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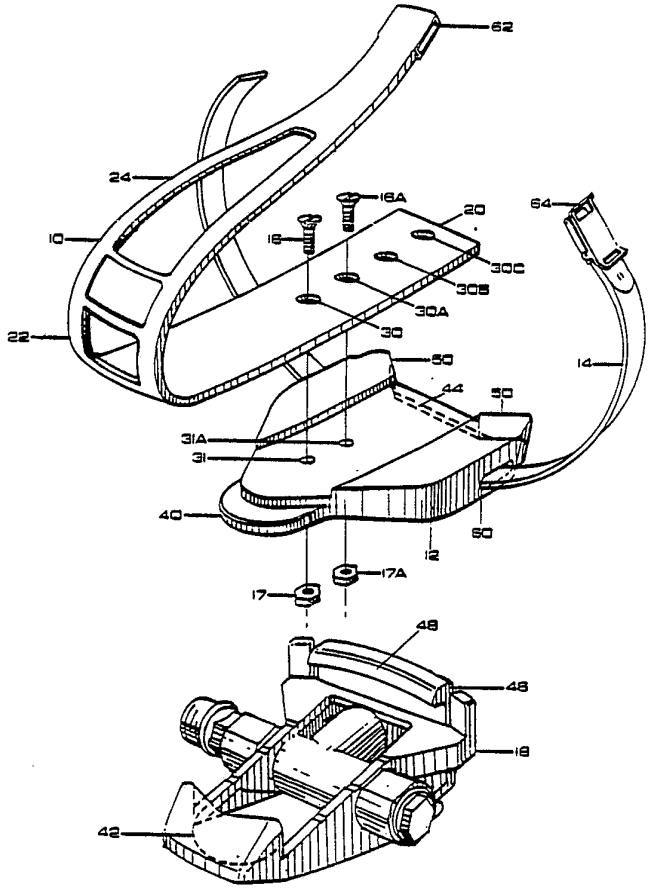
(54) Title: SHOE AND PEDAL ATTACHMENT DEVICE AND METHOD

(57) Abstract

A device and method for releasably attaching a shoe to a binding pedal. The shoe mates with a smoothly curved frame (10) attached by an adjustable and releasable strap (14). The frame (10) is adjustably attached to a platform (12) containing cleats (40, 44) which clip into the binding pedals.



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SHOE AND PEDAL ATTACHMENT DEVICE AND METHOD

BACKGROUND OF THE INVENTION

A number of devices allow a bicyclist to attach his foot to a bicycle pedal. Such attachment dramatically increases the efficiency of the bicyclist's leg strokes by allowing the bicyclist to apply force tangentially to the circular path of the pedal through its travel, rather than only as the pedal moves downwardly.

The existing devices are generally metal or plastic foot frames, together with leather or plastic straps. Those devices subject the bicyclist to a number of physical dangers and personal inconveniences. Once a shoe is attached to the pedal, it may be difficult to detach it. This difficulty can cause the bicyclist to fall off the bicycle when it is necessary to stop at traffic signals or at other times. Moreover, the bicyclist can be severely injured or killed if he is unable to roll away from the bicycle during an accident, especially at high speeds.

In response to these inconveniences and dangers, devices have been developed which attach the bicyclist's foot to the pedal but permit instantaneous detachment when necessary. Such a device is described in Patent No. 4,488,453 by Drugeon. Devices such as described in Drugeon typically require the permanent attachment of a rigid cleat about a half inch thick to the sole of an ordinary bicycle shoe beneath the ball of the foot. The cleat clips into a spring-loaded binding built into an irregularly-shaped platform fixed around a pedal spindle. The cleat can be removed from the spring-loaded binding by a twisting motion transmitted from the bicyclist's leg through the shoe and cleat.

The Drugeon-type devices have a number of drawbacks. Walking is indescribably uncomfortable in shoes with a half-inch cleat permanently attached to the bottom. Thus, bicyclists are forced to travel with an extra pair of ordinary shoes. Further, bicyclists find it inconvenient to put on the special cleated shoes for short rides. This reduces the actual use of the cleated shoes. It also tempts bicyclists to use a bicycle equipped with the binding pedals without going to the trouble of putting on the special shoes. Because ordinary shoes slip easily from the special pedals, this creates new risks of mishaps and accidents. Finally, the cleated shoes are inordinately expensive in view of their limited function and restricted use.

SUMMARY OF THE INVENTION

The primary object of the present invention is to create an adaptor for the spring-loaded binding pedals enabling them to function like conventional pedals while at the same time overcoming the shortcomings of both the conventional pedals and existing binding pedal systems.

A curved frame which is shaped to receive the forward portion of a shoe is bolted into a molded platform on the bottom of which are toe and rear cleats. The frame fits both right and left shoes. To secure the frame to the shoe, a strap made of leather or nylon is fitted through slots molded in both the frame and the platform and then fastened with a buckle near the outside ankle of the foot. The toe and rear cleats are configured to clip into ordinary binding pedals. The cleat is removably attached to the shoe using the frame-and-strap assembly, while the frame-and-strap assembly is removably attached to the pedal with the cleat.

To use the invention, the bicyclist can clip the frame into the pedal by hand and then ride the bicycle in ordinary shoes with the straps loosely fastened to allow the shoe to be slipped out of the frame if necessary. Alternatively, the bicyclist can strap the frame tightly to the shoes and then clip into the binding pedals upon mounting the bicycle. When stopping for traffic, the bicyclist may twist his foot slightly to unclip the shoe from the binding pedal.

The invention offers several important benefits to the bicyclist. First, it increases the versatility of a bicycle equipped with the clip-in pedals. Since the invention uses a cleat compatible with standard binding pedals, the cyclist has the choice of riding the bicycle in street shoes using the invention or riding it in the special, permanently-cleated shoes without the invention. Second, the invention increases the safety of the binding pedal when permanently cleated shoes are not in use. The shoe is secured to the pedal by the invention, reducing the chances for slippage and accident. Third, the invention is removably attached to the shoe, thus eliminating the need for specialized shoes of limited usefulness. Fourth, the invention is safer than conventional frame-and-strap attachments. When the invention is secured to the binding pedal, the modified pedal system functions in much the same way as the conventional system, yet with the important difference that the shoe, together with the invention attached to it, can be detached swiftly from the pedal, whether at a traffic light or in an emergency. Riders fearful of conventional frame-and-strap arrangements but still eager to obtain the efficiencies offered by fixing the shoe to a pedal can use the invention in concert with the clip-in system for optimal results and without the expense of cleated shoes.

An additional advantage is that the invention is adjustable to the size of the bicyclist's foot. The curved frame designed to hold the foot in place is fitted into a shallow channel molded in the top of the shoe platform. Once one of several different sizes is selected, bolts or other attachment means are inserted into spaced holes in the flat base of the frame. The bolts pass through the shoe platform and are tightened with locknuts fitted into recessed spaces in the underside of the platform near the cleat placement. Adjustability serves two functions: first, it accommodates variations in foot size; and, second, it provides the bicyclist an opportunity to obtain greater efficiency in pedal strokes by arranging the frame so that the ball of the foot is held directly over the center of the pedal.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a pictorial view showing the frame, strap and cleated platform of the invention, together with a typical binding pedal.

FIG. 2 is a top plan view of the cleated platform of the invention.

FIG.3 is a sectional view of the cleated platform of the invention, taken along line 3-3 of FIG. 2.

DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT

FIG. 1 shows the frame 10, cleated platform 12, securing strap 14 and attaching bolts 16 and 16A with securing nuts 17 and 17A, together with an ordinary binding pedal 18. The frame 10 has a bottom plate 20 to receive the bottom of forward portion of the bicyclist's shoe (not shown), a sharply curved toe

piece 22 for the toe of the bicyclist's shoe and an upper curved portion 24 which contacts the top of the forward portion of the bicyclist's shoe. The smooth and continuous joining of the bottom plate 20, toe piece 22 and upper curved portion 24 allows the frame 10 to snugly receive and hold the forward portion of the bicyclist's shoe.

The frame 10 is bolted to the cleated platform 12 by two bolts 16 and 16A which extend through holes 30 and 30A in the bottom plate 20 and holes 31 and 31A in the cleated platform 12, and which are tightened by nuts 17 and 17A on the lower surface of the cleated platform 12. The bolts 16 and 16A may be set screws which set into countersinks in the top of the bottom plate holes 30 and 30A, in order to avoid interfering with the smooth surface of the bottom plate 20 for receiving the bicyclist's shoe. As shown with the aid of FIG. 2 and FIG. 3, depicting a top plan view and sectional view, respectively, of the cleated platform 12, the nuts 17 and 17A may be tightened against the bolts 16 and 16A into recesses 32 and 32A in the bottom of the cleated platform 12 to avoid any interference with the binding pedal 18.

The bottom plate 20 has several other holes 30B and 30C spaced equally with holes 30 and 30A. The four holes 30, 30A, 30B and 30C allow the frame 10 to be positioned in three different locations relative to the cleated platform 12 by using either the forward two holes 30 and 30A, the middle two holes 30A and 30B, or the rear two holes 30B and 30C. This variable positioning allows the bicyclist to select the optimum placement of his foot with respect to the binding pedal, and also allows him to adjust the frame 12 to accommodate different foot sizes.

The cleated platform 12 is configured to fit ordinary binding pedals 18. Typically, the cleated platform 12 will have a toe cleat 40 with a flat top and bottom and a semicircular front that is nestled into a toe slot 42 in the binding pedal 18. The rear of the cleated platform 12 has a rear cleat 44 that is nestled under a lip 46 on the rear of the binding pedal 12. The lip 46 has a spring-loading (not shown) that allows forward and backward movement and has a bevelled upper surface 48.

The cleated platform 12 is attached to the binding pedal 18 by inserting the toe cleat 40 into the toe slot 42 and then pressing the rear cleat 44 down onto the upper bevel 48 of the lip 46, thereby forcing the lip rearward against the spring-loading until the rear cleat drops under the lip, whereupon the lip springs forward and over the rear cleat. The cleated platform 12 is thereby secured to the binding pedal 18. The cleated platform 12 is removed from the binding pedal 18 by applying a twisting or rotational force to the cleated platform about a vertical axis to effect a lateral movement of the rear cleat 44 one way or another. The lateral movement causes the lip 46 to be sprung rearward by angled wings 50 on each side of the rear cleat 44 until the angled wings clear the lip and the cleated platform is free.

The spring tension against the lip 46 of the binding pedal is typically adjustable to suit the individual bicyclist. By adjusting the tension to his own riding habits, the bicyclist can maintain sufficient attachment to allow forceful pedaling in all directions, while still being able to disengage himself with a quick twisting action of his foot.

Additional attachment of the frame 10 to the bicyclist's shoe is achieved with a flexible strap 14 extending through a platform slot 60 in the cleated platform 12, around the bicyclist's shoe and through a frame slot 62 in the upper curved portion 24 of the frame 10. The ends of the strap are connected with a buckle 64 or other connecting means to allow secure and adjustable tightening against the bicyclist's foot.

CLAIMS

What is claimed is:

1. A device for releasability securing a shoe to a spring-loaded binding pedal adapted to receive and releasably secure cleat means, comprising a platform containing said cleat means and a shoe-receiving frame attached to the top of said platform.

2. The device of claim 1, wherein said shoe-receiving frame has an interior surface mating with the forward portion of the shoe, including a horizontal bottom plate, a sharply curved toe piece at the forward end of said bottom plate extending upward and rearward, and an upper curved portion extending rearward, said bottom plate, toe piece and upper curved portion all being smoothly joined.

3. The device of claim 2, further comprising a flexible strap extending through a horizontal slot parallel to the pedal axis through said platform and slidably secured through said frame upper curved portion, and adjustable strap end attachment means.

4. The device of claim 2, wherein said platform is attached to said frame with at least one bolt extending vertically through a hole in said bottom plate and in said platform, the head of said bolt being in a countersunk hole in said bottom plate to prevent interference with the shoe, and wherein said bottom plate fits into a mating channel in said platform to inhibit rotational and lateral movement of said frame relative to said bottom plate.

5. The device of claim 5, further comprising at least one additional hole in said bottom plate to permit forward and backward adjustment of the frame position relative to said platform.

6. The device of claim 5, further comprising a nut tightened against each said bolt on the bottom of

the platform, each said nut fitting into a recess in said platform to prevent interference with the pedal.

7. A method for releasably securing a shoe to a spring-loaded binding pedal, comprising attaching the forward portion of said shoe to a mating frame including a bottom plate, a sharply curved toe piece and a curved upper portion, attaching said frame bottom plate to a cleat-containing platform, and clipping the cleats of said cleat-containing platform into said spring-loaded binding pedal.

8. The method of claim 8, wherein said attaching of the frame bottom plate to the cleat-containing platform is adjustable by choosing from a plurality of attachment bolt holes, and wherein said attaching of the forward portion of the shoe is aided by an adjustable strap extending through the platform and the frame curved upper portion.

AMENDED CLAIMS

[received by the International Bureau on 3 October 1988 (03.10.88); original claims 7 and 8 cancelled; claims 1-5 amended; new claims 9-11 added; claim 6 unchanged (2 pages)]

1. A device for releasably securing a shoe to a spring-loaded binding pedal adapted to receive and releasably secure cleat means, comprising a platform containing said cleat means and a shoe-receiving frame attached to the top of said platform.

2. The device of claim 1, wherein said shoe-receiving frame has an interior surface mating with the forward portion of the shoe, and said shoe-receiving frame includes a horizontal bottom plate, a sharply curved toe piece at the forward end of said bottom plate extending upward and rearward, and an upper curved portion extending rearward, said bottom plate, toe piece and upper curved portion all being smoothly joined.

3. The device of claim 2, further comprising a flexible strap extending through a horizontal slot parallel to the pedal axis through said platform and slidably secured through said frame upper curved portion, and adjustable attachment means at the end of said strap.

4. The device of claim 2, wherein said platform is attached to said frame with at least one bolt extending vertically through a hole in said bottom plate and in said platform, the head of said bolt being in a countersunk hole in said bottom plate to prevent interference with the shoe, and wherein said bottom plate fits into a mating channel in said platform to inhibit rotational and lateral movement of said frame relative to said platform.

5. The device of claim 4, further comprising at lest one additional hole in said bottom plate to permit forward and backward adjustment of the frame position relative to said platform.

6. The device of claim 5, further comprising a nut tightened against each said bolt on the bottom of the

platform, each said nut fitting into a recess in said platform to prevent interference with the pedal.

9. The device of claim 1, wherein said cleat means is releasable from said spring-loaded binding pedal by application of a rotational force about an axis perpendicular to the surface of said spring-loaded pedal.

10. The device of claim 9, wherein said cleat means includes a toe cleat at the forward edge of said platform and a rear cleat at the rear edge of said platform, said toe and rear cleats being protusions adapted to fit into said binding pedal.

11. The device of claim 10, wherein said toe cleat locks under a forward lip on said binding pedal and said rear cleat locks under a spring-loaded rear lip on said binding pedal, and said toe and rear cleats and said forward and rear lips are shaped so that upon rotation of said platform about an axis perpendicular to the surface of said spring-loaded binding pedal the spring-loaded rear lip is displaced rearward to release said rear cleat.

STATEMENT UNDER ARTICLE 19

Claim 1: The change to claim 1 is made to correct a typographical error in the original application.

Claim 2: Claim 2 has been amended to clarify that it is the shoe receiving frame that is being described in the claim.

Claim 3: Claim 3 has been amended to clarify that the attachment means are located at the end of the previously defined strap.

Claim 4: The change in claim 4 has been made to clarify that the frame is held stable relative to the entire platform by the channeling means.

Claim 5: Claim 5 has been amended to indicate the proper dependency.

Claims 7 - 11: Claims 7 and 8 have been cancelled and Claims 9-11 have been added in order to accentuate the differences between the device of the present invention and that described in the prior art of Steinvorth.

Steinvorth uses a pin and notch arrangement movable with a worm-thread upon reversal of the pedal direction. Steinvorth does not disclose a "cleat means" as required by all of the claims of the present invention. The meaning of "cleat" is described in the specification to mean only a particular device that is removable by a twisting

motion. For example, the last sentence on page 1 states:

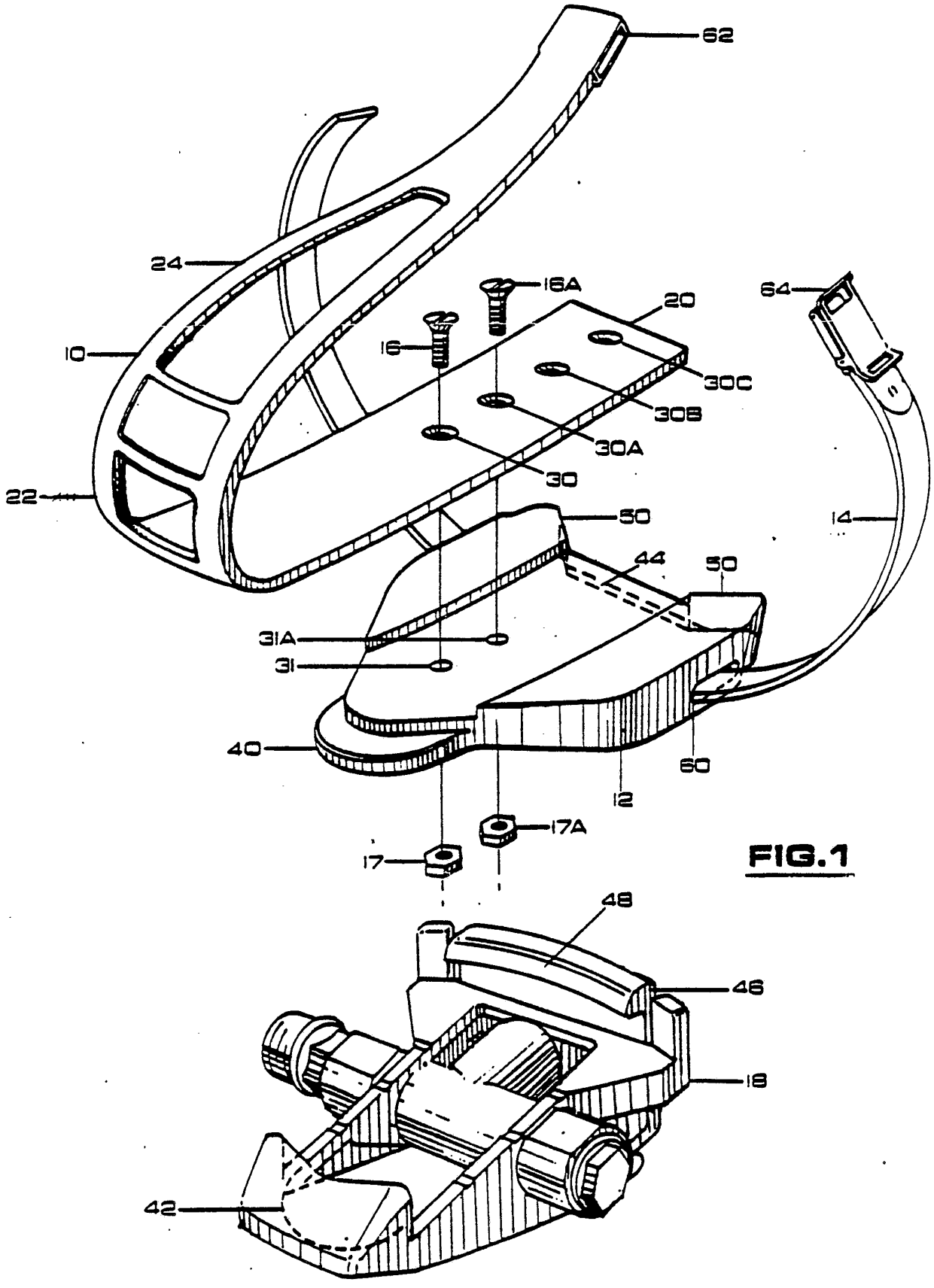
> The cleat can be removed from the spring-loaded binding by a twisting motion transmitted from the bicyclist's leg through the shoe and cleat.

Further, it is stated on page 6, lines 23-27 that

> The cleated platform 12 is removed from the binding pedal 18 by applying a twisting or rotational force to the cleated platform about a vertical axis to effect a lateral movement of the rear cleat 44 one way or another.

The Steinvorth arrangement would not be characterized as a "cleat" under the meaning given it within the specification.

The new claims 9-11 expressly include the cleated means described in the specification and drawings. The detailed combination of elements as described herein is not taught or suggested by any of the references uncovered in the International Search Report.


62
24
16A
20
64
10
16
30C
30B
30A
30
22
50
14
44
50
31A
31
40
60
12
17A
17
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18
42

FIG.1

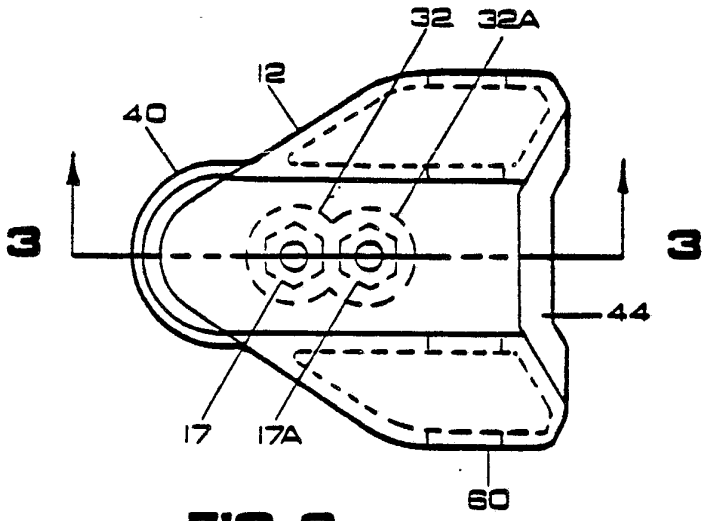

FIG. 2

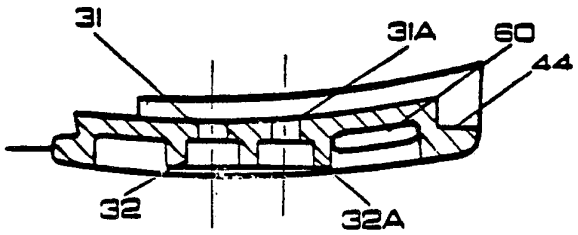

FIG. 3

INTERNATIONAL SEARCH REPORT

International Application No. PCT/US88/00179

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) [6]

According to International Patent Classification (IPC) or to both National Classification and IPC

IPC(4):G05G 1/14;A43B 5/00; B62M 3/08

US. CL. 74/594.4,594.6; 36/131

II. FIELDS SEARCHED

Minimum Documentation Searched [7]

Classification System	Classification Symbols
U.S.	74/594.6,560,594.7,594.4,594.5;36/131

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched [8]

III. DOCUMENTS CONSIDERED TO BE RELEVANT [9]

Category *	Citation of Document, [11] with indication, where appropriate, of the relevant passages [12]	Relevant to Claim No. [13]
X	GB,A, 703,040 (STEINVORTH) 27 JANUARY 1954 (SEE FIGURE 6 AND PAGE 3, LINES 31-34)	1-3,7
Y	FR,A, 2,510,967 (CHAVANON) 11 FEBRUARY 1983 (SEE FIGURES 4 AND 5)	4,5
Y	GB,A, 19,241 (LUCAS) 13 OCTOBER 1893	4,5,8
Y	EP,A, 57,240 (CERESOLI) 11 AUGUST 1982	6
A	GB,A, 7,248 (DENNY) 19 APRIL 1900	1-8
A	US,A, 639,132 (AVERY) 12 DECEMBER 1899	1-8

* Special categories of cited documents: [10]

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IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
05 JULY 1988	25 JUL 1988.
International Searching Authority	**Signature of Authorized Officer**
ISA/US	RODNEY M. LINDSEY

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III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)

Category *	Citation of Document, with indication, where appropriate, of the relevant passages	Relevant to Claim No
A	US,A, 4,686,867 (Bernard et al.) 18 August 1987	1-8
A	US,A, 4,488,453 (Drugeon et al.) 18 December 1984	1-8
A	US,A, 588,038 (Tudor) 10 August 1897	1-8
A	US,A, 581,481 (Spencer) 20 April 1897	1-8
A	GB,A, 427,576 (Bench) 26 April 1935	1-8
A	DE,A, 3,426,103 (Beck et al.) 23 January 1986	1-8
A	DE,A, 3,424,759 (Eser et al.) 16 January 1986	1-8
A	DE,A, 3,414,971 (Eser et al.) 31 October 1985	1-8
A	FR,A 1,013,908 (Villebonnet) 06 August 1952	1-8
A	FR,A, 667,032 (Dome) 09 October 1929	1-8
A	EP,A, 29,192 (MAZZAROLO) 27 May 1981	1-8
A	FR,A, 2,279,607 (Gormand) 20 February 1976	1-8
A	DE,A, 3,149,345 (Kupper) 16 June 1983	1-8