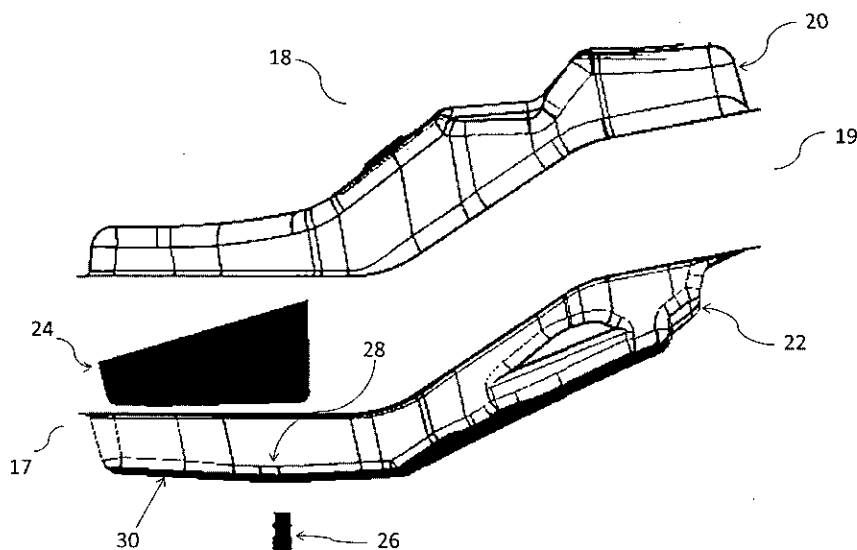


Abstract

A two wheeled vehicle (10) includes a fuel tank (18) for storing the fuel required for propelling an internal combustion engine (16). The two wheeled vehicle (10) typically can be a straddle type vehicle with an internal combustion engine (16) mounted on the front. The fuel tank (18) of the two wheeled vehicle (10) comprises a base portion (22) having an aperture (28) at a pre-determined location on its bottom surface (30), a top portion (20), a enclosure (24) located inside the base portion (22) and a fuel outlet (26) connected to the enclosure (24). The enclosure (24) has a bottom surface (34) provided with an aperture (32) and side surfaces (36, 37, 40 and 41) that together defines the enclosure volume. On one of the side surfaces (41) of the enclosure (24) there is an opening (38) provided at a predetermined distance away from the bottom surface (34) of the enclosure (24) to allow the ingress of fuel from the base portion (22) into the enclosure (24).



WE CLAIM:

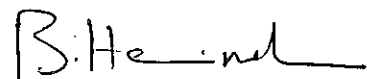
1. A two wheeled vehicle having a fuel tank for storing a fuel required for propelling an internal combustion engine, said fuel tank located underneath a seating arrangement and extending longitudinally in the fore and aft direction of the two wheeled vehicle **characterized by** an enclosure inside said fuel tank creating a space for accumulating the incoming fuel from the fuel tank and retaining at least a part of the accumulated fuel when the two wheeled vehicle traverses an inclined surface.
2. A two wheeled vehicle having a fuel tank as claimed in claim 1, **characterized in that** the fuel tank comprises a base portion, a top portion and a fuel outlet such that the fuel outlet is connected to the enclosure and said enclosure is disposed inside the base portion of the fuel tank.
3. A two wheeled vehicle having a fuel tank as claimed in claim 1, **characterized in that** the enclosure has a bottom surface and a plurality of side surfaces and at least one of the side surfaces of said enclosure has an opening provided at a predetermined distance away from the bottom surface of said enclosure to allow the ingress of fuel from the base portion of the fuel tank into said enclosure.

4. A two wheeled vehicle having a fuel tank as claimed in claim 1,
characterized in that the at least one of the side surfaces of the enclosure having the opening is the side surface with the least height.
5. A two wheeled vehicle having a fuel tank as claimed in claim 1,
characterized in that the base portion has an aperture at a pre-determined location on its bottom surface and the enclosure has an aperture at a pre-determined location on its bottom surface such that the aperture on the bottom surface of the base portion, aperture on the bottom surface of the enclosure and the fuel outlet are coaxially disposed thereby allowing the transfer of fuel from the fuel tank to the fuel outlet through the enclosure.
6. A two wheeled vehicle having a fuel tank as claimed in claim 1,
characterized in that the bottom surface of the base portion is adaptable to cooperate with the side surfaces of the enclosure such that the fuel outlet is adaptably connected to the bottom surface of the base portion.
7. A two wheeled vehicle having a fuel tank as claimed in claim 1,
characterized in that the enclosure is located on the frontal end of the base portion of the fuel tank.
8. A two wheeled vehicle having a fuel tank as claimed in claim 1,
characterized in that the base portion, the top portion and the enclosure combines to define the volume of said fuel tank.

9. A two wheeled vehicle having a fuel tank as claimed in claim 1,
characterized in that the fuel in said fuel tank is delivered to the
internal combustion engine by means of gravity.
10. A two wheeled vehicle having a fuel tank substantially as herein
described with reference to accompanying drawings and
description.

Dated 19th September 2014

Mahindra Two Wheelers Limited
Authorized Signatory for the Applicant



(HARI MOHAN NAIDU B.)

FIELD OF THE INVENTION

The present invention relates to a fuel tank for storing the fuel required for propelling an internal combustion engine in a two wheeled vehicle.

BACKGROUND OF THE INVENTION

A fuel tank in a two wheeled vehicle provides for storing and supplying the fuel required for propelling the internal combustion engine. The capacity of the fuel tank is designed taking into account the fuel consumption characteristics of a two wheeled vehicle and the possible range of travel before the refilling event can occur. In a two wheeled vehicle like a motorcycle, the fuel tank is mounted in front of the saddle which is well known in the art. In the recent past attempts have been made by motorcycle manufacturers and designers alike to unveil two wheeled motorcycles with fuel tanks mounted on the rear of the saddle or beneath the saddle. The advantage that rear mounted fuel tanks offer can be seen from the need to better utilize the storage space available on front of the vehicle besides increasing the in-built fuel storage capacity of the vehicle.

One known reference in the art is disclosed through the patent publication EP 2599700 A1, where the fuel tank is mounted on a saddle-riding type vehicle in an inclined attitude in the front-to-rear direction of the vehicle. The fuelling system in this arrangement utilizes a pumping device along with necessary electrical harnesses for transferring fuel to the internal combustion engine. Use of pumping devices adds to the cost besides increasing the power requirements which indirectly leads to higher fuel consumption. Also, the increased presence of movable components has the possibility of increasing the number of modes in which the given machine can fail.

The mounting of a fuel tank beneath the saddle in a motorcycle is also known through the patent publication US 5147077 B where the space in front of the rider is utilized as a storage box for the head gear and fuel tank is arranged beneath the saddle. The known fuel tank comprises an upper half and a lower half which are seamlessly welded together to create the space for storage of the fuel. The fuel tank utilizes a set of thermistor elements to detect the reserve state of the fuel thereby indicating the refueling event to the rider. The invention described in this patent publication inherently has a drawback which is bound to surface especially when the motorcycle is moving uphill. When the motorcycle is moving uphill, the fuel stored in the front end portion of the fuel tank tends to drift rearwards and away from the fuel outlet making the internal combustion engine starve.

It is therefore, the object of the present invention to provide a fuel tank for a two wheeled vehicle on its rear end and beneath the saddle which overcomes the drawbacks of the fuel tanks for two wheeled vehicles known in the prior art.

It is another object of the present invention to provide a fuel tank for a two wheeled vehicle that is simple in construction.

It is yet another object of the present invention to provide a fuel tank for a two wheeled vehicle that is adaptive to the ground conditions on which the given vehicle traverses.

SUMMARY

A fuel tank for use in a two wheeled vehicle, according to the present invention, is provided with an enclosure.

In accordance with the present invention, there is disclosed a two wheeled vehicle having a fuel tank for storing the fuel required for propelling an internal combustion engine. The internal combustion engine can be a compressed ignition engine or spark ignition engine which converts the energy stored in the fuel into power for propelling the two wheeled vehicle. The fuel required for propelling an internal combustion engine of the two wheeled vehicle can be a liquid fuel which includes but not limited to petrol, diesel, and ethanol based bio-

fuels etc. The two wheeled vehicle is provided with a seating arrangement for the rider to conveniently sit on the vehicle in the riding condition.

The fuel tank is located underneath a seating arrangement and extends longitudinally in the fore and aft direction of the two wheeled vehicle. The enclosure provided inside the fuel tank creates the space needed for accumulating the incoming fuel from the fuel tank. The enclosure retains at least a part of the fuel accumulated inside it when the two wheeled vehicle traverses an inclined surface.

The fuel tank of the two wheeled vehicle comprises a base portion having an aperture at a pre-determined location on its bottom surface, a top portion, an enclosure located inside the base portion and a fuel outlet connected to the enclosure. The enclosure has a bottom surface provided and a plurality of side surfaces that together defines the enclosure volume. On one of the side surfaces of the enclosure there is an opening provided at a predetermined distance away from the bottom surface of the enclosure to allow the ingress of fuel from the base portion into the enclosure.

Additionally, one of the side surfaces of the enclosure having the opening is the side surface with the least height.

Further, the base portion has an aperture at a pre-determined location on its bottom surface and the enclosure also has an aperture at a pre-determined location on its bottom surface. The aperture on the bottom surface of the base portion, aperture on the bottom surface of the enclosure and the fuel outlet are coaxially disposed. The fuel is transferred from the fuel tank to the fuel outlet through the enclosure. The fuel outlet typically can be a tube removably or irremovably connected to the aperture on the bottom surface of the enclosure and passing through the aperture on the bottom surface of the base portion.

As an alternative, the bottom surface of the base portion is adaptable to cooperate with the side surfaces of the enclosure thus making the bottom surface of the base portion act as the bottom surface of the enclosure. In this arrangement, the fuel outlet is connected to the bottom surface of the base portion.

The tank can be of metallic type or non – metallic type. The base portion, the top portion and the enclosure are attached to one another removably or irremovably. The base portion, the top portion and the enclosure combines to define the volume of the fuel tank. The enclosure is advantageously located on the frontal end of the base portion.

The fuel in the fuel tank is delivered to the internal combustion engine by means of gravity.

BRIEF DESCRIPTION OF THE DRAWINGS

The fuel tank in a two wheeled vehicle of the present disclosure will now be described with the help of accompanying drawings in which:

Figure 1 illustrates a side view of a two wheeled vehicle showing the outer appearance thereof in accordance with the present invention

Figure 2 illustrates a side view of the fuel tank of a two wheeled vehicle showing its general shape

Figure 3 illustrates an exploded view of the fuel tank of a two wheeled vehicle with its various elements separately indicated

Figure 4 illustrates top sectional view of the base portion and the enclosure attached therein

Figure 5 illustrates a perspective view of the enclosure

Figure 6 illustrates a front view of the enclosure showing the opening

Figure 7 illustrates the enclosure assembly

Figure 8 illustrates the level of fuel accessible to the fuel outlet in the absence of an enclosure when the vehicle is moving uphill

Figure 9 illustrates the level of fuel accessible to the fuel outlet in the presence of an enclosure when the vehicle is moving uphill

Figure 10 illustrates an alternative arrangement showing two independent fuel transfer paths

DETAILED DESCRIPTION OF THE INVENTION

Hereinafter the invention will be described in more detail with reference to one embodiment of the present invention.

A two wheeled vehicle **10** generally having a pair of wheels (**W1**, **W2**), a manoeuvring arrangement **12**, a seating arrangement **14**, an internal combustion engine **16** and a fuel tank **18** is shown in figure 1. The two wheeled vehicle **10** as shown in figure 1 is a straddle type two wheeled vehicle having its engine **16** on the front and is typically a motorcycle. A pair of wheels one on the front **W1** and the other on the rear **W2** engage with the ground and helps in moving the two wheeled vehicle **10** forward. The manoeuvring arrangement **12** enables the rider to steer the two wheeled vehicle **10** on its given path. The seating arrangement **14** serves to provide the required seating space and comfort to the rider of the two wheeled vehicle **10**. The internal combustion engine **16** provides the required propelling force to drive the two wheeled vehicle **10** forward by converting the energy stored in the fuel into useful work. The fuel to the internal combustion engine **16** is supplied from the fuel tank **18** mounted at a point relatively higher than the internal combustion engine **16**.

Figures 2 in the accompanying drawings illustrate a fuel tank **18** which forms the preferred embodiment of the present disclosure. The fuel tank has two ends **17** and **19**.

Now referring to figure 3, the fuel tank **18** comprises several constituents which are primarily essential for the working of the proposed invention. Fuel tank **18** comprises a base portion **22**, a top portion **20**, a enclosure **24** and a fuel outlet **26**. The bottom surface **30** of the base portion **22** is provided with an aperture **28**.

The base portion **22** of the fuel tank **18** is defined primarily by its bottom surface **30** and side wall **31** as shown in figure 4. The base portion **22** also accommodates the enclosure **24** having a bottom surface **34** and an aperture **32** provided on the bottom surface **34**. As shown in figure 5 and figure 6, the enclosure **24** of the fuel tank **18** is defined by its bottom surface **34**, side surfaces **36**, **37**, **40** & **41** and an opening **38**.

Referring again to figure 1 and figure 2 of the accompanying drawings in the present disclosure, the fuel tank **18** is rigidly mounted above the rear wheel **R** and supported by the chassis frame (not shown in figures) of the two wheeled vehicle **10**. The fuel tank **18** extends longitudinally along the length of the two wheeled vehicle **10**. The seating arrangement **14** is firmly positioned above the fuel tank **18**.

The ends **17** and **19** of the fuel tank **18** are separated longitudinally with one of its ends **17** disposed spatially proximate to the internal combustion engine **16** and the other end **19** disposed spatially away from the internal combustion engine **16**.

The arrangement of enclosure **24** inside the fuel tank **18** will be explained in detail with reference to figure 3 and figure 4. The top portion **20**, the base portion **22** and the enclosure **24** together defines the space inside the fuel tank **18** for storing the fuel. The aperture **28** on the base portion **22** of the fuel tank **18** is provided at a suitable location on the bottom surface **30** closer to the end **17** of the fuel tank **18** thereby allowing the fuel outlet **26** to pass through it. The base portion **22** serves as the lower compartment of the fuel tank **18** and houses the enclosure **24**. It is advantageous to locate the enclosure **24** closer to the end **17** of the fuel tank **18**. The fuel outlet **26** is removably or irremovably connected to the aperture **32** provided at a suitable location on the bottom surface **34** of the enclosure **24** which forms the enclosure assembly **35** as shown in figure 7. The fuel outlet **26** is connected to the aperture **32** either by means of fastening or welding. The enclosure assembly **35** thus formed is attached to the bottom surface **30** of the base portion **22** such that the fuel outlet **26** and the aperture **28** on the bottom surface **30** are coaxially located. The enclosure assembly **35** and the base portion **22** are fixedly or removably attached to one another either by means of welding or by using a suitable fastening means. After attaching the enclosure assembly **35** to the base portion **22**, the top portion **20** is then

connected to the base portion **22** by bringing the contacting surfaces together thus forming the fuel tank **18** shown in figure 2. The contacting surfaces of the top portion **20** and the base portion **22** are joined in a manner so as to prevent any leakage of fluid from the tank **18** into the outside environment through the interstices created in between the contacting surfaces.

The enclosure **24** as shown in figure 5 and figure 6 stores the incoming fuel by virtue of the space created by the bottom surface **34** and a plurality of side surfaces **36**, **37**, **40** and **41**. The side surfaces **40** and **41** face each other and are disposed along the direction of orientation of the fuel tank **18**. The side surfaces **36** and **37** faces each other and are disposed normal to the side surfaces **40** and **41** thus forming a four walled envelope. The bottom surface **34** encloses the four walled envelope on one side thereby creating an enclosure for holding the incoming fuel. Alternatively, the bottom surface **30** of the base portion **22** can serve to enclose the four walled envelope of the enclosure **24** in which case the fuel outlet **26** is connected to the aperture **28** of the base portion **22**. The surface area of the side surfaces **40** and **41** can be same or different. However, in the preferred embodiment the surface areas of side surfaces **40** and **41** are different. Also, in the preferred embodiment, the surface areas of the side surfaces **36** and **37** are the same. The height of the side surfaces **36** and **37** gradually tends to change as it progresses from one of the side surfaces **40**, **41** to the other side surfaces **41**, **40** correspondingly with the height being the lowest near the side surface **41** and highest near

the side surface **40** in the preferred embodiment. Another characteristic feature in the construction of the enclosure **24** is the gradual change in the width of the bottom surface **34** as it progresses from one of the side surfaces **40**, **41** to the other **41**, **40** correspondingly with the width being the lowest near the side surface **41** and highest near the side surface **40** in the preferred embodiment.

On at least one of the side surfaces **36**, **37**, **40** and **41** there is provided an opening **38** to allow the ingress of incoming fuel into the enclosure **24**. In the preferred embodiment, the opening **38** is provided on the side surface **41** which is the side surface with the least height as measured from the bottom surface **34** of the enclosure **24**. The opening **38** can assume any geometric shape or configuration. It is advantageous to provide an opening **38** which is U – shaped with smoothened corners. The volume of fuel present in the fuel tank **18**, size of the opening **38** on the side surface **41** and its location with reference to the bottom surface **34** determines the amount of fuel that the enclosure **24** can store when the vehicle **10** usually moves on a horizontal surface.

Now the working of the invention will be explained in more detail with reference to one or more of the accompanying drawings and with special reference to figure 8 and figure 9. The various surface conditions in which the two wheeled vehicle **10** is operated is broadly classified into horizontal condition, positively inclined condition

(uphill) and negatively inclined condition (downhill). In any given surface condition, the fuel inside the fuel tank **18** enters the enclosure **24** through the opening **38** provided on the side surface **41** and then reaches the fuel outlet **26**. Through the fuel outlet **26**, the fuel reaches the internal combustion engine **16**. The aforementioned flow path of the fuel will remain the same irrespective of the surface conditions.

For the fuel to enter the enclosure **24** through the opening **38**, the fuel level inside the fuel tank **18** must have to exceed a minimum threshold level set by means of the location of the opening **38** on the side surface **41** with reference to the bottom surface **34** of the enclosure. The amount of fuel inside the fuel tank **18** that does not cross the aforementioned threshold level will not become accessible to be used for running the internal combustion engine **16**. This inaccessible amount of fuel inside the fuel tank **18** is called the 'dead volume'. The use of words 'dead volume' and 'inaccessible amount' in relation to the fuel inside the fuel tank **18** must be construed as synonymous to each another. For a given volume of fuel inside the fuel tank **18** and with the location of the opening **38** of the enclosure **24** being fixed, the inaccessible amount of fuel inside the fuel tank **18** varies depending on the surface conditions upon which the two wheeled vehicle **10** moves.

Referring to figure 8, there is shown a base portion **22** and fuel outlet **26** of the fuel tank **18** with ends **17** and **19**. The fuel inside the fuel

tank **18** is referenced as **F1**. In the absence of enclosure **24** inside the fuel tank **18**, the fuel **F1** inside the tank **18** directly enters the fuel outlet **26**. When the two wheeled vehicle **10** moves on a negatively inclined surface condition (downhill), for a given volume of fuel **F1** inside the fuel tank **18**, the fuel **F1** tends to move towards the end **17** of the fuel tank there by maximizing the fuel accessible to the fuel outlet **26**. When the two wheeled vehicle **10** moves on a horizontal surface condition, for a given volume of fuel **F1** inside the fuel tank **18**, the fuel **F1** tends to remain in a state of equilibrium inside the fuel tank **18** there by keeping the fuel accessible to the fuel outlet **26** constant. When the two wheeled vehicle **10** moves on a positively inclined surface condition (uphill), for a given volume of fuel **F1** inside the fuel tank **18**, the fuel **F1** tends to move away from the end **17** of the fuel tank **18** thereby minimizing the fuel accessible to the fuel outlet **26**. While the problem of fuel inaccessibility to the fuel outlet **26** does not arise when the two wheeled vehicle **10** moves on a horizontal surface or downhill, there is a definitive problem of fuel inaccessibility in case if the two wheeled vehicle **10** moves uphill.

Referring now to figure 9, there is shown a base portion **22**, enclosure **24** and fuel outlet **26** of the fuel tank **18** with ends **17** and **19**. Part of the fuel stored inside the enclosure is referenced as **F2** and the part of the fuel inside the fuel tank **18** will be referenced as **F1**. In the presence of enclosure **24** inside the fuel tank **18**, the fuel **F1** inside the tank **18** enters the enclosure **24** and then moves into the fuel outlet **26** provided the level of fuel **F1** inside the fuel tank **18** can cross the

minimum threshold level which is defined by the location of the opening **38** on the side surface **41**. In case of the two wheeled vehicle **10** moving uphill, part of the fuel **F1** inside the fuel tank **18** will tend to move away from the end **17** there by gradually depleting the amount of fuel available at the opening **38** of the enclosure **24**. However, the part of the fuel **F2** stored in the enclosure **24** will continue to feed the fuel outlet **26** which ensures to supply the fuel required for running the internal combustion engine **16**.

An alternative embodiment is envisaged as shown in figure 10, in which there is provided a second fuel outlet **27** through which the fuel inside the fuel tank **18** is fed into the internal combustion engine **16**. One end of the second fuel outlet **27** is connected to the aperture **28** provided on the bottom surface **30** of the fuel tank **18**. The other end of the second fuel outlet **27** is connected to a fuel flow path (not shown) leading to the internal combustion engine **16**. The second fuel outlet **27** and the fuel outlet **26** are telescopically arranged such that the apertures **28** and **32** are concentrically located. This arrangement offers ease of packaging. Alternatively, the aperture **28** can be positioned at any convenient location along the bottom surface **30** of the fuel tank **18** to which the fuel outlet **27** can be connected. Thus the arrangement described hereinbefore creates two independent fuel transfer paths from the fuel tank **18** to the fuel flow path (not shown) leading to the internal combustion engine **16**. The fuel stored inside the enclosure **24** exits the fuel tank **18** through the fuel outlet **26** whose one end is connected to the aperture **32**. The remaining fuel stored inside the fuel tank **18** exits through the second fuel outlet **27**

whose one end is connected to the aperture **28**. The arrangement as envisaged hereinbefore can significantly reduce the amount of inaccessible fuel inside the fuel tank **18** thereby maximising the fuel available for running the internal combustion engine **16**.

The enclosure **24** inside the fuel tank **18** is indispensable to continuously keep feeding the fuel to the internal combustion engine **16** especially when the two wheeled vehicle **10** is moving uphill and the level of fuel inside the fuel tank **18** falls below a certain minimum threshold level.

Certain modifications and improvements in the proposed invention will become readily apparent to a person of ordinary skill in the art of fluid storage and conveyance systems and such changes must be treated as equivalents to the elements of the present invention. Changes in the claimed invention by the use of substitutes and alternatives in terms of material, method, manufacturing process, configuration, arrangement, duplication etc., will render them fall within the scope of the claimed invention.

WE CLAIM:

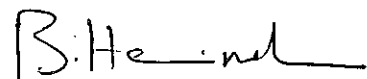
1. A two wheeled vehicle having a fuel tank for storing a fuel required for propelling an internal combustion engine, said fuel tank located underneath a seating arrangement and extending longitudinally in the fore and aft direction of the two wheeled vehicle **characterized by** an enclosure inside said fuel tank creating a space for accumulating the incoming fuel from the fuel tank and retaining at least a part of the accumulated fuel when the two wheeled vehicle traverses an inclined surface.
2. A two wheeled vehicle having a fuel tank as claimed in claim 1, **characterized in that** the fuel tank comprises a base portion, a top portion and a fuel outlet such that the fuel outlet is connected to the enclosure and said enclosure is disposed inside the base portion of the fuel tank.
3. A two wheeled vehicle having a fuel tank as claimed in claim 1, **characterized in that** the enclosure has a bottom surface and a plurality of side surfaces and at least one of the side surfaces of said enclosure has an opening provided at a predetermined distance away from the bottom surface of said enclosure to allow the ingress of fuel from the base portion of the fuel tank into said enclosure.

4. A two wheeled vehicle having a fuel tank as claimed in claim 1, **characterized in that** the at least one of the side surfaces of the enclosure having the opening is the side surface with the least height.
5. A two wheeled vehicle having a fuel tank as claimed in claim 1, **characterized in that** the base portion has an aperture at a pre-determined location on its bottom surface and the enclosure has an aperture at a pre-determined location on its bottom surface such that the aperture on the bottom surface of the base portion, aperture on the bottom surface of the enclosure and the fuel outlet are coaxially disposed thereby allowing the transfer of fuel from the fuel tank to the fuel outlet through the enclosure.
6. A two wheeled vehicle having a fuel tank as claimed in claim 1, **characterized in that** the bottom surface of the base portion is adaptable to cooperate with the side surfaces of the enclosure such that the fuel outlet is adaptably connected to the bottom surface of the base portion.
7. A two wheeled vehicle having a fuel tank as claimed in claim 1, **characterized in that** the enclosure is located on the frontal end of the base portion of the fuel tank.
8. A two wheeled vehicle having a fuel tank as claimed in claim 1, **characterized in that** the base portion, the top portion and the enclosure combines to define the volume of said fuel tank.

9. A two wheeled vehicle having a fuel tank as claimed in claim 1,
characterized in that the fuel in said fuel tank is delivered to the
internal combustion engine by means of gravity.
10. A two wheeled vehicle having a fuel tank substantially as herein
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