

July 30, 1929.

W. C. BENNETT ET AL

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SHOE AND THE ART OF MAKING SHOES

Filed Aug. 3, 1926

Fig. 1.



Fig. 2.

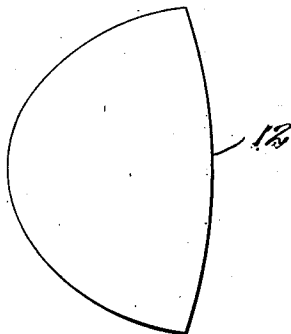


Fig. 3.

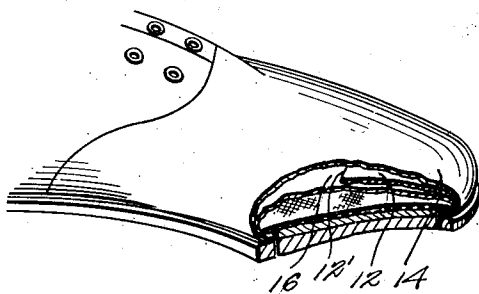
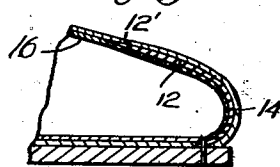


Fig. 4.



INVENTORS
Wallace C. Bennett
Albert B. Miller

By Mitchell, Chadwick & Kent.

ATTORNEYS

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UNITED STATES PATENT OFFICE.

WALLACE C. BENNETT, OF HINGHAM, AND ALBERT B. MILLER, OF CAMBRIDGE, MASSACHUSETTS, ASSIGNORS TO BENNETT BOX CO., OF BOSTON, MASSACHUSETTS, A CORPORATION OF MASSACHUSETTS.

SHOE AND THE ART OF MAKING SHOES.

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This invention, which relates to improvements in shoes and in the art of making shoes, has especial reference to those parts of the shoe where a permanence of form is desired greater than is natural for the regular materials of which the upper is made, e. g. the leather and lining.

For attaining this desired permanence of form or stiffness, as in a toe box or a counter, the invention introduces a sheet of material which is naturally limp and can easily be worked with the other materials to the desired shape, as by lasting, while it is at atmospheric temperature and in its natural state; and this working having been effected, the invention employs a reaction which changes the character of the worked sheet of material so that it tends to remain in the shape in which it is, and thus produces the final fixed result. Hence its utility is not limited to those kinds of shoes in which the process can be completed only within a certain limited time, after which the stiffener will have lost its temporary softness, but its applicability extends to all types of shoes having an upper stitched to a sole, including types, such as turn shoes, to which stiffeners heretofore known to us have not been conveniently applicable. The invention permits of the operation being interrupted, at any time before the final step, without the condition of the stiffener being appreciably altered by any delay thus occurring. The process is nevertheless more speedy than others known to us, more simple and convenient in its incidents, very economical and perfectly safe as regards danger of fire, or discomfort or danger to health of workmen practicing it. At the same time it makes a product, as a toe box, which is superior to any other variety of box of which we know in that it can make a smoothly finished toe, and can be made to have any chosen degree of softness, flexibility or hardness, and constitutes a toe in which the materials are well integrated, with a tendency, if distorted by pressure, always to return to the predetermined form. Applied in a counter, the counter fits closely to the last, is pliable and not stiff like a board, yet holding its shape. Therefore it is particularly useful, for example, in such cases as felt slippers where comfort is a quality principally desired. In the case of delicate fabric shoes, or fine

leather, the setting reaction may be carried out by a step, selected from among those available, which will not impair the fabric or leather. The execution of the process is adaptable to mechanism having automatic control, so as to produce exactness of execution; but even without this the process is particularly free from producing "seconds" or damaged pieces. When the preferred material is used the completed box is not brittle and is not spoiled by proximity to a steam pipe or other heat such as the wearer may casually encounter. The box may be made very thin, a quality which is much desired by manufacturers of high grade shoes, to enable them to preserve the smooth lines of the last, without that bulging of the tip which shows where the box is inserted, in cases where the stiffening material is thick or bulky. The preferred style of the box of the invention yields when pressed gently, and, when the pressure is relieved, seeks automatically to return to the shape in which it was finished. Thus it is not broken by pressure, it is not injured by water or thereby separated from other parts of the toe; but when once finished it remains permanently in the shape of the last, except when temporarily distorted by pressure, making a shoe in which the lining, the box, and the tip, or doubler if any is used, are a completely integrated unit. The process of manufacture is simpler than others known to us, among those commonly practiced, in that the operations are fewer and are of such character that they fit naturally into the routine of shoe factory organization; the process is also more convenient in that it can be interrupted, at any time before the final step by which the toe is actually finished, without damage or trouble arising; and in that any but the final step can easily be repeated for correction of an error. And another advantage is lowness of cost, both as to materials and as to labor and as to incidental losses, such that it makes the finest of box toes appear about comparable in cost with the cheapest and the poorest of such at present known to us to be practiced in the industry.

The state of the art prior to this invention is shown by the foregoing list of advantages, in that no prior product of this nature possesses them all, so far as we are aware; and

in that in each instance the statement of one of these advantages is the statement of a distinction of the present from some or other of the numerous efforts that have heretofore been made to work out a satisfactory method and product in the art of shoe manufacture to which the invention relates.

These and other advantages herein mentioned result in part from the generic process and in part from the particular species and ingredients herein described. The improvement in general involves the preparing of a sheet of material which is naturally limp but which has the property of being converted by a chemical reaction, preferably occasioned by application of heat, to a substance or state having a permanent set; the inserting of this limp sheet into the shoe; the forming of it therein as desired, and then by heat giving to it a permanent set. A specific illustration is found in the filling of a sheet of cloth, cotton-flannel, or felt or other fibrous material, with an unvulcanized rubber compound; cutting a toe blank from a sheet of this limp material; lasting the said blank in the toe of the shoe; and afterward subjecting the shoe while still on the last to heat for vulcanizing the said compound. Pressure is provided by the stretch of the leather, due to the presence of the last, during the heat; and the continuation of this heat for three minutes or whatever other time may be suitable for the particular compound used, at a temperature which may be predetermined, and which may be automatically controlled at a degree not injurious to the leather, occasions the reaction which produces the finished product; and then the last may be immediately pulled.

This specification sets forth the material, rubber, and the specific final step, vulcanization, occasioned by the method, application of heat while the shoe is on the last, which constitute the form at present deemed preferable; but the invention is not so limited as this in scope. It will be understood, therefore, that variations may be made in many respects from the particular illustration which is here given for its exposition.

It is intended that the patent shall cover, by suitable expression in the appended claims, whatever features of patentable novelty exist in the invention disclosed.

In the accompanying drawing:

Figure 1 is an edge view of a sheet of material and

Figure 2 is a face view of a blank cut therefrom, the same being cloth impregnated with rubber compound containing vulcanizing material, with which the invention may be practiced.

Figure 3 is a view of part of a shoe embodying the invention.

Figure 4 is a longitudinal section through the toe of a shoe embodying the invention.

The more detailed description now to be given will both show the practice of the invention and certain contrasts thereof with the methods and materials which are at present extensively in use for the same purposes. As the largest and most important field for the invention appears to be that of toe boxes and their manufacture, it is the application of the invention to this part of the shoe which will be described.

The desired stiffness is obtained by associating with the other elements of the toe some sort of a carrier such as cloth or felt or wood pulp, in the form of a sheet holding a rubber compound ready for vulcanizing. For example, a rubber compound may be spread over a sheet of cotton flannel of light weight in such manner as to impregnate it thoroughly and to cover both sides. Figure 1 is an edge view of such a sheet, which may be assumed to have been treated with the compound by suitable machinery, the sheet being in whatever width of cloth comes in the market and being of indefinite length. The rubber compound is preferably one which will vulcanize at a temperature that does not injure the leather or other material which is to be used in the toe, for example, about 200° F. or a trifle lower. Rubber compounds of this description, capable of vulcanization in three to twelve minutes at such a temperature are already known to rubber chemists and can be selected or compounded according to the temperature and length of time desired for the vulcanization set, or for the degree of hardness desired. By the selection of the compound, or by the selection and compounding of ingredients therefor, the operator can control the softness, resilience, or hardness of the finished toe.

The sheet thus prepared is soft, pliable and limp; and is tacky. It is to be cut into shapes suitable for the uses to which it is to be put. A suitable shape for a toe box is shown in Figure 2, the dimensions being preferably such that when lasted it fits around the edge of the last under the bottom of the toe, like the lining and the upper.

For manufacture of the shoe, this blank may be stitched in with the lining and the upper, in the "stitching room" as shoe factories are now commonly organized; and being limp it requires no incidental preparation as is common in connection with other box stiffeners, where heat or some solvent is used to soften a naturally hard stiffening material in order to permit of its being shaped to the last. The avoidance of the use of solvents is one distinctive advantage of the invention, as the softening solvents commonly in use have obnoxious fumes which are detrimental to workmen, and which often involve a fire risk for the factory, increasing both cost and dangers of operation.

If preferred, the stitching of the blank as above described may be omitted and the blank may be slipped in with the other parts at the time of pulling-over, without being stitched. As the toe blank preferably is tacky, it easily adheres to the upper on one side and to the lining on the other. The thinness of the sheet of cloth and rubber of which the blank consists is the reason why the completed box has the very distinct advantage of being made so notably thin, making a superior product. This feature also eliminates the manufacturing step, which is necessary in many previous boxes, of skiving the edges of the stiffening material in the effort to prevent the finished toe from showing a bulge where the edge of the stiffening material occurs. Another characteristic is that the box of the invention can be hammered out nicely with the effect that the hammering tends to improve the box rather than to harm it, as the material oozes under the hammer blow and easily flattens out and fills up crevices.

The upper, with the box thus stitched in, in its natural rag-limpness, is given to the puller-over and then to the laster who carry out the lasting operation to completion, with the stiffener remaining limp and unresilient while the toe is pulled over and made fast. All thus far has been with no waste of time in assembling, heating or softening the blank, and without the serious wrinkles which sometimes occur in the lasting operation, due to stiffness of the inserted stiffener. The quality of resilience, or of permanence of set, is then developed by a brief period, which may be one, three or more minutes, of heating of the entire shoe toe while on the last. This may be done by steam, or in any other convenient way, and thereby this part of the shoe manufacture is finished.

The application of this vulcanizing heat may be executed under automatic control as to temperature and duration. No pressure is needed other than that under which the material is, as a result of the pulling over and the lasting, because the shoe is remaining on the last. As soon as this step has been completed, the last can be pulled, immediately if desired, the application of heat having made an integrated toe which, when distorted, seeks to return to the shape in which it was vulcanized.

In the finished shoe represented in Figure 3 the box 12 is seen between the leather 14 and the lining 16 of the upper. The thickness of the box 12 is necessarily exaggerated, it may have sufficient resilience for its purposes and yet be so thin that its edge 12', extending across the toe, makes no ridge or mark observable on the exterior or palpable on the interior, the resilience being accomplished by the vulcanization at a temperature enduring for a brief time, as above indi-

cated, less than is sufficient to injure the leather.

The process may proceed from step to step as slowly or as rapidly as may be convenient, thus permitting the handling of shoes in lots of any size, for during the process the individual shoe stiffener undergoes but slight change while waiting. Thus a number of uppers, after having the blanks stitched in, may be left until the next workman is ready to take them; or the shoe, in a partially or fully lasted form, may be left for a time upon the racks without damage. Or it may be lasted, pulled out and relasted several times, if necessary. In these respects it differs from other boxes which when softened have to be dealt with immediately, and which in some cases after once being lasted cannot be reworked, without great difficulty. The box of the invention also differs from those in which heat is used to soften the box into pliability, in that this box is initially perfectly pliable, and the heat is used to convert it into its final stage of stiffness.

Thus a permanently hard box is produced by the temporary application of heat. The hardness and strength may at choice be those of hard rubber or they may be those of a very soft flexible rubber, or anything between; and the quality of resilience comes incidentally, as also waterproofness. The vulcanization or final reaction is not necessarily effected by heat, but it will be observed that if a cold vulcanization process be employed in which the reaction begins with the mere putting together of the ingredients and proceeds until finished some of the advantages which attend the vulcanization by heat are not attained. Other suitable materials may be used in place of rubber, producing their characteristic qualities when converted or hardened by heat or otherwise. The word "rubber" is used in this specification in a generic sense, so as to include any natural or synthetic products having the general properties of rubber as utilized by the process and product herein set forth.

We claim as our invention:

1. A leather shoe having in its upper a soft toe which is flexibly resilient as a whole, exteriorly is smoothly continuous with the adjacent exterior leather surface of the upper, and interiorly has a composite box endowing it with the said quality of resilience; said box being the composite product of a thin sheet of carrier material, rubber compound carried thereby, and sheet fabric in the ordinary interior covering of the leather, both of these sheet elements being interpenetrated by the rubber compound, and said compound being set by vulcanization in the form constituted by its said position of interpenetration, whereby the thinness of the said carrier and the in-

terpenetration of the said compound produce an edge beginning of the box part of the toe which is substantially imperceptible in exterior visual aspect and substantially impalpable interiorly to the foot of the wearer; the said composite product constituting an organization in the toe lining wherein the carrier sheet and its interconnection by the vulcanized rubber to the adjacent fabric modify the normal limpness of said fabric so that without substantial increase of thickness the whole has become sufficiently stiff to maintain the toe form normally and sufficiently resilient to restore the toe form after deformation.

2. A leather shoe at an intermediate stage of manufacture, ready for lasting, comprising an upper, in the toe portion of which there is leather with its exterior extending smoothly and continuously from the adjacent part of the shoe into the toe portion; material lining the leather interiorly; and a thin and limp fabricated sheet carrier, with rubber compound carried thereby, lying next to the lining and in position for the rubber compound carried by it to be pressed into the lining; said compound being pre-

pared for vulcanization by heat and pressure, and being vulcanizable at a temperature approximating 200 degrees F. and not exceeding that sufficiently to injure the said leather.

3. The art of making a soft and resilient toe in a leather shoe comprising the inserting, between ordinary limp sheet materials of the upper at the toe, of a sheet of thin and limp fibrous fabric carrying unvulcanized rubber compound distributed over at least one of its faces; compressing the said sheet materials of the toe together with the inserted sheet by the lasting operation; and then vulcanizing the said rubber while on the last by heat applied for a few minutes at a temperature not substantially exceeding 200 degrees F. whereby without adding substantially to the thickness of the toe materials in the aggregate, and without injurious heating of the leather the previously limp lining materials become softly and resiliently set in the form of the toe.

Signed at Boston, Massachusetts, this twenty-ninth day of July, 1926.

WALLACE C. BENNETT.
ALBERT B. MILLER.