May 14, 1940. F. A. EICH 2,200,385

MANUFACTURE OF SHOES

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Fig. 1.

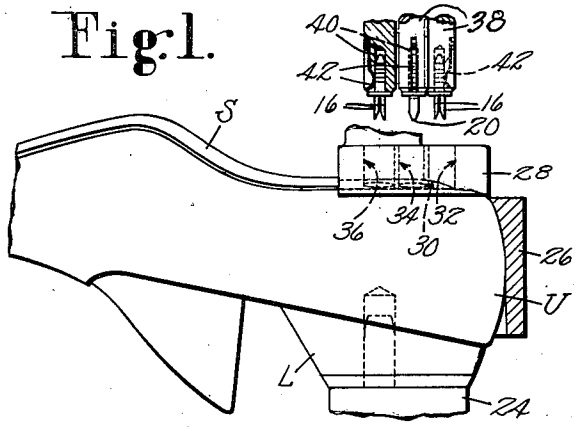


Fig. 2.

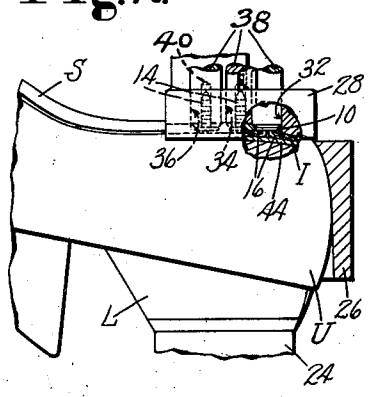


Fig. 3.

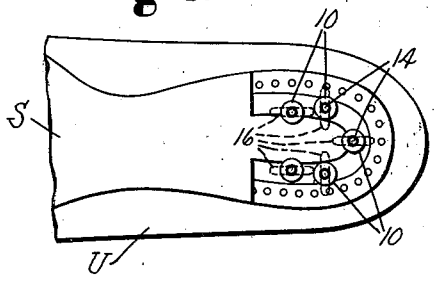


Fig. 4.

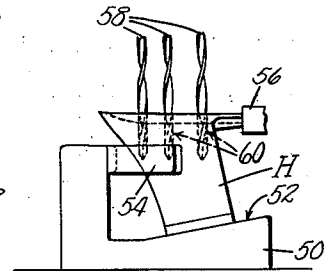


Fig. 6.

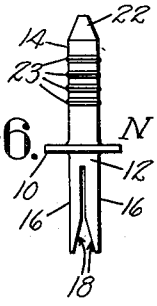


Fig. 5.

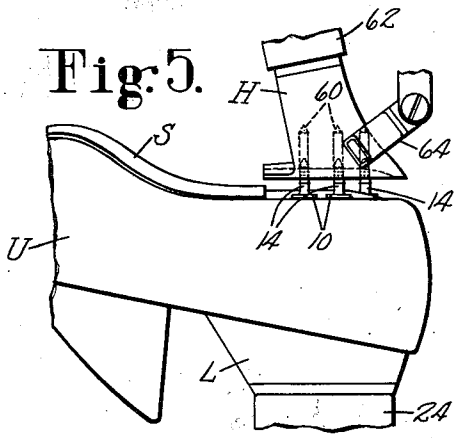
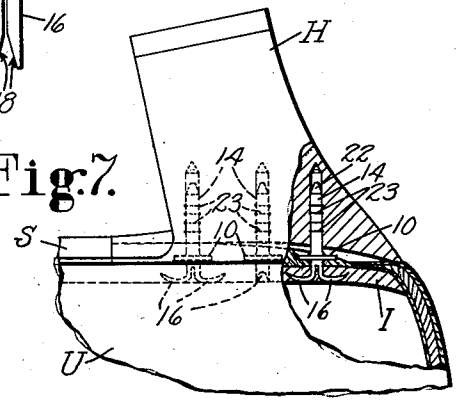


Fig. 7.



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Fig. 8.

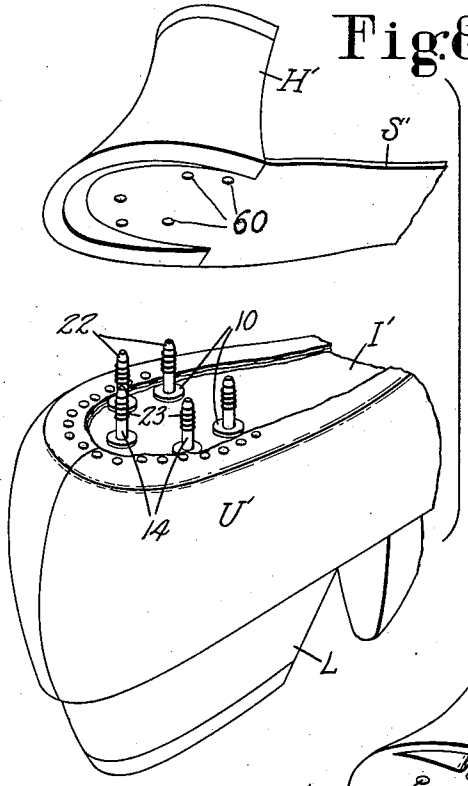


Fig. 9.

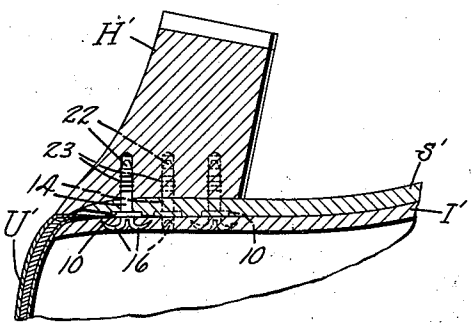
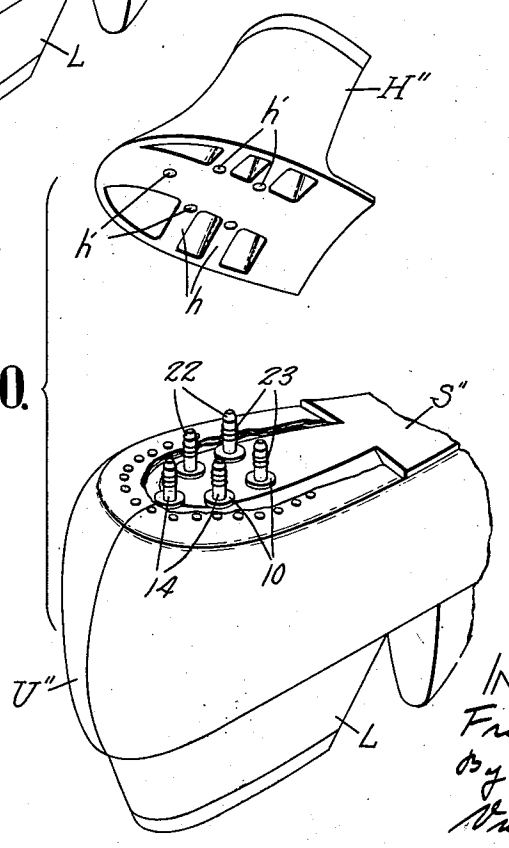


Fig. 10.



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UNITED STATES PATENT OFFICE

2,200,385

MANUFACTURE OF SHOES

Frank A. Eich, Melrose, Mass., assignor to United Shoe Machinery Corporation, Borough of Flemington, N. J., a corporation of New Jersey

Application August 4, 1938, Serial No. 223,055

24 Claims. (Cl. 12—142)

My invention relates to the making of shoes, it being especially concerned with the attachment to an upper-portion of a bottom-portion, as a heel or a preassembled outsole- and heel-unit. In application filed in the United States Patent Office in my name on November 18, 1938, Serial No. 241,211 is described and claimed an apparatus by which certain of the steps of the herein disclosed method may be performed.

The invention has as an object the creation of such an attachment that the bottom-portion will be located accurately with respect to the upper-portion; which may be accomplished on or off the last; in which the connection between portions is secure and is formed without danger of injury to the shoe-parts; with the joint or crease between the upper- and bottom-portions close; and with the interior of the shoe at the heel-seat permanently retaining its initial transverse contour and being relatively free from projections produced by the attaching fastenings.

A feature of the invention by which the above end is attained may be found in a method of shoemaking which consists in driving a series of fastenings from the outside into the margin of and interlocking said fastenings with the assembled parts of the heel-seat-end of a shoe, forming, as by drilling in a shoe-bottom-portion, a series of passages so located that they will register with the fastenings when the bottom-portion is in assembling relation to the shoe-upper-portion and forcing together the two portions, with the fastenings in the passages. To facilitate this condition of registeration, and therefore the correct positioning of the bottom-portion upon the upper-portion, I prefer to effect a forming of the heel-seat-end of the upper-portion by a mold having one or more openings arranged in accordance with the same inserting design as that of the passages, and to insert the fastenings through these openings. The simultaneous molding and fastening-inserting also reduces the operating time. One extremity of each fastening is clinched in a predetermined direction, this, as herein disclosed, being the end which passes through the insole of a shoe-upper. The fastening which is best employed consists of a collar-nail, one of the oppositely extending shanks of which is divided or otherwise formed with two prongs. The nails may be inserted in a series about the margin of the heel-seat of the shoe, with the prongs clinched oppositely, one of these overturned portions of one or more fastenings extended toward the nearest point in the periphery of the heel-seat. Because of the exact control over the points of insertion of the fastenings, they may be positioned as closely as practicable to the crease, and by the extension of the outer prong directly toward said crease, this may be made close and so retained. The shank of each nail opposite the divided portion is of such a greater diameter than the passage by which it is to be received after the separation of the shoe from the mold that it will be held fast in the shoe-bottom-portion, without producing injury during insertion, the difference in diameter being capable of such variation as is made desirable by the nature of the material. The holding capacity of the fastenings in the work may be increased by lateral projections from the passage-entering shank. With both the opposite fastening-portions thus firmly set in the work, any form which has been imparted to the heel-seat will be retained in the wear of the shoe. If it is desired to attach to a shoe, instead of such a bottom-portion as a heel, a preassembled unit made up of an outsole and a heel, the procedure may be generally as has been outlined, except that the fastenings are fixed in the heel-seat portion of the insole, and the receiving passages are formed through the outsole of the unit into the heel. The unit is not only thus attached at the heel-end, but the fore-part is also located upon the shoe by the attaching means. My improved method of attachment lends itself to use with heels of plastic material, in which fastening-receiving passages are molded. A ratio of fastening-and passage-diameters may be chosen which will give the maximum retention, with the minimum liability to rupture the plastic. Further, if the fastenings have the lateral projections previously noted which enter the plastic wall, the holding power will be made greater, without substantially adding to the rupturing strain, and the efficiency of retention may be increased still more by applying a solvent for the plastic to one of the engaging surfaces. This will soften the material and cause it to better accommodate itself to the registering surface of the fastening.

Another feature of the invention lies in a shoe which may be made by the performance of my improved method. This shoe has an upper with its insole and a bottom-portion, as a heel, which may be of wood, molded plastic or other material, or a compound bottom-unit including an outsole and a heel, such bottom-portion preferably being secured to the upper by collar-nails having oppositely projecting shanks, one of the shanks being divided and clinched oppositely upon the inner

face of the insole, and the other shank lying within the bottom-portion. With the compound bottom-unit, the last-mentioned shank passes through the outsole and in any case may have lateral projections. The outer clinched prong of the divided shank extends toward the nearest point in the periphery of the heel-seat. The advantages of such a shoe-construction have already been outlined in connection with the method by which said construction is produced.

In the accompanying drawings,

Fig. 1 illustrates in broken side elevation the step of molding the heel-seat of a shoe and positioning fastenings for insertion therein;

Fig. 2 shows similarly the setting of the fastenings in the work;

In Fig. 3 appears in plan the shoe-bottom with the fastenings set in it;

Fig 4 illustrates the step of drilling a heel;

Fig. 5 in a like manner shows the forcing together of the shoe with its fastenings and the heel;

Fig. 6 is an enlarged side elevation of one of the fastenings;

Fig. 7, a broken side elevation of the rear portion of a shoe with its attached heel;

Fig. 8, a partial, separated, perspective view of an upper-portion and a compound bottom-portion of a shoe which are to be secured together in accordance with this invention;

Fig. 9, a longitudinal section through the heel-end of the parts of Fig. 8 assembled, and

Fig. 10 shows similarly to Fig. 8 a shoe-upper arranged for the attachment of a molded plastic heel.

In Figs. 1 to 5 of the drawings are illustrated the more essential steps involved in practicing my improved method for securing a shoe-bottom-portion, in the form of a heel H, to a shoe-upper-portion including an upper U lasted over an insole I and having an attached outsole S. The fastening preferably employed is a nail N, which appears in Fig. 6. This nail is of the collar-type, having a flange or enlargement 10 from which project opposite shanks 12 and 14. The shank 12 is divided along its axis to a point near the collar, this bifurcation producing two slightly spaced prongs 16, 16. The adjacent faces of the outer ends of the prongs at 18 diverge outwardly, so when the ends contact with such a surface as the clinching plate of a last, the prongs will be deflected outwardly and upset. The extremity of each prong may be somewhat rounded, as appears at 20 in Fig. 1. The other fastening-shank 14 is shown as longer than its companion and has a conical tip 22 which will facilitate its entrance into an opening. It may also have from its cylindrical surface projections 23 swaged out of the shank.

First, for effecting the attachment, the upper-portion U of a shoe is jacked, either upon a post 24, as illustrated in Figs. 1 and 2, with a contained last L, or with the last pulled and the insole resting directly upon a jack-top. In either case, the shoe is held upon the jack in a definite lateral and angular position by some such means as a band 26 embracing its counter-portion. Above the jack a mold 28 is supported, this having at its under side a concave surface 30 vertically alined with the jack and of such a transverse contour that when the heel-seat of a shoe and the mold are pressed together, as a result of relative movement between the jack and mold, the heel-seat-material will be compressed and formed to generally correspond to the cup of the heel H. It is, however, somewhat less convex, so that when the heel is attached to the shoe, firm, unbroken contact of the edge of the cup with the upper-material will be assured. Under some conditions, the gaging of the upper-portion may be effected by engagement of the breast-shoulders of the outsole S with a properly located wall at the front of the mold, instead of by the use of a counter-band. Extending vertically through the mold from within the depression 30 are openings shown as five in number, arranged in accordance with a chosen inserting design, these including a rear opening 32, opposite side openings 34, 34 and opposite breast-openings 36, 36. They are formed about the portion of the mold corresponding to the margin of the heel-seat which it is to engage and are as close to the periphery as is permitted by the shape of the heel H to be attached and the length of the shanks 14 of the nails N. Above the mold, a set of five fastening-drivers 38 are arranged to reciprocate. In the lower end of each driver is an axial bore 40, in which the shank 14 of a nail will fit closely, with the collar 10 against the driver-end. A spring 42, acting in each bore, bears against the nail therein, and will not only retain this from downward displacement but will also hold it in a predetermined angular position about its axis. With the shoe jacked and under molding pressure, the shanks 14 of five nails N are introduced into the bores 40 and positioned as appears in Fig. 1 and as made more clear by Fig. 3, which shows the relation of the nails after they have been set in the work. The prongs 16 of the nail contained in the opening 32 will lie generally along the longitudinal axis of the shoe. Those of the nails in the openings 34, 34 are substantially at right-angles thereto, while the nails in the openings 36, 36 lie at the same general angle as the rear nail but at the opposite sides of the longitudinal axis. With the nails thus located, the drivers descend into the mold-openings. The curved ends 20 of the fastenings penetrate the tab of the outsole S and the insole I, readily displacing such obstacles as lasting tacks which they may encounter. The diverging fastening-surfaces 18 start the separation of the prongs in this movement through the heel-seat-material, and this is completed by engagement of the surfaces with the last-plate 44, or, when the shoe is off the last, with the jack-top. At the end of the driver-stroke, the prongs are oppositely clinched upon the inner surface of the insole I in the manner illustrated in Figs. 2, 3 and 7. In each case, the outer prong extends toward substantially the nearest point in the periphery of the heel-seat, at which it is desired to exert a retaining effect between the shoe-upper and the edge of the heel about the cup. Thus, the clinched outer prongs of the nails in the passages 32 and 34, projecting at substantially right-angles from their shanks, reach toward that portion of the heel-seat at which is to be the crease between the upper and the heel-cup. The outer prongs of the nails in the passages 36 approach the joint between the outsole and that forward extension of the heel which is common in women's work and where the strains caused by walking are peculiarly liable to lead to the separation and tearing of the breast-flap of the heel. With the shanks 12 of the nails set in this manner, the heel-seat-material is firmly clamped between the collars 10 resting against the outsole and the prongs 16, 16 extended over the insole in the manner just described. The jack or mold and

the drivers may now be restored to their normal positions.

At 50 in Fig. 4 is shown a support for the heel H, this being provided with a tread-rest 52, a backfork 54 and a breast-gage 56. By this means, the heel is held in a predetermined relation to a gang of five drills 58. With the drills in rotation and lowered to bore through the surface of the heel-cup into the body of the heel, they will produce a series of passages 60 about the cup, which, when the heel is in assembling relation to the shoe, will register with the shanks 14 of the nails N projecting from the heel-seat. These passages in the heel are of less diameter than are the nail-shanks 14, the difference being such that when the nails are inserted in the passages, the surrounding walls of the heel-material will be sufficiently compressed to insure retention without splitting the heel.

With the shoe and heel thus prepared, the former is jacked beneath a hold-down device (Fig. 5), which may include a tread-abutment 62 and a rear abutment 64. The passages 60 in the heel H are applied to the nail-shanks 14 projecting from the heel-seat. The jack and hold-down are thereupon moved relatively, so the shoe and heel will be forced together. The extent of this movement is such to somewhat sink the edge of the heel-cup in the lasted-over edge of the upper U. The thus-assembled upper- and lower-portions are illustrated in Fig. 7. The relatively large area of contact of the clinched prongs 16 with the insole will insure the fastenings from pulling through the heel-seat-material, and the divided prongs, when clinched oppositely, project but little, if at all, from the inner face of the insole. The compression of the heel-material by the shanks 14 gives more secure frictional retention than does the driving of nails into a solid heel. This follows because of the freedom from deformation produced by tearing apart of the heel-substance. Since a definite and substantially unvarying relation is established between the location of the nails in the heel-seat and that of the passages in the heel during the driving and forming operations, the problem of correctly positioning the heel for attachment is disposed of without the necessity for exercising special care during the assembling operation. Nothing being left to chance as to the relation between the shoe-parts during the assembling, and the nails following preformed paths, said nails may be inserted as close to the crease as the form of the heel will allow, and the heel-engaging shanks 14 may be made comparatively long without danger of penetrating the heel-wall. As the nails thus pass straight through the heel-seat into the heel instead of being toed in or inclined, their points of entrance into the heel are closer to the crease by about a size of nailing design, and because of the extension of the upset prongs 16 toward the periphery of the heel-seat, the effective holding forces exerted by the nails are applied farther toward the crease by at least two more sizes. A close joint is therefore held without gaping. It should particularly be observed that with the insole I and other heel-seat-material clamped fast between the nail-collars 10 and the clinched prongs 16, and the opposite shanks 14 fixed immovably in the heel, the inner surface of the insole will be held effectively against deformation. Therefore, whatever transverse contour has been imparted by the last will largely be retained in the wearing of the shoe. The true form will thus be maintained, even though the heel-seat-material be spaced from the surface of the heel-cup, as indicated in Fig. 7.

Figs. 8 and 9 show the attachment to a shoe-upper-portion, made up of an upper U' lasted over an insole I', of a compound bottom-unit in which a heel H' has been assembled with an outsole S', as by cementing. The operations may be generally as already described, except that the nails N clamp only the insole between their collars 10 and their clinched prongs 16, 16, and the passages 60 which receive the shanks 14 pass through the tab of the outsole into the heel. In addition to the advantages which have been developed before for this method of attachment, it will be seen that with the plurality of nails held in the upper-portion of a shoe, and the nail-receiving passages formed in the outsole and heel, said fastenings and passages being arranged to register when the upper- and bottom-portions are in assembling relation, there is a further gain. The outsole is definitely positioned, with the heel, upon the upper-portion, both longitudinally and laterally thereof.

My invention is also of peculiar utility in connection with the attachment of a heel such as appears at H'' in Fig. 10. This heel is molded of plastic material, for example a nitrocellulose compound, it being formed with internal webs *h* to reduce the weight and having attaching passages *h'* molded in the webs. There is likely to be comparatively little material between the walls of the passages and the adjacent walls of the webs, so they rupture easily. Then, too, in inserting attaching fastenings in passages formed during the manufacture of the heel, it is difficult to so locate the heel upon the heel-seat that the fastenings will enter the passages. In making by the present method a shoe having attached to it a molded plastic heel, it is only necessary to furnish an inserting mold 28 in which are openings 32, 34 and 36 located in accordance with the same design as the heel-passages. Then, by employing fastenings N with the shanks 14 correctly proportioned in diameter with respect to the passages, the attachment to the outsole S'' and the insole may be effected accurately as to position and without breaking the heel. The shank-projections 23, if utilized, aid in the retention of the heel without materially increasing the rupturing stresses. It may be desirable, if the molded material is especially frail, to use a fastening with a shank 14 of a diameter not much greater than that of the passage which it is to enter, and apply to either the shank or the passage before assembling, a solvent for the particular plastic of which the heel is made. For a nitrocellulose compound, this may be acetone. Then, when the elements are forced together, the contacting surfaces tend to adhere, the softened plastic surrounding and interlocking with the projections 23. This renders the attachment secure, even if the pressure exerted by the fastening-shanks upon the heel-material is light. A similar advantage is gained in the use of glue in the attachment of wood heels. The adhesive is applied to the cup of the heel after the passages 60 have been formed. The adhesive naturally enters said passages and increases the holding power of the fastenings. The retentive force is markedly greater if the shanks 14 have the projections 23.

Having described my invention, what I claim as new and desire to secure by Letters Patent of the United States is:

1. The method of shoemaking which consists in driving a series of fastenings from the outside into the margin of and interlocking said fastenings with the assembled parts of the heel-seat-end of a shoe, forming in a shoe-bottom-portion a series of passages so located that said passages and fastenings will register when the bottom-portion is in assembling relation to the shoe, and forcing together the shoe and bottom-portion with the fastenings in the passages.

2. The method of shoemaking which consists in pressing together the heel-seat-end of a shoe and a mold provided with an opening, inserting a fastening through the opening into the shoe, separating the shoe with its fastening from the mold, forming in a shoe-bottom-portion a passage corresponding in location to the inserted fastening, and forcing together the shoe and bottom-portion with the fastening in the passage.

3. The method of shoemaking which consists in pressing together the heel-seat-end of a shoe and a mold provided with openings arranged in accordance with a fastening-inserting design, inserting fastenings through the openings into the shoe, separating the shoe with its fastenings from the mold, forming in a shoe-bottom-portion a series of passages each of less diameter than the fastenings and so located that said passages and fastenings will register when the bottom-portion is in assembling relation to the heel-seat, and forcing together the shoe and bottom-portion with the fastenings in the passages.

4. The method of shoemaking which consists in inserting about the margin of the heel-seat-end of a shoe a series of fastenings each having a divided end and an oppositely extending end, said divided end being clinched with one prong extending outwardly toward the periphery of the heel-seat, forming in a shoe-bottom-portion a series of passages so located that said passages and fastenings will register when the bottom-portion is in assembling relation to the shoe, and forcing together the shoe and the bottom-portion with the oppositely extending ends of the fastenings in the passages.

5. The method of attaching heels to shoes which consists in inserting in the heel-seat of a shoe the divided end of a fastening clinched oppositely upon the insole and having an outwardly projecting end, forming in a heel a passage corresponding in location to and of less diameter than the projecting fastening-end and opening through the heel-cup, and forcing together the shoe and heel with the projecting end of the fastening in the passage.

6. The method of attaching heels to shoes which consists in inserting about the margin of the heel-seat of a shoe the divided ends of a series of fastenings clinched oppositely upon the insole in predetermined relation to the periphery of the heel-seat, the ends of the fastenings opposite the divided ends projecting outwardly, drilling in a heel a series of passages so located that said passages and the projecting ends of the fastenings will register when the heel is in assembling relation to the heel-seat, and forcing together the shoe and heel with the projecting ends of the fastenings in the passages.

7. The method of attaching heels to shoes which consists in pressing together the heel-seat of a shoe and a mold provided with openings arranged in accordance with a fastening-inserting design, aligning with the mold-openings fastenings positioned in predetermined angular relations about their axes, driving the thus-positioned fastenings through the mold-openings into the heel-seat and clinching them as determined by their positions and with ends projecting outwardly, drilling in a heel passages corresponding in location to the mold-passages, and forcing together the shoe and heel with the projecting ends of the fastenings in the passages.

8. The method of attaching heels to shoes by collar-nails which consists in inserting a series of the nails about the margin of the heel-seat of a shoe with the heel-seat-material clamped between each nail-collar and one of the opposite projections from said collar, forming passages in a heel corresponding in location to the inserted nails, and forcing together the shoe and heel with the ends of the nails opposite those set in the heel-seat in the passages.

9. The method of attaching heels to shoes by collar-nails which consists in inserting a series of the nails about the margin of the heel-seat of a shoe with the heel-seat-material clamped between each nail-collar and one of the opposite projections from said collar, the other of said opposite projections being provided with lateral projections, forming passages in a heel corresponding in location to the inserted nails, and forcing together the shoe and heel with the ends of the nails having the lateral projections in the passages.

10. The method of attaching heels to shoes by collar-nails having oppositely projecting ends and one end of each of which nails is bifurcated which consists in driving the nails with the collars seated upon the outsole and the divided ends clinched oppositely upon the insole, drilling passages in a heel corresponding in location to the driven nails, and forcing together the shoe and heel with the ends of the nails opposite the bifurcated portions in the passages.

11. The method of attaching to shoes bottom-units which consists in securing together in a definite relation outsoles and heels to furnish the bottom-units, driving a series of fastenings directly and fixedly from the outside into the margin of the assembled portions of the heel-seat-end of a shoe, forming through the outsole of an assembled bottom-unit into the heel a series of passages so located that said passages and fastenings will register when the bottom-unit is in assembling relation to the heel, and forcing together the shoe and bottom-unit with the fastenings in the passages.

12. The method of attaching to shoes bottom-units formed of outsoles assembled with heels which consists in pressing together the heel-seat-portion of a shoe and a mold provided with openings arranged in accordance with a fastening-inserting design, inserting fastenings through the openings into the shoe, separating the shoe with its fastening from the mold, forming through the sole of an assembled bottom-unit into the heel passages corresponding in location to the inserted fastenings, and forcing together the shoe and bottom-unit with the fastenings in the passages.

13. The method of attaching bottom-units formed of outsoles assembled with heels to shoes by collar-nails each having one of the oppositely projecting shank-portions divided which consists in inserting through the heel-seat of a shoe the divided ends of a plurality of the nails and clinching their ends upon the insole, drilling through the outsole of the bottom-unit into the heel passages corresponding in location to the inserted nails, and forcing together the shoe and

bottom-unit with the shank-portions of the nails opposite the divided portions in the passages.

14. The method of attaching heels molded of plastic material and containing attaching passages formed during molding which consists in driving from the outside into the heel-seat of a shoe fastenings independent of one another and arranged in positions determined by the design of the molded heel-passages, and forcing together the shoe and heel with the fastenings in the passages.

15. The method of attaching heels molded of plastic material and containing attaching passages formed during molding which consists in pressing together the heel-seat-portion of a shoe and a mold provided with openings corresponding in location to those molded in a heel, inserting fastenings through the mold-openings into the shoe, and forcing together the shoe and heel with the fastenings in the molded passages.

16. The method of attaching heels molded of plastic material and containing attaching passages formed during molding which consists in inserting in the heel-seat of a shoe in accordance with the same design as the molded heel-passages the divided shanks of collar-nails and clinching said shanks upon the insole, the shanks of the nails opposite the divided shanks extending outwardly from the heel-seat and being provided with lateral projections, and forcing together the shoe and heel with the outer shanks in the heel-passages.

17. The method of attaching heels molded of plastic material and containing attaching passages formed during molding which consists in inserting in the heel-seat of a shoe in accordance with the same design as the molded heel-passages the divided shanks of collar-nails and clinching said shanks upon the insole, the shanks of the nails opposite the divided shanks extending outwardly from the heel-seat and being arranged to register with the heel-passages by which they are received, applying to one of the registering surfaces a solvent for the plastic, and forcing said surfaces together.

18. A shoe comprising an upper with its insole, and a bottom-portion attached to the upper by collar-nails having oppositely projecting shanks, one of the shanks of each nail being divided and clinched oppositely upon the inner face of the insole and the other shank lying within the bottom-portion.

19. A shoe comprising an upper with its insole and an attached outsole, and a heel attached to the heel-seat of the outsole by collar-nails having oppositely projecting shanks, one of the shanks of each nail being divided, it passing through the outsole and insole and being clinched oppositely upon the inner face of said insole and the other shank lying within the heel.

20. A shoe comprising an upper with its insole and an attached outsole, and a heel attached to the heel-seat of the outsole by collar-nails having oppositely projecting shanks, one of the shanks of each nail being divided, it passing through the outsole and insole and being clinched oppositely upon the inner face of said insole with the outer prong of the divided portion extending toward the nearest point in the periphery of the heel-seat and the other shank lying within the heel.

21. A shoe comprising an upper with its insole and an attached outsole, and a heel attached to the heel-seat of the outsole by collar-nails having oppositely projecting shanks, one of the shanks of each nail being divided, it passing through the outsole and insole and being clinched oppositely upon the inner face of said insole and the other shank entering the heel and provided with lateral projections engaging said heel.

22. A shoe comprising an upper with its insole, and a preassembled outsole-and-heel-unit attached to the insole by collar-nails having shanks projecting oppositely from the collars, one of the shanks of each nail being divided, it passing through the insole and being clinched oppositely upon the inner face thereof and the other shank passing through the outsole and lying within the heel.

23. A shoe comprising an upper and its insole and an attached outsole, and a heel attached to the heel-seat and consisting of plastic material in which passages are molded, there being collar-nails having shanks extending oppositely from the collars, one of the shanks of each nail being divided, it passing through the outsole and insole and being clinched oppositely upon the inner face of said insole and the other shank lying in the heel and provided with lateral projections surrounded by the plastic material.

24. A shoe comprising an upper and its insole and an attached outsole, and a heel attached to the heel-seat and consisting of plastic material in which passages are molded, there being collar-nails with their collars lying spaced from one another about the margin of the heel-seat and between the outsole and the cup of the heel, the shank upon one side of the collar of each nail passing through the outsole and insole and being clinched over the inner face of said insole and the opposite shank lying in one of the heel-passages.

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