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MANUFACTURING PROCESS FOR SHOES OF POLYMERIZING ELASTOMERS

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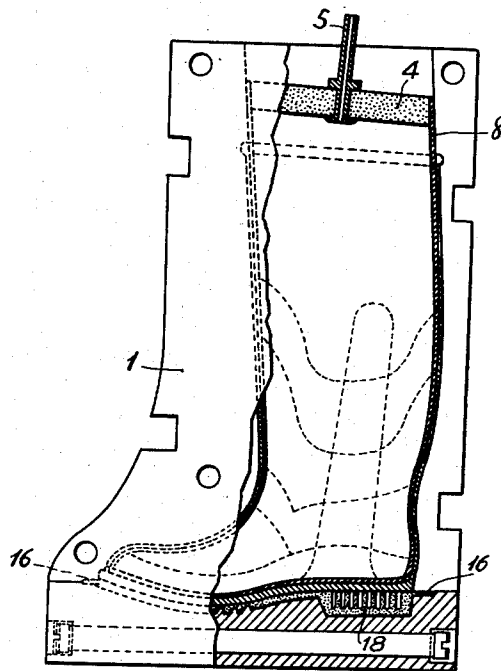


FIG. 3



FIG. 1

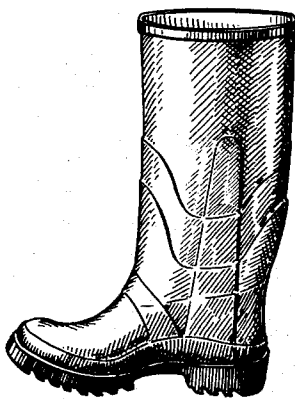


FIG. 4

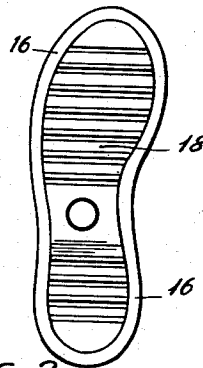


FIG. 2

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MANUFACTURING PROCESS FOR SHOES OF POLYMERIZING ELASTOMERS

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The present invention relates to a manufacturing process for shoe articles in general and in particular for boots of polymerizing elastomers, with or without lining fabric, said process utilizing the pressure of an elastic expandible mold placed inside of suitable dies so as to obtain a perfect configuration of the shoe article with a considerable saving of time in the vulcanization as well as in the production and finishing processes.

Manufacturing processes for shoes and in particular for boots made of rubber and fabric or more generically of elastomers and fabric employing presses of various types wherein dies are disposed are known. Said dies consisting of two or more parts which, by exerting a pressure on a rigid mold for instance of aluminium or steel placed inside of the dies upon convenient coating of the same with fabric or rubber, impress the die shape to the rubber and at the same time vulcanize it through the action of heat.

Processes utilizing elastic molds and exerting the pressure from the inside to the die walls are likewise known but merely in a rudimentary and empirical form similarly as in the case of the adoption of the air tube, i.e. of the AIR-BAG system in tire manufacture. The improvements in said system utilizing such definitive industrial application thereof are only 50 years old.

According to these well-known processes the several operations take place as follows:

Preparation of a rigid or elastic mold reproducing the inner shape of the boot or of the shoe article to be manufactured;

Coating of said mold with rubberized fabric and superimposing thereon in the desired quantities according to the different thicknesses in particular of the uppers, of the sole and of the heel, a rubber mixture of suitable characteristics;

Introduction of the whole into a die formed of several mechanically tightly fitting and heatable parts, which, by pressing on the rubber-coated mold or by being pressed from this last reproduces the die shape representing the desired shoe article or boot;

Upon vulcanization, opening of the various die parts, extraction of the mold together with the shoe article reproduced by the die, extraction of the shoe article from the mold and thus finishing of the shoe, whereafter the mold is coated again and replaced into the dies to continue the production cycle.

According to these known processes the uppers as well as the sole with the heel are pressed in a single operation.

Although the results may seem at first sight satisfactory, the above-mentioned known processes exhibit a series of technical constructive defects and disadvantages in the production on an industrial scale as well as in their use, said defects and disadvantages being hereafter listed:

The simultaneous vulcanization of the heel, of the sole and of the uppers, these three parts exhibiting different thicknesses, will not only require very much time to heat in order to uniformly act on the thicknesses of the heel and of the sole which are considerably larger than that of the uppers but also it will not give an optimum vulcanization of the three parts simultaneously and consequently it will produce a structurally defective shoe.

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Several systems have been developed to speed up the vulcanization of the heel. Among said systems, a widely employed one consists of the introduction into the heel of metallic pointed elements fixed to the die in the position of the heel, whereby said pointed elements by conducting the heat into the inner part of the heel speed up its heating and therefore its vulcanization which however takes place in an irregular form especially where the connection or junction line between the heel and the uppers is concerned, said line representing a position of dubious execution. As the sole, the application of pointed elements or the like thereto is made impracticable by the fact that these would produce cavities acting as "hiding places" for dirt or the like during the use of the shoe. Thus, it has been necessary to limit sole thicknesses to a fairly low value and to adopt a bottom surface having light relief patterns, this last feature being unfavorable in the structure of, for instance, a boot to be used for agricultural purposes. Furthermore the junction line between the uppers and the sole could not receive a uniform and computed heat quantity at the same time of vulcanization as the sole, which has a minimum thickness of 8-10 mm., whereas the uppers have a maximum thickness of 2-3 mm. Therefore by using a single rubber or synthetic elastomer compound in the manufacture of shoe articles and in particular of boots pressed at a single phase, the uppers and the sole together with heel being simultaneously formed, it is inevitable that one or more of said parts will be defective.

To obviate the above-mentioned inconveniences as well as to impart to the sole mixture a higher resistance to abrasion and to the upper mixtures a greater flexibility, various mixtures have been used which exhibit different heat sensitivities and perform a simultaneous vulcanization of different thicknesses at the same time. In this case however it is just the junction line of the two mixtures between the uppers and the sole which under the action of the required pressure is filled in an irregular and uncontrollable manner, and it may be that the two mixtures melting together form a "hybrid" region unfavorable for a homogeneous vulcanization. The shoe or boot will therefore be defective just in that point which is subjected to the higher deflection stresses during usage.

The sole of a shoe article of rubber and fabric, for instance of a work shoe or of a boot to be used for agricultural purposes or for personnel attending special jobs in the chemical industries, garages, dyeing plants, tanneries, mines and so on, must always exhibit well determined structural characteristics of resistance to the use intended therefor. Said sole will have to be fairly high with an edge and protruding portions of about 12 to 20 mm. In the old fashioned process but still in use by virtue of its technical perfection and domineering manufacture with the autoclave of boots of rubber and fabric, the sole is applied to the leg of the boot in pre-vulcanized or unvulcanized form but always exhibiting the thickness and quality characteristics which should give the best results for the use for which they are intended. The presses for manufacturing said shoe articles employing the systems used up to now do not allow however for obtaining products suited to which they will be used and all the attempts made by the firms in this field to substitute the autoclaves with the presses as it has been already done for shoe articles having uppers of fabric, cloth, leather or also synthetic leather fabric have completely failed.

It is not possible to obtain a sole of different color from one of the uppers if the two parts are simultaneously pressed together in a die with or without a mixture cutter or barrier since the junction line of two parts cannot have such a thickness as to allow the application of

a barrier in said junction line. Without the use of the barrier the two mixtures of different color (or quality) would flow without control over their own limits, thus producing a production twice as defective.

With the above-mentioned well-known systems employing a process with rigid or elastic molds in order to vulcanize in a single die simultaneously the sole and the heel, it is absolutely necessary to exert a very high internal or external pressure as it is required to act not only on the uppers but also on the sole and on the heel which require a greater pressure due to the greater mixture thickness to be placed in the die specially for the relief patterns. The employed presses are therefore voluminous, complicated and expensive.

By exerting a high pressure from the outside on inner rigid molds, the inner fabric will easily become pricked especially in the junction points of the dies during the closing of the last, and the outflowing of the excess rubber will drag along the fabric though only to the edge of the die where the burr starts underneath whereby, once this last is cut away in the finishing process, the fabric will show up thus making the boot permeable to the water. Said points will at any rate always exhibit irregular thicknesses and will be easily subjected to rupture.

By exerting a high inner pressure on an expansible air tube-like mold (air-bag) with the aim of obtaining the pressing of relief patterns on a boot sole, it will be inevitable to exert an excess pressure on the inner wall of the uppers whereby the rubber will leak out thus providing insufficient rubber thicknesses especially near the delimitation of the relief patterns of the uppers, and consequent showing of the fabric, this being the cause of a defective production.

In both the preceding cases of high outer or inner pressure on different thicknesses, much rubber mixture will flow out in a noncontrollable quantity, whereby this fact not only causes constructive defects but also renders very difficult and expensive the finishing of the shoe article i.e. the removal of all the burrs.

In the pressing processes of shoes and in particular of boots of rubber and fabric with molds made of expansible elastomers and simultaneous vulcanization of the sole, heel and uppers, besides being necessary to exert a different pressure within a single enveloping element, the carrying out of this process being practically impossible, it is also necessary to use a particular system for constructing the air chamber itself in order that its thickness be homogeneous and furthermore that it be so shaped as to exert a homogeneous inner pressure in all the useful working points, i.e. in all the positions of the uppers which provide in a preshape manufacture the right setting of the reinforcements as for instance of the spur, the ferrule and the like according to the different types of shoe articles as well as the right quantity of rubber or synthetic elastomer mixture to apply to the mold so as to minimize the burrs thus saving material and allowing a consequent speeding up of the finishing process. As explained above the systems, employing molds in the form of air tubes are empirical also because they do not manufacture air tubes having a homogeneous and constant thickness and exhibiting special characteristics in the necessary positions as, on the contrary, they are obtainable by means of the present invention.

The process according to the present invention eliminates the above-mentioned inconveniences and obtains products especially on large industrial scale having a quality even higher than the ones obtained not only with all the production systems employing presses but even superior to the ones obtainable with the old autoclave processes. It offers furthermore very considerable economical advantages from each point of view and finally the possibility of establishing the production of shoe articles of elastomers and fabric and especially of boots without having to take into particular consideration or at least only to a certain limited extent the ability and

the specialization of labor because of the fact that the production process is highly mechanized by employing systems similar to the ones commonly used in tire manufacturing plants.

The present invention is characterized by:

The preparation of a preliminary hollow die reproducing the outer shape of the expansible mold and of a rigid inner mold initially reproducing the inner shape of the shoe article and successively decreased to a regular thickness on all its parts in correspondence to the thickness of the walls of the elastic expansible mold;

The carrying out of the elastic expansible mold, taking care that it is made fluid tight, the valve being inserted in the mouth or in the inlet portion, and that all the enveloping portion which must be acted upon that all the pressure in the direction of the uppers exhibits a uniform thickness and imparts to said uppers, a homogenous pressure in all the points while the part closing the inlet is made sufficiently rigid i.e. so as to prevent deflection of the same due to the pressure, the foot sole of said elastic expansible mold having to be reinforced by means of an underfoot element preferably made of such resistant rubberized fabric so as to prevent the expansion thereof which otherwise would reduce the peripheral thickness of the uppers in the junction lines thereof with the sole.

The preparation in an auxiliary separated die of a sole at least partially prevulcanized having chemical-physical characteristics in accordance with the use requirements and therefore preferably different from the ones of the uppers, said sole being provided with a peripheral edge which besides acting as a closing packing for the successive main die also provides the connection of the material to the uppers and the discharge of the possible excess material of the uppers during the vulcanization.

The introduction into the main vulcanization die of the at least partially prevulcanized sole and of the elastic expansible mold covered by the still nonvulcanized uppers, if these are made of polymerizing elastomer or by the uppers of nonvulcanizable material provided with a thin sheet of polymerizing elastomer for its attachment to the sole.

The carrying out of the vulcanization within a relatively short time by virtue of the already effected prevulcanization of the sole, taking care that the pressure required for expanding the elastic is not excessive but is uniformly distributed on the uppers and ensures the adherence of said uppers to the sole, causing the discharge of the possibly existing excess material of the uppers only in correspondence to the outer edge of the sole so as to avoid smearing of the lateral portion as well as the removal of said excess material by automatic mechanical means.

The discharge of the pressure from the inner side of the elastic expansible mold and the extraction of this last from the finished shoe or boot upon removal of the die.

The accompanying drawings show in:

FIG. 1 the cross section of a prevulcanized sole provided with a peripheral edge and ready to be introduced into the main die;

FIG. 2 a plain view from below of the same sole of FIG. 1;

FIG. 3 the longitudinal section of the main die which contains inserted therein the sole and the expansible mold covered with the material intended to form the uppers; and

FIG. 4 the finished boot obtained from the die of FIG. 3.

The process for the manufacture of the shoe article consists in its more diagrammatical form of the following operations:

Preparation of the elastic expansible mold 8 shown in FIG. 3 exhibiting uniform thickness is performed in accordance with known molding procedure and is provided with a rigid tap 4 intended to close the inlet opening of the expansible mold 8, said tap being provided with an outwardly protruding valve 5. During the vulcanization

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of this expansible mold a reinforcing substance, preferably of rubberized resistance fabric provided with threads disposed at 45° to the longitudinal center line of the sole, is applied to the foot sole thereof, said reinforcing element having the task of impairing the lateral expansion of the "foot" sole which would reduce the peripheral thickness of the uppers in the attachment points with the sole;

Separate preparation in an auxiliary die (not represented) of a sole 18 similar to the one shown in FIGS. 1 and 2, provided with a peripheral edge 16 and prevulcanization thereof so as to considerably reduce the time required for the successive vulcanization of the whole shoe article in the main die;

Covering of the expansible mold 8 with the material suited to constitute the uppers, this operation being explained later in more detail;

Introduction of all the precedingly mentioned parts into the main die 1 as illustrated in FIG. 3 and vulcanization thereof for a short time, for instance of the order of 5 minutes, by mounting the main die preferably on a conventional double-action oil dynamic press.

The above-mentioned very diagrammatically indicated operations will now be analyzed in detail for a better understanding of their importance:

The particular adopted arrangement for the insertion of the underfoot element of fabric in the manufacture of the elastic mold 8 so as to obtain in the inside of the shoe a pressure homogeneously acting on the uppers without the fact that the "foot" sole stretches out and causes in this way a reduction of the peripheral thickness in the points of attachment with the sole, still providing however a homogeneous expansion of the part corresponding to the shoe sole.

The underfoot element is made of resistant rubberized fabric cut out with threads disposed at 45° to the longitudinal center line of the foot portion.

The use of a prevulcanized sole 13 (FIGS. 1 and 2) i.e. a prepressed or also only partially prepressed sole exhibiting in its portion of attachment to the uppers a concave part reproducing the convex arch of the mold sole which is going to be applied thereto with homogeneous decreasing of the thicknesses corresponding to the manufacture and attachment materials to the uppers and provided with an edge 16 on the periphery parallel to the longitudinal portion of sole 13 and in the upper part of the sole or other piece which fulfills some special functions of fundamental importance.

The fact that the introduction into the main die (FIG. 3) of the at least partially prevulcanized sole (FIGS. 1 and 2) exhibiting chemical-physical characteristics convenient to the particular use for which they are intended and being provided with a peripheral edge 16 so that said edge acts as a closure packing between the sole die and the two halves of the uppers die and forces the possible, even if very small, quantity of excess uppers material to discharge by flowing on the surface of this edge i.e. in a position that does not require a special finishing operation and by virtue of the fact that it is fairly thin and disposed in a position so that it may be easily removed with mechanical means.

The fact that this is made possible by means of a preferred embodiment to facilitate the adherence of the uppers to the vulcanized sole without having to scrape it (i.e. removing the oxidation formed on the surface of the vulcanized products as well as the scaling and fouling products used during the pressing operation and imparting a definite attack to other elastomer mixtures as in the present case) and precisely by preparing the sole with an elastomer compound containing a minimum sulphur content namely inferior to the sulphur quantity used in the mixture for the uppers so that, during the heating of the portions placed into contact with each other upon simple washing of the prevulcanized sole in a solvent, the sul-

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phur flows from the mixture of the uppers towards the sole thus ensuring a perfect connection.

The execution in a minimum of time of the vulcanization of the uppers exhibiting a minimum thickness varying only in the reinforced points between 1½ and 3 mm. as well as the analogous thickness in the attachment portion to the prepressed sole, said time being possibly reduced with the help of the modern accelerators for the vulcanization to even less than 5 minutes including the opening and closing time for the dies effected by a suitable and well-known oleodynamic automatic press or the like.

The possibility of interposing between the inner fabric and the outer elastomer compound sheet all the necessary reinforcing elements required to impart a convenient solidity to the various parts of the shoe, taking care that said reinforcing elements are prepared with felted and non-sliding rubber or synthetic mixtures or by interposition of fabrics so as to stay permanently within the imposed limits and to present the thicknesses reproduced by the dies so that the elastic expansible mold homogeneously arranges or sets the various components by exerting a homogeneous pressure which is automatically established on all the inner walls of the shoe article.

The possibility of quickly charging and discharging the dies and to realize a production cycle lasting even less than 5 minutes for each pair of shoes due to the simplicity of the operations to be carried out.

The possibility of realizing a continuous and rapid production cycle by heating the various parts of the dies to a convenient temperature to obtain a homogeneous vulcanization of the uppers having a lower thickness as compared to that of the sole, which sole although being already vulcanized or at least semi-vulcanized still requires a suitable amount of heating in order to provide a substantially perfect connection to the uppers.

The possibility of producing as many expansible molds as the production cycle requires which can be heated in common multiple-stage presses.

The possibility of performing a chain working for the preparation of the various components to be applied on the expansible molds so as to obtain a constant production in a minimum of time using the presses in a continuous manner. In fact the prestressed sole with the attachment edge as well as the expansible mold covered with the shoe materials may be readily disposed in the hollow space of the die without any danger that either one of said two parts may undergo a displacement from the predetermined positions;

The positiveness that with a minimum of pressure from the inside through air or any other fluid it is possible to perfectly press the uppers and thus to obtain a perfect connection or attachment to the prevulcanized sole without outflow from the matching die portions of such material, which besides deforming the thicknesses would also make the finishing quite expensive and the aspect of the shoe rather antiesthetical;

The facility and therefore the saving in time for removing the burrs and the sole edge as well as the excess material from the inlet opening of the shoe.

The possibility of readily expelling during the manufacturing process the air or the excess material from the inlet opening of the shoe article and on the whole periphery of the last.

It should be noted that the peripheral edge 16 of the sole (FIGS. 1 and 2) plays an important role in the process according to the present invention. In fact said edge fulfills the following functions:

By arranging the sole in the main die 1 as shown in FIG. 3, which is suitably disposed in such a position as to readily receive it, said edge serves to provide a safe setting of said sole in the die and to keep it in such a position as to connect it with great precision to the peripheral part of the uppers.

It serves furthermore as a closing packing between

the bottom die of the sole and the two die halves of the uppers so that the discharge outflow of the possible excess material of the uppers (which under the action of heat and pressure could exceed the foreseen quantity and cause fragility in any peripheral point of this particular connection or junction line of the sole to the uppers) is held back and reinforces said point of particular importance, thus being homogeneously distributed in the inside of the shoe under the action of the homogeneous inner pressure and thus ensuring a proper connection.

Said edge serves furthermore to set the limits of the colors in the production of shoes exhibiting soles of different color from the uppers.

It serves to realize a possible two-color well-defined line through indentations engraved in the die portions reproducing the welt. In this case however, the addition of the mixtures necessary for the required outflow of the material has to be carefully computed.

It acts as a hold-back barrier between the lower edge of the uppers and the conveniently prepressed sole thus imparting the flow along the outer surface of the sole line or of the heel of the excess material coming from the uppers mixture provided that said material could possibly find a way to discharge or would positively discharge, the occurrence of this discharge determining the absolute necessity of providing for a special finishing operation.

It realizes a position of compulsory stop and discharge, which establishes a well-defined region to be removed by the finishing which can be easily performed in a precise and economical manner.

The process according to the invention discloses wide application possibilities.

It provides for instance the manufacture of the uppers portion of heat-resistant leather with special surface treatment (Bayer system) or of any other suitable material by applying an intermediate nonvulcanized rubber sheet between the semivulcanized sole and the uppers pre-assembled on the expansive mold, closing the main die portions and then subjecting this intermediate rubber to pressure and heat. Overflowing of the material from the uppers onto the sole is held back by the peripheral edge acting as packing, so that the material penetrates into the two available surfaces up to the exact delimitation defined by the die.

In order to carry out this process, it should be noted that, provided that the inner concave portions of the dies are equal or even larger than the envelope they are supposed to enclose, said dies being disposed in a horizontal plane or in an inclined position but always so as to readily receive one of the two sides of the uppers in such a manner that said uppers as well as their enveloping element lie within the concave portion and provided that the elastic mold covered by the material constituting the uppers exhibits a mainly oval section with upper and lower pressed-in poles, it will suffice to create in the air tube a pressure slightly larger than atmospheric pressure in order that said air tube assumes a surface line with less pressed-in poles thus compelling the two opposite sides to give up the required volume. In view of the fact that said sides opposed to the poles are possibly the cause of a pricking-in during the closing of the dies, it is now positive that such a detrimental effect will not occur. The special formation of the foot is also suitable for said phenomenon by virtue of its special manufacture employing a fabric under-foot element.

Upon introduction of all the elements into the die heated to a predetermined temperature, the die portions are closed while being positively sure that the envelope does not become pricked-in, whereafter compressed air is introduced into the inside of the expansible mold through the valve at the necessary pressure conditioned by the shoe type being manufactured, thus obtaining in a controlled and precise manner the homogeneous ex-

pansion of the elastic mold on minimum regular or slightly different thicknesses which at any rate are compensated or further compensated by the plasticity of the compound and the perfect junction of the uppers to the sole.

During the heating and the consequent softening of the rubber or synthetic compounds, the air which at the closure of the dies may have been held back between these and the compound surface, the air which may have been withheld in the compound during the manufacture thereof, as well as the gases produced during the heating find an easy discharge outlet on the side of the inlet opening where the expansible mold has a free seat in the dies.

If the excess of compound is very small during the softening, it can be homogeneously distributed or set on the walls easier than discharged outwards; whereas if it occurs in excessive quantities, it flows out of the inlet opening easier than from the junction lines of the dies, the parts of which are strongly pressed one against the other. Two factors intervene to favour this important practical possibility:

The homogeneous inner pressure of the air tube having homogeneous thickness and tap-like inlet opening, the thickness and the material being pressure resistant so as to provide that the expansible mold effects also the arranging or setting work through its possible stretching provided by the special properties of its material without any danger of deformation.

The free inlet opening of the dies allowing beside the discharge of the held-back air and of the excess compound that the expansible mold homogeneously becomes set in the inside of the dies with a minimum of stretching proportional to the (also in the longitudinal direction) homogeneous dilatation which, starting from a fixed point on the foot sole and progressing towards the free inlet opening, favours the general setting of the shoe compound obtained through a definite homogeneous thrust or pressure.

The vulcanization time depends on the composition of the shoe components and on the two adjustable temperatures of the uppers and of the sole which are applied to the dies proportionally to the thicknesses of the materials to be heated. The application time may be lower than 5 minutes as the mass to be heated in order to soften it, molding it through pressure and hence fixing it through vulcanization has a very small thickness corresponding to the one of the uppers also in the junction portion of the sole. Furthermore the composition of the mixture is unique and therefore responsive only to a temperature which the dies for the uppers are in a position to readily impart in a minimum of time due to the very small thicknesses and that the die of the sole with a proportionally adjusted temperature according to the requirements conditioned by the thickness and by the special junction form is also in a position to impart in a very small period of time.

Once the vulcanization has been completed, the pressure is also automatically removed, the die portions are automatically opened, the manufactured and vulcanized shoe article together with the expansible mold contained therein is extracted from the open die, the whole is sent by means of a conveyor to be water cooled and two other elastic covered molds and two other prepressed soles are introduced at once into the die or into the dies (if the shoe article is manufactured by pairs) whereafter the die portions are rapidly closed so as to continue with the rapid production employing a single worker for five or even six presses each producing a pair of shoes every five minutes.

Usually in the production of shoes with prepressed soles with or without presses it is necessary to scrape the portion to be attached to the uppers and this operation is sometimes difficult because of the particular formation of the surface to be deglazed. This difficulty

occurs especially when the portions to be scraped are curved and not plain or straight as in the present case, where the upper part of the sole is curved to adhere to the foot sole of the mold which it is intended to match and furthermore exhibits a peripheral protruding edge of very small thickness.

The present invention eliminates the necessity of the deglazing of the prepressed shoe by virtue of the particular way of introducing the sulphur in the mixture for the uppers and for the soles, said proportion of ingredients providing for the vulcanization of the sole through a simple preliminary bath in a light solvent and the perfect junction and attachment of the soles to the uppers through migration of the sulphur from the uppers to the soles.

In the production process the finishing also presents considerable advantages as upon the rapid cooling in water of the shoe article and of its elastic expansible mold it suffices to suck the air from the valve of the expansible mold to remove this last from the shoe article and use it in the molding cycle again. The shoe is provided at its sole edge with a fixed point of minimum homogeneous thickness which may therefore be easily removed to obtain a perfectly regular welt with possible small burrs on the junction lines of the dies which may be readily removed by means of a rotating flexible felt bung. An end edge is provided corresponding to the inlet opening, whereby said edge positively determines the point where the excess material may be readily removed to obtain a perfectly finished shoe without danger that the two shoes forming the pair are different in the height or in the inclination of the inlet opening.

What I claim is:

1. A method for affixing a sole portion to an upper portion to obtain a vulcanized shoe comprising introducing a pre-vulcanized sole portion having a peripheral edge portion into a molding zone, said peripheral edge portion extending substantially parallel to the longitudinal axis of the sole portion, placing in said molding zone an inflatable member having the configuration of an upper portion of a shoe and being covered thereover with an unvulcanized material, vulcanizing the unvulcanized material constituting the upper portion to the pre-vulcanized sole portion for a predetermined period of time to form a vulcanized shoe having a strong connection between the upper and sole portions, removing the vulcanized shoe from said molding zone, and removing the peripheral edge portion and the excess material collected thereon from the upper portion during vulcanization inwardly toward said sole portion to provide a continuous smooth edge between and at the junction of the removed excess material and the peripheral edge portion.

2. A method according to claim 1 in which said predetermined period of time is substantially five minutes.

3. A method according to claim 1 in which said pre-vulcanized sole portion has a concave cavity thereby forming the convex arch portion in said upper portion during vulcanizing of the sole portion to the upper portion.

4. A method according to claim 1 in which the vulcanizing is made more effective by adding to the unvulcanized material of the upper portion more sulphur material than to the sole portion so that during the vulcanizing thereof the sulphur material migrates from the upper portion to the sole portion thereby ensuring a strong junction therebetween.

5. A method according to claim 1 in which said inflatable member has placed thereon in the foot portion prior to being introduced into said molding zone a reinforcing fabric such that the threads thereof are disposed at about 45° to the center line of the foot portion so as to reduce the lateral expansion of the foot portion of the shoe when completed.

6. A method according to claim 1 in which the vulcanizing is made more effective by adding to either of said upper portion or said sole portion more sulphur material than that which is added to the other so that during vulcanizing thereof the sulphur material migrates from the portion having the additional sulphur material to the portion having the least.

7. A method for affixing a sole portion to an upper portion to obtain a vulcanized shoe comprising introducing a pre-vulcanized sole portion having a peripheral edge portion into a molding zone, placing in said molding zone a member having the configuration of an upper portion of a shoe and being covered thereover with an unvulcanized material, said peripheral portion extending outwardly from said sole portion to such an extent so as to provide an effective seal in said molding zone between the sole portion and the member covered thereover with said unvulcanized material as well as receiving thereon excess unvulcanized material when subjected to vulcanization, vulcanizing the unvulcanized material constituting the upper portion to the prevulcanized sole portion for a predetermined period of time to form a vulcanized shoe having a strong connection between the upper and sole portions, removing the vulcanized shoe from said molding zone, and removing the peripheral edge portion and the excess material collected thereon from the upper portion during vulcanization inwardly toward said sole portion to provide a continuous smooth edge between and at the junction of the removed excess material and the peripheral edge portion.

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