

# United States Patent

White et al.

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[54] **METHOD OF MANUFACTURING LEATHER GOODS AND THE LIKE**

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[51] Int. Cl. .... **A43d 11/00**

[58] Field of Search.....12/146 R, 146 C, 146 D, 21, 12/54.1, 54.2, 54.3, 64, 223/57

[56]

### References Cited

UNITED STATES PATENTS

3,397,418 8/1968 Steadman et al.....12/146 C  
3,445,873 5/1969 Staden .....12/146 C

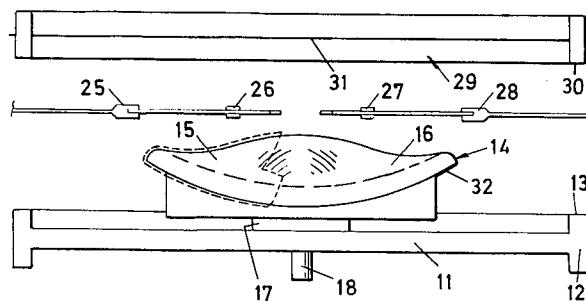
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[57]

## ABSTRACT

Method of and apparatus for manufacturing goods made of leather or like material in which a flat piece of the material, preconditioned to be readily deformable, is located between a diaphragm and a former, the diaphragm is moved to nip the material between the diaphragm and the former, the locating means is removed, the diaphragm is moved towards the former until a frame in which it is held makes a vacuum-tight seal with a table on which the former is mounted, and vacuum is applied to cause the diaphragm to draw and shape the material closely around the former.

## 4 Claims, 10 Drawing Figures



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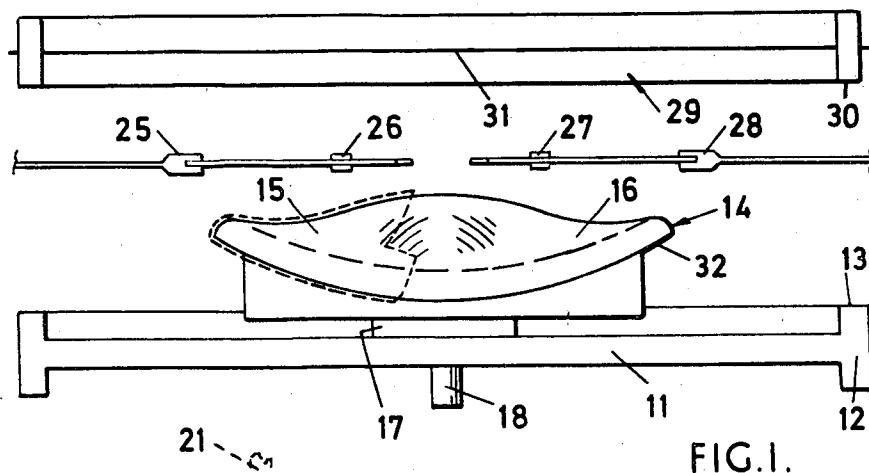


FIG. 1.

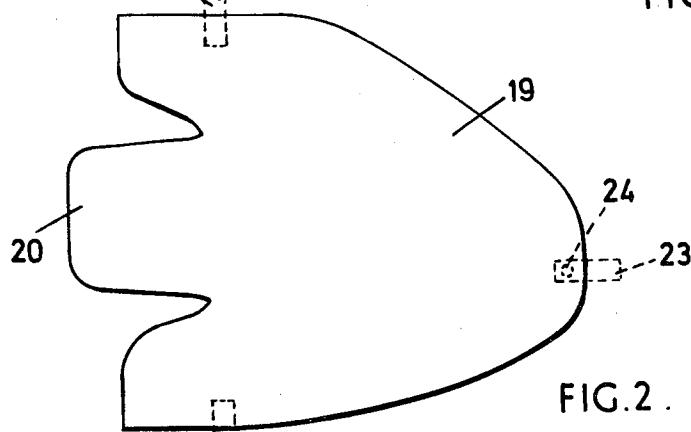


FIG. 2.

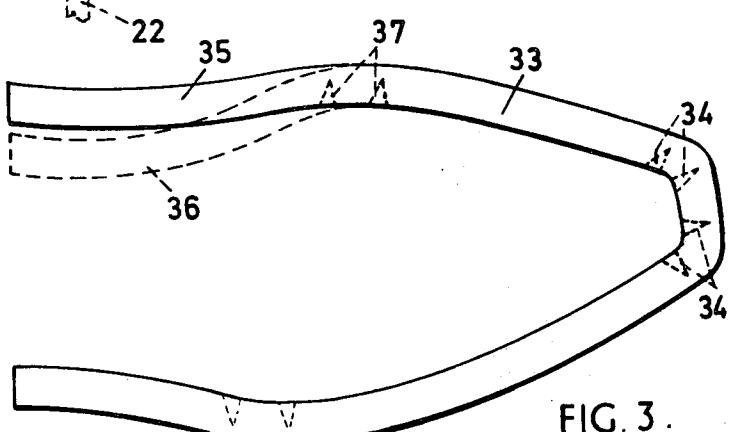
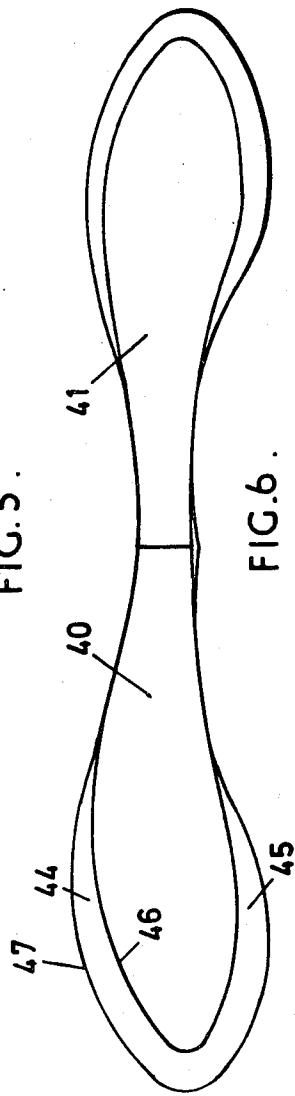
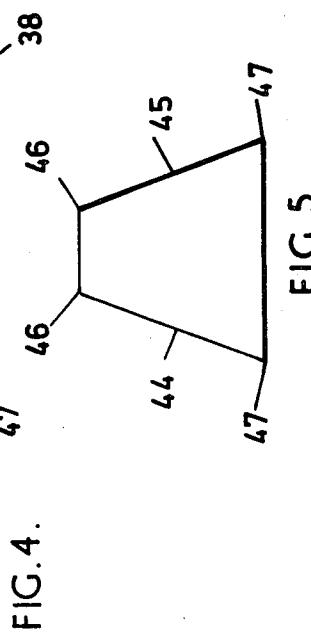
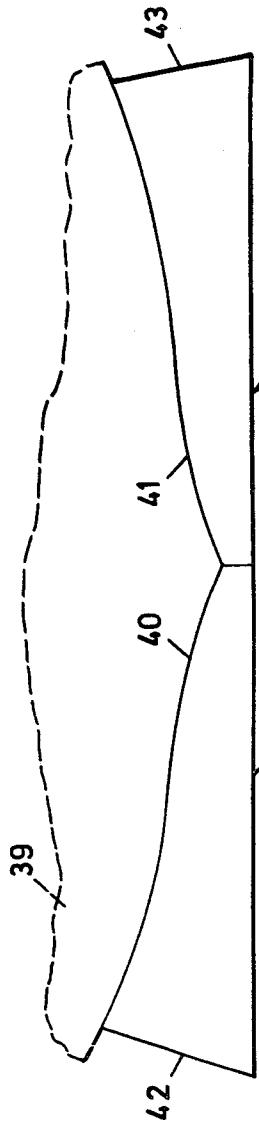


FIG. 3.

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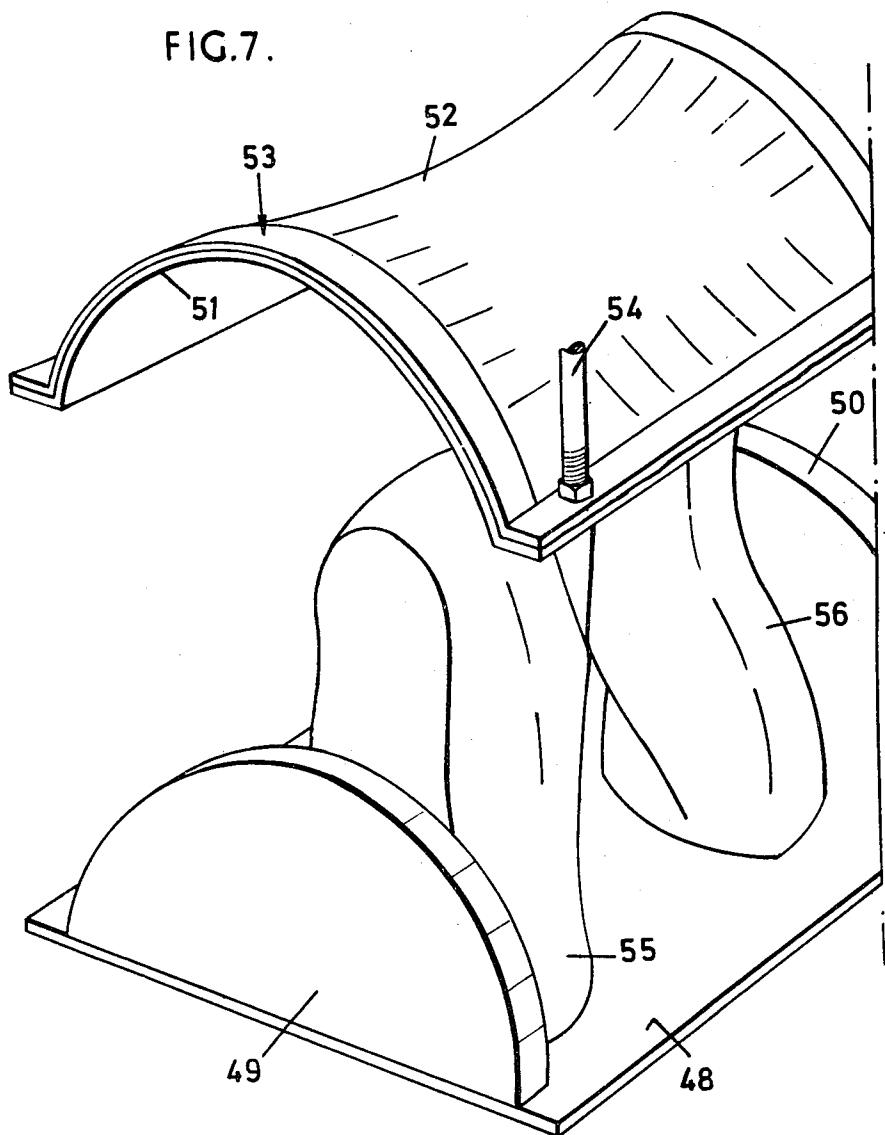


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FIG.7.



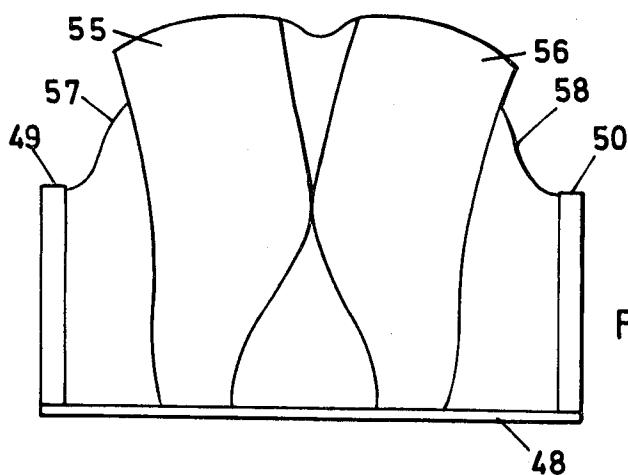


FIG. 8.

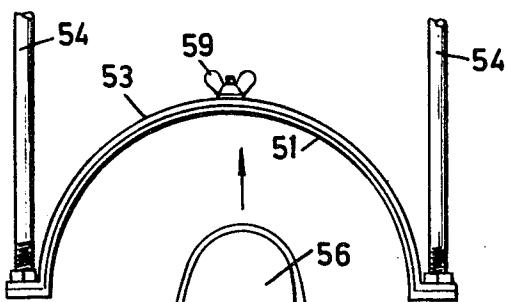
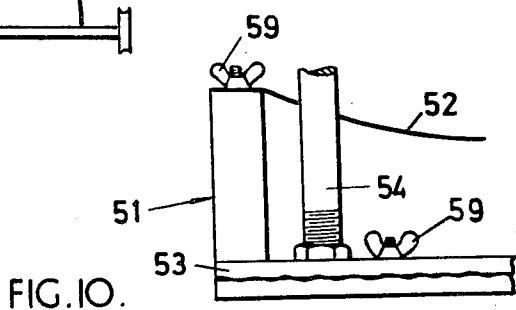
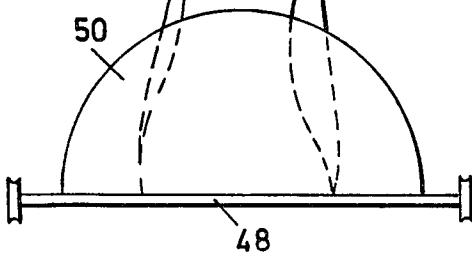


FIG. 9.



## METHOD OF MANUFACTURING LEATHER GOODS AND THE LIKE

This invention relates to the manufacture of articles made from leather, synthetic plastics, bonded or woven fiber, paper or other materials which may simulate leather, even to the extent that they are very slightly porous and are said to "breathe." One such material, made from polyurethane, is known by the registered trademark Porvair.

The invention is particularly useful in the manufacture of boots and shoes but may be applied to the manufacture of other types of leather goods. Similarly it may be applied to the manufacture of boots and shoes or other goods which are made from synthetic plastics, bonded fiber, paper or other materials which simulate leather. The term "or the like" is used to embrace all these variations.

In the manufacture of shoes, the method as generally practiced at present is first to construct the upper and for this purpose shaped pieces are cut from a sheet of leather or the like.

One or more of the pieces may be partly preformed, that is, shaped by treating each piece with heat and/or steam, or otherwise, to make it readily deformable, and then clamping it in a shaped die. The pieces are then sewn or bonded together so that a substantially complete upper is provided, and linings are attached to the inside surface if desired. A last of the shape of shoe to be made has an insole attached to it, the upper is placed upon it and the assembly is placed in a machine in which the edges of the upper are pulled underneath the edges of the last and over the insole. Heating, which may be high frequency, and/or conditioning by steam, may be applied so that when the operation has been completed the upper conforms to the shape of the last. The edges of the upper which have been pulled under the last vary considerably in width and are creased and puckered, and they are attached to the under surface of the insole, usually by nailing or adhesives. The uneven, creased and puckered edges of the piece at the under surface of the last are next ground away so that the creases and puckers disappear and the edges are roughened to accept an adhesive for sole attachment.

Numerous operations are necessary up to the stage described above and since the last must remain in the shoe beyond the stage covered by the foregoing description and up to an advanced stage of manufacture, it is necessary to stock a large number of pairs of lasts for each size and shape of shoe which is to be manufactured, to ensure that during a long production run the factory is not brought to a halt by a shortage of lasts.

The principal object of the invention is to provide a simplified and improved method of manufacture of footwear, such as boots and shoes, and other leather goods and the like, in which the number of operations necessary is reduced and a minimum number of formers is used to produce an article, which article conforms more accurately to the desired shape and is better adapted to mass production.

The invention consists of a method of manufacturing goods made of a material such as leather or a leather substitute or like material comprising the steps of providing a former having the shape and size to which it is desired to form the material, cutting a piece of the material in flat form to a shape such that when formed

over the former it will have the desired shape and dimensions, conditioning the material so that it will readily deform when drawn over the former, suspending the piece of material in juxtaposition to the former, placing a flexible and expansible diaphragm near the outside of the material so that the material lies between the former and the diaphragm, moving the material into contact with the former and moving the diaphragm into contact with the material so that the material is interleaved between the former and the diaphragm and is held in accurate location with respect to the former, removing the means by which the material is suspended, and applying a vacuum between the former and the diaphragm so that the diaphragm and the material are closely drawn around the former.

Conveniently the former is fixed to a horizontal table having a peripheral vacuum sealing edge, the material is suspended above the former in a horizontal plane by means of finger clamps, retaining pins, clips, adhesive, vacuum or pressure depending upon the material being used and the final shape, which are disengaged and withdrawn after the material has been held in its correct location between the former and the diaphragm, and the diaphragm is attached to a horizontal frame having a lower vacuum sealing edge around the periphery of its underside which engages the peripheral sealing edge of the table when the frame is lowered.

One method according to the invention will now be described, by way of example, with reference to the accompanying drawing in which:

FIG. 1 is a diagrammatic elevation partly in section, of the apparatus used to carry out the method;

FIG. 2 is a view of a piece of material cut to a shape which, when formed, will provide an article having the desired shape and dimensions;

FIG. 3 is a view of the bottom of a shoe upper;

FIG. 4 is a side elevation of a support for a fore-part former;

FIG. 5 is a side elevation of the support of FIG. 4;

FIG. 6 is a plan view of the support of FIGS. 4 and 5;

FIG. 7 is a pictorial view of the former, support and diaphragm for a former for producing full backs of shoes;

FIG. 8 is a wide elevation of the former shown in FIG. 7;

FIG. 9 is an end elevation of the former of FIG. 8, also showing the diaphragm; and

FIG. 10 is an enlarged view of a small part of the diaphragm support of FIGS. 7 and 9 showing how the diaphragm is clamped in position.

Referring to the drawings, a suitable apparatus for carrying out the invention in relation to the manufacture of shoes comprises a horizontal table 11 having an upstanding peripheral edge 12 whose upper surface 13 will, in conjunction with a mating surface, form a vacuum seal. A former, generally indicated by reference 14, is so shaped as to define the fore-parts of two shoe uppers joined together, one being indicated by reference 15 and the other by reference 16.

Since two shoe upper fore-parts are to be formed in one operation the former is so shaped that one upper fore-part is for a left shoe and the other is for a right shoe of the same size and matching fitting. The former is mounted on the table by a small platform 17. A tube 18 forms a connection to vacuum equipment and is

connected with ducts or channels (not shown) by which the outer part of the former is placed in communication with the vacuum equipment. FIG. 2 shows the shape of a piece 19 of material for a particular shape and size of shoe, drawn to a larger scale than FIG. 1. It includes a tongue portion 20, and the points at which finger clamps may be attached are shown dotted at 21, 22 and 23. It will be evident that if a moderate pull is exerted on each of these clamps the piece 19 will be kept reasonably taut and if the clamps are correctly located the piece 19 may be located with equal accuracy. An aperture such as a small slot or hole may be punched at each of the clamping points, as indicated at 24, and the finger clamps may include small pins to promote accuracy in location. If the outer, tanned, surface (in the case of a piece of leather) is uppermost in FIG. 2 then the resulting upper will be for a left shoe and if the tanned surface is underneath then the upper will be for a right shoe.

Two pieces, as shown in FIG. 2, to form a pair of upper fore-parts or vamps, are engaged by finger clamps such as those shown at 25, 26, 27, and 28, and two more which are not seen. By means of the finger clamps the pieces are accurately located above the former 14. A frame, generally indicated at 29, is of the same overall size as the peripheral portion 12 of the table 11 and has a lower surface 30 which, when engaged with the surface 13, will form a vacuum seal. Clamped in the frame 29 is a diaphragm 31 which is made of a flexible and expansible material such as rubber latex. At any suitable point in the procedure, the pieces are conditioned, by heating if purely thermoplastic, or by the application of moist heat, for example by steaming, so that they will readily distort and conform to the shape of the former.

To carry out the forming operation a carrier by which the finger clamps, and hence the pieces of material, are carried, is lowered until the pieces of material touch the former at one or more points. The frame 29 is then lowered until the diaphragm 31 is in contact with the pieces of material so that the material is nipped and lightly held in its correct location. The finger clamps are then removed and the frame 29 is lowered until the surface 30 engages the surface 13 to provide a vacuum seal. Vacuum is applied so that the diaphragm is drawn downwardly and forms and draws the pieces of material closely around the former and turns the edges over to lie against a marginal undersurface of the former at 32.

The apparatus is then left for a time sufficient for the pieces of material to cool, whereupon the vacuum may be released and the apparatus opened to allow removal of the formed fore-parts or vamps.

By the simple process described above it is possible to produce the two vamps for a pair of shoes.

FIG. 3 shows a view of the bottom of a formed vamp, the shape showing only the marginal or edge portion 33 which is formed against the marginal undersurface 32 of the former. An important characteristic of this marginal portion is that it is of uniform width and accurately shaped, which simplifies later operations in the manufacture of the shoes.

Since the process according to the invention minimizes the creases or puckers and the marginal portion is of uniform width no initial grinding away is

required and the vamp (with a lining if this is required) may be cemented or welded to a sole, an insole being inserted and cemented or welded into place afterwards. Naturally, variations in the process described above may be made within the scope of the invention.

The shape of upper shown in FIG. 3 has deliberately been chosen as one which includes rather sharp bends. In order to make quite sure that there can be no creasing or puckering of the marginal undersurface 33 of the formed piece small nicks, indicated at 34, may be made in the pieces when they are first cut to shape. For the particular shoe for which the upper shown in FIG. 3 is required the portion of the margin at 35 will be turned into the position shown dotted at 36 when the upper is placed on a foot former for a subsequent operation, such as welding on of a sole, and nicks 37 may be provided to ensure that there is no puckering as the part is turned in. It will be understood that other components of a shoe upper may also be formed, singly or in pairs or other multiples, by the use of appropriate formers.

In forming a complex shape such as a shoe upper or a full back (that is to say, the rear part of a shoe which is made in one piece without the usual vertical seam at the back) it is often desirable to shape the support on which the former is carried in such a way as to facilitate the movement of the diaphragm on the one hand, so that it makes intimate contact with the former and the support without becoming crinkled and, on the other hand, without being excessively stretched at any point. It may also be desirable to support the diaphragm in such a way that, instead of being flat, it has a desired configuration to suit the shape of the former. Examples of such shaping of the support and configuration of the diaphragm are shown in FIGS. 4 to 6 and 7 to 10. In FIGS. 4 to 6 the support for the former is generally indicated by reference 38, the former being indicated in dotted lines at 39. In plan the support has the general shape of the former but is cut back all round. The upper contour is indicated at 40 and 41 and, as shown at 42 and 43, the ends are sloped, the sides of the support being also sloped, as indicated at 44 and 45. The contour as seen in plan is indicated in FIGS. 5 and 6, the contour of the upper surface of the support being shown at 46 and the contour of the lower surface being shown at 47.

FIG. 7 is a pictorial view of the former and diaphragm for forming full backs for a pair of shoes, which may or may not have a vertical seam at the rear. The base of the former is indicated at 48. Two end pieces, respectively 49 and 50, are shaped to make a vacuum tight joint with a curved portion 51 at each end of a framework 53 which supports the diaphragm 52. The framework 53 is in two parts to enable the edges of the diaphragm to be clamped between them and the framework is so shaped that the configuration of the diaphragm suits the shape of the former. One support 54 by which the framework 53 is carried is shown. The other supports and a number of clamping screws have been omitted in FIG. 7 but are shown in later Figures. The former itself consists of two parts, respectively 55 and 56, which are joined together, and an elevation of the former parts 55 and 56 is shown in FIG. 8, the diaphragm and its supporting framework being omitted in the last-mentioned Figure.

As shown in FIG. 8, the former parts 55 and 56 are formed to produce two full backs, one for a right shoe and one for a left shoe. The end pieces 49 and 50 are shown and it will be observed that the former parts 55 and 56 are provided with end supports, respectively 57 and 58, which are shaped in such a manner that the diaphragm is not excessively stretched and at the same time will not become crinkled when it is drawn over the former parts 55 and 56. The base 48 of the former is also shown in FIG. 8. The manner in which vacuum may be applied will be obvious from the foregoing description of FIG. 1.

FIG. 9 is an end view of the former assembly of FIGS. 7 and 8 and shows the diaphragm with its framework. The base 48, end piece 50 and the former part 56 are shown in FIG. 9, together with the framework 53 which is in two mating parts to enable the diaphragm to be clamped between them by means of nuts on the supports 54, of which there are four, and additional screws and wingnuts 59. One end of the framework 53 is shown drawn to a slightly larger scale in FIG. 10. This includes one of the supports 54 and screws and wingnuts 59 which are placed at intervals around the framework 53 so that the diaphragm 52 may be securely clamped. It will be noted from FIGS. 7 and 10 that the diaphragm 52 is not necessarily stretched when in the framework 53 and it may be advantageous in fixing the diaphragm into the framework 53 to leave it somewhat slacker or looser in some places than in others, depending upon the shape of the mould and the amount of stretching to which different parts of the diaphragm will be subjected in actual operation. Attention to such matters increases the life of the diaphragm when in actual operation.

Similarly, parts for other kinds of leather goods or the like may be formed by the use of the method according to the invention.

We claim:

1. A method of manufacturing goods made of a

material such as leather or a leather substitute or like material comprising the steps of providing a former having the shape and size to which it is desired to form the material, cutting a piece of the material in flat form 5 to a shape such that when formed over the former it will have the desired shape and dimensions, conditioning the material so that it will readily deform when drawn over the former, suspending the piece of material in juxtaposition to the former, placing a flexible and 10 expandable diaphragm near the outside of the material so that the material lies between the former and the diaphragm, moving the material into contact with the former and moving the diaphragm into contact with the material so that the material is interleaved between the 15 former and the diaphragm and is held in accurate location with respect to the former, removing the means by which the material is suspended, and applying a vacuum between the former and the diaphragm so that the diaphragm and the material are closely drawn 20 around the former.

2. A method as claimed in claim 1 comprising the step of making a former having the shape and size of a plurality of pieces of material, cutting the said plurality of pieces of material, suspending the plurality of pieces 25 of material in correct location with respect to the former and to each other, moving the material and diaphragm so that each of the plurality of pieces is held in accurate location with respect to the former, whereby the application of vacuum will cause all the 30 pieces of material to be closely drawn around the respective areas of the former.

3. A method as claimed in claim 1 comprising the step of so placing the diaphragm that its initial configuration is accommodated to the shape of the former.

4. A method as claimed in claim 1 comprising the step of forming the or each piece of material with apertures and suspending the material by means of removable clips which engage the aperture.