



IMPROVING THE DESIGN OF PREVENTIVE SHOES FOR PATIENTS WITH DIABETES

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ABSTRACT

In people with diabetes, unloading high-risk areas of the foot by optimizing shoes or insoles can prevent ulceration. This systematic review aimed to summarize and evaluate the properties of shoes and insoles that reduce plantar pressure and the incidence of diabetic neuropathy, ulceration of the plantar forefoot in people with diabetic neuropathy. This article describes the influencing aspects of the foot and the improvement of the design of preventive footwear for patients with diabetes mellitus.

KEYWORDS: *insole, preventive footwear, foot, last, sole, construction, foot pathology, plantar pressure.*

The bespoke shoe task is the preferred means of preventing foot ulcer recurrence in diabetes. These shoes are primarily designed to relieve stress on plantar areas with a high risk of ulceration. However, the incidence of recurrent ulcers is high. Custom shoes are often prescribed for people with diabetes who have a moderate to high risk of ulceration to compensate for existing foot deformities, reduce peak plantar pressure, provide stability when walking, and protect the foot from minor injuries. International guidelines recommend the use of custom-made shoes to prevent ulcers in diabetic feet, with shoe pressure targets for those patients who have recovered from plantar foot ulcers.

Foot ulcers often occur as a late complication in people with diabetes; lifetime morbidity is estimated at 19–34% [1]. The risk of ulcer recurrence after healing is high: 40% in the first year and 60% after three years. Increased plantar pressure during walking plays a key role in the development of foot ulcers and their recurrence [2,3].

When designing preventive footwear, the following tasks were set:

1. To study the clinical features of the feet of patients with initial manifestations of diabetic pathology of the distal parts of the lower extremities.
2. To study the nature of the interaction of feet with a support in patients with initial manifestations of diabetic foot pathology in the standing position and when walking, as well as spatial indicators of walking.
3. To develop a classification that allows to determine the tactics of rational orthopedic support for patients with initial manifestations of diabetic foot pathology, based on the results of clinical, radiological and biomechanical studies.
4. To formulate medical and technical requirements for orthopedic blocks, shoes and insoles for patients with initial manifestations of diabetic foot pathology, as well as indications for their appointment.

The present invention relates to footwear for postoperative use in instep capable of walking on Sol land. The footwear according to the invention is essentially characterized in that it has a sole 10 bounded by two bearing surfaces 12 and a bearing 14, one upper 20 with two outer side walls and an inner part 22, a front end wall 23 and a cover wall 24, a heel wall 30 in the form of a U, a base U corresponding to the rear portion 31, two side branches corresponding to two portions, the outer and inner side 33 of the heel wall, the abutment surface 12 is a continuous convex surface substantially from the front end to the rear end of the sole 10, the abutment surface 14 is a flat surface and the inner side walls 22 and 33 are in the same plane perpendicular to



the bearing face 14 (Fig. 1.). The footwear is suitable for use after surgery in case of hallux valgus, rigid big toe, metatarsalgia, Morton's neuroma, deformity of the toe [4].

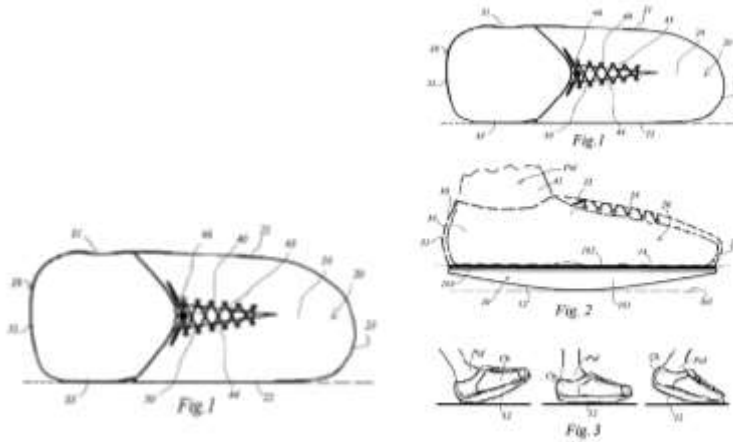
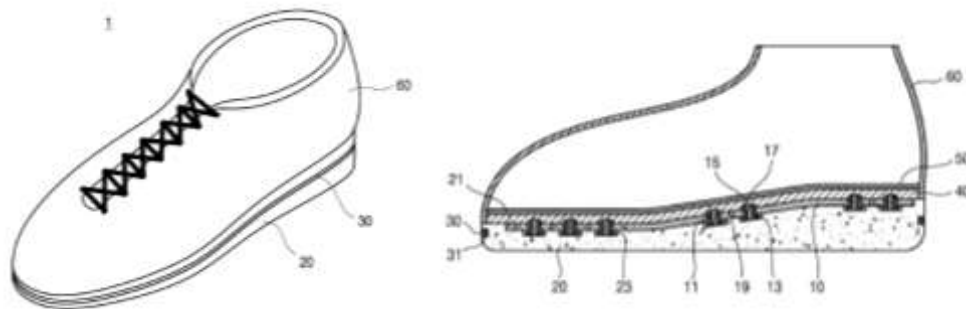


Fig. 1. Postoperative shoe construction for instep

The present invention relates to a diabetic shoe, and in particular, a pillar is formed on the lower surface having a spring embedded therein, and acupressure is applied to the upper surface of the rack. Attach the lug-shaped insole to the upper surface of the sole, and the cushioning insole to the upper surface of the insole, and by placing the integrated insole upper on the upper surface of the insole and making the shoe integrated with the sole, the pressure of the sole is distributed. It prevents twisting and deformation of the shoe by attaching the anti-deformation frame to the outer surface of the sole and reduces the weight of the shoe. A custom to prevent the development of diabetes, prevent diabetic feet caused by diabetic complications, and relieve pain in diabetic necrotic ulcers.

A plurality of springs are integrally molded using a urethane material, and a plurality of struts are provided on the lower surface, and an insole with acupressure protrusions protruding from the upper surface; It is formed of a urethane material, and a space is formed on its upper surface to accommodate an insole, and a stand is formed at the bottom of the space. a sole with a plurality of insertion grooves; It is made of any plastic, rubber or metal in order to have elastic restoring force upon deformation, and is integrated with the outsole. an anti-deformation cage that is inserted inward and attached to the side edge of the sole; an insole formed of urethane foam or foam foam and disposed on the upper surface of the insole; The specific gravity is relatively lower than that of the insole to prevent micro-damage to the muscles due to a sudden decrease in elasticity depending on the weight. rafters made of low density polyurethane foam and glued to the upper surface of the insole; and Prevention of diabetes mellitus, characterized in that the upper is glued to the inner side of the lower edge of the insole and the upper edge of the sole. Special footwear to prevent diabetic feet and relieve pain in diabetic necrotic ulcers.



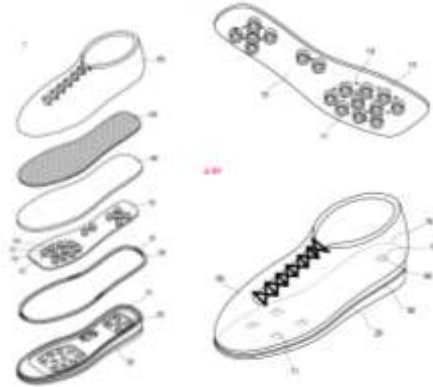


Fig. 2. The design of the diabetic shoe has a built-in spring.

The invention [6] relates to a safety shoe (10) for diabetics, comprising an outer shoe (12) and an inner shoe (14), which can be inserted into the outer shoe (12) and removed again from the said outer shoe (12), and the outer shoe (12) contains an outer shoe sole (24), which has an outer sole (26) of a shoe and an outer insole (30) of a shoe and, in addition, contains the upper part of the outer shoe (32). The outer shoe (12) has a protective toe for the outer shoe (66). The inner shoe (14) has an upper inner shoe (18) and an inner shoe insole (20) and the inner upper of the shoe (18) has a supporting front cover (22). Preferably, the outer sole (24) of the shoe comprises an outer midsole of the shoe (28). In addition, the inner shoe (14) and the outer shoe (12) preferably have an inner shoe tongue (34) and an outer shoe tongue (36), respectively. The safety shoe (10) for diabetics also contains a foot support (16), which can be inserted into the inner shoe (14) and can be removed from the said inner shoe again. The invention also relates to a method for adapting the safety footwear (10) for diabetics to the shape of the user's foot.

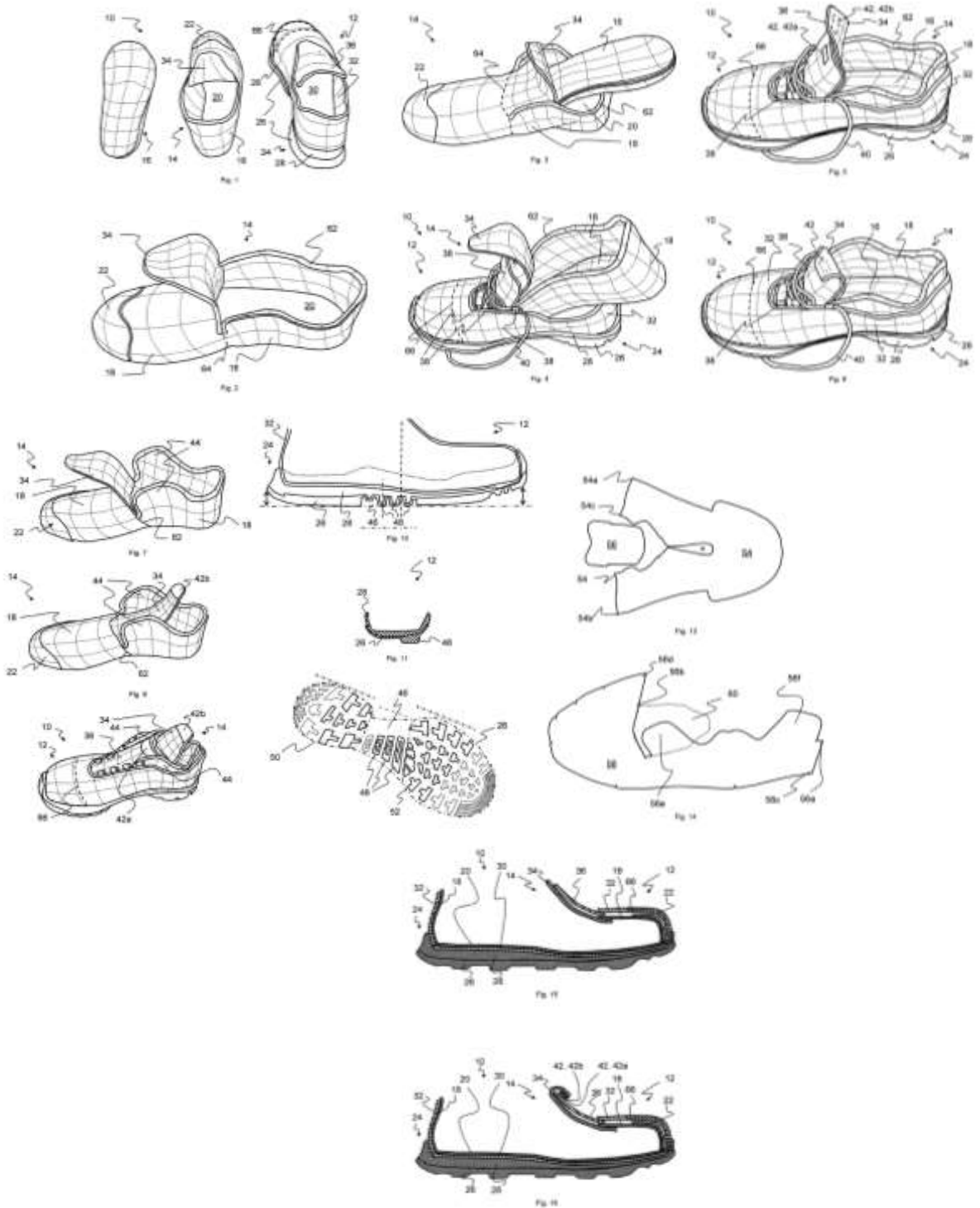


Fig. 3. Design of protective footwear for patients with diabetes mellitus.



The invention [7] relates to a sole for diabetics. Safety footwear according to the preamble of claim 1 and a shoe with such a sole. The sole of a shoe is defined as most of the cushioning, rolling, pressure distribution and stabilizing effect of the shoe and thus significantly affects the wearing comfort.

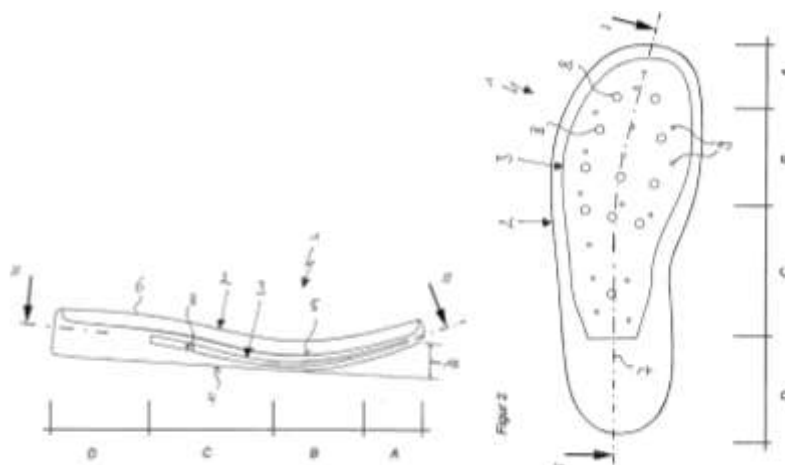


Fig. 4. Diabetic shoe sole

By choosing the right sole material, as well as the shape and distribution of the thickness of the sole, the above properties of steel were influenced. This circumstance is especially true for medical shoes, such as bandage shoes or diabetic safety shoes, reinforced to be worn wherever post-operative interventions concentrate pressure on the foot. The foot should be avoided or in cases where the sensitivity to pain is impaired as a result of neuropathy, so that local overuse of the foot can no longer be perceived. In these cases, it is advisable to train the sole on the distribution of pressure; a large area of the foot, smooth riding and provides the best stabilization of the steel foot.

The result of our study was to ensure the comfort of shoes for patients with diabetes mellitus, which is a sufficient opening of the intervals of direct wearing and undressing of shoes. There are also a number of other requirements: shoe width; applying a soft piping to the top of the piping; the use of Velcro tapes, taking into account the change in the size of the foot during prolonged walking of the patient; the construction of the shoe is created taking into account the high breathability, naturalness and softness of the materials used in the shoe.

Preventive footwear for diabetic patients consists of the following: the upper part of which is glued to the lower parts, external parts: vamp, toe, tongue, heel, internal parts - the main textile lining, tongue lining.

In the upper part of the frame, the upper outer parts are sewn with the lining details over the wrong side and folded to the right. The shoes are attached to the toe with Velcro. In the created model, the lining is made of textiles, and under the tongue there is a separate lining in leather.



Fig. 5. Preventive shoe design for patients with diabetes.



A distinctive feature of the workpiece is that the outer parts are sewn to each other along the perimeter. This reduces lateral deformation during molding. At the same time, in the central part along the surface of the shoe, the tension increases, which makes it possible to better form the upper parts of the shoe during transverse stretching during formation.

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