled margins defining imperforate side and crest portions of substantially uniform thickness and suppleness and with the portions of the lands of each side forming the depressions of the other side, respectively, said side portions connecting the lands of adjacent opposite sides together in alternate relation, said margins being capable of removing foreign matter from a surface when wiped thereover for accumulation within said depressions.

6. Thin and supple paper capable of use as toweling and being of a substantially uniform thickness and suppleness throughout its entirety, said paper being formed with a plurality of crests and depressions in each side thereof, the depressions in one side forming the crests on the other side and the crests on one side forming depressions in the other side, imperforate connecting portions intervening crests and depressions, the paper being provided with relatively soft roll bites which form and define said connecting portions.

7. An apparatus having a pair of rolls provided with embossing patterns for embossing a paper web fed between said rolls and with the pattern of each roll being formed with projections and wells, the projections of one roll being operable into and about the wells of the other roll and disposed in a definite longitudinal and transverse alternately spaced relationship with the projections of the other roll to define uniform spacing zones therebetween of a preestablished size for accommodating portions of said web fed therein without substantially changing the thickness of said portions, and means associated with said rolls for maintaining said projections in said spaced relationship during the embossing to insure said thickness.

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8. Thin and supple paper capable of use as toweling and formed with a plurality of definitely arranged lands and depressions in each side thereof with the lands of both sides forming depressions on the opposite sides, respectively, said lands having crest and intervening portions of an identical structuralization and substantially the same thickness and suppleness throughout their entireties, said intervening portions being wholly defined by the crest portions and extending between the crest portions, said intervening portions connecting the crest portions of the lands of opposite sides together in alternate and adjacent relation.

9. A method of fabricating paper towels comprising, subjecting a relatively smooth supple imperforate paper web of substantially uniform thickness throughout its entirety to an embossing operation, forming longitudinal and transverse alternately spaced grooves and imperforate lands of substantially uniform thickness on each side of said web by folding portions of said web.

10. A method of fabricating paper towels comprising, subjecting a relatively smooth supple paper web of a substantially uniform thickness and definite structuralization throughout its entirety to an embossing operation, and forming longitudinal and transverse alternately spaced grooves and lands of said thickness and structuralization on each side of said web by softly folding portions of said web during said operation to insure said thickness and structuralization and prevent rupture of said lands.

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