Jan. 21, 1947. H. F. MILLER ET AL 2,414,542

INSOLE

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Fig. 1.

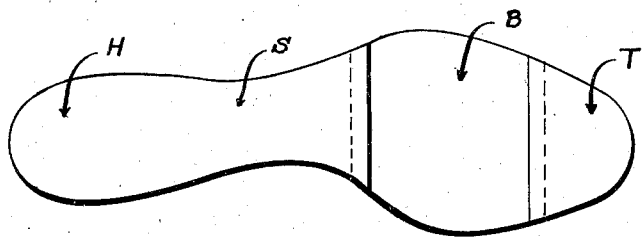
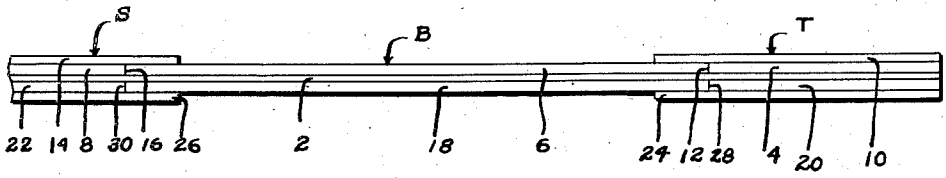


Fig. 2.



Inventor
Harold F. Miller
John A. Crowe
Hermon T. Barker
By Thurman H. Hamilton
Attorney

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INSOLE

Harold F. Miller and John A. Crowe, Dedham, and Hermon T. Barker, East Walpole, Mass., assignors to Bird & Son, Inc., East Walpole, Mass., a corporation of Massachusetts

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4 Claims. (Cl. 36—44)

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This invention relates to a shoe innersole and more particularly to a composite strip innersole of the synthetic type in which strips of fibrous sheet materials of dissimilar character are joined together to provide relatively stiff toe and shank innersole portions, separated by a relatively flexible ball portion.

Composite insoles are well known in the trade and are commonly produced by cutting or dieing-out the innersole from a so-called innersole strip. These strips are made up of a combination of flexible and rigid sheet materials arranged adjacent to one another in such fashion that the stiff and flexible parts will occur in the right areas of a died-out innersole to furnish an intermediate flexible ball portion. An important point in the manufacture of the innersole strips which has not been fully solved is the method of securing together the unlike sheets of material. The common practice now followed is to do this by beveling each of the edges of adjacent sheets, applying a tacky cement, and then pressing the edges together.

Joining beveled edges in this manner is objectionable in several respects. A common complaint is that the beveled joints do not hold and that the unlike materials become again separated. Innersole strips are made in long lengths of approximately 44 inches and in widths of thirteen inches to seventeen inches. A bundle of thirty to fifty of these strips is heavy and bends when picked up, and also when leaned against the wall on end as is done in the processing in the factory. This flexing, under considerable strain, frequently breaks the joints apart along part or all of their length before the innersole strips are even put into process. Further breaking commonly occurs during the dieing-out process, and the subsequent steps of molding, tying up in tight case-lot bundles, edge binding, transporting about the factory, and fitting to the last. A broken joint at any of the above stages means the total loss of the innersole as it cannot be repaired. From dieing-out on, the loss is more serious than simply the cost of the innersole since the case lot has to be sent back, the broken innersole have to be replaced by dieing-out and then processed by molding etc. up to the point to which the remainder of the case has been carried, and the replaced, processed innersoles have to be inserted in the proper part of the bundle by sizes and by lefts and rights. Breaking may also occur in the finished shoe during the course of its life which would weaken the shoe, and tend to detract from its appearance, comfort, and length of life.

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Another common complaint is that the beveled joints tend to cause the innersole member to flex in such a manner that the flexible ball portion abruptly bends away from the rigid or stiff toe and shank portions, along a sharp line of bending. The effect of this is to induce flexing along a very narrow section of the insole instead of throughout the ball area as desired. This flexing, along a single narrow line at every step taken in the shoe, also contributes to the failure of beveled joints.

It is also impractical to attempt to join dissimilar materials of limited thickness by the beveled edge method. Thus materials less than two irons thick cannot be satisfactorily beveled and joined.

Again in dieing-out the bevel joint type of insoles, one side of the sheet has to be used for lefts and the opposite side for rights in order that the beveled edge of the flexible material will always be uppermost. This means that the operator has to turn the sheet over each time she changes from left to right. In actual practice, all of the lefts of a single size called for in the case will be died out, and the operator will then turn the sheet over and die-out the same number of rights. The operator then shuffles the two stacks together, matching up the lefts and rights.

This is not only a time-consuming operation, but also leaves quite an opening for mistakes in counts, mismatching, etc. It also requires a somewhat more intelligent operator than would otherwise be the case. Turning the long 44-inch sheets over is a clumsy job, requires more space about the dinking machine, and tends toward greater hazard.

A further drawback to beveled joint insoles is the variation in thickness from one part to another. In actual practice, it is usually necessary to run the shank piece as high as .120 to .140 in. in thickness. The flexible portion will run about .080 inch in a so-called 3½ iron innersole, and the fibre toe area will commonly run as light as .060 inch. The thick shank area is necessary to give adequate strength with the materials commonly employed. The thinner toe area is necessary to reduce costs The overall effect of such a variation in thickness, however, is not conducive to good shoemaking, which calls for an innersole makeup of as uniform thickness as possible.

An object of the invention, therefore, is to improve innersoles of the character noted and to devise means for joining together dissimilar fibrous sheet materials in an effort to avoid the difficulties which are now attendant upon the use

of composite innersole members having beveled joints.

As one solution to the problem of more satisfactorily joining together dissimilar fibrous sheet materials, we have designed a multi-ply innersole member in which edges of dissimilar materials are arranged adjacent to one another in staggered relation, to provide a novel combination of dissimilar sheet materials.

An important feature of the invention is an improved tongue and groove type of joint for securing together edges of the dissimilar sheet materials. This joint is particularly effective in preventing the flexible ball portion of an insole from abruptly bending along a sharp line. Instead, a more gradual, rounded type of bending is provided in which a larger area of the flexible sheet material is included. The joint is of such a nature that it entirely prevents breaking apart.

Another important feature is an innersole which may be used interchangeably for either lefts or rights.

Still another feature is an innersole which is cheap to make, easily handled, durable, of excellent flexing character in the portions where flexibility is required, of excellent rigidity in areas that need to be rigid, more uniform in thickness, and especially adjusted to shoemaking operations such as are practical in the manufacture of shoes.

Other features will appear from the following description. In the accompanying drawing:

Fig. 1 is a plan view of an innersole employing one embodiment of the invention; and

Fig. 2 is a fragmentary elevational view illustrating the fore part of the innersole.

The innersole of the invention is made up of a plurality of plies of fibrous sheet materials of unlike character. The several plies are utilized in strips arranged so that some of the strips overlap abutting edges of other strips to provide a double tongue and groove type of joint.

An important element in providing the double tongue and groove joint in this embodiment of the invention is a thin center ply. The general plan of assembly of the plies includes starting with the center ply member as a continuous sheet of material, on either side of which are alternately disposed relatively flexible plies and relatively stiff plies in abutting relation. Then relatively stiff plies in spaced-apart relation are superimposed on the abutting plies so that the superimposed plies overlap the underlying points of abutment of the intermediate plies. In this way edges of stiff materials are brought into contact with edges of flexible materials over a considerable area and each material modifies the flexing character of the other to thus extend the region of bending. The innersole members are then died-out in the usual manner.

As an example of this embodiment of the invention, we have illustrated in Fig. 1 an innersole member which includes a ball portion generally denoted by the arrow B; a toe portion denoted by arrow T; a heel portion denoted by arrow H; and a shank portion denoted by arrow S. The innersole is made of several plies which are illustrated in Fig. 2, in which numeral 2 denotes a thin center ply running the full length of the innersole. The center ply 2 may for example consist of a single ply of a relatively stiff fibrous board such as a layer of paper, preferably kraft or board of approximately .015 inch in thickness; or it may consist of a sheet of flexible material of approximately .015 inch in thickness; or it may consist of combinations of fibre board and flexible material as described at a later point.

At the upper side of center ply 2 is cemented another ply 4 which may consist of a layer of stiff paper board, preferably kraft, of approximately .030 inch in thickness. In abutting relation to the ply 4 on center ply 2 is provided another ply 6 of relatively flexible character such as is conveniently provided by a rubber impregnated paper of approximately .030 inch in thickness. Similarly, another relatively stiff ply 8, corresponding to ply 4, is provided in abutting relation to the opposite side of ply 6.

A top ply 10 of a relatively thin, stiff, fibrous sheet is then superimposed on ply 4 in a position such that it overlaps the line of abutment 12 and extends across over the ply 6 throughout a substantial area. In the same manner a top ply 14 is arranged to overlie the line of abutment 16 of plies 6 and 8.

This arrangement is repeated at the under side of the center ply 2 with a second relatively flexible rubber impregnated paper sheet 18 being cemented as above and with abutting plies 20 and 22 of stiff material being secured adjacent thereto, and plies 24 and 26 occurring in overlapping relation with respect to line of abutment 28 and 30 respectively.

The center ply 2, running through the entire length of the innersole, has the inherent disadvantage, when made of a relatively stiff, fibrous sheet, of injecting stiff material in the flexible area, and when made of flexible material, of injecting flexible material in rigid areas. This can be overcome by making the center ply from a comparatively thin sheet of paper, such as one of approximately .004 inch in thickness on either side of which are adhered strips of stiff and flexible materials of somewhat greater thickness, such as .006 inch, in the same general arrangement as the ply shown in Fig. 2 and consisting of parts 4, 6 and 8. In this arrangement, the single sheet of paper stock in the center is so thin that it causes no appreciable decrease in flexibility.

A still greater degree of flexibility could be obtained by making center ply 2 entirely from a sheet of flexible material, although this, as mentioned above, detracts from the rigidity of the rigid shank portion. In applications where such decreased rigidity is objectionable, a form of construction can be used in which a series of stiff and flexible materials with abutting edges are substituted for the center ply 2. In this style of construction, the fibre board portion of the center ply in the toe piece could either coincide with the areas of parts 10 and 24 in Fig. 2, or preferably would extend approximately ½-inch further into the ball area indicated by B. In the joint between the ball area B and the shank area S, the portion of the center ply 2 made of stiff paperboard in the shank area could either coincide in area with parts 14 and 26, or extend approximately ½-inch further into the ball area B. The portion of the center ply lying between the shank and the toe would be made of flexible material. In this design, the portion of the ball area in which extreme flexibility is desirable is made entirely of flexible material and at the same time the gradation from completely rigid material in the shank and toe to the completely flexible material in the ball area is made still more gradual, giving advantages as subsequently explained.

It will be observed that in all of these various arrangements there are provided at least four separate tongue and groove assemblies which

combine to furnish an exceedingly strong bond between the two types of sheet material, well capable of resisting any tendency to become separated. Another result is a relatively wide surface contact between the two sheet materials at their end portions, the immediate effect of which is to develop gradual bending over an increased area and thus produce a more comfortable flexing action. This enables the innersole to hug the last and fit accurately against it, thus leading to better shoemaking. Breaking apart is prevented both during manufacture of the shoe and also during the life of the shoe. Moreover, when the innersole is flexed, there is no feeling of bending along a sharp line. Instead, bending is spread over a relatively large area to give the effect of overall softness and yieldability without loss of necessary stiffness in the shank and toe portions. This advantage is especially pronounced in the embodiment of the invention in which the series of stiff and flexible materials with abutting edges are used as the center ply **2** in Fig. 2.

The tongue and groove type of joint as may be readily seen is the same on each side and thus soles may be used interchangeably for either lefts or rights. This is a definite advantage over the bevel point type of innersole, only one side of which may be used as the top of the insole. As a consequence of this advantage, the innersole of the invention is more acceptable to shoemakers, is more readily salable, and more economical to use.

Another important aspect of the multi-ply construction resides in the fact that while overall stiffness and flexibility are provided at the desired points, the rigid portion still possesses the ability to be easily penetrated by stitching needles and easily die cut. This results from the laminated type of construction which involves a large number of sheeted fibrous materials laminated with adhesive layers. Many adhesive layers give such a high degree of rigidity that it is possible to use much less costly fibres in the fibre board than would be practical with the bevel type of innersoles. Such a laminated structure gives greater rigidity, thickness for thickness, than materials at present commonly used. Moreover, the structure is more easily penetrated by a sewing machine needle, which in turn permits easier and faster stitching with less needle heating. Such a laminated structure also has advantages in dieing-out operations in that it extends die life, makes innersoles more easily removable from the die, and generally speeds up the dieing-out operation.

The greater rigidity per unit of thickness makes it possible to use somewhat lighter fibre board in the shank area. At the same time, the low cost of the fibre which can be used makes it practical to have the toe area at least as thick as the ball area. By decreasing the thickness of the shank area and increasing the thickness of the toe area from that employed in the usual practice with the beveled type innersole, a much greater uniformity in thickness is obtained, which gives definite shoemaking advantages as pointed out above.

The center ply member is particularly adapted to impregnation with bituminous materials to provide a so-called "bitusized" sheet which passes

vapor freely but has a high resistance to the passage of free water. When so treated, the center ply prevents wet feet from water passing through the outer sole, without obstructing passage of moisture from perspiration.

While we have shown several preferred embodiments of the invention, it should be understood that various changes may be resorted to, such as use of stiffer sheet materials and different tongue and groove assemblies, in keeping with the spirit of the invention as defined by the appended claims.

We claim:

1. As an article of manufacture an improved insole member including a relatively stiff toe portion, a relatively flexible ball portion, a relatively stiff heel and shank portion, said ball portion composed of two plies of flexible fibrous sheet material separated by a center ply of fibrous material, said toe portion and said heel and shank portion composed of relatively stiff plies arranged at either side of the center ply in abutting relation to the relatively flexible plies, said toe portion further including relatively stiff plies overlying points of abutment of the intermediate plies at either side of the center ply.

2. An innersole member comprising a plurality of relatively flexible and relatively stiff plies of fibrous sheet material secured together to provide a flexible ball portion in the insole, edges of said relatively flexible plies being abutted against edges of relatively stiff plies, and portions of the flexible plies extending for a substantial distance between contacting surfaces of other relatively stiff plies to provide an extended region of flexing in the sole.

3. An innersole member comprising a plurality of relatively flexible and relatively stiff plies of fibrous sheet material and layers of adhesive material secured together to provide a flexible ball portion intermediate relatively stiff heel and toe portions, one of said plies consisting of a central element extending throughout the innersole, said relatively flexible plies being mounted at either side of the central element and having their edges abutted against edges of relatively stiff plies, side portions of the flexible plies extending for a substantial distance between contacting surfaces of other relatively stiff plies to provide a region of gradual bending in the sole.

4. An innersole member comprising a plurality of relatively flexible and relatively stiff plies of fibrous sheet material secured together with layers of cement to provide a flexible ball portion intermediate relatively rigid heel and toe portions, one of said plies being impregnated with a bituminous substance and extending throughout the sole to constitute a central moisture-controlling element, said relatively flexible plies being mounted at either side of the central element, edges of said flexible plies abutted against edges of relatively stiff plies, portions of the flexible plies, together with their lines of abutment with the stiff plies, being covered with other stiff plies to provide tongue and groove construction for extending the region of flexing in the sole.

HAROLD F. MILLER.
JOHN A. CROWE.
HERMON T. BARKER.