March 1, 1966 M. S. BROMFIELD 3,237,227

DIRECTIONALLY SHRINKING LASTED SHOE UPPERS

Filed April 10, 1964 2 Sheets-Sheet 1

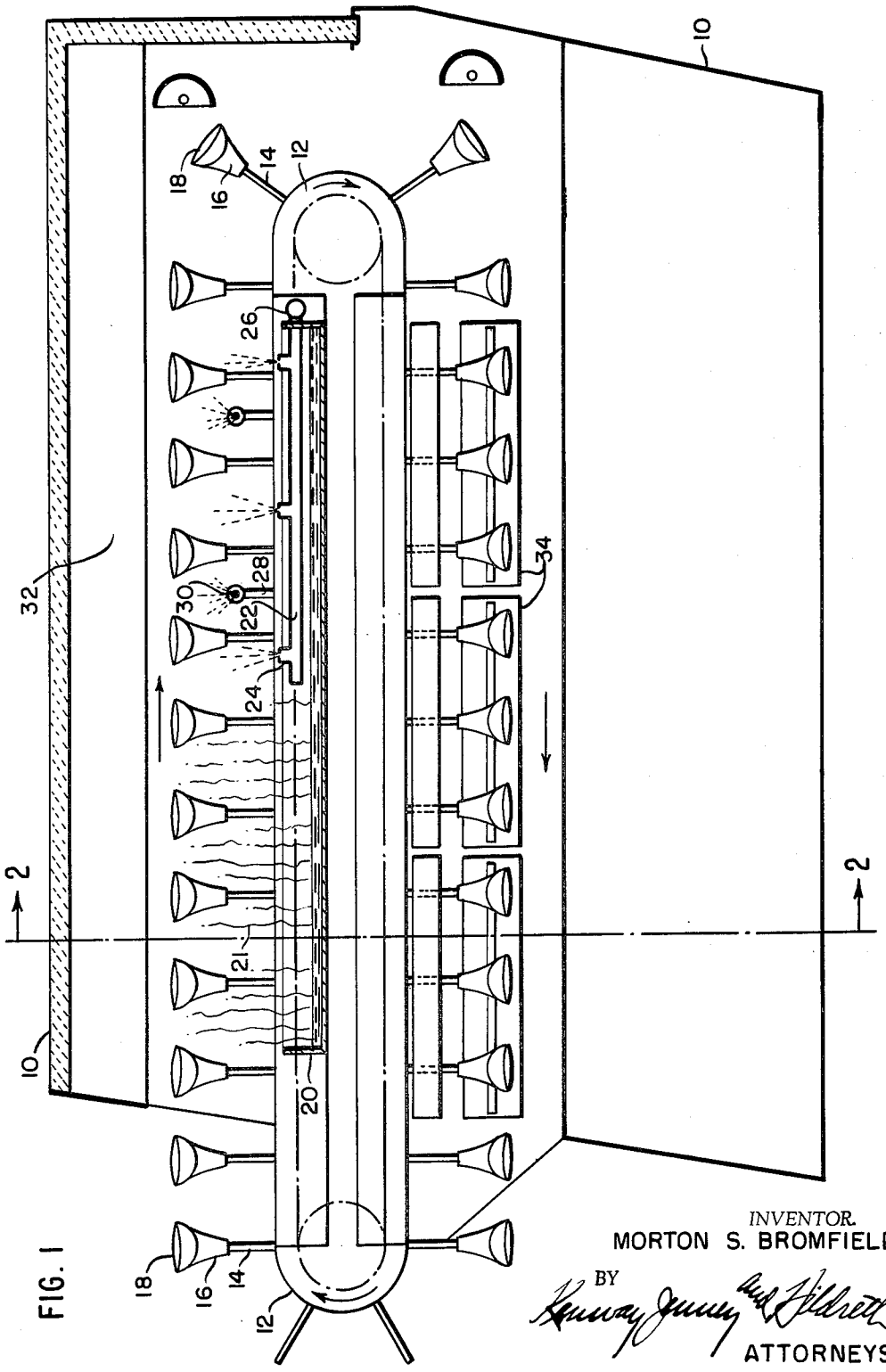


FIG. 1

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DIRECTIONALLY SHRINKING LASTED SHOE UPPERS

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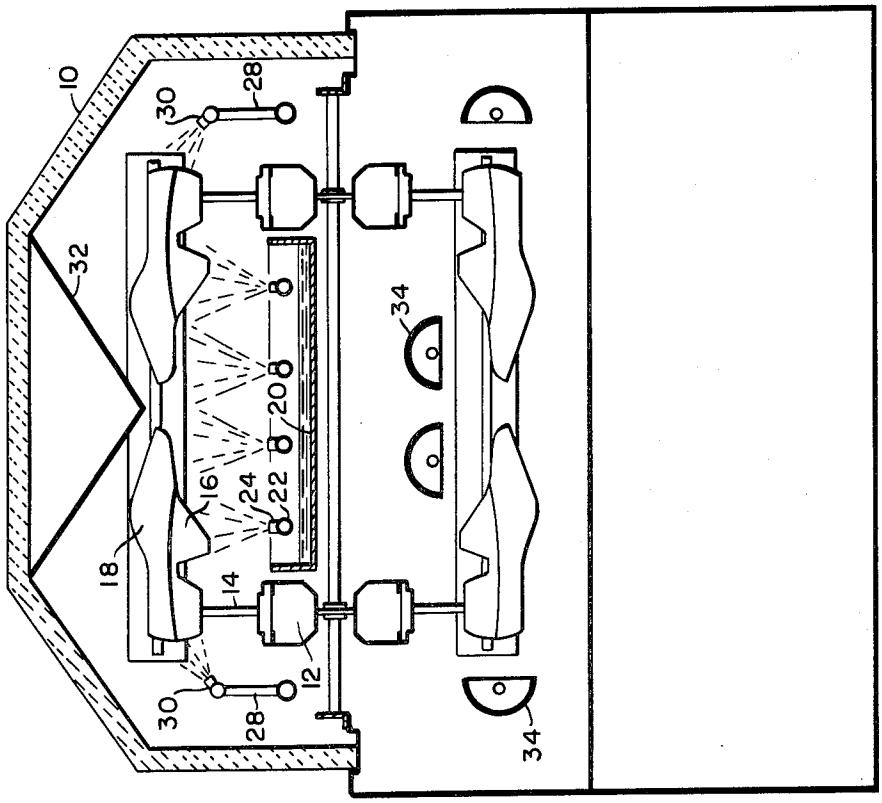


FIG. 2

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3,237,227 DIRECTIONALLY SHRINKING LASTED SHOE UPPERS

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4 Claims. (Cl. 12—142)

The invention, in the field of shoemaking, relates to directionally shrinking lightly lasted shoe uppers.

In the production of quality shoes, it is necessary during the shoemaking operation to conform the shoe upper closely to the shape of the shoe last, and to relieve the stresses normally set up in the upper during the lasting operation so that the lasted upper retains the shape of the last after the last is removed. If this is not done, the completed shoe will not be of true size and shape, and may even be wrinkled in places.

The best way to relieve or avoid stresses in the upper due to lasting is described in my Reissue Patent No. 25,411, i.e. surface treating the upper with moisture and heat prior to lasting. The moisture and heat renders the upper quite flexible, so that it more readily conforms to the shape of the last. Accordingly, the lasting operation may be accomplished with maximum ease and facility. The stresses set up in the upper due to the lasting operation may be relieved by quickly drying the lasted uppers, the moist heat serving to relieve the stresses and set the upper in the shape of the last. These latter advantages are secured provided the upper is heated before the added mulling moisture has pervaded the thickness of the upper. In practice, this increases lasting productivity and reduces lasting damage to the shoe upper, while producing a quality shoe upper which conforms closely to the contours of the last.

The object of this invention is to conform a lightly lasted shoe upper closely to the shape of the last and to relieve any stresses in the lasted upper so that the upper retains the shape of the last after the last has been removed, and to perform this in the minimum amount of time.

The invention encompasses a shoemaking method for directionally shrinking a lightly lasted shoe upper. The directional shrinkage conforms the shoe upper to the last, while the moisture and heat associated with the directional shrinkage relieves stresses in the upper. Accordingly, the shoe upper will conform closely to the shape of the last and will retain the shape of the last after the last has been removed.

Directional shrinkage is accomplished by directing fine sprays of hot water upon the throat and back seam or counter areas of the lasted upper. The selectively moistened, lasted upper is then promptly subjected to a force drying operation to quickly withdraw the moisture from the upper before it substantially penetrates and disperses through the upper. This prompt force drying achieves directional shrinkage as the drying heat energy evaporates the surface moisture and is converted into latent heat of evaporation, and simultaneously effects stress relief in the lasted shoe upper. By differentially moistening the throat and counter areas of the lasted upper, directional shrinkage is produced which exerts a fore and aft pull on the upper, conforming it closely to the shape of the last.

This preferred method will be described more particularly in connection with apparatus constructed to automatically perform it. This apparatus is illustrated in the accompanying two figures.

FIG. 1 being a side view in horizontal cross section of the apparatus, and

FIG. 2 being a view in transverse cross section of the apparatus taken on lines 2—2 of FIG. 1.

In using this invention, the shoe uppers of leather or comparable materials, and which preferably have been conventionally mulled, are laid lightly to the last during the lasting operation, with appreciably less than normal pull being applied by the lasting machines to the shoe upper. In fact, on the order of one-third of the lasting machine spring tension may be released, reducing by a similar amount the pull applied by the lasting machines to the shoe upper during the lasting operation. This produces a shoe upper which is underpulled or lightly lasted; accordingly, there is far less likelihood of producing the damage to the shoe upper which most often occurs during such operations. This light lasting also accelerates the lasting operation.

The lightly lasted shoe uppers are then subject to directional shrinkage, which is achieved automatically in the illustrated apparatus. This apparatus includes an insulated, generally rectangular housing **10** in which is mounted two parallel, coextensive endless shoe last conveyors **12**. The shoe last conveyors, of conventional construction, both extend from a position outside of the housing through an opening in the housing to adjacent the opposite closed end of the housing. The conveyors include opposed pairs of upstanding posts **14** which hold the lasts **16** carrying shoe uppers **18**, the lasts being aligned transversely to the path of movement with the toe ends disposed adjacent the center of the housing, as clearly shown in FIG. 2. The conveyors are driven by an appropriate mechanism (not illustrated) in a direction such that the lasts above the conveyor move into the housing while the lasts beneath the conveyor move out of the housing.

In operation, an operator stands at the end of the housing adjacent the exposed end of the conveyor, and places the lasts carrying the shoe uppers on the posts **14** as they move into the housing, while removing the lasts leaving the housing beneath the conveyor and carrying the treated shoe uppers. As the lasts carrying shoe uppers to be treated move into and through the housing above the conveyor and in a hot, moist atmosphere of about 160° F., they pass over an elongated tray **20** between the conveyors from which rises hot, moist vapors **21**. In the rear end of this tray is mounted a first set of hot water pipes **22** extending parallel to the conveyors, and having fine spray heads **24** spaced along their length. The hot water pipes are connected to a hot water main **26**, the pressure in which may be controlled by a valve (not shown) to vary the volume of the hot water sprayed. The temperature of the hot water is preferably about 180° F. The conveyors hold the lasts and shoe uppers over the hot water sprays so that, as the lasts and shoe uppers move along the tray and over the hot water sprays, primarily the throat areas of the shoe uppers are subjected to a controlled spray of hot water. A second set of hot water pipes **28** is positioned between the posts **14** and the side walls of the housing. This set of pipes includes spray heads **30**, which direct sprays of hot water onto the back seam or counter areas of the shoe uppers as they pass through the housing above the conveyor. It is preferred to provide within the housing a V-shaped top wall **32** on which the water spray that misses the shoe uppers may impinge and collect. By virtue of its shape, this top wall conducts water droplets collecting on it to its apex where they drop between the toes of the shoe uppers and into tray **20**.

After the throat and back seam areas of the uppers are selectively moistened by the sprays, the conveyor then immediately carries the uppers to the lower course of the conveyor where they pass along adjacent a set of

infrared heaters 34. The infrared heaters are energized by an appropriate, preferably variable, source of electric potential (not shown). The infrared heaters are mounted in the housing to direct radiation onto the throat and back seam areas of the shoe uppers, and subject these previously moistened areas to a blast of heat. This blast of heat quickly evaporates the water molecules from the uppers, which results in maximum shrinkage and stress relief in the shoe uppers, maximum shrinkage occurring in throat and back seam areas of maximum moistening and drying.

To obtain maximum shrinkage, while avoiding scorching, the shoe upper is subjected to the intense drying heat immediately following the hot water sprays. Not only at this time does the upper have the greatest amount of surface moisture which, upon evaporation, effects the greatest molecular pull on the free water within the grain structure of the upper, in turn maximizing shrinkage, but it also drives the greatest amount of water initially into the upper, lubricating the leather fibers and fibrils beneath the grain and mucoid layers to relieve stresses. In other words, force drying the upper immediately after moistening the upper achieves both maximum shrinkage and the greatest stress relief.

By selectively moistening the throat and back seam areas, and then immediately drying these areas with a blast of heat, directional shrinkage from a high moisture level will occur in a direction producing, in effect, a supplementary lasting operation on the shoe uppers. That operation tightens the top line of the upper, molds the upper to the counter, settles the throat area, and generally conforms the previously lightly lasted shoe upper closely to the shape of the last. The stresses in the upper which are set up by the supplementary lasting are immediately relieved by the heating induced in the upper during the drying operation as the water evaporates and by the moisture retained by the upper after treatment. When the thus treated shoe upper cools to room temperature, it regains sufficient set to accurately retain the shape imparted by the last after the last is removed, producing a quality shoe of true size. In the shoe manufacturing operation, this invention permits the shoe uppers to be lightly lasted, which may be quickly accomplished without danger of damaging the upper. The light lasting of the upper is compensated for by the directional shrinkage obtained as just described, and thus does not detrimentally affect subsequent manufacturing operations.

The heat produced by the infrared heaters within the housing will also heat and evaporate water collecting in the tray 20, producing within the housing a hot, moist atmosphere which tends to mull the entire shoe upper during its passage through the housing. That atmosphere, together with the general action of the heaters, relieves any excessive stress set up either by the lasting operation or by the directional shrinkage in the areas of the shoe upper not subjected to the hot water sprays.

It is preferred to set the conveyor speed so that the lasted shoe uppers passing through the housing are first subjected to the hot, moist atmosphere for about one and one-half minutes, and then to the hot water sprays for about thirty seconds. With most leathers, this will increase the general moisture content of the shoe upper approximately 2%, and the moisture content in the selected areas subject to the hot water sprays approximately 6%. The force drying operation will consume a similar amount of time, requiring a total transit time of about four minutes.

It is also preferred to adjust the volume of water sprayed and the intensity of the drying heat, rather than the conveyor speed, to compensate for different upper materials and finishes. By providing such adjustments, the conveyor need not be emptied of one lot before a different lot is treated, as would be the case if the conveyor speed were adjusted. Rather, by adjusting the spray volume and heat intensity between different lots, the conveyor need not be shut down but lot after lot of lasted uppers may be consecutively treated. This is a real advantage in mass production.

If desired, separate water and steam sprays may be directed toward the lightly lasted shoe upper, the shoe upper first passing over the steam sprays and then the hot water sprays. However, the illustrated arrangement is preferred, as it reduces the time required to treat the lasted shoe upper and thus the number of lasted shoe uppers within the housing, the inventory of lasts required, and the size of the housing itself.

While the preferred method and apparatus for achieving directional shrinkage of a lightly lasted shoe upper has been described, it is to be understood that variations in the details of the method and apparatus may be made without departing from the scope or spirit of the invention.

I claim:

1. A method of shoemaking comprising lightly lasting a shoe upper upon a last, directing fine sprays of water only upon the throat and back seam areas of the lightly lasted shoe upper to moisten these areas, and then promptly subjecting the moistened, lightly lasted shoe upper to force drying.

2. A method of shoemaking as set forth in claim 1 including the step of subjecting the lightly lasted shoe upper to a hot, moist atmosphere prior to and during said spraying of the upper.

3. A method of shoemaking as set forth in claim 1 in which the temperature of the hot, moist atmosphere is about 160° F., in which the temperature of the fine sprays of water is about 180° F., and in which the shoe uppers are quickly force dried by a blast of heat.

4. A method of conforming a lightly lasted shoe upper closely to the last by directionally shrinking the shoe upper comprising directly fine sprays of water only upon the throat and back seam areas of the lasted shoe upper to moisten these areas, and then promptly subjecting the moistened shoe upper to heat treatment to withdraw the moisture from the shoe upper before it substantially disperses within the shoe upper.

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JORDAN FRANKLIN, *Primary Examiner.*