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(54) **HAND IMPLEMENT WITH SHOCK ABSORBER**

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E01H 5/02 (2006.01)

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CPC ***B25G 1/01*** (2013.01); ***E01H 5/02*** (2013.01)

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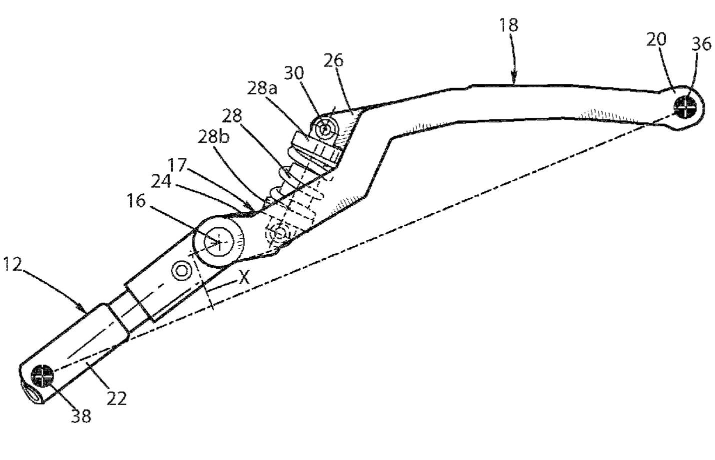
(57) **ABSTRACT**

A lifting implement, such as a shovel has a handle and a load bearing member. The handle includes an articulated joint dividing the handle between a major portion and a lever portion. The lever is adapted to pivot within the range of an acute angle relative to the handle profile. The lever and the major portion of the handle each have a means for mounting a resilient member therebetween, where the resilient member is capable of absorbing shock and storing energy when urged by the pivoting of the lever within the range during the motion of lifting a load, and which stored energy is released when the load is being heaved by the implement. The handle may include a hand grip and a gripping portion on the major portion spaced from the articulated joint such that a triangle is formed with the hand grip, the gripping portion and the articulated joint at the apex of the triangle, wherein the apex of the triangle.

21 Claims, 9 Drawing Sheets



(58) **Field of Classification Search**
USPC 294/49, 54.5, 57, 58, 59; 16/422, 426, 16/430
See application file for complete search history.

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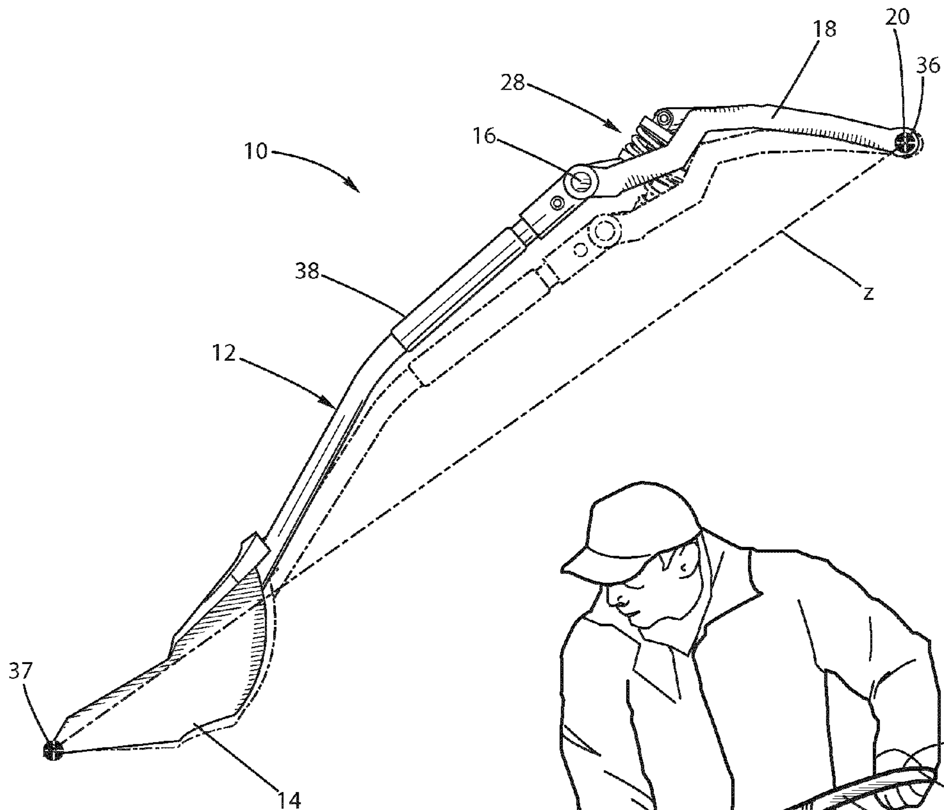

Fig.2

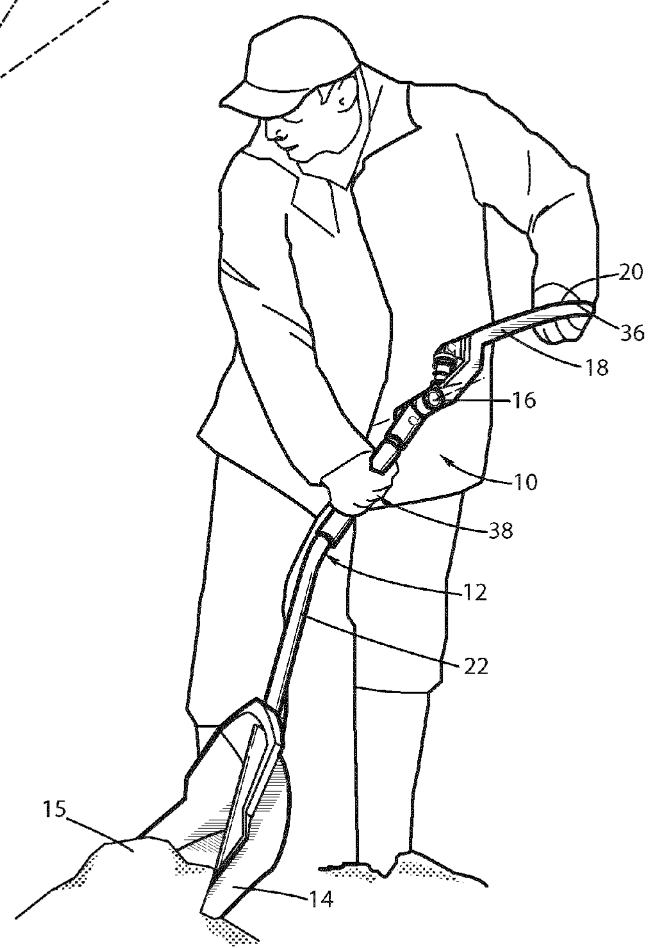

Fig.1

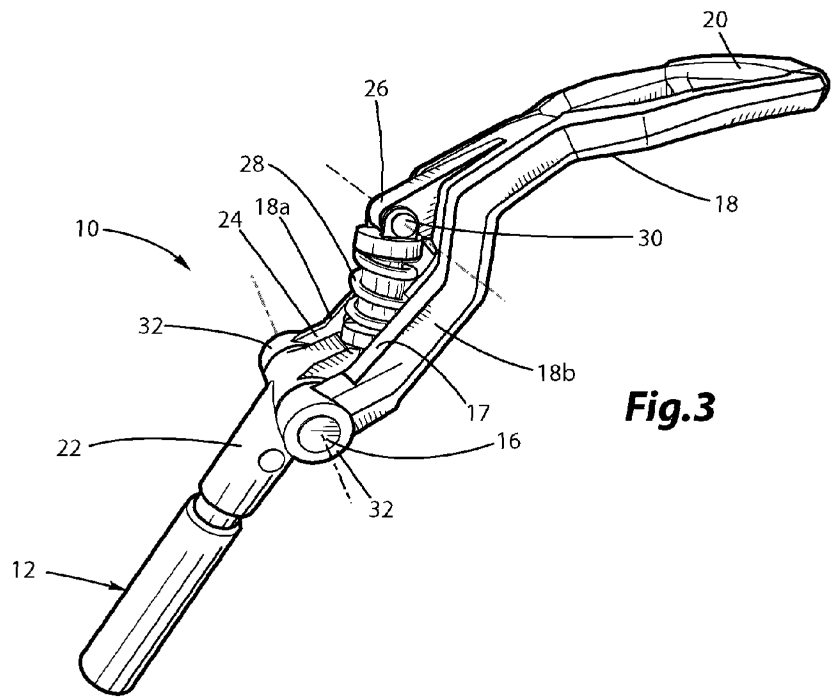
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Fig.3

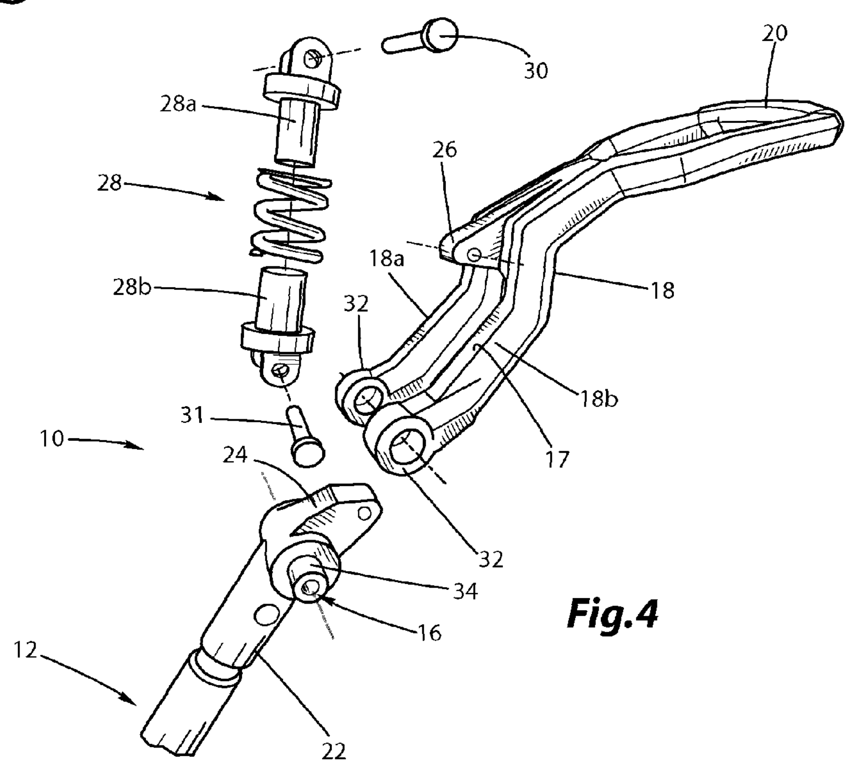
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Fig.4

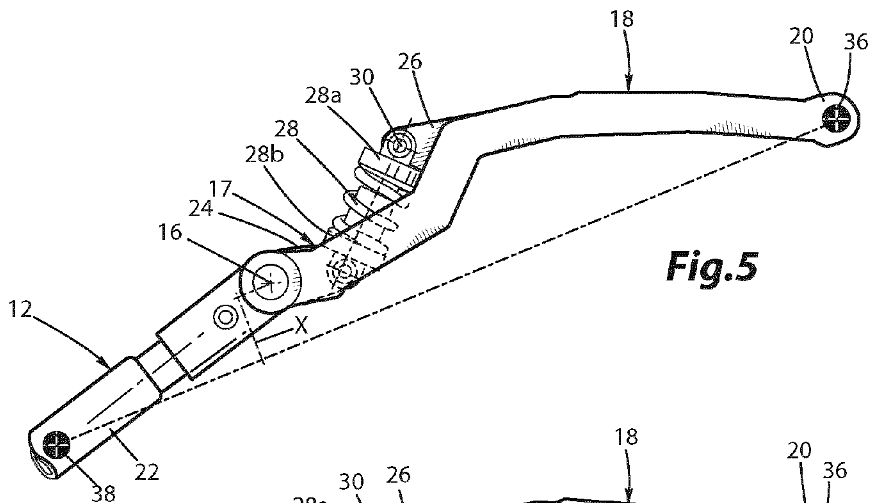

Fig.5

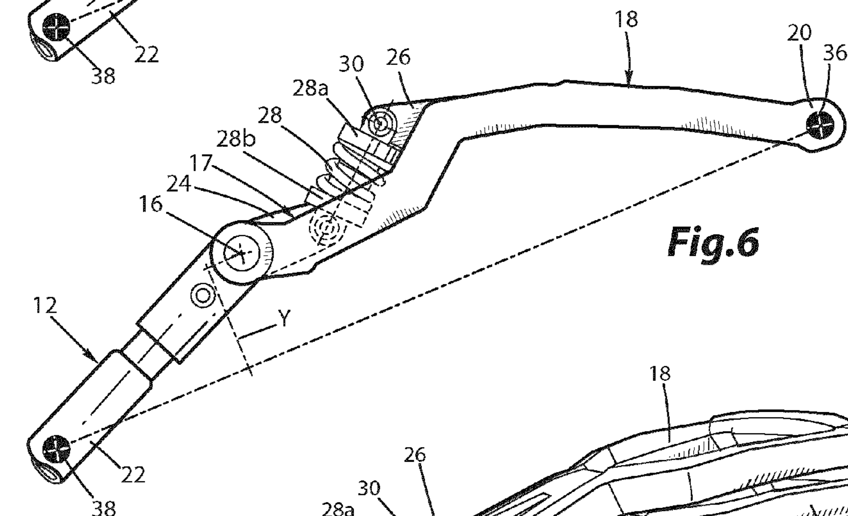

Fig.6

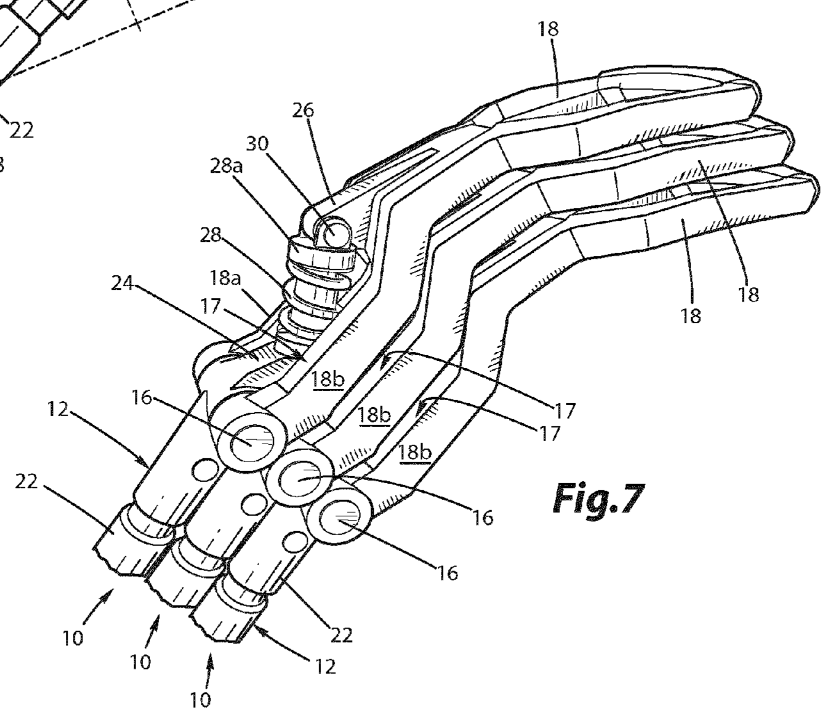

Fig.7

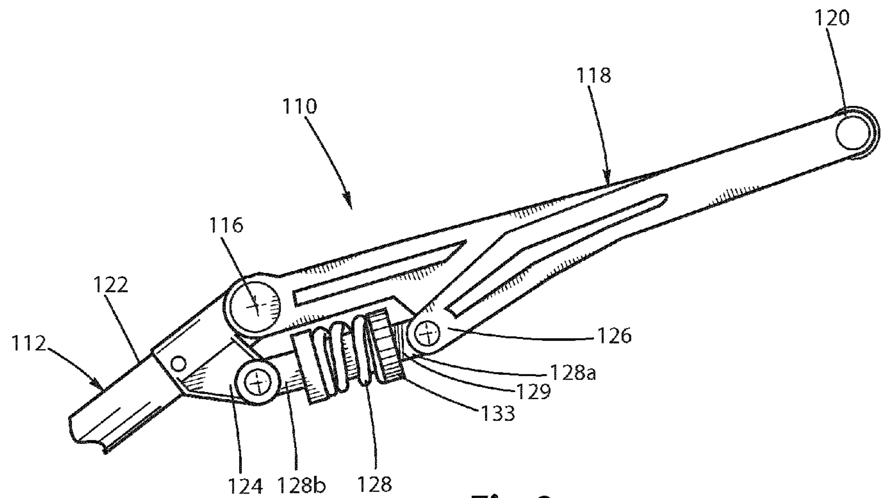

Fig.8

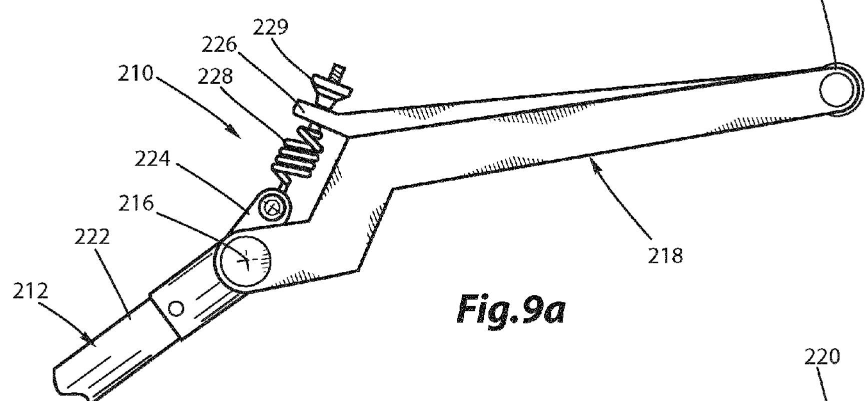

Fig.9a

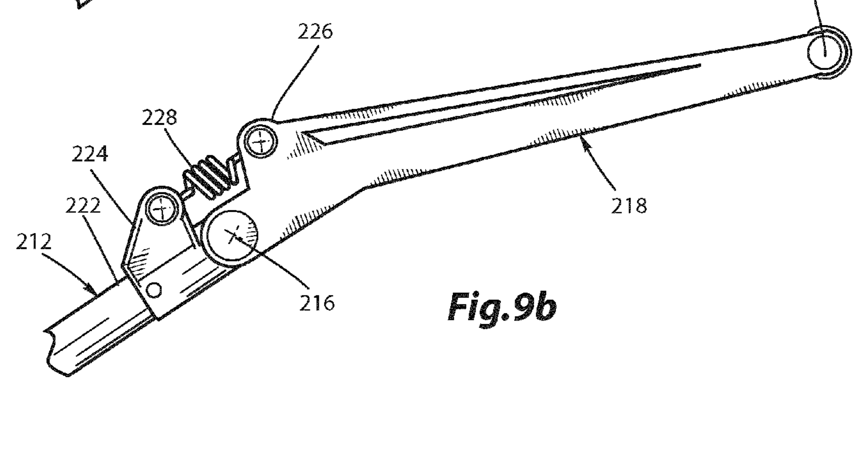

Fig.9b

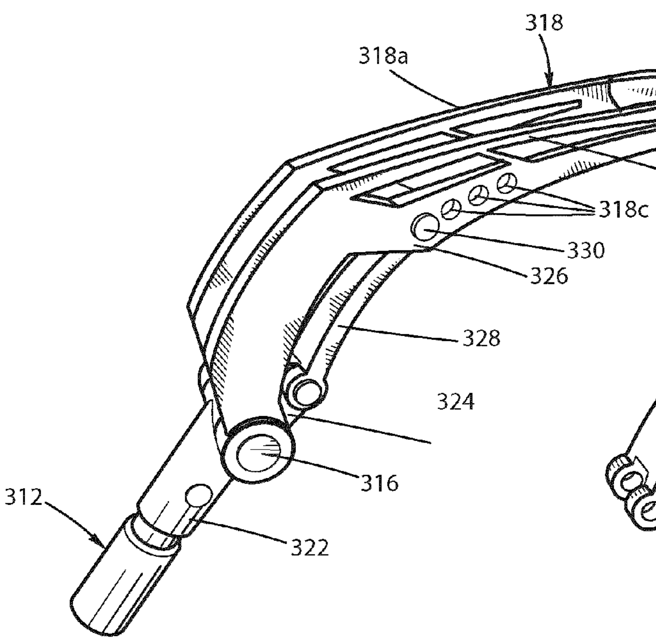

Fig.10a

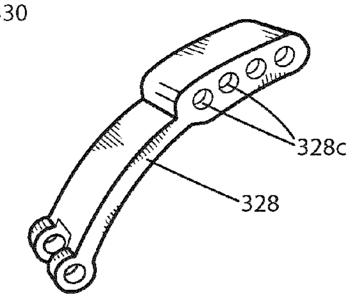

Fig.10b

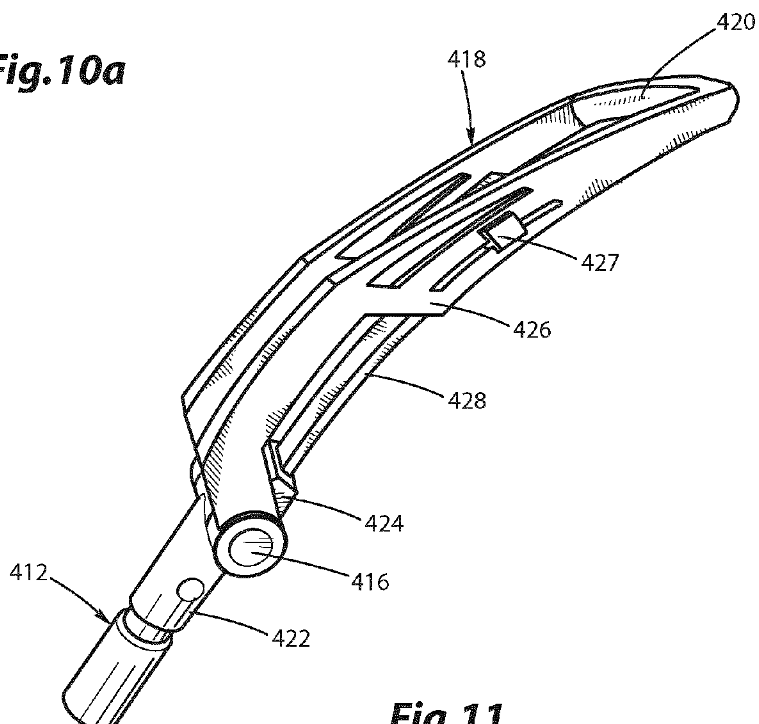

Fig.11

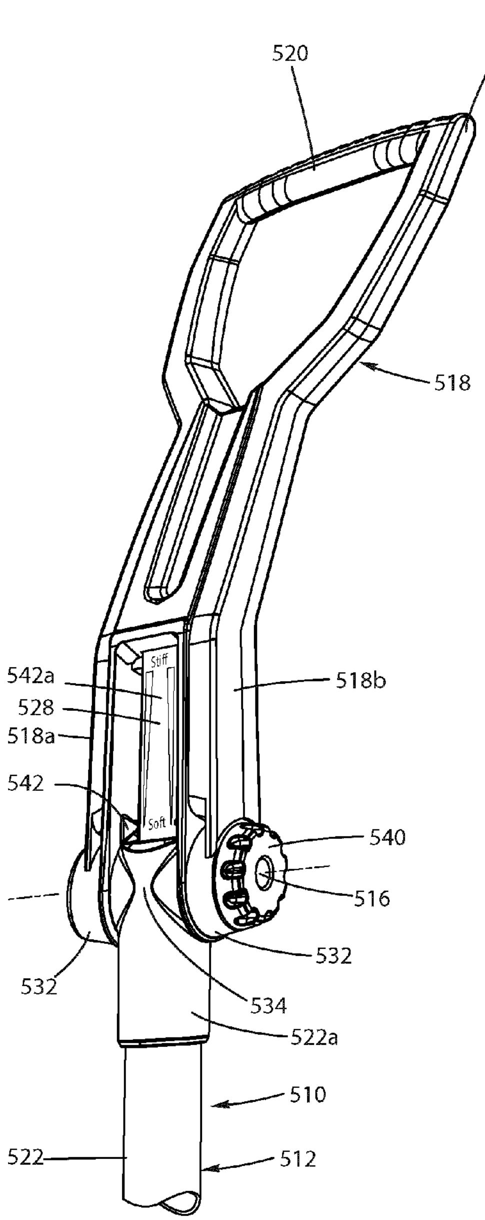

Fig.12a

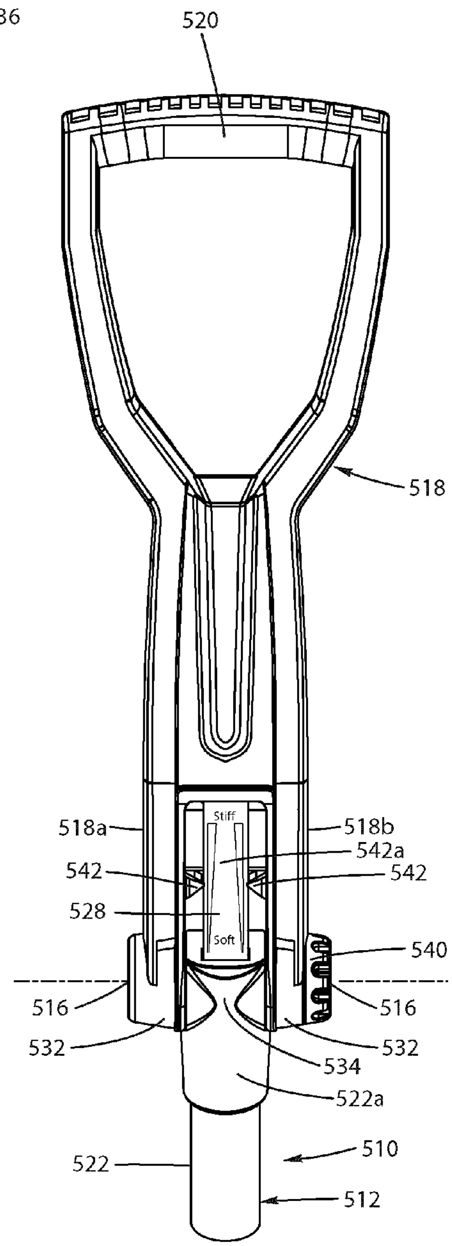

Fig.12b

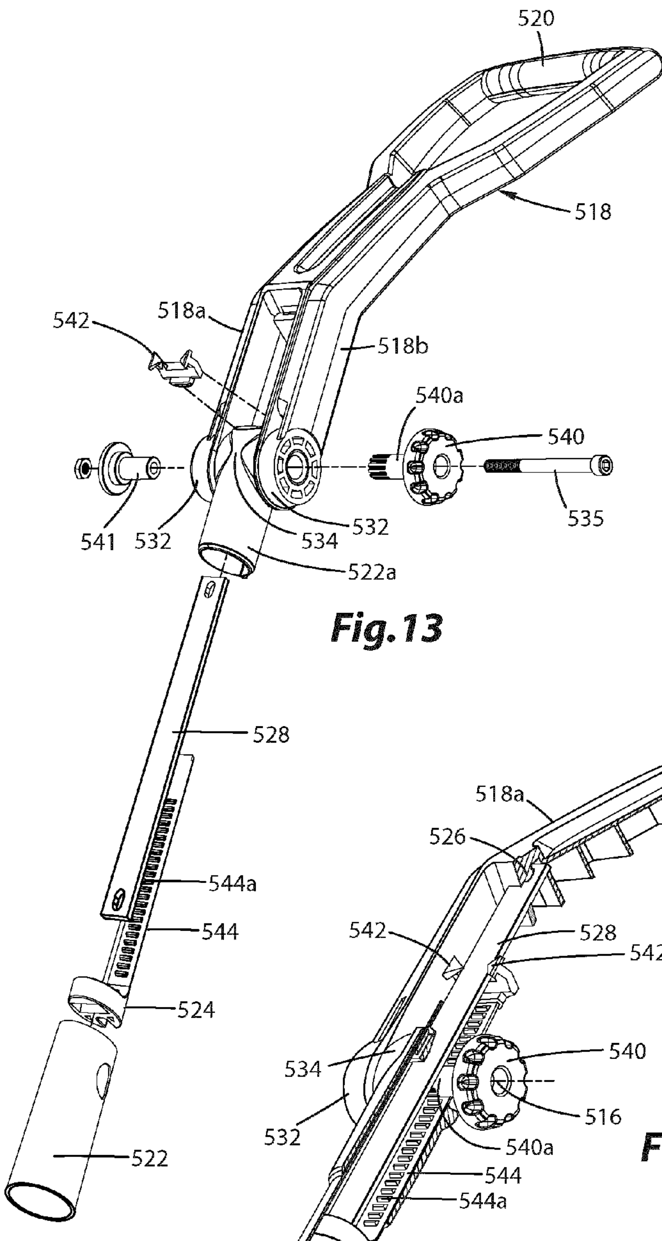
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Fig.13

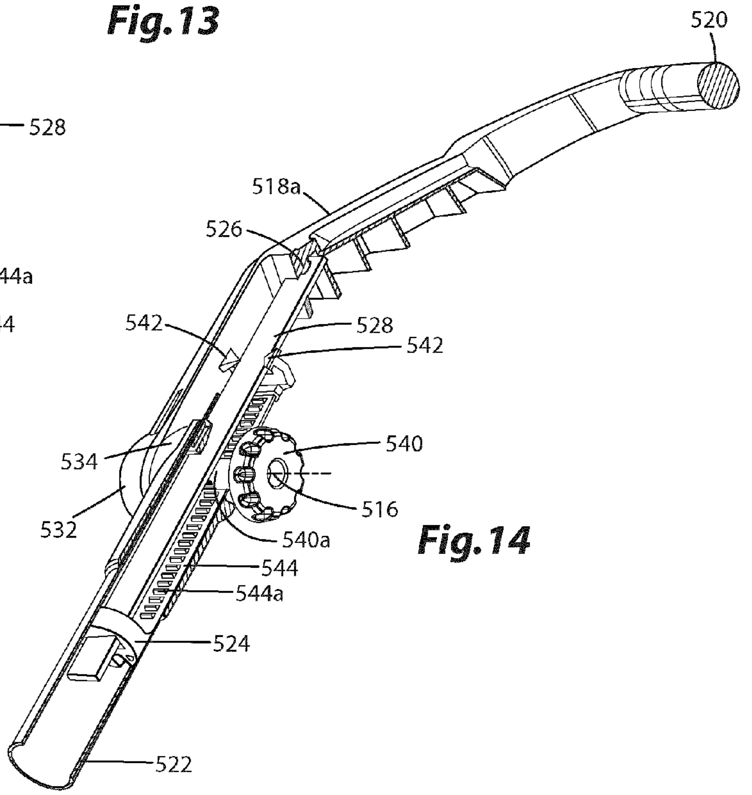
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Fig.14

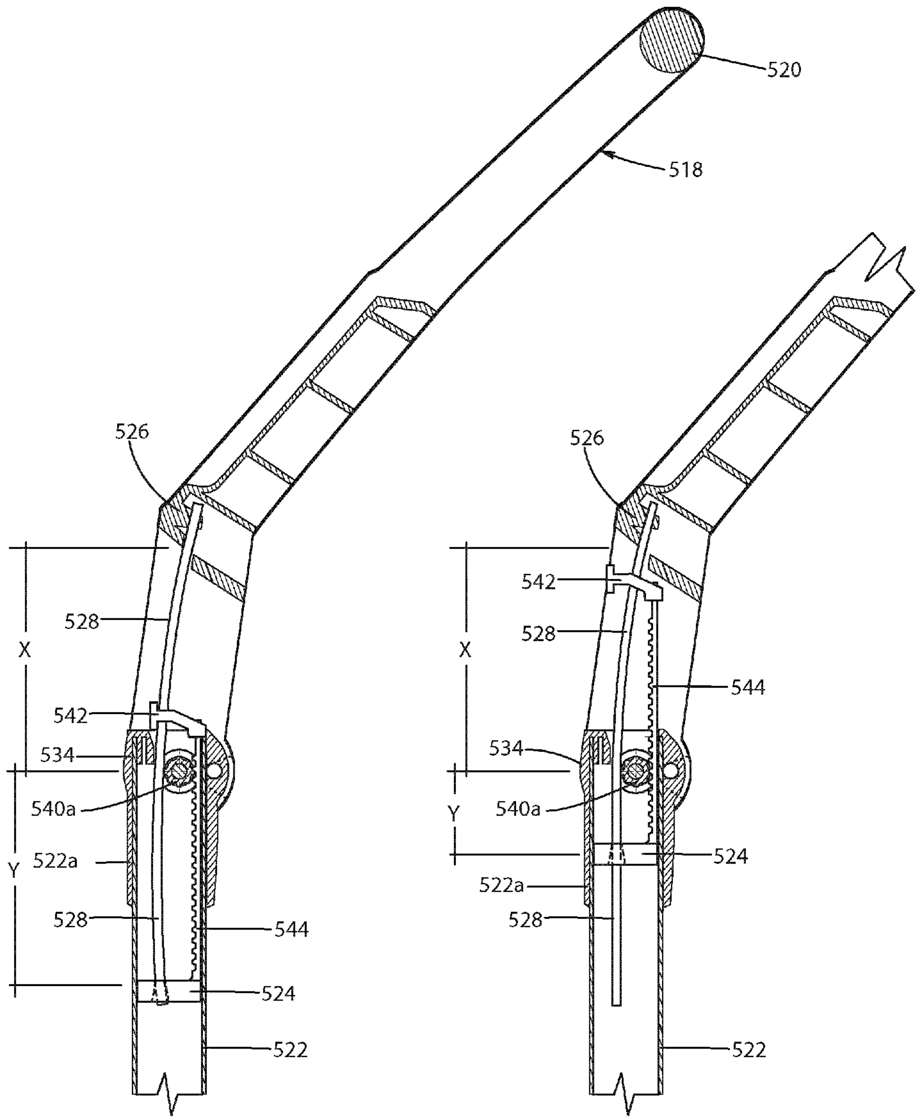

Fig.15a

Fig.15b

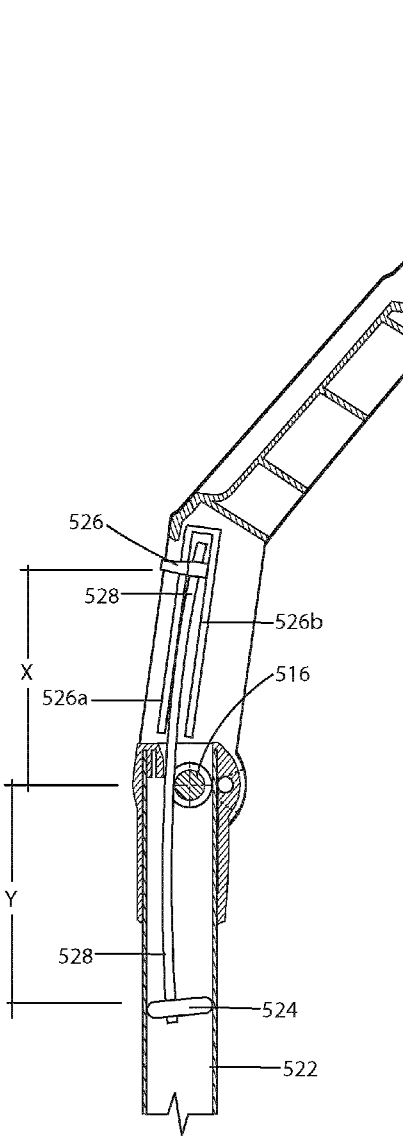

Fig.16a

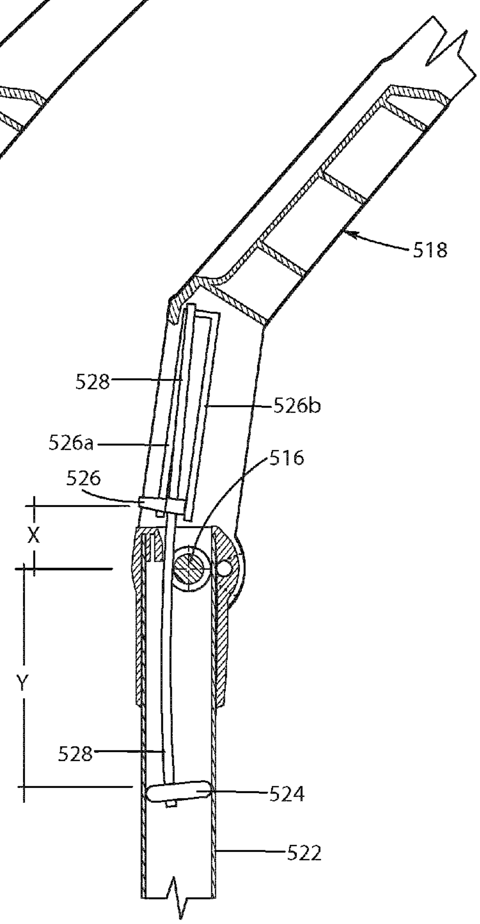

Fig.16b

HAND IMPLEMENT WITH SHOCK ABSORBER

TECHNICAL FIELD

The present application relates to shock-absorbing implement handles and, more specifically, to handles for lifting implements such as shovels.

BACKGROUND ART

When a hand implement, such as a shovel, impacts against a dense substance such as ice or a rock, a shock may be imparted through the implement. Several devices have been identified which attempt to provide a cushion or shock absorber to the handle. For example U.S. Pat. No. 4,691,954 Shaud 1987; AU 9645895 Deliu 1997; U.S. Pat. No. 5,816,634 Jacobs et al; WO99/55135 Nicholl 1999 and GB2,371,513 Russell, all show handles with a linear compression device, usually a compression spring.

Although a linear compression device, in an implement handle, may act as a shock absorber in axial type loads, I have improved on such devices by integrating a deflection feature using a resilient component to the implement handle to absorb lifting loads. Such a shovel is illustrated in my patent Canadian application CA 2,641,020.

The devices shown and described in CA 2,641,020 add an articulated, resilient, leveraging feature, to the shovel handle, providing a force assisting boost allowing the user to heave the contents on the shovel much further, using the energy stored by the resilient device.

SUMMARY

Applicant has made further improvements as described herein.

In accordance with a general aspect, there is provided an elongated handle with a distal end and a proximal end. The handle having a handle profile and including an articulated joint at a minor distance from the proximal end dividing the handle between a major portion extending from the distal end to the joint, and, a lever portion extending from the joint to the proximal end. A first prehension zone provided at the proximal end of the lever and a second prehension zone on the major portion. The lever portion is adapted to pivot about the joint within the range of an acute angle relative to the handle profile, and the handle profile defines a triangle with the base extending between the first and second prehension zones and the joint forms the apex of the triangle. The lever and the major portion of the handle each mounting respective ends of a resilient member therebetween, wherein the resilient member is capable of storing energy when applied by the pivoting of the lever within the range during the motion of engaging a load characterized by the translation of the apex of the triangle with respect to the base causing the resilient member to absorb shock and store energy.

In a more specific embodiment, the lever includes a recessed seat adjacent the joint and a pair of brackets facing each other from the opposite ends of the seat wherein a first bracket is fixed to the lever while the second bracket is fixed to the major portion of the handle; and a resilient member fixed to and extending between the pair of brackets overlying the seat wherein the tool handles lend themselves to being stacked.

In another embodiment of the present invention the bracket in at least one of the lever and major portion of the handle is mobile while the resilient member is an elongated flexible member with one end portion engaged in the bracket that is mobile and the other end portion is engaged with the bracket in the other of the lever and major portion of the handle such that the length of the flexible member may be varied by adjusting the position of the at least one mobile bracket whereby the stiffness of the resilient member is adjusted.

In another aspect there is an energy storing device for a lifting implement including a handle and a load bearing portion wherein the energy storing device includes a an articulated joint to be mounted to a proximal end of the handle; and the device forming a lever extending from the joint to a first prehension zone provided at the proximal end of the lever and a second prehension zone on the handle; the lever adapted to pivot about the joint within the range of an acute angle relative to the handle. The handle and the lever defining a triangle with the base extending between the first and second prehension zones and the joint forming the apex of the triangle; the lever and the handle each mounting respective ends of a resilient member therebetween, the resilient member capable of storing energy when applied by the pivoting of the lever within the range during the motion of engaging a load characterized by the translation of the apex of the triangle with respect to the base causing the resilient member to absorb shock and store energy.

For clarity the following terms are explained in more detail:

"handle profile" means the longitudinal axis of the elongated handle, if it was straight but the approximation of a straight line including the joint when curved the handle is curved. Although a curved ergonomic handle is shown in the drawings, it is intended that a straight linear handle, at least for the major portion, be straight.

"lifting implement" means any shovel blade, fork for hay, blade for a spade, hand plow for scraping or the like.

"Lifting" for the purposes of this description includes any use that the implement is subjected to such as lifting and heaving a load such as snow or soil; scraping snow or ice; breaking or chipping ice or hard snow; digging in soft or hard soil.

BRIEF DESCRIPTION OF THE DRAWINGS

Reference is now made to the accompanying drawings in which:

FIG. **1** is a perspective view of one embodiment of a shovel in accordance with an embodiment, held by a user;

FIG. **2** is a side elevation view of the shovel shown in FIG. **1**, with the handle shown in two positions at opposite limits of the range of operation;

FIG. **3** is an fragmentary, perspective view showing a detail of the shovel shown in FIG. **1**;

FIG. **4** is a fragmentary, perspective, exploded view of the detail shown in FIG. **3**;

FIG. **5** is a side elevational view of the detail shown in FIG. **3**;

FIG. **6** is a side elevational view similar to FIG. **5** but showing the detail in a different operative position;

FIG. **7** is a fragmentary, perspective view of a cluster of shovels in accordance with the embodiment shown in FIG. **1**, in a stacked position;

FIG. **8** is a fragmentary, side elevational view of another embodiment of the of the handle;

FIG. **9***a* is a fragmentary, side elevational view of yet another embodiment of the of the handle;

FIG. **9***b* is a fragmentary, side elevational view of still another embodiment of the handle.

FIG. **10***a* is a fragmentary, perspective view of a still further embodiment of the handle;

FIG. **10***b* is a fragmentary, side elevation of the handle shown in FIG. **10***a;*

FIG. **11** is a fragmentary, perspective view of yet another embodiment of the handle;

FIG. **12***a* is a fragmentary, perspective view of a quite different embodiment of the handle;

FIG. **12***b* is a fragmentary, top view of the handle in accordance with the embodiment shown in FIG. **12***a;*

FIG. **13** is a fragmentary, exploded, perspective view of the handle according to FIG. **12***a:*

FIG. **14** is a fragmentary, perspective view, partly in cross-section, of the handle according to FIG. **12***a;*

FIG. **15***a* is a fragmentary, axial cross-section of the handle according to the embodiment of FIG. **12***a;*

FIG. **15***b* is a fragmentary, axial cross-section of the handle according to the embodiment of FIG. **15***a;*

FIG. **16***a* is a is a fragmentary, axial cross-section of the handle according to a variant of the embodiment of FIG. **12***a*; and

FIG. **16***b* is a fragmentary, axial cross-section of the handle according to the embodiment of FIG. **16***a.*

DETAILED DESCRIPTION

Referring to FIGS. **1** to **7** there is shown a lifting implement such as a snow shovel **10** having an elongated handle **12**, a blade **14** at the distal end of the handle **12**, and a grip **20** at the proximal end of the handle **12**. The handle **12**, as will be described may be used with any implement used for lifting or scraping. Examples in addition to snow shovels include round shovels, square shovels, spades, hand plows, hay forks, and the like.

As shown in FIGS. **1** and **2**, the handle **12** is a so-called ergonomic handle which allows a user to stand more upright because the lower prehension zone **38** is higher due to the curvature of the handle profile. The handle **12** has the profile of an arc with an chord "z" extending from the proximal end or prehension zone **36** of the lever **18** to the contact tip **37** of the shovel blade **14**. The joint **16** as well as the prehension zone **38** is spaced from the chord "z". In use this configuration allows any impact energy to be absorbed and converted into rotational energy. This is especially true when the implement is impacting a load or dense material as opposed to mere lifting.

As shown in FIGS. **3** and **4**, the handle **12** is separated by a joint **16**. The joint **16** is located a minor distance from the grip **20** at the proximal end of the handle **12**. The portion of the handle between the joint **16** and the grip **20** is identified as lever **18**. The major portion **22** of the handle **12** extends between the distal end and the joint **16**. The grip **20** represents a first prehension zone **36** and the second prehension zone is located at **38** on the major portion **22**. The joint **16** is approximately midway between the first and second prehension zones **36** and **38**.

The lever **18** is made up of bifurcated arms **18***a* and **18***b* forming a recessed seat **17**. The bifurcated arms **18***a* and **18***b* define hinge barrels **32** at the free ends thereof and are adapted to engage bushings **34** mounted to the major portion **22** coincident with the joint **16**. A bracket **24** projects from the distal end of the major portion **22** towards a position between the bifurcated arms **18***a* and **18***b* within the seat **17**, beyond the axis of joint **16**. A companion bracket **26** projects from the lever **18** over a portion of the seat **17**.

A coiled spring assembly is best shown in FIG. **4**. The spring assembly includes a pair of hinge brackets **28***a* and **28***b* extending from either end of a coil spring **28** and fixed to the respective ends thereof. Each of the hinge brackets **28***a* and **28***b* have stub shafts which act as stops as will be described further. The hinge bracket **28***a* is pivotally mounted to the bracket **26** on the lever **18** by means of a pin **30**. The hinge bracket **28***b* is likewise pivotally mounted to the bracket **24** by means of a pin **31**.

As can be seen, the shovel handle **12** thus includes a shock absorber that allows an angular deflection, during use, of the shovel **10**. Referring to FIGS. **5** and **6**, the displacement of the joint **16** can be seen in relation to the major portion **22** and the lever **18**. FIG. **5** shows the handle **12** in a relaxed, neutral position. A triangle is defined that includes a base extending from a point at the first prehension zone **36**, at the hand grip **20**, to a point at the second prehension zone **38** on the major portion **22**. The joint **16** is at the apex of the triangle. In a preferred embodiment, the triangle is an isosceles triangle. The distance between the center of the joint **16** and the base of the triangle, is shown as "x". Normally, a user would grip the shovel at prehension zone **36**, with one hand, and the prehension zone **38** with the other hand. When the load **15** is engaged on the blade **14**, as shown in FIG. **1**, the other hand of the user, at prehension zone **38**, will lift the major portion **22** causing the joint **16** to move counterclockwise about the fulcrum presented by the user's other hand at prehension zone **38**; while the handle **12** is rotated in a clockwise rotation about the fulcrum presented by the user's one hand at prehension zone **36**. The torque resulting from this translation movement of the joint **16** compresses the spring **28** as shown in FIG. **6**. The compression of the spring **28** is limited by the stops on brackets **28***a* and **28***b* as previously described. The maximum translation of the joint **16** relative to the base of the triangle between the first and second prehension zones **36** and **38** is now a distance "y".

When using a lifting implement, such as a shovel **10** or hay fork (not shown), shock sometimes caused by striking a rock or ice will be absorbed by the resilient deflection of the translation of the joint **16**. Likewise when displacing a load, such as snow or hay from one location to another by a "heaving" action, the implement **10**, is a free lever operated by the user to enhance the heaving action by multiplying the forces resulting from the energy input provided by the user. In addition to acting as a shock absorber, when the spring **28** is compressed, the stored energy in the spring **28** is released when the load is "heaved" increasing the multiplication of force for the same energy input.

A shovel **10** would typically lift between 4.5 kg (10 lbs) and 23 kg (50 lbs), but more particularly 16 kg (35 lbs). In the present embodiment the spring was calibrated for a load of 14.5 kg (32 lbs). In this case the spring **28** would reach its maximum compression at 16 kg (35 lbs) with an angular deflection of 20°, displacing the joint **16** from "x" to "y". The lever **18** from the point on the prehension zone **36** (grip **20**) to the joint **16** measures 36.80 cm (14.50"). The length of the major portion **22** will vary depending on the type of tool, but in the present embodiment the length was 86.36 cm (34"), the coil spring **28** had a spring index of 8.17; a length of 6.35 cm (2.5"); an internal diameter of 4.52 cm (1.78"); and a wire diameter of 0.55 cm (0.218").

It has been found that when the prehension zones **36** and **38** are at an initial angle from one another, as the joint **16** is translated through the work of the implement **10**, the angle of the prehension zones **36** and **38** changes in direct proportion with level of deflection of the handle **12**. The human brain registers this change of angle and sends appropriate signals to the body to "adapt" to the "imminent" change of load as the handle **12** progressively reaches its maximum deflection angle for a given load.

FIG. **7** shows three shovels **10** stacked for transport or storage. The particular configuration of the seat **17** and the position of the spring assembly **28** between the arms **18***a* and **18***b* allows the stackability of the shovels **10**.

A second embodiment is shown in FIG. **8**. In this embodiment similar reference numbers have been used but raised by 100. The bracket **126** extends behind the joint **116**. The spring assembly **128** extends between the bracket **126** and bracket **124** which is fixed to the major portion **122**. The hinge brackets **128***a* mounts a threaded disk **133** that can be translated by means of threads **129** on bracket **128***a* for adjusting the pitch of coil spring **128** and therefore the pre-compression thereof.

FIGS. **9***a* and **9***b* illustrate two variants of a third embodiment where similar references have been increased by 200. In this embodiment, the spring **228** extends between the respective brackets **224**, **226** on the front side of the handle **212** but offset of the profile of the handle. In FIG. **9***a*, an adjustment screw **229** is provided on the bracket **226** to adjust the pitch of the spring **228**. The spring stores energy in tension as it is being extended.

The embodiment in FIGS. **10***a* and **10***b* shows the coil spring replaced by a resilient semi-rigid plastic bar **328** pivoted to the brackets **324** and **326**. Arm **318***a* and **318***b* can be provided with a series of bores **318***c* to form pivot barrels to accommodate the adjustment of the length of the plastic bar **328**. Corresponding bores **328***c* on the bar **328** match the bores **318***c*. When assembled the pin **330** may be selectively located in any pair of bores **318***c*, **328***c* in order to accommodate different pretension settings. The energy in this embodiment is stored by the deformation of the bar **328**.

The embodiment in FIG. **11** utilizes a springboard **428** that is fixed at one end to the brackets **424** and extends in a slot provided in the bracket **426**. A clamp **427** is adjustable on the bracket **426** in order to determine the effective length of the springboard **428** in order to select the pretension setting. Although the springboard **428** will not act in compression, it will store energy when deflected as in the embodiment of FIG. **10**.

From the embodiments shown in FIGS. **10***a*-**11**, it will be evident to the person skilled in the art that the tool handles may also be stackable.

FIGS. **12** to **16***b*, shows embodiments that are conceptually similar to the embodiment shown in FIG. **11**. The energy is stored by the degree of deflection of a flexible blade **528**. The blade **528** is preferably made of spring steel but may be of another material with similar characteristics. In one example a spring steel section of 3.175 mm (0.125 in.) in thickness by 19.05 mm (0.750 in.) large by 203 mm (8 in.) in length.

FIGS. **12** to **15***b* illustrate an embodiment that includes a handle **512**, with a grip **520** and arms **518***a* and **518***b*. A major portion **522** of the handle **512** pivots relative to the lever **518** at the joint **516**. The major portion **522** including the extension **522***a*, is hollow as shown in FIGS. **13** to **15***b*. The bracket **524** is mobile and can slide within the hollow major portion **522**. The bracket **524** includes an elongated rack **544** having gear teeth **544***a*.

The joint **516** includes a pair of barrels **532** formed on the ends of arms **518***a* and **518***b*, to accommodate bushings **534** on the major portion extension **522***a*. A pivot pin **535** extends through the axis of joint **516**. Knob **540** is journalled on pivot pin **535**. The knob assembly includes a flanged sleeve **541** journalled on the pivot pin **535**. The knob **540** includes a sleeve with geared teeth **540***a*, as shown in FIG. **13**.

As shown in FIGS. **15***a* and **15***b*, the flexible blade **528** is slidable in bracket **524** but is fixed, at the other end, to the bracket **526** within the handle **518**. By rotating the knob **540**, the geared sleeve **540***a* will engage the rack **544** to advance the bracket **524** along the flexible blade **528** effectively reducing the active length "y" of the flexible blade **528**. Likewise the mobile arrow **542** mounted to the end of the rack **544** and exposed on the top of the handle **518**, as shown in FIGS. **12***a* and **12***b*, will display the stiffness of the flexible blade **528** either as "soft", as shown in FIG. **15***a*, or as "stiff", as shown in FIG. **15***b*.

FIGS. **16***a* and **16***b* show a variant of the embodiment in FIGS. **15***a* and **15***b*. In this variant, bracket **524** is fixed within the hollow major portion **522**. On the other hand the bracket **526** within the handle **518** is movable along tracks **526***a* and **526***b*. The bracket **526** protrudes through the handle **518** and may be engaged manually to adjust the effective length of the flexible blade **528**, and thus the stiffness. In this case the distance "y" remains constant while the distance "x" is variable. According to this variant the position of the bracket **526** shown in FIG. **16***a* represents the soft condition of the flexible blade **528** while FIG. **16***b* illustrates the stiffer condition of the blade **528**.

The above description is meant to be exemplary only, and one skilled in the art will recognize that changes may be made to the embodiments described without departing from the scope of the invention disclosed. Any modifications which fall within the scope of the present invention will be apparent to those skilled in the art, in light of a review of this disclosure, and such modifications are intended to fall within the appended claims.

The invention claimed is:

1. An elongated handle for a lifting instrument including a load bearing member, the handle having a distal end and a proximal end, the distal end being configured for connection to the load bearing member; the handle having a handle profile and including an articulated joint at a minor distance from the proximal end, the articulated joint dividing the handle between a major portion extending from the distal end to the articulated joint, and a lever portion extending from the articulated joint to the proximal end; a first prehension zone provided at the proximal end of the lever portion and a second prehension zone on the major portion; the lever portion being pivotable about the articulated joint within the range of an acute angle relative to the handle profile, the handle profile defining a triangle with a base of the triangle extending between the first and second prehension zones and the articulated joint forming an apex of the triangle; the lever portion and the major portion of the handle each mounting respective ends of a resilient member extending therebetween, the resilient member storing energy when applied by the pivoting of the lever portion within the range due to a load transferred to the handle characterized by the translation of the apex of the triangle with respect to the base causing the resilient member to absorb shock and store energy.

2. The elongated handle as defined in claim **1**, wherein the handle includes a hand grip at the first prehension zone and a gripping portion at the second prehension zone, and wherein the triangle is an isosceles triangle, whereby the apex of the triangle is translated during a load transferred to the handle.

3. The elongated handle as defined in claim **1**, wherein the resilient member is a coiled spring.

4. The elongated handle as defined in claim **3**, wherein the coiled spring stores the energy in compression.

5. The elongated handle as defined in claim **3**, wherein the coiled spring stores the energy in tension.

6. The elongated handle as defined in claim **1**, wherein the range is between 0° and 20°.

7. The elongated handle as defined in claim **1**, wherein the lever portion includes a recessed seat adjacent the articulated joint, wherein first and second brackets are located at the seat, the first bracket being provided to the lever portion while the second bracket is provided to the major portion of the handle; and wherein the resilient member is fixed to and extends between the first and second brackets, overlying the seat.

8. The elongated handle as defined in claim **1**, wherein the resilient member is an elongated flexible member.

9. The elongated handle as defined in claim **8**, wherein the elongated flexible member is a spring blade.

10. The elongated handle as defined in claim **9**, wherein the spring blade is made of spring steel.

11. The elongated handle as defined in claim **1**, wherein the lever portion and the major portion of the handle each include a bracket for mounting the resilient member therebetween, the resilient member storing energy when urged by the pivoting of the lever within the range during the motion of lifting a load.

12. The elongated as defined in claim **1**, wherein the resilient member is adjustable to provide different degrees of stiffness to the handle.

13. The elongated handle as defined in claim **1**, wherein the resilient member is adjustable to provide different degrees of stiffness to the handle, and wherein the resilient member is an elongated flexible member held between a pair of brackets one on the lever portion and the other on the major portion, whereby one of the brackets may be moved relative to the other to vary the length of the elongated flexible member to thereby adjust the degree of stiffness of the resilient member.

14. The elongated handle as defined in claim **13** wherein the elongated flexible member is a spring blade and one end of the blade is fixed to a movable bracket of the brackets, the movable bracket being movably engaged to one of the lever portion and the major portion.

15. The lifting implement as defined in claim **14**, wherein the movable bracket is mounted for movement to the major portion and the other bracket is fixed to the lever portion and is in the form of a geared wheel journalled to the axis of the joint and forming part of the lever portion, the geared wheel engaging a geared rack fixed to the movable bracket such that when the geared wheel is rotated, it moves the movable bracket and the blade relative to the other bracket thereby adjusting the stiffness of the blade.

16. The elongated handle as defined in claim **14** wherein each of the brackets is movable, one on the major portion and the other on the lever portion; a track is fixedly mounted to one of the major portion and the lever portion so that one or the other of the brackets may be selectively engaged thereby; the spring blade being restrained from axial movement while the bracket selectively engaged on the track can determine the length of the spring blade between the brackets thus determining the stiffness of the spring blade.

17. The lifting implement as defined in claim **14**, wherein the spring blade is a spring steel blade.

18. A lifting implement including an elongated handle with a distal end and a proximal end and a load bearing member at the distal end; the handle having a handle profile and including an articulated joint at a minor distance from the proximal end dividing the handle between a major portion extending from the distal end to the joint, and a lever portion extending from the joint to the proximal end; a first prehension zone provided at the proximal end of the lever portion and a second prehension zone on the major portion; the lever portion adapted to pivot about the joint within the range of an acute angle relative to the handle profile, the handle profile defining a triangle with a base of the triangle extending between the first and second prehension zones and the joint forming an apex of the triangle; the lever portion and the major portion of the handle each mounting respective ends of a resilient member therebetween, the resilient member storing energy when applied by the pivoting of the lever within the range during the motion of engaging a load characterized by the translation of the apex of the triangle with respect to the base causing the resilient member to absorb shock and store energy.

19. The lifting implement as defined in claim **18**, wherein the handle includes a hand grip at the first prehension zone and a gripping portion at the second prehension zone and the triangle is an isosceles triangle, whereby the apex of the triangle is translated during a lifting and heaving motion of the lifting implement.

20. The lifting implement as defined in claim **18**, wherein the handle profile is that of an arc with a chord extending from the proximal end to the tip of the implement at the distal end of the handle and the articulated joint is spaced from the chord.

21. An energy storing device for a lifting implement including a handle and a load bearing portion wherein the energy storing device includes an articulated joint to be mounted to a proximal end of the handle; the device forming a lever extending from the joint to a first prehension zone provided at the proximal end of the lever and a second prehension zone on the handle; the lever being pivotable about the joint within the range of an acute angle relative to the handle; the handle and the lever defining a triangle with a base of the triangle extending between the first and second prehension zones and the joint forming the apex of the triangle; the lever and the handle each mounting respective ends of a resilient member therebetween, the resilient member storing energy when applied by the pivoting of the lever within the range during the motion of engaging a load characterized by the translation of the apex of the triangle with respect to the base causing the resilient member to absorb shock and store energy.

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