

Design Philosophy of Honda WANDER WALKER CONCEPT

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ABSTRACT

Advanced nations are undergoing a major shift in direction from “car-centered” to “human-centered” urban design. Essential functions are being concentrated and city centers are becoming more compact, while initiatives to provide and expand pedestrian areas are intensifying. As we welcome an era in which the number of elderly citizens and others experiencing restricted mobility will increase and populations will undergo further urban concentration, expectations are increasing for new personal mobility aids that will supplement cars and public transport.

The Honda WANDER WALKER CONCEPT was developed to offer an “urban micro-mover” that would encourage all users to leave their homes and become mobile. Seeking a package design that would contribute to reducing infrastructural barriers, the development team achieved a size that would make it easy for users to access urban infrastructure. The WANDER WALKER CONCEPT is 540 mm wide with a minimum turning radius of 1,000 mm, making it capable of turning in its place. Twin-lever steering has been employed to ensure intuitive operation that is easily understood by all users.

In order to reduce psychological barriers to leaving the home, the WANDER WALKER CONCEPT is provided with an information and communications platform including a “Safety Watch” application, and an electrically operated seat with a “Welcome Mode.” Under the concept of “Urban Construction Style,” through the use of a simple twin-frame structure the styling design of the vehicle achieved a stylish yet unselfconscious design that would fit into the urban environment. The use of a frame structure also made it possible to provide a freely usable cargo space in the interior of the unit.

1. Introduction

Committed to a vision of realizing the joy of freedom of mobility and a sustainable society where people can enjoy life, Honda is working towards the realization of a society in which every individual is able to freely move anywhere they desire with a feeling of complete security.

Today, advanced nations are experiencing a rapid decline in birth rates and the aging of their populations (in particular Japan), a rise in environmental awareness and the entrenchment of measures to reduce CO₂ emissions, the concentration of populations in cities⁽¹⁾, and the consequent design of urban spaces to reduce dependence on cars⁽²⁾.

In concrete terms, urban design measures include the creation of high-density residential areas in compact urban spaces in which functions essential to daily life are concentrated, and the examination and implementation of measures such as “road diet” schemes that reduce the number or width of vehicle lanes in order to help ensure space for pedestrians.

This trend, together with the expansion in IT services that make it possible to conduct necessary activities without

leaving the house, has created a new issue, the concern that the spheres of life of city residents, and in particular those with limited mobility, will narrow, and that possibilities for social contact will be lost.

Through actual proof experiments of next-generation personal mobility modalities^{(3), (4)}, Honda has identified the maintenance and improvement of quality of life (QOL), for example through an increased sense of health and vitality, as a new value for mobility.

Based on the findings and experience gained from these actual proof experiments, the impetus to create a new form of urban personal mobility grew stronger, and development efforts were launched.

The completed concept model was called the Honda WANDER WALKER CONCEPT, and was made public at the Tokyo Motor Show 2015.

2. Design Concept

Projecting independent elderly people around the age at which they will return their driving licenses, whose numbers are expected to increase in cities in the future, as

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target users, the development of the concept commenced based on JIS standards for mobility scooters, which have a long history of use as mobility aids in pedestrian spaces.

During Honda's actual proof experiments of next-generation personal mobility modalities, analysis of the opinions of users of mobility scooters and their experience of operating market mobility scooters in city streets and in stores showed that users faced psychological barriers, infrastructural barriers, and physical barriers, and these represented factors that impeded the carefree and comfortable use of the vehicles.

As shown in Fig. 1, psychological barriers included being looked at by other people, concern about causing trouble or being a burden to other people when going out, and opposition from the family to elderly people leaving the house by themselves.

Infrastructural barriers included the status of roads, for example differences in level, the width of automatic ticket gates, and stores that could not be entered while riding the vehicle, in addition to a lack of space to store the vehicle at home and few places to park the vehicle when out.

The physical barriers were declining eyesight, hearing, and physical strength, and a concern among users that their legs would become weaker if they were to use a mobility aid regularly.

Working to formulate designs and develop technologies that would help to reduce these barriers, the development team for the WANDER WALKER CONCEPT sets out to create a one-person urban micro-mover that would enable users to feel comfortable in getting out into lively city streets.

that would make it possible for the vehicle to be used indoors and outdoors and to access elevators, trains, and other urban infrastructure. A number of turning and drive methods were available for the realization of these goals. Front-wheel steering was set as a precondition, to help ensure that drivers and pedestrians around the vehicle could easily judge vehicle behavior when turning. It was necessary to increase the steering angle of the front wheel in order to restrict the minimum turning radius to no more than 1,000 mm, and a front-wheel-drive system was therefore employed to make effective use of drive force when the vehicle is turning in its place. A tire diameter of 260 mm and a minimum ground clearance of 80 mm were set to help ensure that the vehicle was able to smoothly ride over the differences in level and uneven surfaces that are still encountered in urban areas (Fig. 2). Elements of vehicle design, including ease of entry and exit and the appropriateness of the user's eye point, were considered based on these predetermined conditions (Fig. 3).

Like the user's sitting position, the steering method is also an important element in considering package design. The joystick-type control used in some mobility scooters was initially a candidate for the steering method. This method presented the advantages of making it possible to control the vehicle with one hand and presenting few restrictions in terms of space, but it was judged that the use of this method would make it more challenging for users attempting to support themselves at such times as when riding over rough surfaces at a speed of 6 km/h or braking suddenly.

By contrast, when the handlebar steering method used in

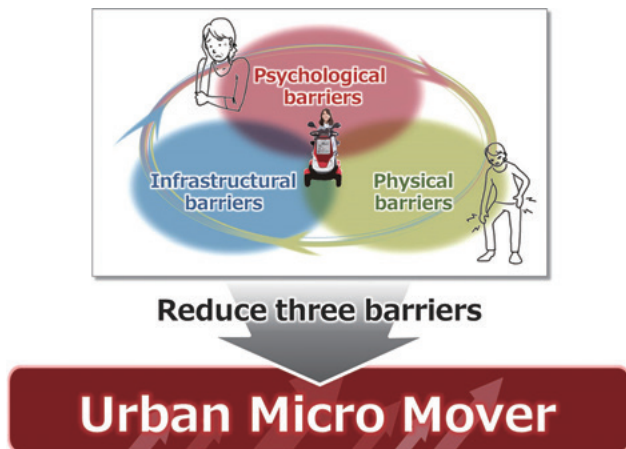


Fig. 1 Grand concept

3. Package Design

In order to realize a package design that would contribute to reducing infrastructural barriers, the target for the vehicle's width was set at no more than 550 mm, and the target for its minimum turning radius at no more than 1,000 mm, a size

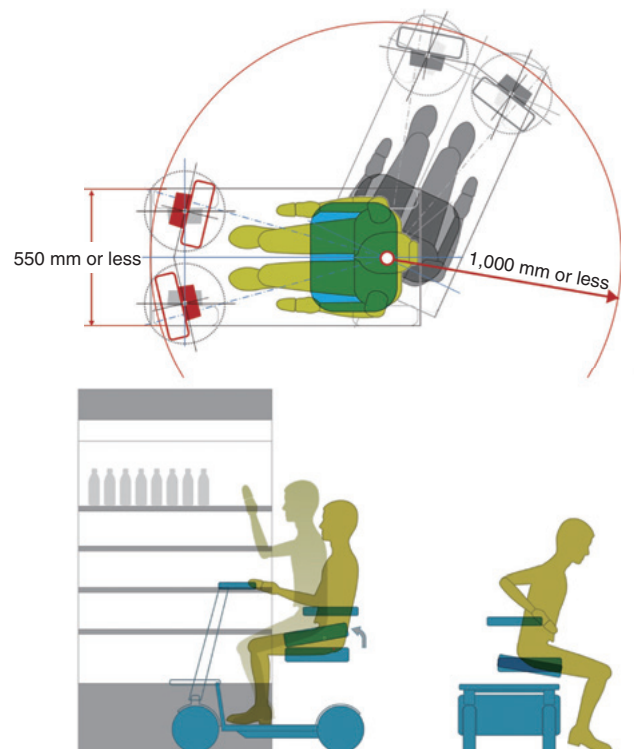


Fig. 2 Package concept

some mobility scooters is employed, loads on the upper body are naturally absorbed. This is not the only advantage of the handlebar steering method. The users of mobility scooters are treated as pedestrians, and it is necessary for other pedestrians around them to be aware of their intentions. The handlebar steering method, as also used on bicycles, has the advantage of allowing people close to the vehicle to readily perceive the rider's intentions. Based on these considerations, a twin-lever steering (TLS) system, to be discussed below, was adopted for the WANDER WALKER CONCEPT.

A questionnaire survey of mobility scooter users conducted during actual proof experiments of next-generation mobility modalities indicated that the main source of dissatisfaction with the vehicles was the limited number of spaces to carry packages, and the small volume of those spaces. The WANDER WALKER CONCEPT was designed to provide a cargo space that makes it possible to carry a 12-roll pack of toilet paper or a five-box pack of tissues: everyday items that the elderly have trouble transporting.



Fig. 3 Package prototype

4. Styling Design

Psychological barriers can be considered to be the main barriers among the three types of barrier impeding the use of vehicles of this type. Because the use of personal aid equipment can cause others to regard the user as somehow disabled, people may avoid its use if they can, or they may tend to avoid going out because of a sense that devices such as wheelchairs are a nuisance to people around them.

Development team therefore sets "Urban Construction Style" as the styling concept for a stylish but unselfconscious design that would help prevent users from feeling any embarrassment, and sought a form that would blend into the urban environment.

Using contemporary urban landscape designs that create comfortable and pleasant city spaces as a reference, development team attempted a fusion of designs of conveyances that travel at a maximum speed of 6 km/h.

The lightness and see-through structure of the simple twin-frame configuration, in which left and right frames enclose the vehicle space, blend into the streetscape like a piece of modern street furniture (Fig. 4). The empty spaces in the vehicle's structure were also designed to function as free cargo spaces with unlimited usage. A distinctive feature of the configuration is that even if packages or bags are placed inside the twin-frame structure, it does not affect the vehicle's styling (Figs. 5 and 6).

Solid tires do away with the worry of punctures. The rims feature a geometric pattern composed of hexagons and squares. The use of holes in the geometric pattern sought to convey a sense of lightness and agility (Fig. 7).



Fig. 4 Final exterior rendering

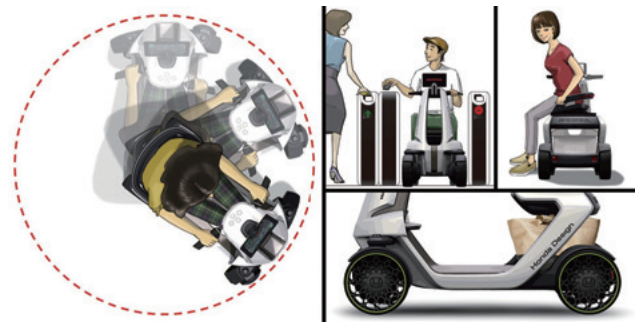


Fig. 5 Features of Honda WANDER WALKER CONCEPT



Fig. 6 Final exterior



Fig. 7 Airless tire

5. Interface Design

It was necessary to attempt to ensure that the operation of various devices would not in itself become a barrier to the use of the vehicle for its target elderly users, who would be beginning to be aware of a decline in their physical powers with advancing age. However, taking elderly users into consideration and making the functions and interface overly obvious would result in people hesitating to use the functions of the unit and thereby become a psychological barrier. The development team therefore aimed to realize an interface based on universal design (UD) principles, combining intuitive operation that is easy for anyone to understand with a welcoming feeling achieved through the use of new technologies. The distinctive features of this design are TLS, a seat with a user assist mechanism linked to the user recognition system, and the “Safety Watch” application. Based on the belief that the use of information and communication technology (ICT), for example links between mobile devices, and an information and communications platform for Intelligent Transport Systems (ITS), such as V2X and automatic charging and automatic parking, will be important for personal mobility aids in the future, the design of the WANDER WALKER CONCEPT incorporates an 8-inch tablet as the foundation for a communications system (Fig. 8).

TLS is an original Honda steering method that alternates between front and rear. Input is intuitive, and the system’s ability to be operated by means of the elongation and contraction of biarticular muscles without twisting of the joints has been proven to be effective in reducing fatigue⁽⁵⁾. At the same time, the use of steer-by-wire control further reduces steering force. The steering angle of the front wheels is controlled in response to the degree of movement of the handlebars to the front or rear; the vehicle can be turned in place only by turning the handlebars as far as possible when the vehicle is stationary. TLS is also provided with a handlebar function that helps to enable the user to maintain their riding posture, offering a new steering mechanism that is easy even for the elderly to use (Fig. 9).

To make the flow of procedures for getting into the vehicle smooth for users with weak legs, the vehicle is

provided with a seat with a “Welcome Mode.” When the user approaches the vehicle holding the tablet that functions as the key, the lights flash and the seat rotates outward to the user’s position and tilts 10 degrees downwards in order to assist the user in taking their seat. In addition, when the user sets the tablet in a predetermined position, the vehicle automatically goes into standby mode. The vehicle therefore does not automatically switch to a state in which it can immediately be driven; the purpose of this is to help prevent unintended takeoffs, for example if the user accidentally operates the exposed controls for advancing the vehicle.

Objections from elderly people’s families represented a psychological barrier to use of the vehicle. A “Safety Watch” application was therefore developed during actual

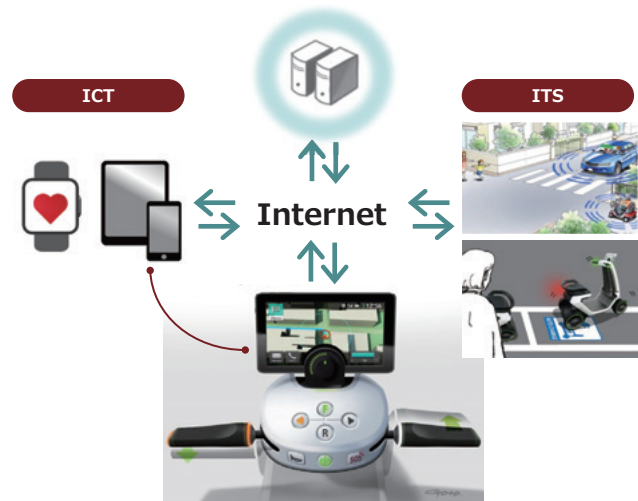


Fig. 8 Connection via ICT and ITS



Fig. 9 Pivot turn mode realized by TLS

proof experiments of next-generation mobility modalities. The results of a survey of users and their families indicated that the sense of security offered by knowing that the elderly user is being watched over and the sense of security offered by watching over the elderly user are reciprocal, suggesting that the application could be an effective tool in supporting the elderly in going out by themselves.

The use of a variety of other applications, for example a traffic alert application, applications to provide information, and health management software, can also be considered in addition to the application described above. These would reduce the psychological barriers to going out in the vehicle, and make it possible for users to go where they want to go, rather than merely to where they are able to go. This is the starting point for the joy of movement, allowing everyone to freely move anywhere they wish with a feeling of security.

6. Color Design

Based on the concept of urban style with a sense of warmth, the color concept for the vehicle was set as “Urban Natural Coordinate.” This enabled an expression that offers a sense of functional beauty in addition to aesthetic beauty (Fig. 10). A combination of white, presenting an image of advancement, with accent colors has been employed for the vehicle. The white used as the exterior color is contrasted with a warm, dark-toned brown wood-grain pattern, emphasizing the vehicle’s framework. A fluorescent yellow-green has been used as an accent on the sides of the tires to make going out fun, and the use of a reflective material for the color contributes to increased visibility. The vehicle’s main white pearl color has gold highlights that make the styling stand out when the vehicle is turning in its place or executing other unique movements. The coating, which highlights the design, is made up of two coats. The first base

coat is solid white, while the main content of the second base coat is glittering glass flakes and gold interference pearl pigment. This creates a hue that glitteringly reflects the sunlight to emphasize the solidity of the styling, while also blending into contemporary urban streetscapes.

7. Concept and Social Acceptance

The Honda WANDER WALKER CONCEPT was exhibited at the Tokyo Motor Show 2015 (Fig. 11). A questionnaire survey conducted at Honda’s Personal Mobility Concept booth received 215 responses. These responses contained 40 comments concerning the Honda WANDER WALKER CONCEPT. Approximately 80% of these were from males in their 20s, indicating a greater than anticipated interest in the concept among young people, and suggesting the potential for the concept to be developed as a



Fig. 11 Tokyo Motor Show 2015

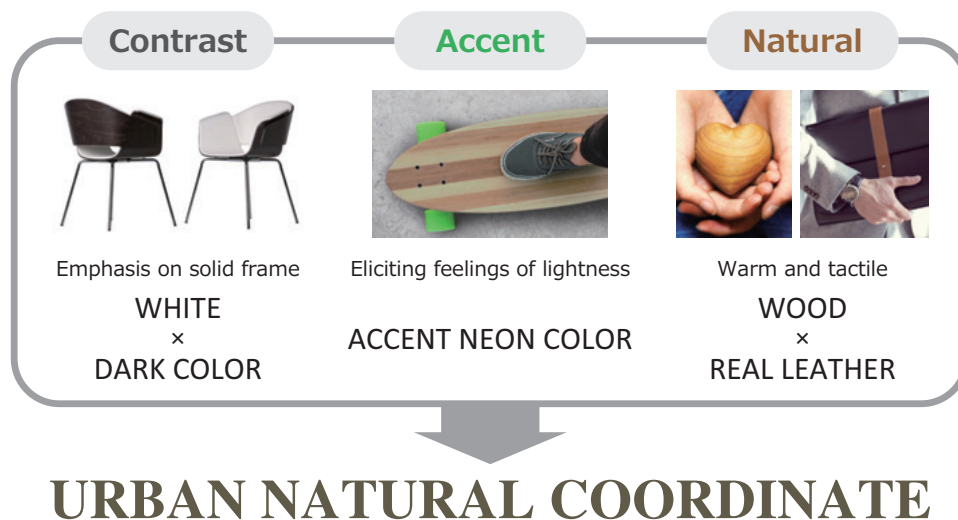


Fig. 10 Color concept

new form of personal mobility aid.

Four comments concerned the reception of the concept, for example that it took Japan's aging society into consideration; one respondent indicated that they would want their parents to use the vehicle. Thirty comments concerned the reception of the vehicle's functions, positively evaluating its small turning radius, compact size and cargo space. Six comments concerned the reception of the vehicle's styling. Two comments added the qualification that the vehicle was a mobility aid for the elderly, but opinions were generally positive, with praise for the excellence of the simple and non-tiring design.

Eleven comments were received from journalists, and articles on the concept were published in 15 media outlets.

As a proposal that seeks to respond to the special social issues facing Japan as a "super-aging" society, the concept resonated strongly with Motor Show visitors. A selection of representative comments is presented below.

"This is a great initiative for an aging society. Honda's stance of appealing to the social responsibility of car companies is praiseworthy." "It's a concept that has gone back to the starting point of the car while looking towards the future. Our aging society has been waiting for a mode of transportation like this one." "The level of maneuverability of the compact body is impressive." "TLS is a technology that is well-suited to the elderly." "An insightful design based on a monotone color scheme that can be used at any time, place, or opportunity." These responses demonstrate the receptiveness of the public to the proposed concept and design.

8. Conclusion

The development team for the Honda WANDER WALKER CONCEPT made the most of the design techniques and sensibility employed when designing Honda cars, and created an appealing personal mobility aid that responds to the mobility needs of people living and going about their business in compact urban spaces, which will contribute to creating livelier cities.

Looking towards the holding of the Tokyo Olympics and Paralympics in 2020, the transport services environment is targeting a diverse range of users and beginning to undergo considerable change. In November 2016, the Ministry of Land, Infrastructure, Transport and Tourism established the Committee for the Review of the Use of Mobility Scooters on Public Transport⁽⁶⁾, to reconsider necessary conditions for users and for mobility scooters themselves when the scooters are used on trains and elsewhere in the public transport system. The committee has commenced its reconsideration of the conditions for the use of mobility scooters when using public transportation.

In the future, based on analysis of the public's reaction at the Tokyo Motor Show 2015 and responses to the associated questionnaire, in addition to changes in social trends, the development team intends to create a functioning

model of the Honda WANDER WALKER CONCEPT that takes potential mass production into consideration, making it possible to refine the unit's design and functions in the real world, and to study its potential as a communication tool that helps to connect people with society.

Honda will continue to advance research and development efforts towards the realization of a society in which all people are able to move freely wherever they wish with a feeling of complete security.

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