High heel shoes with adjustable height of the heel

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Abstract. High heel shoes have been worn by women since a long time especially in western culture. Like clothing, high heel shoes are also categorizing as one of the personality symbol. Therefore, it is a necessary part of every woman’s closet. The main objective of the present invention is to disclose a shoe with an automatic adjustable heel using a quite simple and less complex arrangement for adjusting heel height wherein the same is configured to be operated from mobile application. The present literature suggests that the design of the existing solutions is complex. It has been also found from the literature review that wearing high heel shoes for a long duration have certain side effects. Therefore, high heel shoes are worn occasionally. This paper presents the design of an adjustable height of a high heel shoe by using a mobile application as per requirement of the user. A mini screw-jack arrangement connected with a motor unit is placed within a defined heel area. Thus, the dual functionality of the shoe allows women to wear it on special occasion like parties as well as in casual.

1. Introduction

From a historical prospective high heel shoes were used by both men and women. However, in the western culture the high heel shoes were worn solely by the women [1]. High heel is a necessary part in every women wardrobe. Most of the time while going for party or special occasion, it becomes an affinity of most of the women to use high heels as they feel incomplete without wearing such stuff. On one side it looks entirely pleasant on ladies yet on the opposite side high heels regularly lead to an issue with regards to running or strolling quickly. Wearing high heel shoes also have significant side effects on the muscles of the human body [2-4]. If a woman having such high heels have to suddenly run or any other emergency occurs like attack, fire alarm etc. it troubles women for running. Also, sometimes it happens that while normal walking, it creates a problem of sprain.

Although high heels have the stigma of being bad for health and comfort, this barely stops women from wearing them occasionally and often daily. Therefore, if someone wears the high heel shoes for the long duration it has adverse consequences on the health of the wearer [5], [6].
Women often make sacrifices for foot fashion. Studies have shown that these towering shoes can be costly in more ways than one, taking their toll on your spine, hips, knees, ankles and feet, while altering your posture and gait. High heels often lead to pain in feet if wore for longer period of time. Had there been such heels where the height of the heel can be adjusted automatically, it would have been a great help to women so that same heel can be used with increased height as well as with decreased height in some emergency situations where women needs to run.

The primary object of the present invention is to disclose a shoe with an automatic adjustable heel using a quite simple and less complex arrangement for adjusting heel height wherein the same is configured to be operated from mobile application. Therefore, dual functionality of the shoes allows the wearer to carry only one pair of the shoe, as it can be easily switched from high heel to flat or vice-versa [7].

Another object of the present invention is to disclose a shoe with an automatic adjustable heel wherein the involved electronic as well as mechanical components within heel is protected by means of an adjustable material which simultaneously provides a protection to involved components as well as a nice view when wore.

2. Related Work

Prior art study to find the relevant patent with keywords, design of high heel shoe, adjustable height of high heel shoes, shoe with adjustable heights were searched from patents.google.com. The research papers were searched from scholar.google.com.

2.1 Adjustable Shoe

The present invention [8] discloses a shoe integrated with a telescopic arrangement at the heel area for either increasing or decreasing the heel height as shown in figure-1. The telescopic arrangement is further in communication with a controller which receives a signal from a mobile as per the situation of user. Multiple rod arrangement are arranged within a single hollow rod thereby forming a telescopic arrangement which either extends or contracts thereby either increasing or decreasing the heel height as per user wish.
2.2 Adjustable height increasing shoe

The invention discloses a shoe wherein the wearer appears taller. Said shoe [9] comprises an inner sole for a shoe combined with a metallic arch including a vertically adjustable means supporting the heel portion of the arch and inner sole which adjustable means is mounted in the heel of the shoe as shown in figure-2. The shoe was designed for both men and women and the wearer of these shoes appear taller.

2.3 Adjustable height high heel shoe

The invention [10] discloses a heel which contains an additional portion pivoted with the heel at bottom portion wherein the pivoted portion can move forward and backward on an application of force by hand thereby either increasing or decreasing the height of heel.

2.4 Shoe with a retractable and extractable heel controlled by a Smart device

It discloses a shoe [11] with a retractable heel wherein the heel comprises a motor, a gear connected with the said motor and a threaded bolt connected with the said gear. The design of
the shoe is given in figure-3. The whole arrangement is placed in a heel and the motor is controlled by a mobile application to modify the heel height.

![Figure-3 Motor controlled High Heel Design](image)

### 2.5 Heel detachable high-heeled shoes

This invention [12] discloses a detachable utility of the high heel shoe including heel and body of the shoe. This utility patent provides a high heel shoe with dual functionality which can be converted as a flat shoe as per requirement. The wearer of the shoe has to make the manual adjustments in order to change the height with respect to the attached components.

![Figure-4 Design of the Detachable High Heel Shoe](image)

### 2.6 Height-adjustable high-heeled shoes

A shoe with a feature to adjust the height of the heel is developed where two bevel gears were placed in the cavity of the shoe [13]. A sliding groove is shaped in the bottom face. The height of the shoe can be adjusted by means of adjusting rods and bevel gears manually. The design of the height-adjustable shoe is given in figure-5.
Figure-5 Design of Height-adjustable high-heeled shoe

2.7 Shoe for Ladies with multiple heels

A ladies shoe with multiple heels [14] is proposed. In this invention two heels are attached at the rear end of the bottom of the shoe. The heels are connected through pins with the soul of the shoe. This design will help to raise the height of the wearer up-to 10 cm.

Figure-6 Shoe with two heels

3. Limitations

The literature survey shows that the available system for modifying the height of heel is too complex in terms of involved components. As an example, in order to provide a facility for modifying the height of heel, US 8,322,053 B2 discloses a folding mechanism of the heel which is to be adjusted manually. So, whenever women wishes, she can fold the heel accordingly and use. But it involves a manual operation for modifying the height of heel which could be time consuming and moreover involves a physical effort [15].

4. Proposed solution

In order to reduce the physical effort and cost of producing a heel with adjustable heel height capability, the present invention discloses a cost effective and a simple arrangement for
modifying the height of heel without even touching it. The inventors have proposed an automatic adjustable heel to be used in a shoe. The said heel comprises a mini screw jack connected with a motor unit. The motor unit rotates the mini-screw jack upon getting a signal from a mobile via a controller. The whole setup of heel is protected by means of an adjustable material which simultaneously provides a protection to involved components as well as a nice view when wore. The whole arrangement is appropriately placed in the heel. Figure-7 depicts the different views of the proposed design of footwear design. The said microcontroller is configured to provide either of clockwise or anti-clock wise rotational signals to a motor via wire. The said motor is further connected with a mini screw-jack at its shaft in such a way that whenever a clockwise rotational signal is provided by microcontroller, the motor rotates the connected mini screw-jack in clockwise direction thereby expanding the mini screw-jack and hence increasing the height of the heel up to desired height level within the permissible higher height of the mini screw-jack. Also, whenever an anti-clockwise rotational signal is provided by microcontroller, motor rotates the connected mini screw-jack in anti-clockwise direction thereby contracting the mini screw-jack and hence decreasing the height of the heel up to desired height level within the permissible lower height of the mini screw-jack. The heel is adjusted to modify the height of the heel in the range of 2-4 inches which can further be extended or lowered.

The microcontroller is further embedded with an appropriate communication module so that it can communicate with a mobile via a wireless communication link. The microcontroller used for the study consists of an inbuilt Bluetooth module. Any other used communication link will fall under the scope of this invention. The communication module receives the signal transmitted by mobile and transfers to the microcontroller. The microcontroller processes the signal and transfers to the motor. Now, the motor rotates accordingly either clockwise or anticlockwise direction and the connected mini screw-jack accordingly increases or decreases the height of the heel. Also, the application is configured to modify the height of individual heel or both heels together.

The outer periphery of the heel is made up an adjustable material whose height can contract as well as elongate along with heel height. The said adjustable material henceforth provides a shelter to the electronic and mechanical components placed in the heel with simultaneous good view from outside.
5. Summary

The invention discloses a shoe with an automatic adjustable heel wherein the heel is configured to adjust its height from ground as per requirement of the user by using a mobile application. A mini screw-jack arrangement connected with a motor unit is placed within a defined heel area. The motor obtains a signal from a controller placed at suitable place nearby heel area. An additional communication module connects the controller with mobile application. Whenever user wants to adjust the heel height, user presses button from mobile application which signals the controller via communication module to start the motor unit. The connected motor unit accordingly rotates the mini screw-jack arrangement to either shift up or down the heel height from ground. The outer periphery of heel area is surrounded by an adjustable material for an easy uplifting or down lifting of the heel area with simultaneous protection to inner placed electrical and mechanical components.

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