DIRECTORATE OF DISTANCE EDUCATION
NALSAR UNIVERSITY OF LAW, HYDERABAD

Post-Graduate Diploma in Patents Law (Batch 2019 – 2020)

Take Home – Supplementary Examination (January, 2021)

Paper II – Practical

Exploitation of Patents – Drafting, Specification & Patent Writing

TOTAL MARKS: 100

INSTRUCTIONS TO CANDIDATES

a) Read the instructions for Take Home Examination carefully and adhere to the same.
b) Please mention your name, ID No., subject name and total number of pages on the Answer Sheet.
c) Clearly indicate the question numbers while answering them.
d) The question paper to be interpreted as given and no additional clarification can be sought.
e) Attempt only one choice – either A or B
f) Since this is a take home exam, we expect your answers to be analytical rather than straight answers.
g) Copying from any source including from other students is strictly prohibited. Plagiarism is considered as a serious academic mis-conduct and the University will take action as it deems fit.

You are required to draft a complete specification containing; a.) Title of the Patent b.) Background of the Invention c.) Summary of the Invention d.) Claims e.) Abstract of the invention. (Do not write a detailed description or draw figures.)

The Claims in the patent draft carries 50 marks and remaining specification carries 50 marks.

Option A

Three brothers – Mark, Adam and Rayan have developed an athletic shoe which includes an upper, an outsole, a pair of hinged plates, and a spring. The pair of hinged plates are attached between the outsole and the upper in a forefoot portion of the shoe, and the spring biases the plates apart, so that energy is stored and returned during a propulsion phase of a gait cycle in a human step. Foam may be disposed between the plates. A shroud may enclose an outer periphery of the plates. An adjustable torsion spring may be disposed in a hinge portion of the plates, and one or more wave springs may be disposed between the plates.

A catapult device of the present invention is located ahead of the ball of the foot and directly below the forefoot of the foot in a forefoot portion of a shoe. device. Such catapult devices are very effective in storing and returning energy where an athlete needs it most: at the front of the shoe, which is where the toe-off in running or jumping occurs. A shoe in the present invention comprises an outsole having a heel portion, a ball portion, and a forefoot portion, and a catapult device comprising two plates and a spring, where the catapult device is located at least partially above the forefoot portion of the outsole. A method in the present invention allows for storing and returning energy during a propulsion phase of a gait cycle in a human step using a catapult device in a shoe including two plates and a spring that biases the two plates apart from each other. The method comprises applying, with a foot, a force on at least one of the two plates that is positioned in the shoe beneath a forefoot portion of the foot, so as to move the two plates together and increase a loading of the spring, and launching the foot due to the two plates being moved apart by the spring as the foot is being lifted.

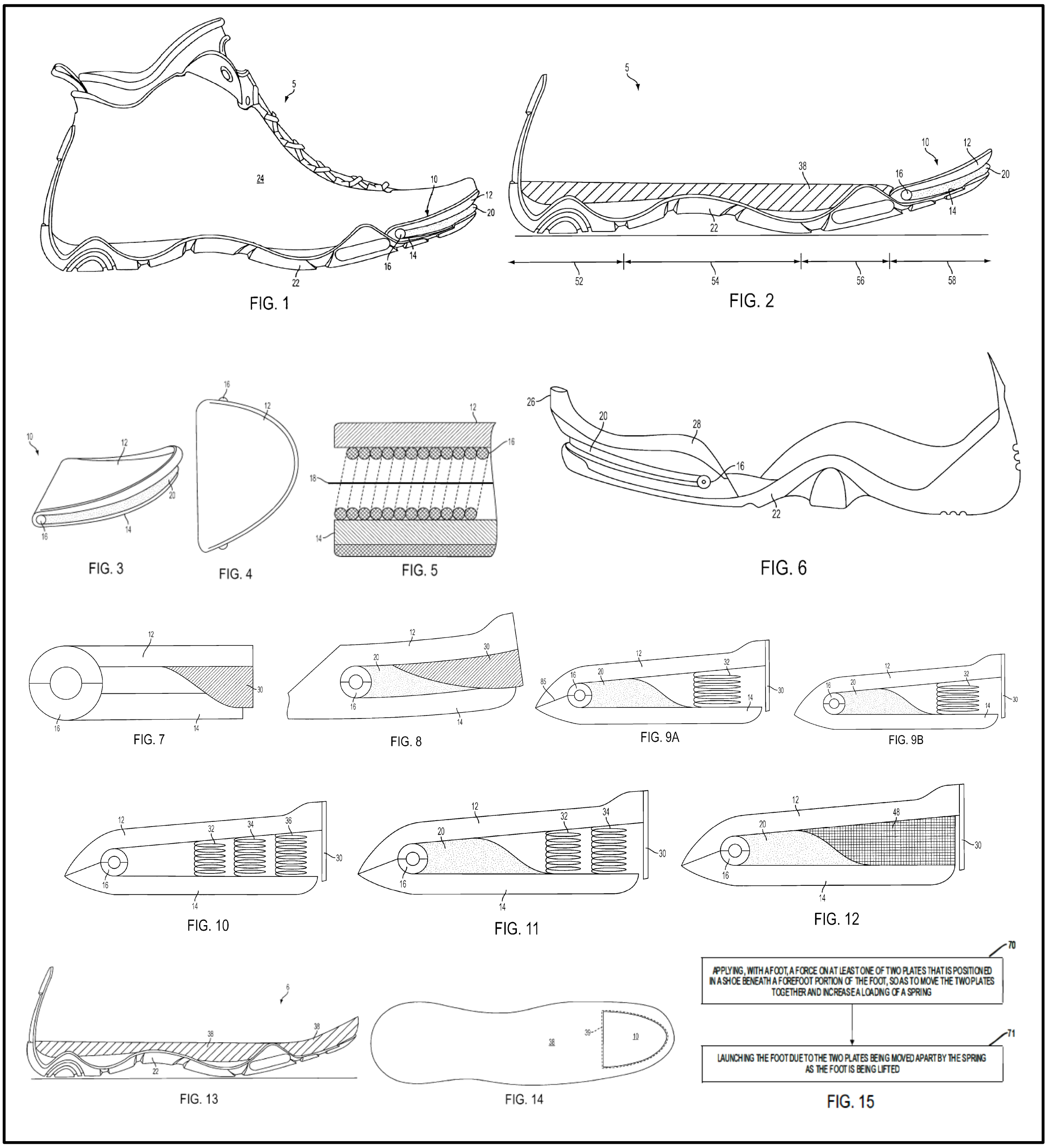

FIG. 1 shows a side view of a catapult device in accordance with an embodiment of the present invention when installed in an athletic shoe;

FIG. 2 shows a side view of a portion of a shoe in accordance with an embodiment of the present invention including a catapult device in an outsole of the shoe;
FIG. 3 shows a perspective view of a catapult device in accordance with an embodiment of the present invention;
FIG. 4 shows a top view of a catapult device in accordance with an embodiment of the present invention;
FIG. 5 shows a partial cross sectional view of a torsion spring mounting in a catapult device in accordance with an embodiment of the present invention;
FIG. 6 shows an alternative embodiment of a catapult device of the present invention, with a top part of the catapult device functioning as a toe bumper;
FIG. 7 shows an alternative embodiment of the catapult device including a shroud;
FIG. 8 shows an embodiment of a catapult device of the present invention;
FIG. 9A shows an embodiment of a catapult device of the present invention, with a wave spring augmenting a torsion spring;
FIG. 9B shows another embodiment of a catapult device of the present invention, with a wave spring augmenting a torsion spring;
FIG. 10 shows an embodiment of a catapult device of the present invention, with wave springs augmenting a torsion spring;
FIG. 11 shows an embodiment of a catapult device of the present invention, with wave springs augmenting a torsion spring;
FIG. 12 shows an embodiment of a catapult device of the present invention, with an energy return material augmenting a torsion spring;
FIG. 13 shows a side view of a portion of a shoe in accordance with an embodiment of the present invention;
FIG. 14 shoes a top view of a midsole having a cavity in which a catapult device is located in accordance with an embodiment of the present invention; and
FIG. 15 shows a flowchart of a method in accordance with an embodiment of the present invention.

Referring to FIG. 1, an athletic shoe 5 is provided with a catapult device 10 according to the present invention. The catapult device 10 is mounted in an outsole 22 of the shoe 5, as shown in more detail in FIG. 2. The catapult device 10 includes a top plate 12 and a bottom plate 14 that are hinged together via a pin 18 (or similar means), as shown in FIG. 5. Also, in a neutral position the plates 12 and 14 are parallel to each other, forming what might be explained as a duck-bill, as shown in FIGS. 3 and 4. The plates 12 and 14 can have a limited motion that allows movement toward one another but not opening beyond (any more than) the two plates being parallel to each other.

With reference to FIG. 1, various materials could be used for the plates 12 and 14, including polymer, block polymer, monomer, etc., that exhibit properties conducive to use in processes known as injection moulding, and in some cases extrusion and the like, or other types of moulding such as compression moulding, etc. The material is selected for rigidity, because in practice the catapult device 10 will be subjected to tremendous force as a wearer goes through a gait cycle ending up on the balls of the feet. At the apex of the propulsion phase of the gait cycle, the catapult device 10 will be subjected to several times the wearer's body weight as the device is "*loading*". During this loading, it may be desirable that the catapult device 10 does not deform under stress. Such deformity would result in loss of load factor resulting in diminished return of energy and a corresponding decrease in the actual intended performance. As such, thin steel is potentially usable to reinforce other materials to ensure the requisite rigidity.

A variety of hinge mechanisms could be used with the plates 12 and 14, such as a barrel hinge, butt hinge, living hinge, plain hinge, or others. A barrel hinge can include moulded features to control a movement of the plates 12 and 14 around its axis, to prevent it from springing open, such as a slot and key feature, or notched stop. A barrel hinge would form the two plates 12 and 14 into a single device with a single axis of rotation. A helical torsion spring 16 may encircle the hinge pin 18, and may bias the plates 12 and 14 apart consistent with a strength of the particular spring utilized. The helical torsion spring 16 is shown in more detail in FIG. 5 or the helical torsion spring 16 is constructed from a metal wire or rod twisted or formed into a helical coil. Each end of the coil may be biased against the plates 12 and 14. Adjustment of the torsion is achieved therein via an inner coil which acts to control the deformation of an outer coil. Alternatively, a torsion spring could be located within a barrel hinge formed as an integral member of the top and bottom plates 12 and 14. Once the catapult device has been properly assembled and installed within the forepart of the footwear, and the wearer moves into the apex of a gait cycle (i.e. toe-off in jumping), the force applied to the top plate 12 will push the two plates 12 and 14 together. This will increase the torque loading of the helical torsion spring 16, and provide the wearer with a launch factor equal to a release of torque from the helical torsion spring 16.

The plates 12 and 14 there can be lightweight foam 20, as shown in FIGS. 1-3. This component's purpose is basically as filler, and may extend partially (FIG. 8) or completely (FIG. 2) between the plates 12 and 14. The catapult device 10 may perform optimally in a case where the space between the plates 12 and 14 is void or empty. However, given the normal spectrum of use for footwear, it might not be desirable to leave the space empty in many instances. Dirt, mud, water, snow, ice, etc. (debris) may find its way within the space and could significantly decrease or even destroy the function of the device. Therefore, a means of blocking debris from entering the working space between the plates 12 and 14 is useful. Because the catapult device 10 would perform optimally without any material between the plates 12 and 14, it may be desirable for performance reasons to include a material that is lightweight, reflects good tear strength values, and that possesses specific compression properties. In addition to the criteria above, the ideal candidate foam 20 would compress under very low loading and compress to 30% of original thickness gauge or more. Based upon these criteria, the foam 20 would preferably be of an open cell type. Thus, polyurethane, rubber, rubber latex, PVC or polyethylene can be used.

One purpose of the foam 20 is to avoid debris collecting between the plates 12 and 14. The foam 20 may slightly inhibit the performance of the catapult device 10, since it adds resistance in the loading phase of performance. Alternatively of the invention shown in FIG. 7, the foam 20 may be replaced with a front shroud 30 on one of the plates 12, 14 (in FIG. 7, it is shown attached to the top plate 12). The shroud 30 acts to keep debris from entering between the plates 12 and 14, and wraps around a perimeter of the toe area.

The foam 20 may be reduced in size or removed completely to allow the use of other springs 32, 34, 36 as shown in FIGS. 9A, 9B, 10, and 11. The springs 32, 34, 36 assist the torsion spring 16 in providing propulsion to the wearer of the shoe. Wave springs are particularly advantageous because the energy return is almost entirely axial, which would serve to press the plates 12 and 14 apart after compression. The springs 32, 34, 36 could be attached directly to the top and bottom plates 12 and 14 in various models. An energy return or rebound material 48 may be disposed between the plates 12 and 14, as shown in FIG. 12. The energy return material 48 comprises rubber, Hytrel®, or the like, and creates an additional energy return effect.

With reference to FIG. 9A, the top plate 12 and the bottom plate 14 are manufactured as separate units and may have portions in contact with each other at a contact location 85. With reference to FIG. 9B, the top plate 12 and the bottom plate 14 are manufactured as a single continuous unit.
The catapult device 10 is mounted to the outsole 22 under a forefoot region by conventional means (gluing, stitching, etc.) and replaces the midsole 38 in the forefoot portion of the shoe 5, as shown in FIG. 2. With reference to FIG. 2, the shoe 5 may be described with respect to different portions of the shoe 5 along a length of the shoe 5, including a heel portion 52, an arch portion 54, a ball portion 56, and a forefoot portion 58.

With reference to FIG. 1, an optimal function of the catapult device 10 within the shoe 5 requires an absence of any material (foam/rubber/etc.) between the catapult device and the shoe upper 24. In other words, to have the shoe upper 24 sit directly on the catapult device 10 in the forepart for best performance, as shown in FIG. 1. Therefore, the top plate 12 of the catapult device 10 would be configured to wrap up around the shoe upper 24 and in addition to its primary function of propulsion, forms features such as a toe bumper 26 and a sidewall 28, as shown in FIG. 6. Such a unique construction with the top plate 12 configured to wrap up around the shoe upper 24 would create a very rigid toe bumper 26 and sidewall 28, which would be a departure from typical basketball footwear.

FIG. 13 shows a side view of part of a shoe 6 of the present invention. The shoe 6 includes an outsole 22 and a midsole 38. In the shoe 6, the midsole 38 extends into a forefoot portion of the shoe 6. FIG. 14 illustrates a top view of the midsole 38 from FIG. 13 the present invention, where the midsole 38 includes a cavity 39 of the catapult device 10 is located.

FIG. 15 illustrates a method of the present invention. The method of FIG. 15 allows for storing and returning energy during a propulsion phase of a gait cycle in a human step using a catapult device in a shoe including two plates and a spring that biases the two plates apart from each other. The method comprises (step 70) applying, with a foot, a force on at least one of the two plates that is positioned in the shoe beneath a forefoot portion of the foot, so as to move the two plates together and increase a loading of the spring, and (step 71) launching the foot due to the two plates being moved apart by the spring as the foot is being lifted.

<u>Option B</u>

Ranveer has developed a method and a device for detecting the impact of a pedestrian with a vehicle, at least one sensor being provided on the bumper and at least one sensor in the area of the front edge of the hood of the engine to measure the pressures or deformations caused by impact and to form a first criterion for the decision as to whether there has been an impact with a pedestrian on the basis of the sensor output signals by comparison with reference quantities.

An object of the present invention is to provide a method and a device with which it is possible in the event of an impact on the front side of a vehicle to decide with the highest possible reliability whether this impact has been caused by a pedestrian.

An example of the invention involves at least one sensor mounted on the bumper and at least one sensor in the area of the front edge of the engine hood to measure the pressures or deformations caused by an impact. The sensor output signals are compared with reference quantities to derive a first criterion for the decision as to whether it is a pedestrian impact, and the change in velocity and/or acceleration of the vehicle caused by the impact may be determined. By comparing the change in velocity and/or acceleration with a reference quantity, a second criterion for deciding whether it is a pedestrian impact may be formed, and when both decision criteria are met, the decision may be made that it is a pedestrian impact.

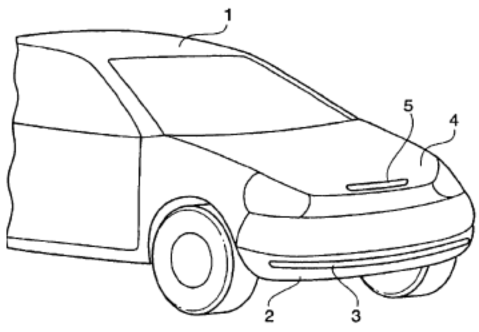

FIG. 1

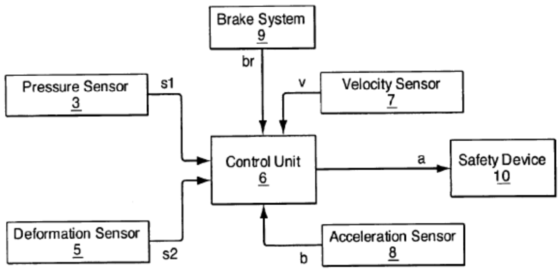

FIG. 2

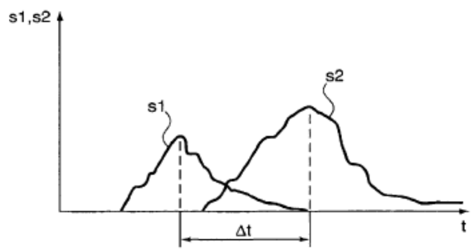

FIG. 3

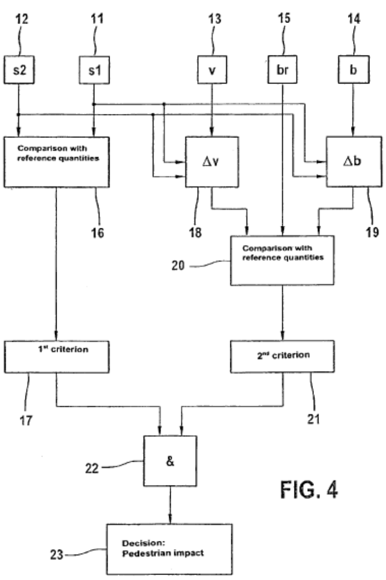

FIG. 4

FIG. 1 shows a front view of a motor vehicle having two sensors.
FIG. 2 shows a block diagram of a device for detecting an impact with a pedestrian.
FIG. 3 shows curves of sensor output signals in an impact with a pedestrian.
FIG. 4 shows a flow chart of the method for detecting an impact with a pedestrian.

As an example for detecting with the highest possible certainty whether a given impact with the front side of a vehicle is a pedestrian impact, vehicle 1 is equipped with a first sensor 3 on its bumper 2, as shown in FIG. 1, and a second sensor 5 on the front edge of its engine hood 4. Both sensors 3 and 5 may be pressure sensors or deformation sensors. Therefore, sensors 3, 5 may be mounted on bumper 2 as well as on the front edge of engine hood 4 because it may then be possible to detect the characteristic kinematics of a pedestrian impact with vehicle 1. In other words, if a vehicle strikes a pedestrian at its front side, the pedestrian may first come in contact with the bumper, so that sensor 3 on bumper 2 delivers a signal which depends on pressure or deformation. Bumper 2 absorbs only a small portion of the total kinetic impact energy. Contact with the bumper may impart to the pedestrian a rotational momentum, possibly throwing him onto the hood of the engine. Second sensor 5 on engine hood 4 may then detect this pressure or deformation produced by the impact with the pedestrian.

FIG. 2 shows a block diagram of a device, and FIG. 4 shows a flow chart of a method, with which impact with a pedestrian may be detected with a high reliability. In FIG. 2, reference numbers 3 and 5 denote pressure and deformation sensors mounted on the bumper and on the engine hood of the vehicle.

When sensor 3 on bumper 2 and sensor 5 on engine hood 4 are mentioned here, this also includes the possibility of multiple sensors or sensor elements being present on both bumper 2 and engine hood 4. Sensors based on different principles for measurement of pressure and deformation may be used. For example, the sensors may be wire strain gauges or piezo resistive films. Optical sensors having a pressure-dependent light transparency may also be used. Likewise, sensors based on the Hall effect or the anisotropic magneto resistive effect may also be used. Any sensor which produces a pressure- or deformation-dependent signal, regardless of the method, may be suitable in principle.

Output signals s1 and s2 of sensors 3 and 5 may be sent to control unit 6. In addition, output signal v of velocity sensor 7, acceleration signal b of acceleration sensor 8, and brake signal br delivered by brake system 9 may all be sent to control unit 6. If control unit 6 decides on the basis of aforementioned input signals s1, s2, v, b, br that an impact with the front side of the vehicle has been produced by a pedestrian, then control unit 6 delivers deployment signal a to safety device 10. Safety device 10 may be, for example, one or more airbags arranged on the engine hood or on the frame of the windshield. The airbags may be adapted to inflate on impact with a pedestrian. Furthermore, to protect the pedestrian, engine hood 4 may be inclined at an angle by a spring mechanism or a pyrotechnic mechanism when control unit 6 delivers deployment signal a.

FIG. 4 illustrates a method of detecting a pedestrian impact in a flow chart. Pressures and/or deformations s1 and s2 occurring on bumper 2 and on engine hood 4 may be measured with sensors 3 and 5 in method steps 11 and 12. In addition, velocity v and acceleration b of the vehicle may be measured continuously according to method steps 13 and 14. Brake signal br may also be determined according to method step 15.

In method step 16, sensor signals s1 and s2 are compared with reference quantities characteristic for a pedestrian impact. FIG. 3 shows curves for both sensor signals s1 and s2 which may be typical of a pedestrian impact. First, sensor 3 on bumper 2 of the vehicle delivers output signal s1 because, upon impact with a pedestrian, the pedestrian will first come in contact with bumper 2. Output signal s2 of sensor 5 on engine hood 4 follows with a time lag Δt which is typical of a pedestrian impact. The amplitudes of output signals s1 and s2 of sensors 3 and 5, as well as time lag Δt between two output signals s1 and s2, may be characteristic of a pedestrian impact. These characteristic quantities may be used in method step 16 as reference quantities with which output signals s1 and s2 of sensors 3 and 5 are compared. This comparison may be a threshold value comparison. If signals s1 and s2 match exactly or if they correspond to the reference quantities within a certain tolerance range, then in method step 17 this may be regarded as satisfying a first criterion for deciding that the impact has been caused by a pedestrian.

In method step 18, change in velocity Δv of the vehicle caused by the impact is determined by forming the difference between velocity v of the vehicle before impact s1, as measured by sensor 3 on bumper 2, and velocity v of the vehicle after impact s2, as measured by sensor 5 on engine hood 4. Likewise, the change in acceleration Δb of the vehicle caused by the impact is determined in method step 19. The change in acceleration Δb is obtained from the difference between the acceleration b measured before impact with the bumper and the acceleration b measured after impact with the engine hood. Acceleration b may preferably be determined with an acceleration sensor which is also used for controlling deployment of the restraint systems in the vehicle.

In method step 20, the change in velocity Δv thus determined and the change in acceleration Δb thus determined are each compared with a reference quantity. The velocity range in which the safety device for the pedestrian is to be deployed may be approximately in the range of 15 km/h to 55 km/h. The velocity of the vehicle may change by approximately 5 km/h in a pedestrian impact, and the acceleration may change by approximately 3 g (g is the acceleration due to gravity) if there is no braking before or during the impact, or by approximately 4 g if there is braking. To take into account the braking operation in determining the reference quantities, brake signal br regarding a braking operation may also be taken into account in method step 20.

If change in velocity Δv and change in acceleration Δb during impact match the reference quantities, or if they match them within a certain tolerance range, then in method step 21 a second criterion for the decision that a pedestrian impact has occurred is considered to be satisfied. The second decision criterion may also be a function of either the change in velocity Δv alone or the change in acceleration Δb alone. However, if braking is already performed before impact, then the change in velocity Δv may not be used to form the second decision criterion, because in brake-locked wheels, the measured velocity has a value of 0 and therefore may no longer be used for determining velocity difference Δv.

In method step 22, the two decision criteria determined in steps 17 and 21 are subjected to an AND operation, and if both decision criteria are met, it is decided in method step 23 that it is a pedestrian impact. As a result of this, available pedestrian safety devices may be deployed.