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(71) Applicant: **Wen, Jack**  
**Tsuo Ying, Kao Hsiung City (TW)**

(72) Inventor: **Wen, Jack**  
**Tsuo Ying, Kao Hsiung City (TW)**

(74) Representative:  
**Cheyne, John Robert Alexander Mackenzie**  
**Haseltine Lake & Co.,**  
**Imperial House,**  
**15-19 Kingsway**  
**London WC2B 6UD (GB)**

### (54) **Shock-absorbing footwear**

(57) A footwear shock-absorbing device comprises a lower receiving member (10), an upper receiving member (20), a plurality of fastening members (30), and a plurality of coil springs (40). The lower receiving member (10) has a flat bottom (12) provided with a plurality of columnar projections (14). The upper receiving member (20) is located on the lower receiving member (10) and provided with a flat top (22) in contact with a footwear pad (4). The fastening members (30) are fastened respectively at one end thereof with said columnar projections (14). The coil springs (40) are fitted respectively over the fastening members (30) such that both ends of the coil springs (40) urge the flat top (22) of the upper receiving member (20) and the flat bottom (12) of the lower receiving member (10), so as to enable the fastening members (30) to locate at an upper dead point at such time when the fastening members (30) are not exerted on by an external force.

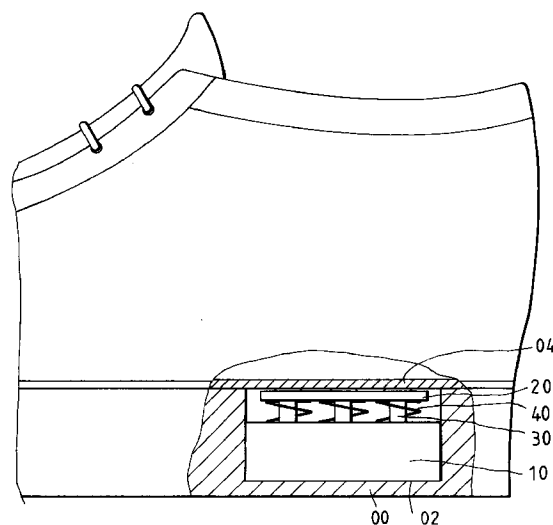


FIG. 1

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## Description

The present invention relates generally to shock-absorbing footwear and more particularly to a footwear shock-absorbing footwear cushion.

The U.S. Patent Nos. 2,668,374; 4,267,648; and 4,322,893 disclose respectively a shoe sole which is provided with a plurality of coil springs for absorbing impact. The coil springs are used to mitigate the shock in view of the fact that they can be easily made at a low cost, and that the coil springs of various specifications are always available. Nevertheless, a variety of problems often arise from the coil springs, which can not be easily located and must be provided with the rigid plates that are fastened with the free ends of the coil springs so as to prevent the stress from being concentrated on the free ends of the coil spring. Such a footwear shock-absorbing device as described above is limited in design in that it is not cost-effective, and that it can not be used in all kinds of footwear, and further that it makes a footwear uncomfortable to wear.

The U.S. Patent No. 5,343,537 discloses a footwear shock-absorbing device capable of overcoming the drawbacks of the coil springs described above. However, this disclosure is rather complicated in construction and is therefore not cost-effective.

According to the present invention, there is provided a footwear shock-absorbing device comprising:

a lower receiving member provided with a flat bottom and a plurality of columnar projections of a tubular construction, said lower receiving member being disposed in a receiving cell of a footwear sole;

an upper receiving member located on said lower receiving member and provided with a flat top in contact with a footwear pad;

a plurality of fastening members each having one end which is fastened with said flat top of said upper receiving member, each of said fastening members further having another end which is fitted into one of said columnar projections such that said another end is located at an upper dead point; and

a plurality of coil springs each being fitted over said fastening member such that both ends of said coil springs urge said flat top of said upper receiving member and said flat bottom of said lower receiving member for enabling said fastening members to locate at said upper dead point at such time when said fastening members are not exerted on by an external force.

One embodiment of the present invention provides a footwear shock-absorbing device suitable for use in a variety of shoes which are available in the market place

today.

Another embodiment of the present invention provides a footwear shock-absorbing device which makes use of the coil springs and is relatively simple in construction and cost-effective.

A further embodiment of the present invention provides a footwear shock-absorbing device with a flat and smooth receiving surface for preventing the stress from being concentrated on the free ends of the coil springs.

A further embodiment of the present invention provides a footwear shock-absorbing device, which comprises a lower receiving member having a flat bottom mountable in the receiving cell of a footwear sole. The flat bottom is provided with a plurality of columnar projections. The device further comprises an upper receiving member having a flat top in contact with the pad of the footwear. A plurality of fastening members are disposed between the lower receiving member and the upper receiving member such that the fastening members are fastened respectively at one end thereof with the flat top of the upper receiving member, and at another end thereof with the columnar projection, and that the fastening members are respectively fitted into a coil spring. The coil spring has two ends urging respectively the flat bottom of the lower receiving member and the flat top of the upper receiving member so as to keep each of the fastening members to locate at an upper dead point at such time when the fastening members are not exerted on by an external force.

For a better understanding of the invention, and to show how the same may be carried into effect, reference will now be made, by way of example, to the accompanying drawings, in which:-

FIG. 1 shows a side elevational view of a first preferred embodiment of the present invention.

FIG. 2 shows a to plan view of the first preferred embodiment of the present invention.

FIG. 3 shows a sectional view of a portion taken along the direction as indicated by a line 3-3 shown in FIG. 2.

FIG. 4 shows a bottom plan view of the first preferred embodiment of the present invention.

FIG. 5 is a schematic view illustrating the structure of a footwear shock-absorbing device in combination according to the first preferred embodiment of the present invention.

FIG. 6 shows a sectional view of a second preferred embodiment of the present invention.

FIG. 7 shows a sectional view of a third preferred embodiment of the present invention.

FIG. 8 shows a sectional view of a fourth preferred embodiment of the present invention.

FIG. 9 shows a side elevational view of a fifth preferred embodiment of the present invention.

FIG. 10 shows a side elevational view of a sixth preferred embodiment of the present invention.

As shown in FIGS. 1-4, a footwear shock-absorbing device embodying the present invention is composed of a lower receiving member 10, an upper receiving member 20, a plurality of fastening members 30, and a plurality of coil springs 40.

The lower receiving member 10 has a flat bottom 12 capable of being located in an inner bottom 02 of the receiving cell of a footwear sole 00. The flat bottom 12 is provided with a plurality of columnar projections 14 extending upwards. Each of the columnar projections 14 has a large hole 141 extending from the bottom thereof towards the top thereof, and a small hole 143 extending from the top thereof towards the bottom thereof. Located at the junction of the large hole 141 and the small hole 143 is a flat circular face 145.

The upper receiving member 20 is located on the lower receiving member 10 and is provided with a flat top 22 on which a shoe pad 04 is mounted. The upper receiving member 20 is provided with a plurality of through holes 24 corresponding in number and location to the columnar projections 14.

The fastening members 30 are provided respectively with two stopping blocks 32 and 34, which are made integrally of a plastic material by injection molding and are inserted into the through holes 24 and the corresponding columnar projections 14 for enabling the stopping blocks 32 and 34 to be retained by the through hole 24 of the upper receiving member 20 and on the circular faces 145 of the columnar projections 10. The stopping block 34 is provided with two slots 341 and 343, which are normal to each other to arrange in a cruciform shape.

The coil springs 40 have a free length equal to or longer than the length of the fastening members 30 and are fitted respectively over the fastening members 30 such that both ends thereof urge respectively the inner faces 16 and 26 of the two receiving members 10 and 20.

As shown in FIGS. 3 and 5, the stopping block 34 located at the tail end of each of the fastening members 30 is tapered along its outer circumferential edge and is provided with the slots 341 and 343 such that the stopping block 34 of the plastic material is resilient radially, and that the stopping block 34 is capable of recovering its original shape after being forced into the through hole 24 and the corresponding columnar projection 14. The stopping block 34 is forced by the spring 40 to engage securely the flat circular face 145, thereby enabling the upper receiving member 20 and the lower

receiving member 10 to join together securely as a shock-absorbing unit. The shock-absorbing unit is embedded in the footwear sole such that the spring compression stroke  $h$  is capable of mitigating the impact on a foot wearing the footwear. The compression stroke  $h$  referred to above is smaller than or equal to the depth  $H$  of the large hole 141 of the columnar projections 14. In addition, the fastening members 30 are provided with two fastening bolts 36 and 38 for holding the component members together, as shown in FIG. 6.

As illustrated in FIGS. 7 and 8, the upper receiving member 20 and the fastening members 30 are made integrally, as designated by 90 in FIG. 7. It is also suggested that the through hole 24 of each of the upper receiving members 20 is provided with a pillow hole 28 for averting the concentration of stress on the stopping block 32 located at the top end of each of the fastening members 30, as shown in FIG. 8.

As shown in FIG. 9, an embodiment of the present invention may be such that the lower receiving member 50 is provided with a plurality of columnar projections 52, and that the fastening member 30 is put through the columnar projections 52 so as to enable the stopping block 34 to engage the lower receiving member 50.

As shown in FIG. 10, a shoe midsole 08 of a soft and elastic material is provided with a rigid base 60 for supporting the shock-absorbing device of the present invention, which is located in a receiving cell 62 of the base 60. In addition, the upper receiving member 20 of the present invention may be provided with a plurality of columnar projections extending downwards for locating the coil springs. The embodiments of the present invention described above are to be regarded in all respects as being merely illustrative and not restrictive.

## Claims

### 1. A footwear shock-absorbing device comprising:

a lower receiving member provided with a flat bottom and a plurality of columnar projections of a tubular construction, said lower receiving member being disposed in a receiving cell of a footwear sole;

an upper receiving member located on said lower receiving member and provided with a flat top in contact with a footwear pad;

a plurality of fastening members each having one end which is fastened with said flat top of said upper receiving member, each of said fastening members further having another end which is fitted into one of said columnar projections such that said another end is located at an upper dead point; and

a plurality of coil springs each being fitted over

said fastening member such that both ends of said coil springs urge said flat top of said upper receiving member and said flat bottom of said lower receiving member for enabling said fastening members to locate at said upper dead point at such time when said fastening members are not exerted on by an external force.

2. The device as defined in claim 1, wherein said columnar projections are provided respectively at a bottom end thereof with a large hole, at a top end thereof with a small hole, and at a junction between said large hole and said small hole with a flat circular face. 10
3. The device as defined in claim 1, wherein said fastening members and said upper receiving member are made integrally. 15
4. The device as defined in claim 1, wherein said upper receiving member is provided with a plurality of through holes corresponding in location to said columnar projections; and wherein said fastening members are provided respectively with a stopping block extending to urge an outer circumferential edge of one of said through holes. 20 25
5. The device as defined in claim 4, wherein said through holes are pillow holes. 30
6. The device as defined in claim 4, wherein said stopping block is a bolt fastened with a top of said fastening member. 35
7. The device as defined in claim 1, wherein said upper receiving member is provided on a top thereof with a plurality of columnar projections extending downwards and corresponding in location to said columnar projections. 40
8. The device as defined in claim 1, wherein said fastening members are provided respectively at a bottom end thereof with a stopping block extending to urge an outer circumferential edge of said hole of said columnar projections. 45
9. The device as defined in claim 2, wherein said fastening members are provided respectively at a bottom end thereof with a stopping block extending to urge said flat circular face of said columnar projection. 50
10. The device as defined in claim 8, wherein said stopping block is a bolt fastened with a bottom of said fastening member. 55
11. The device as defined in claim 8, wherein said stopping block is made integrally with said fastening

member and is made of a plastic material by injection molding.

12. The device as defined in claim 11, wherein said stopping block is provided in a bottom thereof with a plurality of slots of a predetermined depth.
13. The device as defined in claim 12, wherein said slots of said stopping block are normal to one another to arrange in a cruciform shape.
14. The device as defined in claim 13, wherein said cruciform slots have a depth greater than or equal to a thickness of said stopping block.
15. A footwear comprising a footwear body and a plurality of shock-absorbing devices; wherein said footwear body comprises a sole, a pad located on said sole, and a vamp fastened with said sole for accommodating a human foot, said sole provided therein with a plurality of receiving cells for locating said shock-absorbing devices such that said shock-absorbing devices are located under said pad; and wherein said shock-absorbing devices are composed of a lower receiving member, an upper receiving member, a plurality of fastening members, and a plurality of coil springs, said lower receiving member being located in one of said receiving cells of said sole, said lower receiving member having a flat bottom provided with a plurality of columnar projections extending therefrom, said upper receiving member being located on said lower receiving member, said upper receiving member having a flat top in contact with said pad, said fastening members being fastened respectively at a top end thereof with said flat top of said upper receiving member and at a bottom end thereof with said columnar projections such that said bottom end is located at an upper dead point, said fastening members being fitted respectively into said coil springs each having both ends urging said flat top of said upper receiving member and said flat bottom of said lower receiving member so as to enable said bottom end of each of said fastening members to locate at said upper dead point at such time when said fastening members are not exerted on by an external force.
16. The footwear as defined in claim 15, wherein said sole comprises a midsole having a predetermined elasticity and softness; and wherein said receiving cells are located on said midsole.
17. The footwear as defined in claim 16, wherein said receiving cells are provided therein respectively with a base; and wherein each of said shock-absorbing devices is mounted on said base.

18. The footwear as defined in claim 15, wherein said columnar projections are provided respectively at a bottom end thereof with a large hole, at a top end thereof with a small hole, and at a junction between said large hole and said small hole with a flat circular face. 5
19. The footwear as defined in claim 15, wherein said fastening members are made integrally with said upper receiving member. 10
20. The footwear as defined in claim 15, wherein said upper receiving member is provided with a plurality of through holes corresponding in location to said columnar projections; and wherein said fastening members are provided respectively with a stopping block extending therefrom to urge an outer circumferential edge of said through hole. 15
21. The footwear as defined in claim 20, wherein said through holes are pillow holes. 20
22. The footwear as defined in claim 15, wherein said fastening members are provided respectively at a bottom end thereof with a stopping block extending to urge an outer circumferential edge of said hole of said columnar projection. 25
23. The footwear as defined in claim 18, wherein said fastening members are provided respectively at a bottom end thereof with a stopping block extending to urge said flat circular face of said columnar projection. 30
24. The footwear as defined in claim 22, wherein said stopping block is made integrally with said fastening members and is made of a plastic material by injection molding. 35
25. The footwear as defined in claim 24, wherein said stopping block is provided with a plurality of slots of a predetermined depth. 40

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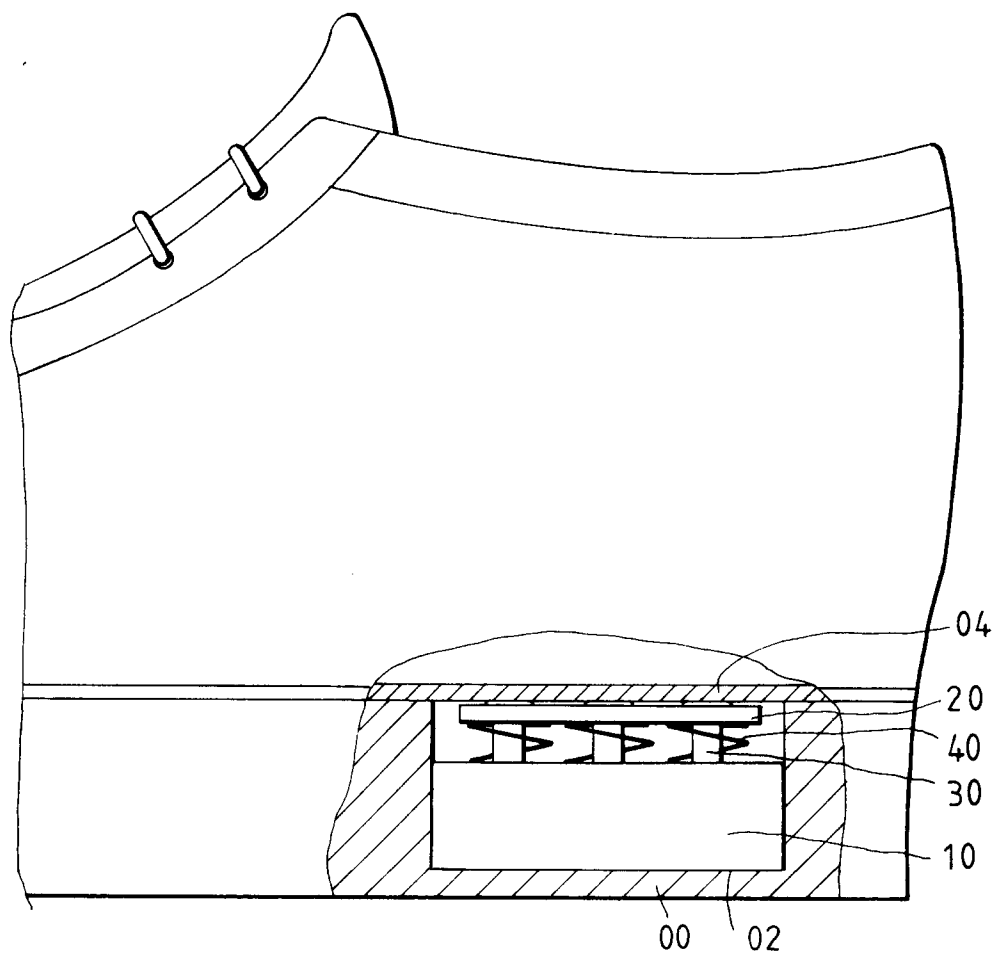


FIG. 1

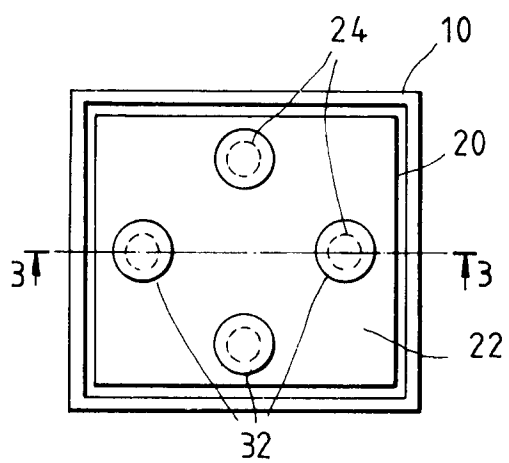


FIG. 2

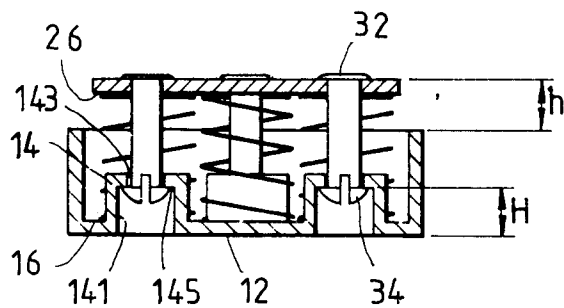


FIG. 3

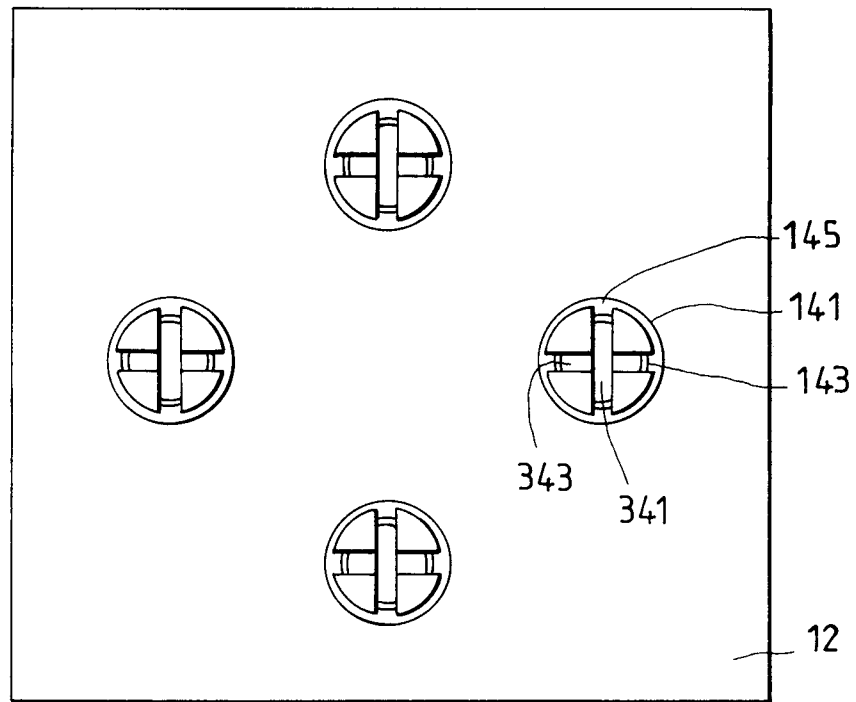


FIG. 4

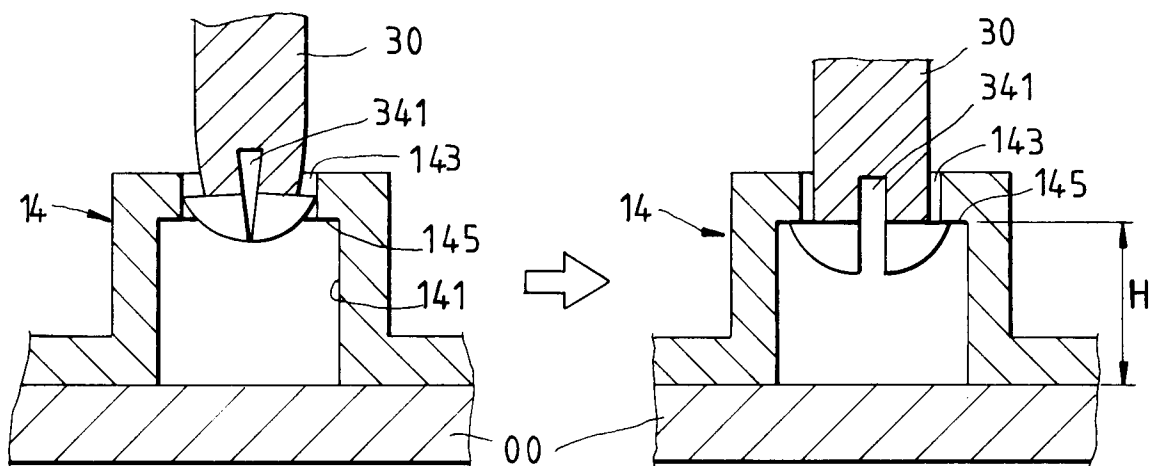


FIG. 5

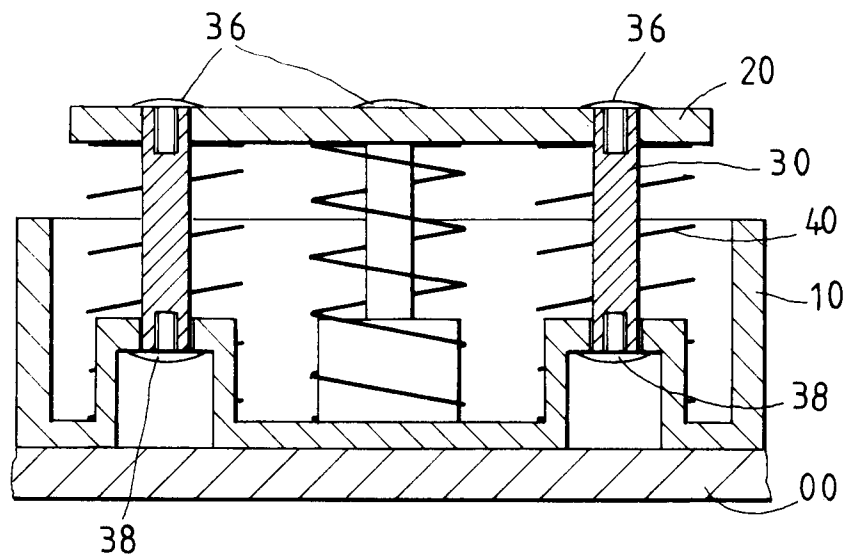


FIG. 6

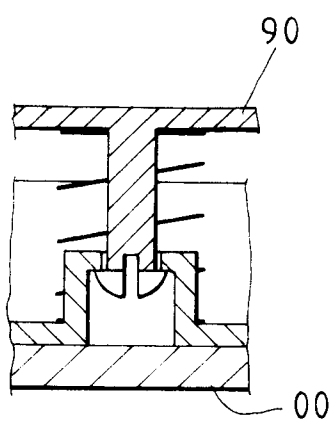


FIG. 7

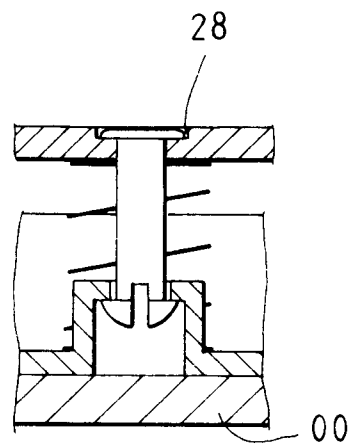


FIG. 8



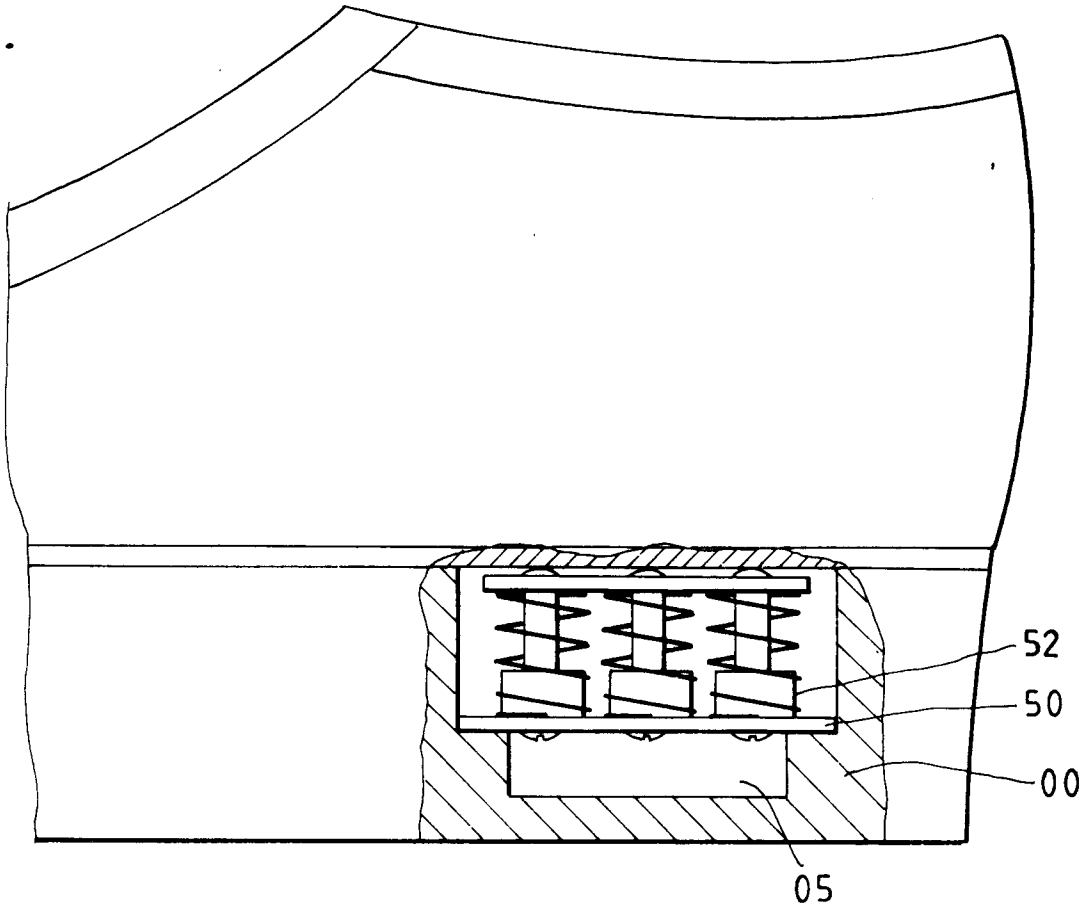


FIG. 9

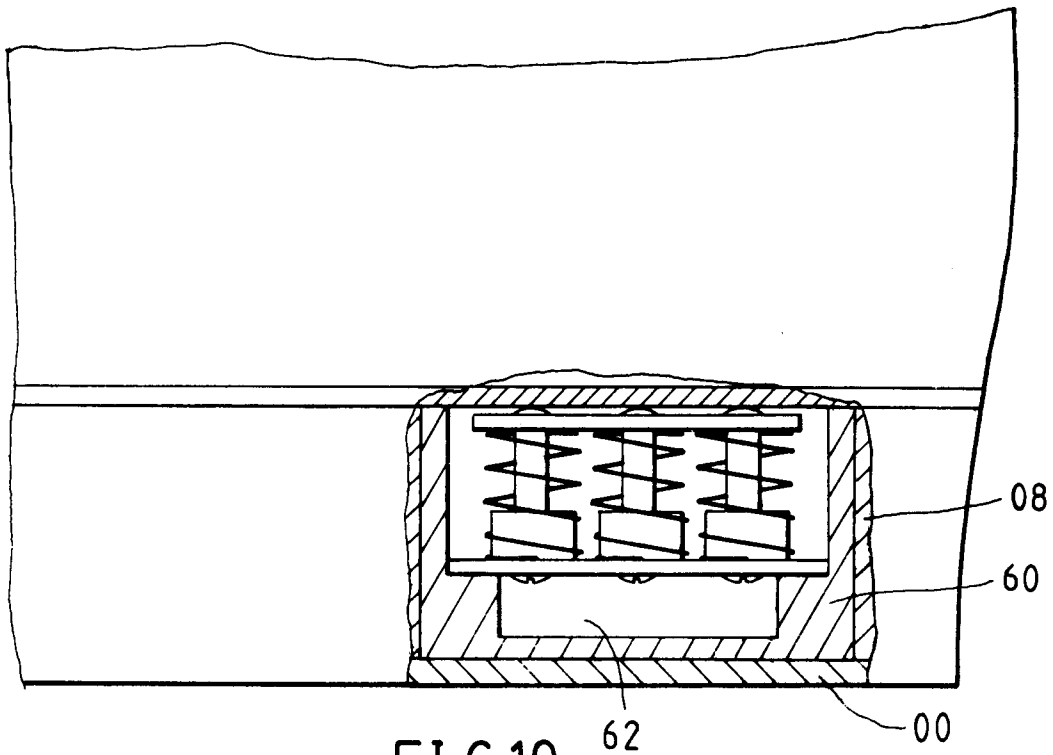


FIG. 10



European Patent  
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# EUROPEAN SEARCH REPORT

Application Number  
EP 96 30 8645

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
A	US 5 544 431 A (R. DIXON) * the whole document *	1,15	A43B13/18 A43B21/30
A	US 2 535 102 A (J. TAYLOR) * the whole document *	1,15	
A	US 1 510 841 A (J. HANLEY) * the whole document *	1,15	
A	US 2 721 400 A (S. ISRAEL) * the whole document *	1,15	
A	US 3 251 145 A (R. MACK) * the whole document *	1,15	
A	US 4 187 620 A (A. SELNER) * the whole document *	1,15	
A	CH 585 531 A (R. CENTANIN) * the whole document *	1,15	
A,D	US 4 322 893 A (N. HALVORSEN) * the whole document *	1,15	<div>TECHNICAL FIELDS SEARCHED (Int.Cl.6)</div> <div>A43B</div>
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 15 April 1997	Examiner Declerck, J
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