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(54) **ERGONOMICALLY DESIGNED WHEELED LUGGAGE**

(76) Inventor: **Awwad J. Dababneh**, Dallas, TX (US)

Correspondence Address:
Needle & Rosenberg
The Candler Building Suite 1200
127 Peachtree Street NE
Atlanta, GA 30303-1811 (US)

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(57) **ABSTRACT**

An ergonomically designed piece of wheeled luggage for being transported by a user across a floor surface is disclosed. The wheeled luggage includes a luggage body having at least a bottom surface, a back surface, and a top surface, the back surface intersecting both of the bottom and the top surfaces, respectively, at least two spaced and parallel wheels rotatably supported on the bottom surface of the body with a longitudinal axis extending through the wheels, the axis being parallel to the intersection of the back surface and the bottom surface of the body. The wheeled luggage also has a handle assembly mounted on the body, the handle assembly including an elongate handle grip for being grasped by the user when the wheeled luggage is rolled across the floor surface. The handle assembly has a first retracted position in which the handle grip is flush with the luggage body and a second extended position in which the handle grip extends for a selectively adjustable distance above the body and within which the handle grip, when grasped by the user, is positioned perpendicularly with respect to the axis of the wheels and substantially parallel to the floor surface. So constructed, the user may adopt a more natural position to pull such wheeled luggage, thereby increasing user comfort and reducing user fatigue.

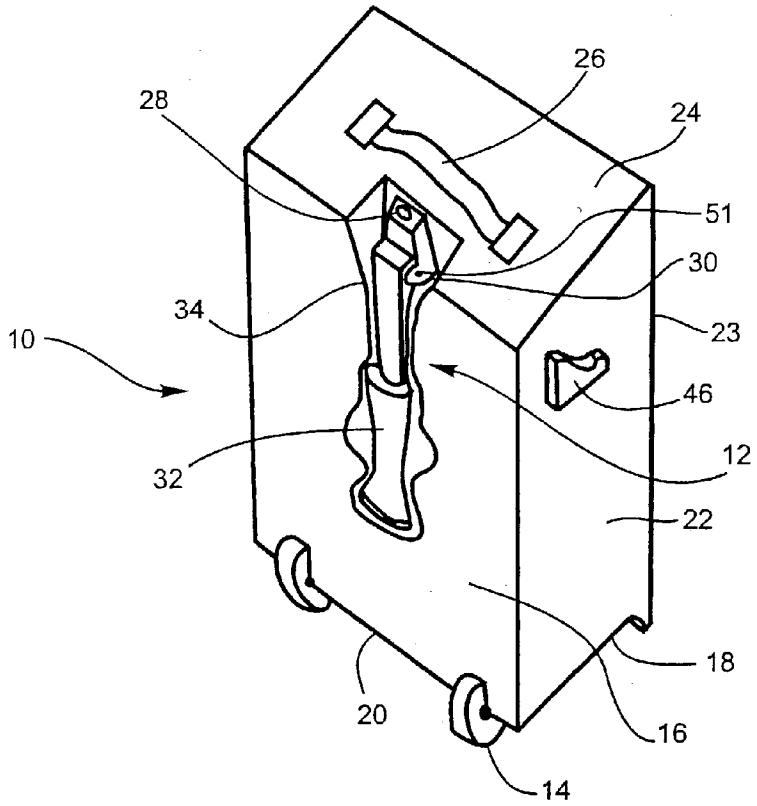


Figure 1 (Prior Art)

Figure 2

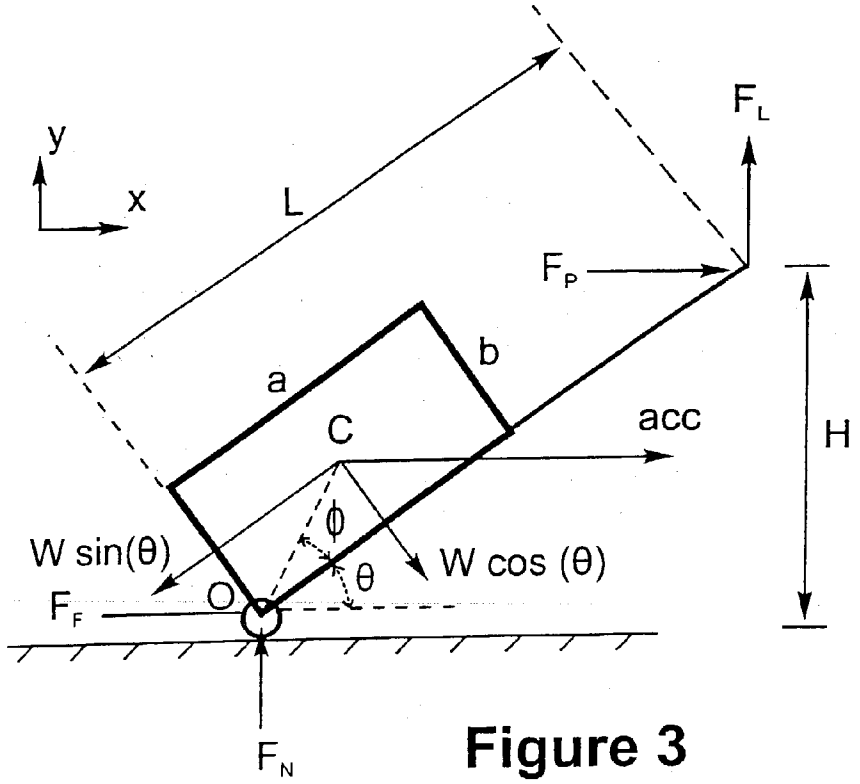


Figure 3

Figure 4

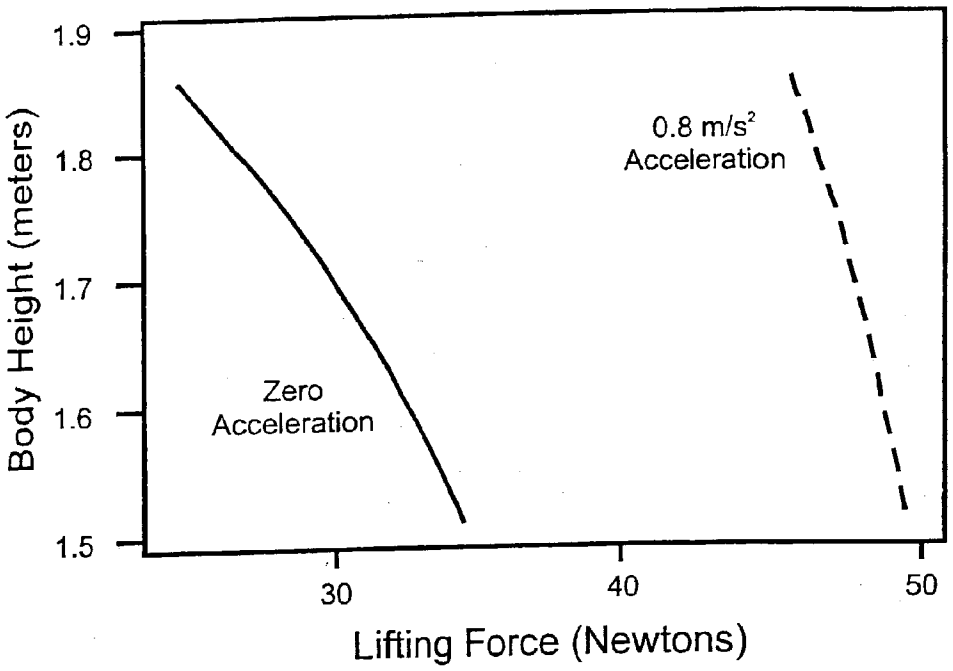


Figure 5

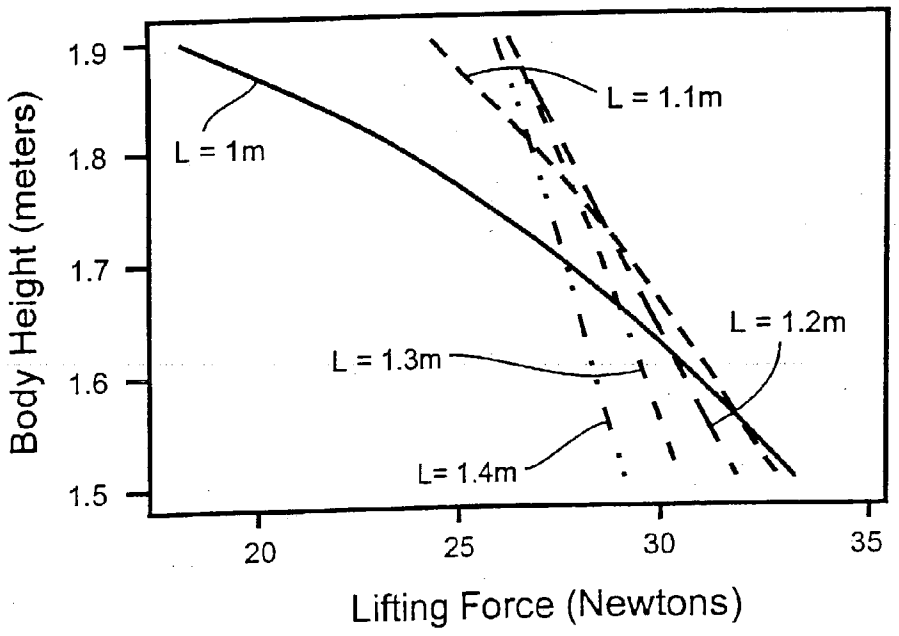
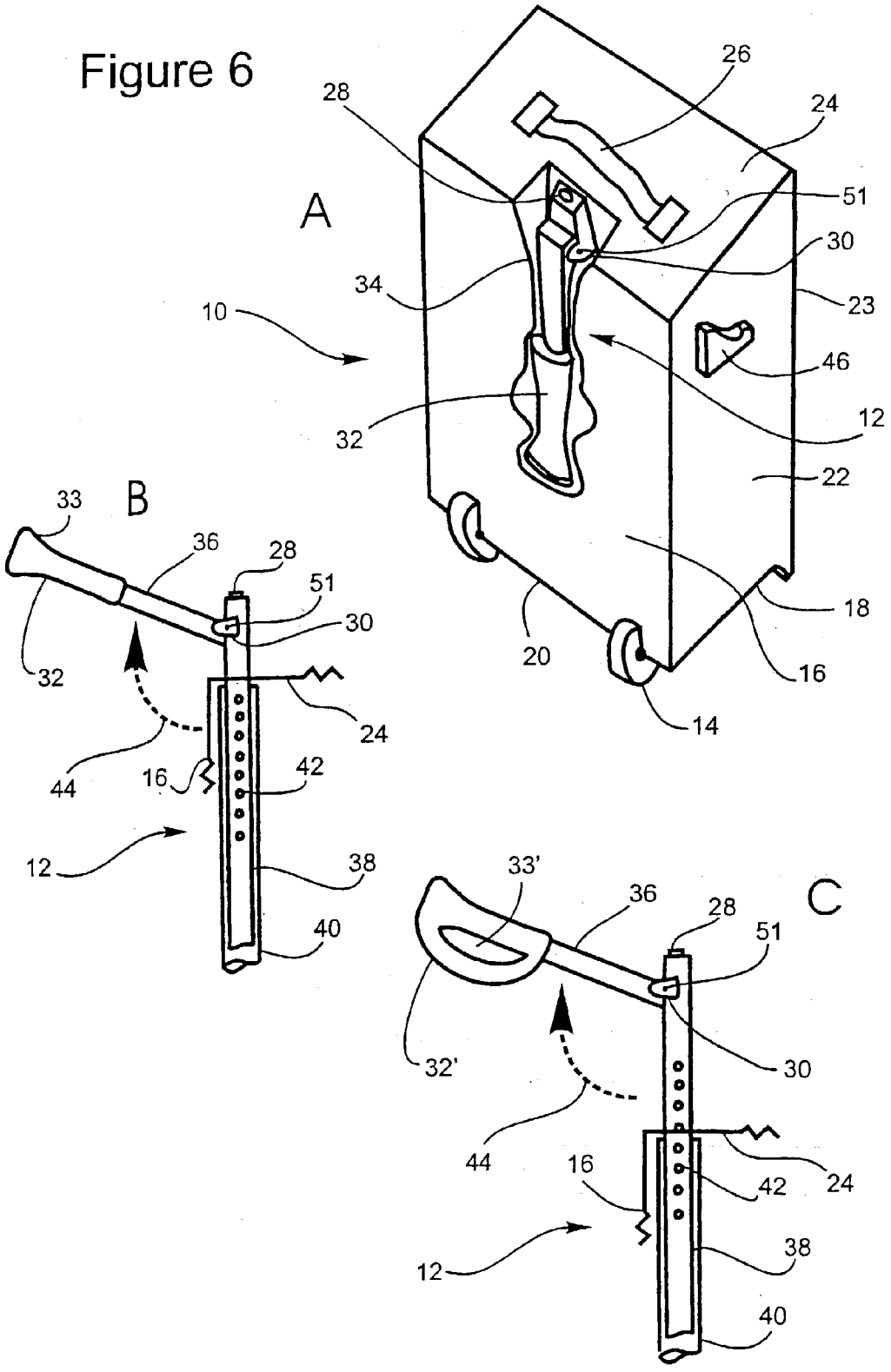


Figure 6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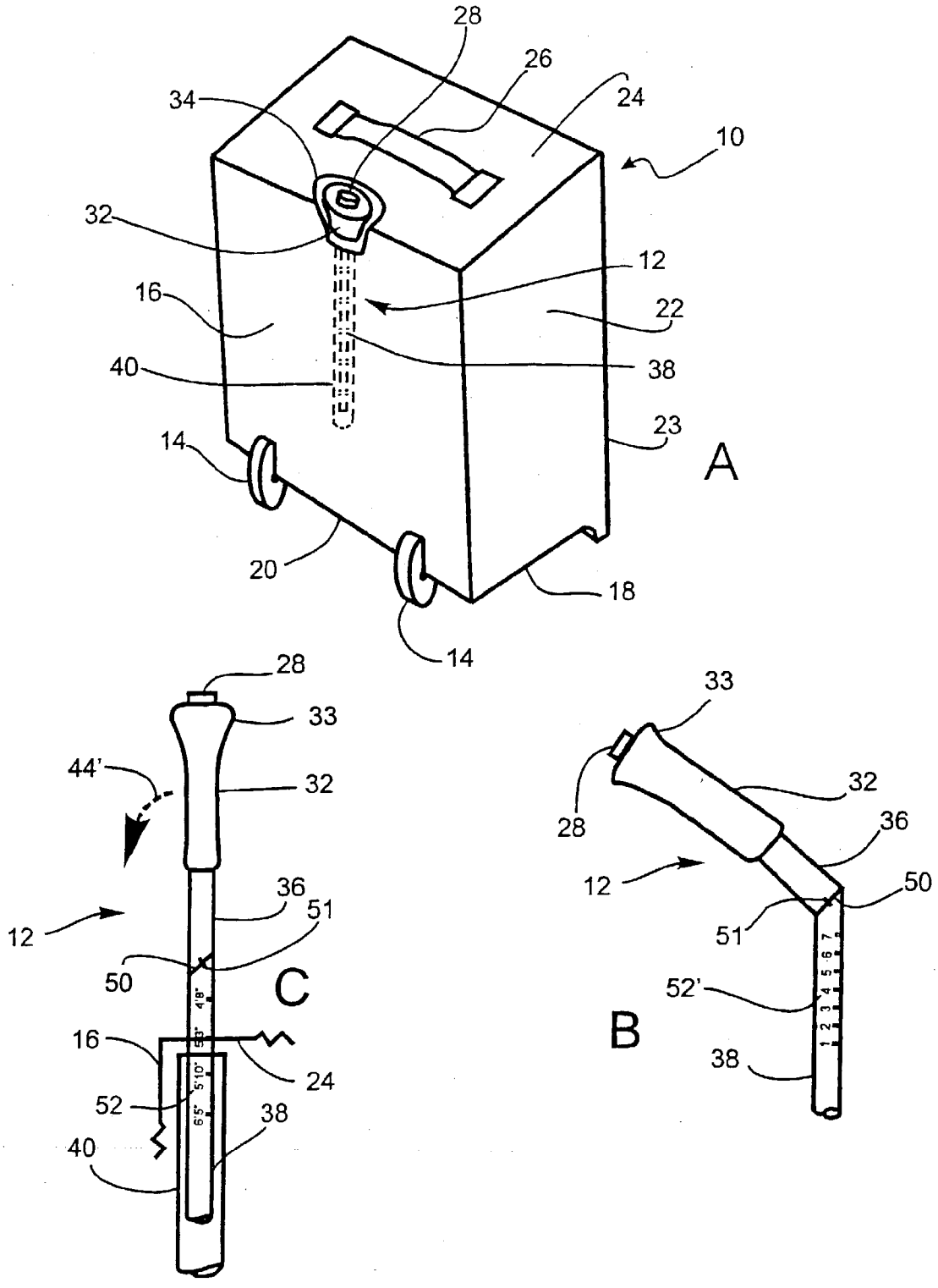
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Figure 7

ERGONOMICALLY DESIGNED WHEELED LUGGAGE

FIELD OF THE INVENTION

[0001] The invention relates in general to luggage. More particularly, the present invention relates to an ergonomically designed wheeled luggage.

BACKGROUND OF THE INVENTION

[0002] A great many types and styles of wheeled luggage, to include suitcases and carry-on bags, are known. The most popular style of wheeled upright luggage has a fixed axis provided as a part thereof and extending along a lengthwise edge of a lower base portion of the case, with a pair of spaced wheels rotatably mounted to the case and along the axis. The wheels are typically oriented so that the case can be rolled broadside. The upper face of the case is provided with a telescopic handle with which the user balances the case on its two wheels. Using the handle, the case can therefore be pulled with relative ease.

[0003] The wheeled luggage, to include cases and bags, collectively referred to hereinafter as "cases," commercially available today have handles for pulling or pushing the case and which are positioned parallel to the axis of the wheels. Such an arrangement forces the user to adopt an unnatural posture or stance in which the user's arm is extended back from the body and rotated about plus or minus 90° from the normal position of the arm, in which the arm extends along the side of the body and the palm faces the leg, while walking and carrying the case such that the user's palm instead faces up or down to grasp the handle.

[0004] This rotation of the arm and hand is achieved by a combination of shoulder and forearm rotation. In pulling the handle forward, the arm is extended from about 10° to about 40° toward the rear of the body. Due to the required position of the hand, shoulder abduction is thus from about 10° to about 30°, and the arm is positioned straight with the elbow joint fully extended. The wrist is deviated in the ulnar direction, generally from about 15° to about 25°, in order to align the user's hand with the luggage handle. Depending on the required pulling force, therefore, the wrist may also be subjected to flexion, generally from about 0° to about 15°. The positioning of the arm required to pull the wheeled case may therefore result in fatigue and/or a repetitive movement type injury to the user, especially those types of injuries associated with wrist movement. For individuals already suffering from repetitive movement injuries associated with other activities, for example keyboard associated wrist injuries, the hand and arm positions required by the currently available wheeled cases can result in significant pain to the user, and/or further injury thereto.

[0005] Moreover, the currently available types of wheeled cases generally come in a "one size fits all" design. The length of the extendable handle when extended is fixed, and is designed for a person of "average height" so that the weight of the luggage should be balanced over the wheels and thus require a minimal amount of force to maintain the luggage in an equilibrium or balanced position during usage. Taller persons, however, generally have to exert a downward force on the handle in order to keep the luggage from tipping backwards, whereas shorter persons have to exert an upward force to keep the luggage from falling toward the floor. Even persons of the "average height" for which the luggage is designed may have similar difficulties if additional items of luggage are attached to, or carried on, the wheeled case due to a shift in the center of gravity over the wheels.

[0006] What is needed, therefore, but currently unavailable among the known types of wheeled cases or luggage, is an improved ergonomically designed piece of wheeled luggage which will allow for a more natural user posture or stance during usage of the luggage. It would also be desirable to provide such a wheeled case with an ergonomic handle that may be easily adjusted for users of different height.

SUMMARY OF THE INVENTION

[0007] The present invention provides an ergonomically designed piece of wheeled luggage including, but not limited to, suitcases, bags, and other forms of luggage, which overcomes some of the design deficiencies of the art. The present invention thus provides luggage that is more comfortable and less tiring to use and which permits the user to adopt a more natural stance when carrying or otherwise moving or transporting the luggage across a floor surface, and which also permits the user to adjust the handle length to fit their respective body height, carrying preferences, and/or load conditions, thereby increasing user comfort while otherwise reducing fatigue and minimizing the risk of injury to the user, including injuries commonly associated with repetitive movement of the arm and wrist. Additionally, the ergonomically designed wheeled luggage of the present invention reduces the risk of repetitive or constant movement injuries to the luggage user.

[0008] More specifically, the present invention provides a wheeled case having a handle which when deployed is positioned to be essentially perpendicular to the axis of the wheels, and which can be adjusted to the height of the operator. Moreover, the present invention allows the user to adjust the length of the handle based on the user's height. The present invention thus provides ergonomically designed wheeled luggage which includes a four sided luggage or suitcase body adapted for holding articles, the luggage body having a bottom surface, a back surface, and a top surface, with the back surface thereof intersecting both of the bottom and top surfaces, respectively.

[0009] The luggage also has at least two wheels rotatably attached to the bottom surface of the luggage body adjacent the intersection of the back surface to the bottom surface thereof, such that a longitudinal axis passing through the wheels is parallel to the intersection of the back surface and the bottom surface of the luggage. A handle assembly is also provided, the handle being mounted on or adjacent the back surface of the luggage body, the handle assembly having a handle grip for being gasped by a user and used to roll or transport the wheeled luggage across a floor surface. The handle, when not in use, is essentially flush with the top surface of the luggage body.

[0010] In use, the handle extends for an adjustable distance above the top surface of the luggage body and can be locked in place at the selected distance or height. When extended, the handle grip is grasped by the user so that the handle is essentially perpendicular to the axis of the wheels, and wherein the adjustable distance or height of the handle can be selectively varied depending on the height of the user.

In a preferred embodiment, the grip portion of the handle is essentially parallel to the surface when the wheeled luggage is being rolled across a floor surface by the user. The handle, when not in use, is essentially flush with both the top surface and the back surface of the luggage body.

[0011] The wheeled luggage of the present invention is also provided with guides or markings by which the user can easily and repeatedly adjust the length of the handle to the user's height and body proportions. For example, the handle may have height or other markings which the user will use as a reference or gauge to adjust the length of the handle. The wheeled luggage may also be provided with a "bubble" indicator which would be used to adjust the appropriate handle length. The length of the handle would be adjusted such that when the grip portion of the of the handle is essentially parallel to the ground, the center of gravity of the luggage would be over, or very nearly over, the wheels, as indicated by the bubble indicator. This would allow the handle length to be adjusted so that the optimum inclination angle, which occurs where the center of gravity is directly, or nearly directly, over the wheels, is achieved when the luggage is either pulled or pushed. Once the optimal handle length has been established for a particular user, the user can then easily adjust the length of the handle using the markings or other indicators on the handle to the desired, and predetermined, handle length.

[0012] An object of the present invention, therefore, is to provide improved ergonomically designed wheeled luggage. It is to these objects, as well as the other objects, features, and advantages of the present invention, which will become apparent upon reading the specification when taken in conjunction with the accompanying drawings, to which the invention is directed.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] **FIG. 1** illustrates the pulling positions employed by persons of varying height using the known types of wheeled luggage.

[0014] **FIG. 2** illustrates the pulling position of a person using the wheeled luggage of the present invention.

[0015] **FIG. 3** illustrates a free body diagram of wheeled luggage used to develop the wheeled luggage of the present invention.

[0016] **FIG. 4** is a graph showing the effect of body height and acceleration on the lifting force with the conventional wheeled luggage of **FIG. 1**, having a handle length of about 1 meter.

[0017] **FIG. 5** is a graph showing the effect of body height on the lifting force for varying handle lengths with the conventional wheeled luggage of **FIG. 1**.

[0018] **FIG. 6A** illustrates a first embodiment of the wheeled luggage of the present invention having a handle assembly.

[0019] **FIG. 6B** is a side elevational view of a first embodiment of the handle assembly of the wheeled luggage of **FIG. 6A**.

[0020] **FIG. 6C** is a side elevational view of a second embodiment of the handle assembly of the wheeled luggage of **FIG. 6A**.

[0021] **FIG. 7A** illustrates a second embodiment of the wheeled luggage of the present invention having a handle assembly.

[0022] **FIG. 7B** is a side elevational view of the handle assembly of **FIG. 7A** as the handle is deployed in its transport position.

[0023] **FIG. 7C** is a side elevational view of the handle assembly of the wheeled luggage of **FIG. 7A** as it is first withdrawn from the wheeled luggage.

DETAILED DESCRIPTION

[0024] Referring now in detail to the drawings, an illustrative embodiment of the known types of conventional wheeled luggage is illustrated in **FIG. 1**. The known wheeled luggage has a handle spaced from and extending parallel to the axis of the wheels. In order to hold the handle of the case, the palm of the user's hand must either face forward or backward, as shown, which requires a rotation of the arm and wrist through approximately 90° in either direction, achieved by a combination of shoulder and forearm rotation. In pulling the handle forward the shoulder is extended in a rearward direction in the range of from about 10° to about 40°, thereby placing the hand behind the user's body. The extension of the arm to the rear, and the rotation of the user's palm results in a shoulder abduction of from about 10° to about 30°, and a wrist deviation in the ulnar direction of from about 15° to about 25°. Additionally, the user's arm is held straight with the elbow joint fully extended. Depending on the required pulling force, therefore, the user's wrist may also be subjected to flexion, generally in the range of from about 0° to about 15°. Most users will find the carrying or transporting positions illustrated in **FIG. 1** uncomfortable, especially during prolonged periods of use, and/or while carrying heavy, unbalanced loads.

[0025] Moreover, conventional wheeled luggage generally has a fixed handle length. Thus, the user's height will significantly affect the angle of inclination between the luggage body and the ground. In **FIG. 1**, the woman on the right is at a disadvantage because she must exert a greater force to pull the same size and weight of the wheeled luggage compared to the man on the left side of **FIG. 1** due to the differing angle the handle makes with the ground. For conventional wheeled luggage as shown in **FIG. 1**, and defining the x and y axes as forming the plane of the paper, as illustrated in **FIG. 3**, the axis of the gripping portion of the handle is parallel to the axis of the shaft joining the two wheels together, with both axes extending along the z axis and out of the page.

[0026] The luggage of the present invention is illustrated in use, generally, in **FIG. 2**. As shown in **FIG. 2** the user can adopt a more natural stance or posture when grasping the handle of the wheeled luggage. Once again representing the x and y axes as forming the plane of the paper, the gripping portion of the handle of the wheeled luggage of the present invention is within the x, y plane and is also perpendicular to the axis extending between the wheels rather than extending along the z axis. Thus, the user is not required to extend their arm to the rear, and/or rotate their arm so that their palm is either facing forward or backwards. As illustrated, the user can now pull the wheeled luggage of the present invention

without extending their arm in a rearward direction, and without significant rotation of the wrist.

[0027] A free body diagram, illustrated in **FIG. 3**, of a piece of conventional wheeled luggage was used to develop the wheeled luggage of the present invention. To simplify the analysis, the following assumptions were made. First, the mass of the wheels is negligible relative to the mass of the luggage and its contents. Secondly, that the radius of the wheels is small relative to the overall geometry of the luggage. Third, that all motion of the wheeled luggage is due to the rolling of the wheels across a floor surface, and fourth, that the rolling of the wheels is frictionless. The required force to move the luggage case has been divided into a horizontal component F_P representing a pulling force, and a vertical component F_L representing a lifting force.

[0028] The nomenclature listed below is used in **FIG. 3**, as well as in the several equations which follow, in which the presence of an asterisk (*) is used to denote the performance of a multiplication step therein:

[0029] L is the length from the wheel center to the end of the extended handle;

[0030] θ is the angle of inclination with respect to the ground;

[0031] ϕ is the angle between the luggage edge and the line OC, where O is the center of the wheel and C is the center of gravity of the luggage (in the plane);

[0032] W is the weight of the luggage;

[0033] m is the mass of the luggage;

[0034] a and b represent the height and width of the luggage, respectively;

[0035] F_L is the lifting force;

[0036] F_P is the pulling force;

[0037] F_N is the normal force;

[0038] F_F is the friction force ($F_F=m*F_N$);

[0039] μ is the coefficient of kinetic friction between the wheel and the ground; and

[0040] acc is the horizontal acceleration vector.

[0041] Summing the forces in the x direction, therefore, the following equation is obtained:

$$\Sigma F=F_P-F_F=m*acc, \quad (1)$$

[0042] which for pure rolling motion becomes

$$F_P=m*acc. \quad (2)$$

[0043] The sum of the forces in the y direction is zero, thus

$$F_L=W-F_N. \quad (3)$$

[0044] Assuming that the center of gravity coincides with the center of geometry C of the case, the sum of the moments around the center of the wheel is zero and is described by the equation:

$$-F_L*L*\cos(\theta)+F_P*L*\sin(\theta)+W*a/2*\cos(\theta)-W*b/2*\sin(\theta)-m*acc*½(a^2+b^2)^{1/2}*\cos(\theta+\phi)=0 \quad (4)$$

[0045] For a static system, or a system moving at a constant speed where acc=0, equation 4 becomes:

$$W*(a/2*\cos(\theta)-b/2*\sin(\theta)=Fl*L*\cos(\theta). \quad (5)$$

[0046] The inclination angle θ of the case is a function of the length L of the extended handle, and the height H of the operator's grip such that:

$$\theta=\arcsin(H/L). \quad (6)$$

[0047] Since the grip height, which is the approximate distance from the floor to the hand with the arm held at the side, of an individual is approximately 45 percent of the total height H, the effect of height can be determined using the above equations. Using typical values for the size and weight of the luggage, for example W=180 Newtons, a=58 cm, b=23 cm, and L=100 cm, the variation in lifting force as a function of body height is shown in **FIG. 4** for an acceleration of zero, representing an at rest or steady movement state, and for a typical acceleration of 0.8 m/s^2. The mechanical advantage of rolling luggage can clearly be seen from **FIG. 4**.

[0048] The force required to steadily pull a 180 Newton wheeled case of known construction thus varies from about 26 Newtons for a tall person to about 36 Newtons for the short person. The shorter person is therefore at a significant disadvantage and would have to exert approximately 50 percent more lifting force than the taller person, with an even higher lifting force required during acceleration. Although the relative advantage of the taller individual is reduced, the shorter individual must still exert a higher lifting force as compared with the taller individual. As the horizontal pulling force is increased due to acceleration, a moment around the axis of the wheels is created which tends to push the handle toward the floor. The vertical lifting force has to create a moment in the opposite direction in order to keep the case stable, and thus a higher lifting force is needed.

[0049] **FIG. 5** shows the effect of the handle length L on the required lifting force for persons of different height. At a handle length of one meter, shorter individuals are again at a disadvantage and have to exert a greater lifting force. As the handle length is increased, the lifting force for shorter users is decreased. As the handle length is further increased, the force curve approaches vertical. Thus, a shorter person would benefit from a somewhat longer handler. Of course, simply extending the length of the handle is not a practical approach since this would become unwieldy and increase the overall weight of the luggage.

[0050] When the center of gravity of the wheeled luggage is directly above the axis of the wheels, the required lifting force to balance the case is essentially zero. From **FIG. 3**, the center of gravity is directly above the wheel axis when

$$\theta+\phi=90.$$

[0051] For typical luggage dimensions, where a=58 cm and b=23 cm, ϕ would be about 22°. Thus, the optimum inclination of the luggage during pulling would be at a θ of about 68°. Using equation 6 and setting H equal to about 45 percent of the total body height, the optimum handle length would be about 0.485 of the total body height. This value is roughly equal to the location of the hand from the floor when standing with the arm and the hand fully extended along the side of the body.

[0052] In order to achieve an ergonomic hand-handle gripping interface, the shape, size, surface, and orientation of the handle can be adjusted consistent with these calculations. Preferably, the surface of the handle grip **32** (FIGS. **6A-7C**) will be coated with a non-slippery and a compress-

ible material, and is otherwise free of sharp edges. If desired, the handle may have finger grooves or other means to assist the user in gripping the handle. The cross-section of the handle is preferably circular, oval, or rectangular with rounded corners, and will provide a good fit between the user's hand, will prevent unwanted rotation of the handle therein, and will give the user a sense of the orientation of the handle. Preferably, the length of the grip portion **32** of the handle is sufficient to allow the largest user to use a closed fist grip that is formed with all fingers and thumb; normally a four inch or longer grip area length is sufficient. The handle axis should be essentially perpendicular to the axis of the wheels when the handle is being used to carry/transport the luggage. The orientation of the handle should allow the use of the luggage without excessive deviation of the wrist. The handle may be provided with a flange or other means at the end of the grip to eliminate or significantly reduce slippage, as desired. Alternatively, the grip portion of the handle may form a closed opening such that the fingers fit within the opening during operation.

[**0053**] The present invention discloses two ergonomic design features to improve the design of a wheeled luggage case. The first is the ability to control the length of the telescopic handle whereby the length of the handle can be set to a suitable and desired length depending on the user's height and/or body proportions, for example the length of the user's arm relative to their height. In contrast, when the handle length of the known types of wheeled luggage is adjusted, this does not significantly effect the center of gravity of the wheeled luggage. The optimum handle length for a given user will generally be a length such that the handle can easily be grasped by the user when standing up with their arm and hand fully extended along their side, and will vary for any given individual based on their unique physical characteristics.

[**0054**] The second design feature is the orientation of the handle. The ergonomically designed handle for use with wheeled luggage of this invention enables a user to pull the luggage using a more comfortable and natural posture. For every joint in the human body there is an ergonomically preferred position at which the human body is the strongest and most comfortable. Thus, in designing for the comfort of the user, the present invention allows the user to assume, or at least approximate, the preferred or more natural posture.

[**0055**] The following Table lists the body segments and joints normally used when pulling wheeled luggage and provides a comparison between convention wheeled luggage and the present invention.

Body Segment or Joint	Preferred Position	Conventional Luggage	The Inventive Luggage
Shoulder Abduction	0°	10–30°	0°
Shoulder Extension	0°	10–40°	0–20°
Shoulder Lateral Rotation	0°	Combination movement of ±45°	0°
Shoulder Medial Rotation	0°		
Forearm Supination	0°		
Forearm Pronation	0°		
Elbow Flexion	90°	0°	0°
Wrist Ulnar Deviation	0°	15–25°	±5°
Wrist Flexion	0°	0–15°	0°

[**0056**] As demonstrated, the wheeled luggage of the present invention allows the user to assume a more natural posture, especially with regard to the position of their wrist, shoulder, and forearm. Use of the inventive wheeled luggage should therefore increase user comfort and reduce user fatigue, as well as the risk of repetitive movement type injuries.

[**0057**] FIGS. **6**A-**7**C illustrates several embodiments of the wheeled luggage of the invention. Accordingly, the wheeled luggage of the present invention includes a luggage body or case **10** provided with a handle assembly **12**. The case is provided with a pair of spaced and parallel wheels **14** which are rotatably mounted thereto and have a common elongate longitudinal axis extending therethrough.

[**0058**] The luggage body or case **10** is formed by a back surface **16**, a bottom surface **18**, two opposed side surfaces **22**, a top surface **24**, and a front surface **23**, all joined to one another along their common side edges, in known fashion. Although shown as a rigid body or case, it is anticipated that the body may instead be a semi-rigid or soft body case or bag formed for carrying and enclosing the user's personal effects (not illustrated) therein. The intersection **20** of the back surface and the bottom surface of the case is parallel to the axis of the two wheels **14**.

[**0059**] The handle assembly **12**, when folded, fits into a well **34** defined within or formed by the case. Preferably when the handle assembly **12** is in its stowed position, the handle is essentially flush with the luggage body, namely the top surface **24** and the back surface **16** thereof, as shown in **FIG. 6A**. The handle assembly **12** is constructed such that it will lock when in its stowed position within the well of the case. Although not shown, the well **34** can also be closed or sealed over with a zippered or Velcro®-type of hook and loop fastener covering when the handle assembly is not being used in order to prevent the handle assembly from opening and/or being damaged during baggage handling. The case **10** will also be equipped with a conventional carry handle **26** mounted on the top surface of the case body.

[**0060**] The handle assembly, when deployed, will provide an elongate handle grip **32** that will be positioned essentially perpendicular to the axis of the wheels **14** of the case, and is also perpendicular with respect to the intersection **20** of the back surface **16** and the bottom surface **18** of the case. The handle assembly as constructed thus allows for the adjustment of the overall handle length to accommodate different users. Preferably, the handle grip **32** is deployed so that it is generally parallel to the floor or other surface over

which the wheeled luggage is to be transported. Of course, other configurations of the handle assembly **12** shown in FIGS. **6**A-**7**C could be used so long as the handle, when in its operating position, is perpendicular to the wheel axis and where the length of the handle can be adjusted to the height of the user without significantly affecting the center of gravity of the luggage.

[**0061**] The handle assembly **12** is shown in its stowed position in **FIG. 6A**. A lock or release button **28** is provided on the handle assembly to lock the handle assembly in place, as illustrated. By engaging the lock button **28**, the user can move the handle assembly into its open operating position as illustrated in **FIGS. 6B and 6C**. In its operating position the handle grip **32** is positioned such that it is perpendicular to the axis of the wheels **14**.

[**0062**] The handle assembly includes the handle grip **32** for being grasped within the hand of the user, a handle shaft **36**, a slidably moveable inner tube **38**, and a stationary outer tube **40**. The handle shaft **36** is attached to the inner tube **38** by a hinge **30** formed about a center point or pivot pin **51**. In the stored position of the handle assembly (**FIG. 6A**), the handle shaft **36** is essentially parallel to the inner and outer tubes **38** and **40**. When the handle is extended, as shown in **FIGS. 6B and C**, the handle shaft **36** is rotated about the pivot pin into the operating position of the handle, as indicated by arrow **44**. In deploying the handle assembly, the inner tube **38** is slidably moved upwardly within the outer tube **40** to provide the desired handle length. The gripping surface of the handle **32** may have a flared end **33** to allow a better grasp thereof by the user, or to minimize hand slippage when being grasped by the user. If desired, the handle may also define an opening **33'** through which the user can insert their fingers in order to permit the user to obtain a better grip.

[**0063**] Once the handle assembly is properly positioned and adjusted to the desired length in its extended position (**FIG. 6C**), the inner tube of the handle assembly will then be locked in position with respect to the outer tube by using any one of the several known types of locking devices and mechanisms. For example, the outer tube could be provided with a fitting which selectively compresses the inner tube so as to tightly grip the inner tube. Alternately, the inner tube may have a series of spaced openings defined therein and through which a pin (not illustrated) can be inserted to lock the two tubes **38** and **40** together so as to provide a handle of the desired length. Additionally, the markings **42** can be used to gauge the extended position of the inner tube **38** relative to the outer tube **40** and, thus, the length of the extended handle.

[**0064**] The length of the extended handle is determined based upon the ergonomic principles described above. Once such a length is determined for a particular user, the length that the inner tube **38** must be extended within the outer tube **40** to attain that desired length can be marked or otherwise indicated on the inner tube **38** by the gauge markings to permit the user to easily set the handle assembly at the desired length in the future.

[**0065**] A bubble indicator **46** (**FIG. 6A**) may also be provided, and used if desired, to assist the user in adjusting the length of the handle to the correct ergonomic position for that user so that the bubble is centered within the level and the extended handle shaft and handle grip are positioned parallel to the floor surface across which the wheeled luggage will be rolled during transport. Of course, for a particular individual, the desired handle length will be determined empirically, or through an initial trial and error process. It is a feature of the present invention, however, that the inclination angle, i.e., the angle θ formed by the lower portion of the handle relative to the ground, is not significantly modified by changing or adjusting the handle length.

[**0066**] Although the weight distribution of the load within the luggage body is not expected to significantly alter the desired handle length, the addition of other luggage, either placed on the top surface **24**, or hung from the top surface **24** and extending over the front surface **23** of the body/case **10** may modify the case's center of gravity to the extent that it may be desirable to further adjust the handle length. Since the handle length can be adjusted as needed, and as described above, the present wheeled luggage is ideally suited for use in situations where the load distribution may change or where more than one user may use and/or pull the luggage.

[**0067**] FIGS. 7A-C illustrate a second embodiment of the present invention, and uses like reference characters to identify like components of the two pieces of luggage. The handle assembly **12** is housed once again within the back surface **16** of the luggage body, and comprises a handle grip **32**, a handle shaft **36**, an inner tube **38**, and an outer tube **40**. In its stored position (**FIG. 7A**), the handle shaft **36** and the inner tube **38** are aligned with and received within the outer tube **40** of the handle assembly, with a flared end **33** of the handle grip fitted within the recess or well **34** of the case.

[**0068**] A locking button **28** is once again provided for locking the handle assembly into, and releasing the handle assembly from, its stored position within the body of the case. To move the handle assembly into its operating position, the handle grip **32** is released by depressing the locking button **28** and pulling the handle grip **32** upwardly until the desired overall extension thereof is obtained, as shown in **FIG. 7C**. The handle grip **32** is then rotated about a pivot **50** and a center pin **51** as indicated by the arrow **44'**, such that the handle grip is positioned to be essentially parallel to the ground (during use) and perpendicular to the axis of the wheels **14**, as illustrated in **FIG. 7B**.

[**0069**] The inner tube **38** may be provided with actual height indicators **52** (**FIG. 7B**), or with arbitrary indicators **52'** (**FIG. 7B**) used to indicate or gauge the desired distance the inner tube **38** must be extended within the outer tube **40** to attain the desired handle length. In **FIG. 7**C, the inner tube **38** has been extended or adjusted for a person having a height in the range of from 5'5" to 5'7".

[**0070**] This embodiment of the wheeled luggage may also be provided with a "bubble" indicator, as discussed above, which will be used to adjust the appropriate handle length. The length of the handle is adjusted such that when the grip portion of the of the handle is held essentially parallel to the ground, the center of gravity of the luggage will be over, or very nearly over, the wheels, as indicated by the centered bubble within the bubble indicator. This allows the handle length to be adjusted so that the optimum inclination angle, which occurs where the center of gravity is directly, or nearly directly, over the wheels, is achieved when the luggage is either pulled or pushed. Once the optimal handle length has been established for a particular user, the user can

then easily adjust the length of the handle using the markings or other indicators on the handle to the desired, and predetermined, handle length.

[0071] Although several embodiments of the invention have been disclosed in the foregoing specification, it is understood by those skilled in the art that many modifications and other embodiments of the invention will come to mind to which the invention pertains, having the benefit of the teaching presented in the foregoing description and associated drawings. It is thus understood that the invention is not limited to the specific embodiments disclosed hereinabove, and that many modifications and other embodiments are intended to be included within the scope of the appended claims. Moreover, although specific terms are employed herein, as well as in the claims which follow, they are used only in a generic and descriptive sense, and not for the purposes of limiting the described invention, nor the claims which follow.

I claim:

1. A piece of wheeled luggage for being transported by a user across a floor surface, comprising:

a luggage body, said body including a bottom surface, a back surface, and a top surface, the back surface intersecting both of the bottom the top surfaces, respectively;

at least two spaced and parallel wheels rotatably supported on said body;

a longitudinal axis extending through said wheels, said axis being parallel to the intersection of the back surface and the bottom surface of said body; and

a handle assembly mounted on the body, said handle assembly including a handle grip for being grasped by the user when the wheeled luggage is rolled across the floor surface, said handle assembly having a first retracted position in which the handle grip is flush with the luggage body and a second extended position in which the handle grip extends for a selectively adjustable distance above the top surface of the body and within which the handle grip, when grasped by the user, is positioned perpendicularly with respect to the said axis.

2. The wheeled luggage of claim 1, said handle assembly being constructed and arranged to be locked in said second extended position.

3. The wheeled luggage of claim 1, said handle assembly being constructed and arranged so that said second extended position thereof may be selectively varied with respect to the height of the user.

4. The wheeled luggage of claim 1, wherein in said second extended position said handle grip is essentially parallel to the floor surface as the wheeled luggage is being transported thereover by the user.

5. The wheeled luggage of claim 1, said handle assembly comprising a fixed outer tube mounted to said body and a movable inner tube slidably received within the outer tube, said handle grip being attached to an end of said inner tube extending out of said outer tube.

6. The wheeled luggage of claim 5, said handle grip comprising an elongate handle shaft attached to the end of the inner tube extending out of the outer tube.

7. The wheeled luggage of claim 5, said inner tube being constructed and arranged to be selectively moved within said outer tube for varying the length of said handle assembly.

8. The wheeled luggage of claim 5, said inner tube having a series of spaced markings thereon and extending along at least a portion of the length thereof, said markings being constructed and arranged to gauge the movement of the inner tube with respect to the outer tube.

9. The wheeled luggage of claim 1, wherein said handle assembly comprises a fixed outer tube and a movable inner tube, said handle grip being attached to the movable inner tube such that adjustable distance of the handle assembly is selectively varied by the movement of the movable inner tube within said outer tube.

10. The wheeled luggage of claim 9, wherein the inner tube has a series of spaced markings thereon and extending along at least a portion of the length thereof, said markings being constructed and arranged to gauge the movement of the inner tube with respect to the outer tube.

11. The wheeled luggage of claim 1, further comprising a bubble level indicator mounted on the luggage body for use in establishing a handle assembly length appropriate to the user.

12. The wheeled luggage of claim 1, further comprising a bubble level indicator mounted on the luggage body for use in positioning the handle assembly and said handle grip in said second extended position.

13. The wheeled luggage of claim 1, wherein in said second extended position said handle grip is spaced from and substantially parallel to the floor surface as the wheeled luggage is being transported thereover by the user.

14. The wheeled luggage of claim 5, wherein in said first retracted position said inner tube is folded over and positioned substantially parallel to said outer tube.

15. The wheeled luggage of claim 5, wherein in said first retracted position said inner tube is substantially enclosed within said outer tube.

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