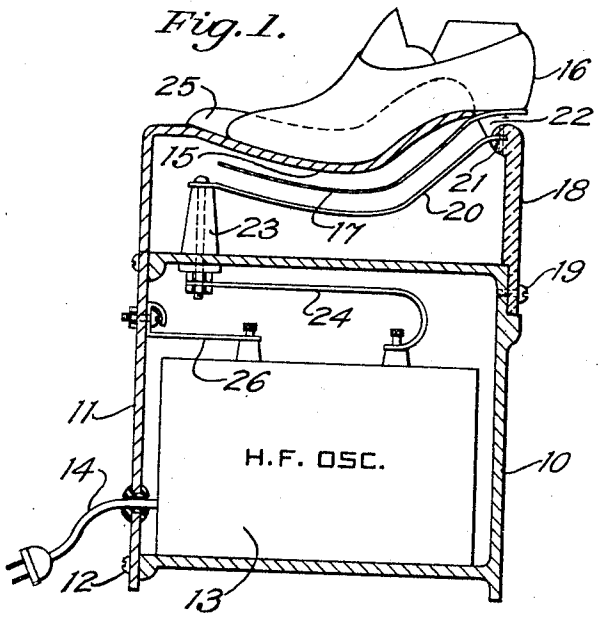
Sept. 25, 1945. H. E. MARASCO 2,385,523

METHOD OF ATTACHING SOLES TO SHOES

Filed March 14, 1944

Fig. 1.



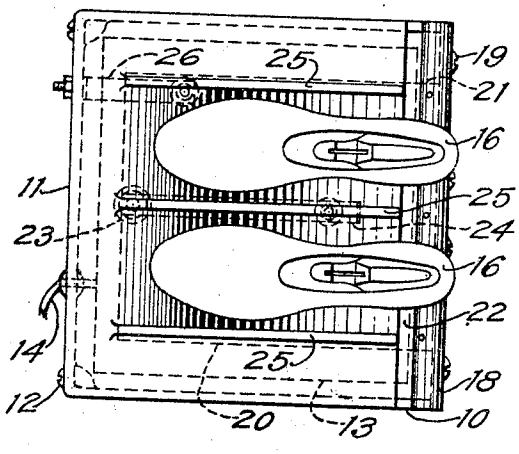


Fig. 2.

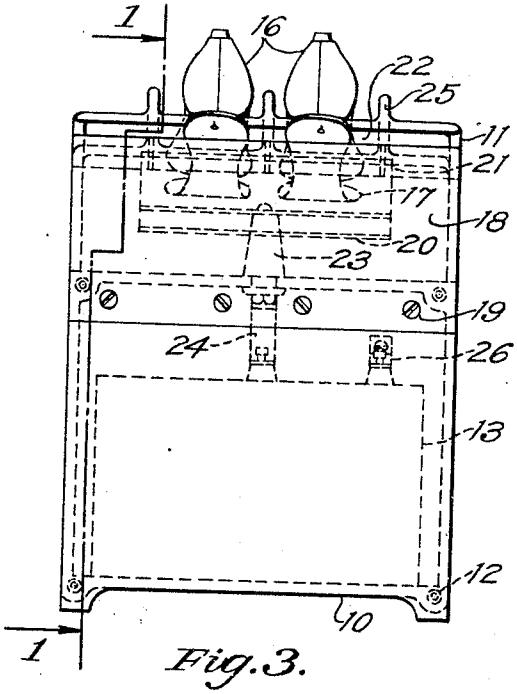


Fig. 3.

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METHOD OF ATTACHING SOLES TO SHOES

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2 Claims. (Cl. 12—142)

This invention relates to the manufacture of footwear and more specifically to methods of treating and attaching cemented outsoles to shoes.

More particularly the invention relates to a method of permanently attaching outsoles to shoes by means of a thermoplastic cement which is heat softened or "activated" by an electrostatic field produced between electrodes connected to a high frequency generator.

In cement attaching outsoles to shoe bottoms it has been proposed to coat the attaching faces of the shoe bottom and outsole with a thermoplastic cement in solution with a solvent; allow the solvent to evaporate so that the cement is substantially dry and non-tacky; and, then bring the parts together and position them in a shoe press, having electrodes associated with its sole pressing pad, so that the adhesive on the outsole and the adhesive on the shoe bottom are included in the electrostatic field produced between the electrodes and are simultaneously heated and activated thereby. In these proposed methods at least one of the electrodes must be attached to and must follow the dilation of the sole pressing pad as it conforms to various sizes and shapes of shoe being processed, and this frequently results in breakage of the electrode material after a comparatively few shoes are processed and arcing occurs which damages the shoe and the sole pressing pad. Furthermore, inclusion of the shoe in the electrostatic field sometimes results in erratic heating of the cemented areas, when metal objects within the shoe such as lasting tacks or staples, shank stiffeners, or even metal parts of the last within the shoe, concentrate the field and cause overheating in some places to the extent that the outsole leather is permanently injured. In cases where one of the electrodes is within the shoe i. e. in or on the insole or attached to the last bottom, some of the lasting tacks or staples may contact same and form a part of the electrode, thus reducing the spacing between the electrodes, and then arcing occurs which burns a hole through the outsole at the point or points where the tacks are located.

Inclusion of the shoe in the electrostatic field also heats the entire shoe bottom so that after the current is shut off the shoe must remain under pressure in the press for a considerable period of time in order to allow it and the adhesive to cool to a point where the shoe can safely be removed without the danger of the outsole springing away from the upper.

Another drawback of including the shoe in the electrostatic field is that it delays production until the bottom filler material of the shoe is dry, as any excessive moisture therein causes steaming to such an extent that the outsole becomes damaged by heat and staining.

Still another disadvantage in activating the adhesive on the outsole and shoe bottom while they are in the shoe press is that the frequency of the current required to produce an electrostatic field of sufficient strength to activate the adhesive must be in the order of several megacycles, thus it is difficult to transfer it to the shoe press electrodes without high losses; and, as the sole pressing pads, with which at least one of the electrodes must be associated, are of leather or rubber they have good dielectric properties at these high frequencies and therefore consume much of the power from the electrodes.

I have found that the above and other difficulties are avoided by my novel method of attaching sole to shoes hereinafter explained.

Accordingly, a principal object of the invention is to provide an improved method of attaching soles to shoes with a thermoplastic cement, whereby the cement is activated by the influence of an electrostatic field without heating the shoe bottom.

Another object of the invention is to provide a method of attaching soles to shoes with a thermoplastic cement which is heat activated by the influence of an electrostatic field, whereby the heated cement is rapidly cooled, thus, reducing the setting time of the cement; reducing the time the shoe must be kept under pressure and consequently reducing the number of shoe presses necessary to process shoes on a production basis, and resulting in considerable savings in manufacturing time and equipment.

A further object of the invention is to provide a method of speeding up the cement attachment of soles to shoes while preventing damage to the shoes and the sole attaching equipment.

A still further object of the invention is to provide a method of attaching soles to shoe with a thermoplastic adhesive by activating the adhesive in an electrostatic field produced by apparatus that is of simple construction, cheap and efficient to operate and which can be used with present shoe pressing equipment.

Other objects of the invention will in part be obvious and will in part appear hereinafter.

The invention accordingly comprises the several steps and the relation of one or more of such steps with respect to each of the others, and the apparatus embodying features of construction,

combination of elements and arrangement of parts which are adapted to effect such steps, all as exemplified in the following detailed disclosure, and the scope of the invention will be indicated in the claims.

For a fuller understanding of the nature and objects of the invention reference should be had to the following detailed description taken in connection with the accompanying drawing, in which:

Fig. 1 is a sectional view, of a preferred form of apparatus for use in carrying out my novel method, taken substantially along lines 1—1 of Fig. 3;

Fig. 2 is a plan view of the apparatus embodying features of my invention; and

Fig. 3 is a front elevation of the apparatus and showing outsoles being treated thereby prior to attachment to shoes.

Referring to the drawing, it will be seen that a suitable and preferred form of apparatus for use in practising my novel method of attaching soles to shoes comprises a cabinet or electrode support 10, which may be mounted on a suitable stand near or attached to a shoe pressing machine preferable of the type shown in the patent to Smith, No. 2,204,386. A metallic cover 11 is secured by the screws 12 to the rear of the cabinet so that the lower portion thereof is fully enclosed, and housed therein is a high frequency electronic oscillator 13 to which current is supplied by the lead 14 passing through a grommet in the cover 11.

One side of the oscillator output is grounded to the cover 11 by the lead 26, and extending substantially at a right angle from the cover and formed integral therewith is an upper sole treating electrode 15 which also serves as a support upon which a shoe 16 may rest in cases where it is desirable to secure the heel end of the outsole 17 to the heel seat of the shoe prior to the sole attaching operation.

The insulator plate 18 is secured by screws 19 to the front of the upper portion of the cabinet 10 and serves as a support for the lower sole treating electrode 20 which fits within a groove 21 formed in the upper portion of the insulator plate so that the electrodes are spaced from each other so as to form a slot 22 into which outsoles may be inserted for treatment. The rear portion of the lower electrode 20 is supported by a standoff insulator 23 held to the upper wall of the cabinet and a lead 24 connects the electrode to the other or ungrounded output side of the oscillator 13.

When the apparatus is made primarily for use with attaching of soles to women's shoes, the electrodes 15 and 20 may be curved to approximate the shape of a molded outsole and/or the shoe bottom, and of course they may be comparatively flat for use with men's work. In any event the top of the electrode 15 is provided with spaced ribs 25 between which the shoes are placed to prevent overlapping of the outsoles as they are inserted between the electrodes for treatment.

When current is supplied to the oscillator 13, high frequency current is supplied to the electrodes 15 and 20 so that an electrostatic field exists therebetween which, as is well known; will heat dielectric or non-conducting materials such as leather and thermoplastic cements of the types described in the patent to Pitman, Reissue No. 22,301, and many others such, for example, as those having a neoprene, or "Chemigum N" or "Hycar" base.

I have found that subjecting only the outsole, with its coating of thermoplastic cement, to the influence of the electrostatic field causes very rapid heating of the outsole and its cement without danger of arcing or burning of the sole and that bringing the heated outsole into contact with the cemented shoe bottom while it is at room temperature and immediately placing them under pressure in a shoe press gives excellent adhesion, as the heated cement on the outsole being tacky, immediately adheres to the cool cement on the upper and the transfer of heat softens the cool cement so that the cements merge and form a homogeneous bond.

I have also found that the cool shoe bottom and its cement rapidly absorbs the heat from the heated outsole cement so that it sets or hardens sufficiently to allow the shoe to be removed from the sole attaching press after being under pressure for only a few seconds and without danger of the sole springing away from the shoe bottom or disrupting the cement bond in any way.

Over a period of years it has been determined that a minimum bond strength of 4 lbs. per linear inch is necessary in cemented shoes before a shoe can safely be removed from the shoe press without danger of the outsole springing away from the shoe upper, therefore, tests were made by heating the outsoles only, between electrodes for 45 seconds and then pressing them to shoe bottoms at room temperature in a shoe press at 50 lbs. per square inch pressure. These tests proved that by utilizing the present invention these shoes could be removed from the press in less than 10 seconds without danger of the soles springing away from the shoe bottoms. Efforts were made to immediately place the shoes in a "Scott" testing machine to determine the bond strength. However, due to time required to place the shoe on the holding fixture and attach the gripper to the outsole, the bond had so aged and the strength thereof had so increased that it was not indicative of the bond strength at the time the shoe was removed from the press.

To obtain a comparative test of bond strength immediately upon removal of the specimens from the press, strips of leather 1 inch wide and 6 inches long were coated with a solution of thermoplastic cement, of the plasticized polyvinyl butyral type, along five inches of their length and allowed to dry. The following tests were then made:

One strip was placed in an electrostatic field and heated for 45 seconds, the heated strip was then removed from the electrodes and immediately placed on another strip at room temperature and pressed together at 50 lbs. per square inch for 5 seconds. The uncemented ends were then quickly attached to a spring scale and the strips pulled apart and a bond strength of 5½ lbs. per linear inch was obtained. This test was repeated several times and the bond strength obtained varied between 5½ and 8½ lbs. per linear inch.

After aging several hours the specimens of the above tests showed a bond strength of over 25 lbs. per linear inch.

Another series of tests was made by placing both strips in the electrostatic field and heating them for 45 seconds, removing them from the electrodes and immediately placing them together under a pressure of 50 lbs. per square inch. After 5 seconds under pressure a bond strength of only 1¼ lbs. to 2½ lbs. per linear inch was

obtained. It was found that after 60 seconds in the press a bond strength of 3 lbs. per linear inch was obtained and it was necessary to leave the specimens in the press as long as 120 seconds before they cooled sufficiently to give a bond strength of 5 lbs. per linear inch.

After aging several hours these specimens also showed a bond strength of over 25 lbs. per linear inch.

In the making of shoes in accordance with my novel method and using the apparatus previously described, the shoe upper is lasted and prepared in the usual manner and the attaching face thereof is coated with a solution of thermoplastic cement which is then allowed to dry.

The outsole is also prepared in the usual manner and the attaching face thereof is coated with a solution of thermoplastic cement which is then allowed to dry.

The outsole may then be attached at its heel end to the heel seat of the shoe by the usual tacks or staples.

The outsole 17 is then inserted in the slot 22 so that it lies between the electrodes 15 and 20, and the shoe 16 if attached to the heel end of the sole is rested on the upper face of the electrode 15. As will be readily understood, only the sole is subjected to the influence of the electrostatic field existing between the electrodes and heated thereby, and the shoe resting on the upper face of the electrode 15, not being included in the field, will remain substantially at room temperature.

After a normal heating period, the outsole is removed from the treater and another put in its place. The hot outsole is then quickly brought into registry with the cool shoe bottom and the assembly is placed in the shoe press where a pressure of about 50 lbs. per square inch is applied to press the outsole into intimate engagement with the shoe bottom, as is usual procedure.

It can readily be seen that attaching soles to shoes by the method and apparatus above described is a substantial advancement over previously proposed methods.

It can also be seen that the apparatus described can be made to accommodate several pairs of shoes so that the time required to heat the soles would not delay production.

Since certain changes in carrying out the above process and in the constructions set forth, which embody the invention, may be made without department from its scope, it is intended that all matter contained in the above description or shown in the accompanying drawing shall be interpreted as illustrative and not in a limiting sense.

It is also to be understood that the following claims are intended to cover all of the generic and specific features of the invention herein described, and all statements of the scope of the invention which, as a matter of language, might be said to fall therebetween.

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

1. That method of attaching outsoles to shoes, which comprises providing a shoe having its sole engaging face coated with a thermoplastic cement, providing an outsole having its shoe engaging face coated with a thermoplastic cement, securing the heel end of said outsole to the heel seat of said shoe, heating the cement on said outsole until it becomes tacky by subjecting it to the influence of an electrostatic field while maintaining the cement on said shoe substantially at room temperature, and thereafter pressing said outsole to said shoe until the heated cement on the outsole merges with the cool cement on the shoe.

2. That method of attaching outsoles to shoes, which comprises providing a shoe having its sole engaging face coated with a thermoplastic cement, providing an outsole having its shoe engaging face coated with a thermoplastic cement, attaching the heel end of said outsole to the heel seat of said shoe, heating the cement on only one of said parts by subjecting it to the influence of an electrostatic field while maintaining the cement of the other of said parts substantially at room temperature, and thereafter pressing said outsole to said shoe until the heated cement has merged with the cool cement.

HAROLD E. MARASCO.