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(54) **TIEDOWN STRAP RATCHET WITH TAKE-UP REEL**

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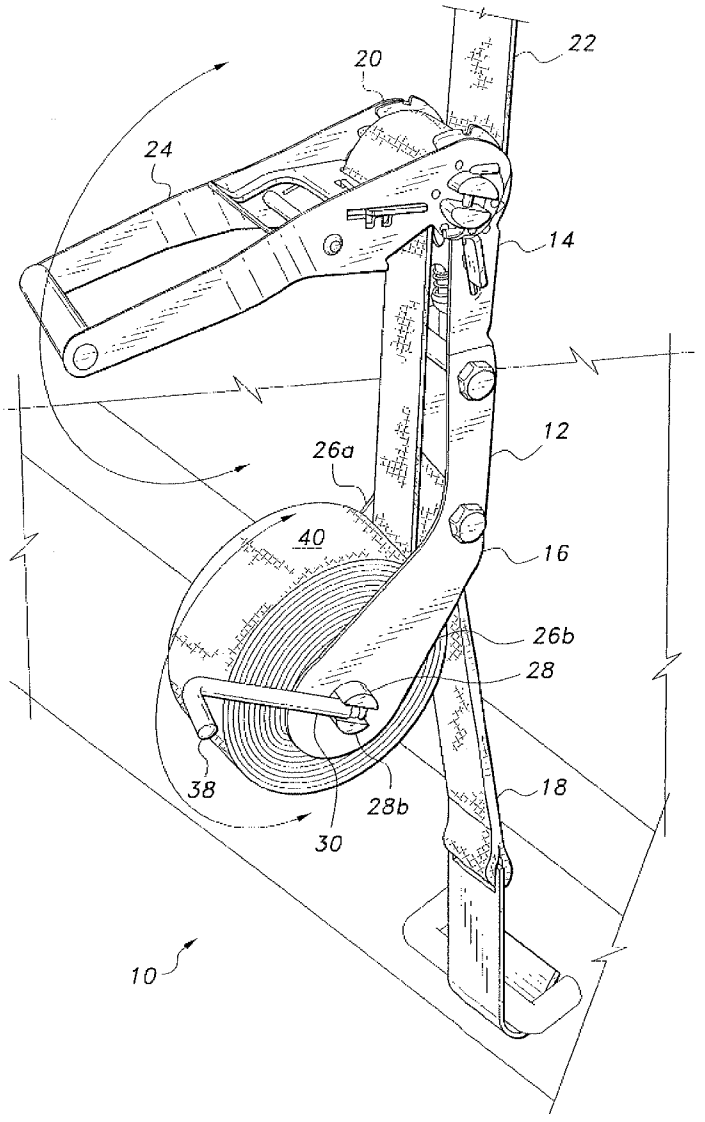
(57) **ABSTRACT**

The tiedown strap ratchet with take-up reel includes a ratchet mechanism for tightening a cargo or tiedown strap and a reel for securing the free end of the strap. The reel includes at least one take-up crank extending radially from at least one end of the take-up reel shaft, the circular path of the distal end of the take-up crank extending into the arc subtended by the ratchet handle during its operation. When the ratchet handle is placed in its stowed position, the handle interferes with travel of the take-up crank, thus preventing the take-up crank from rotating to allow the free end of the strap to unwind from the reel. The take-up reel may have various take-up crank configurations, e.g., a single crank, cranks extending from the opposite ends of the reel shaft, one or two double-ended cranks, etc.



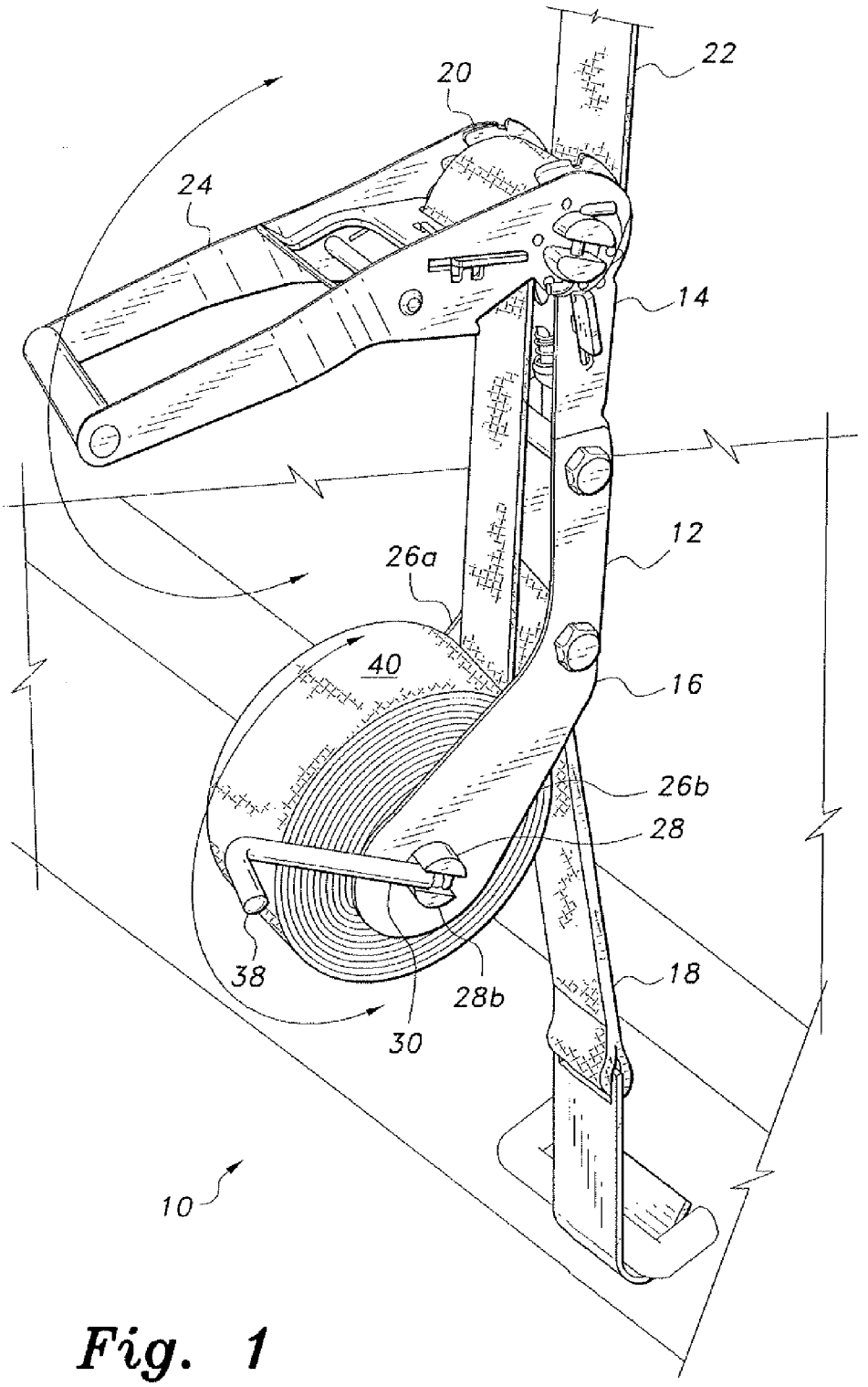


Fig. 1

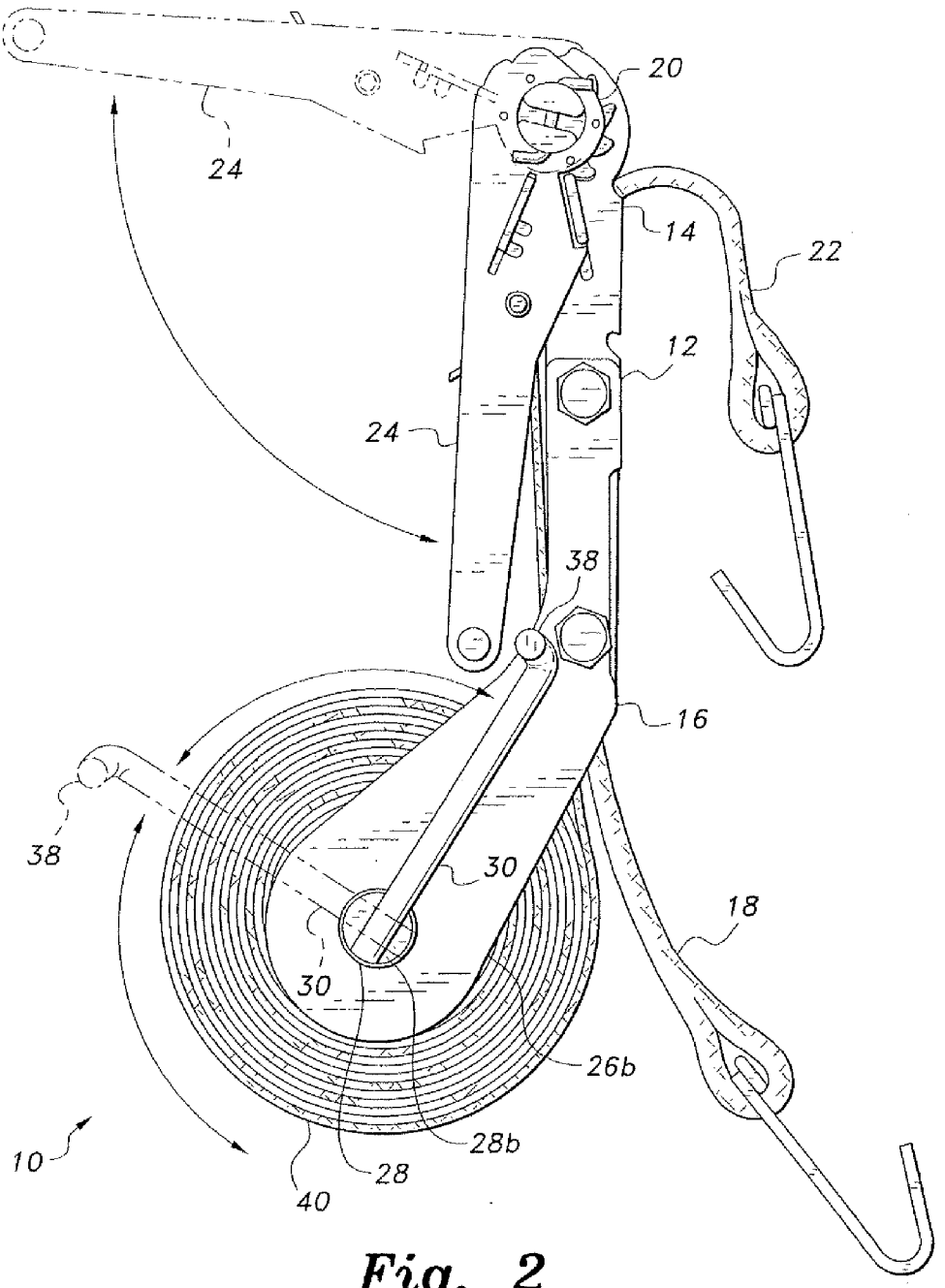


Fig. 2

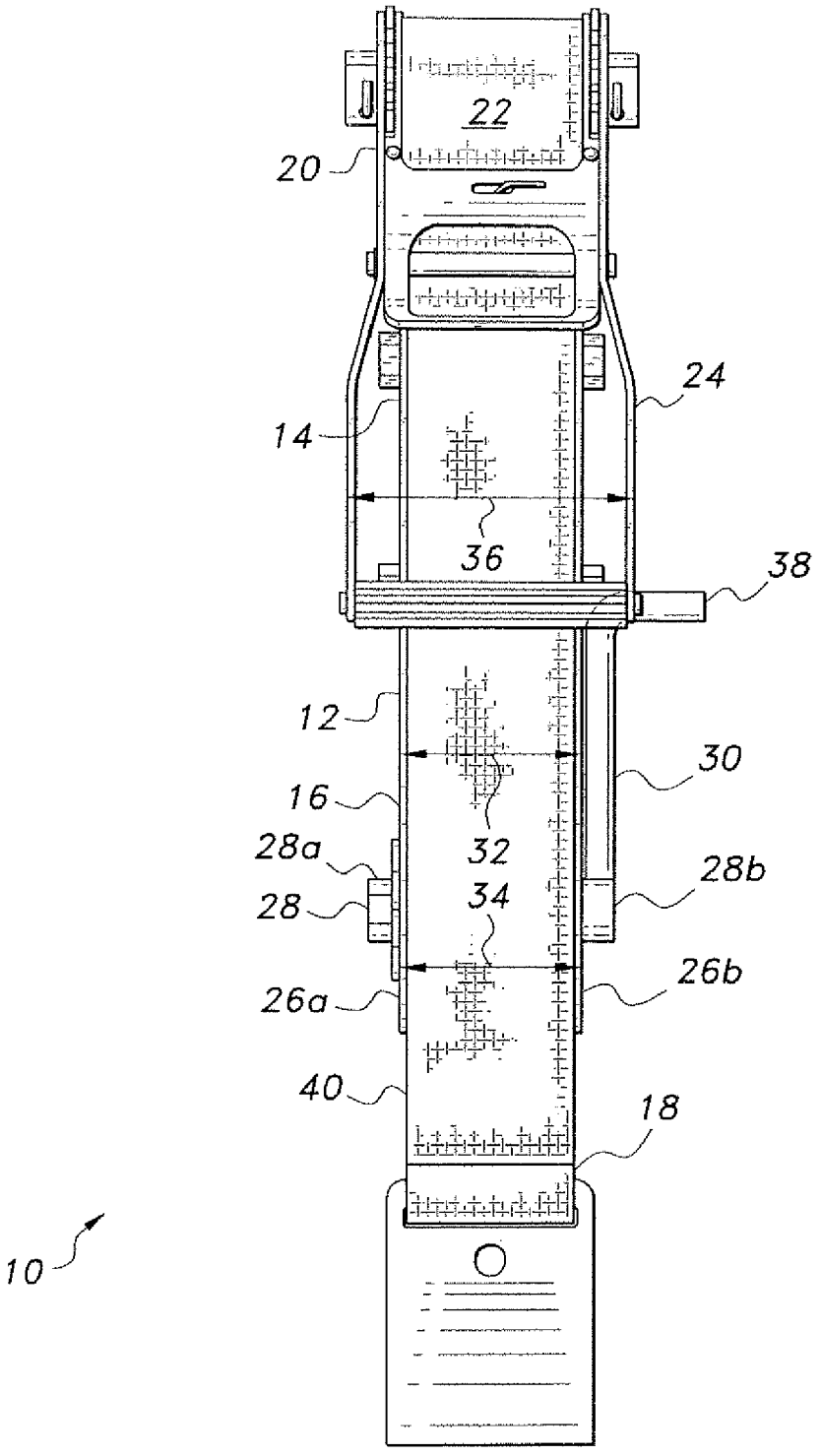


Fig. 3

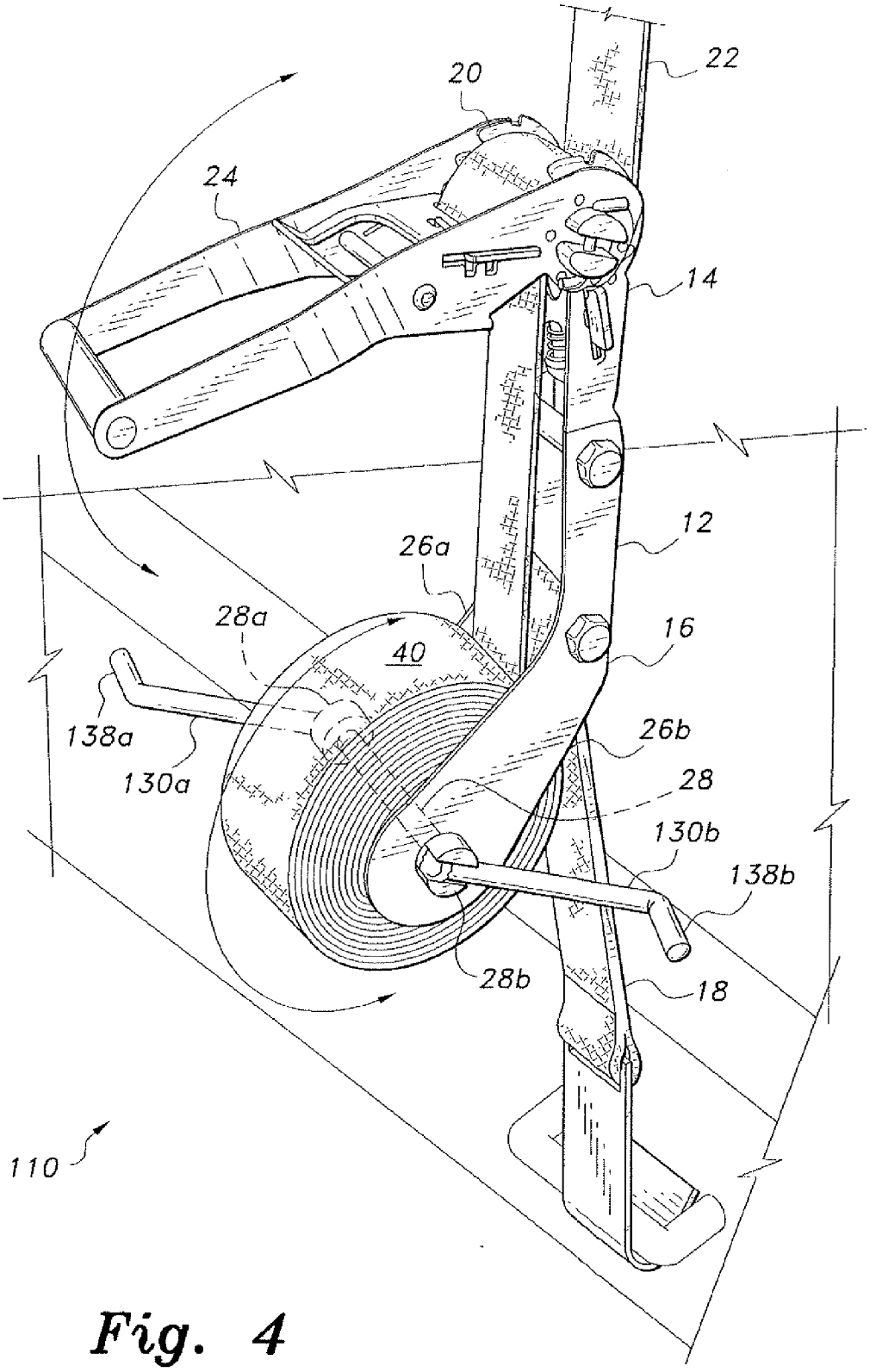


Fig. 4

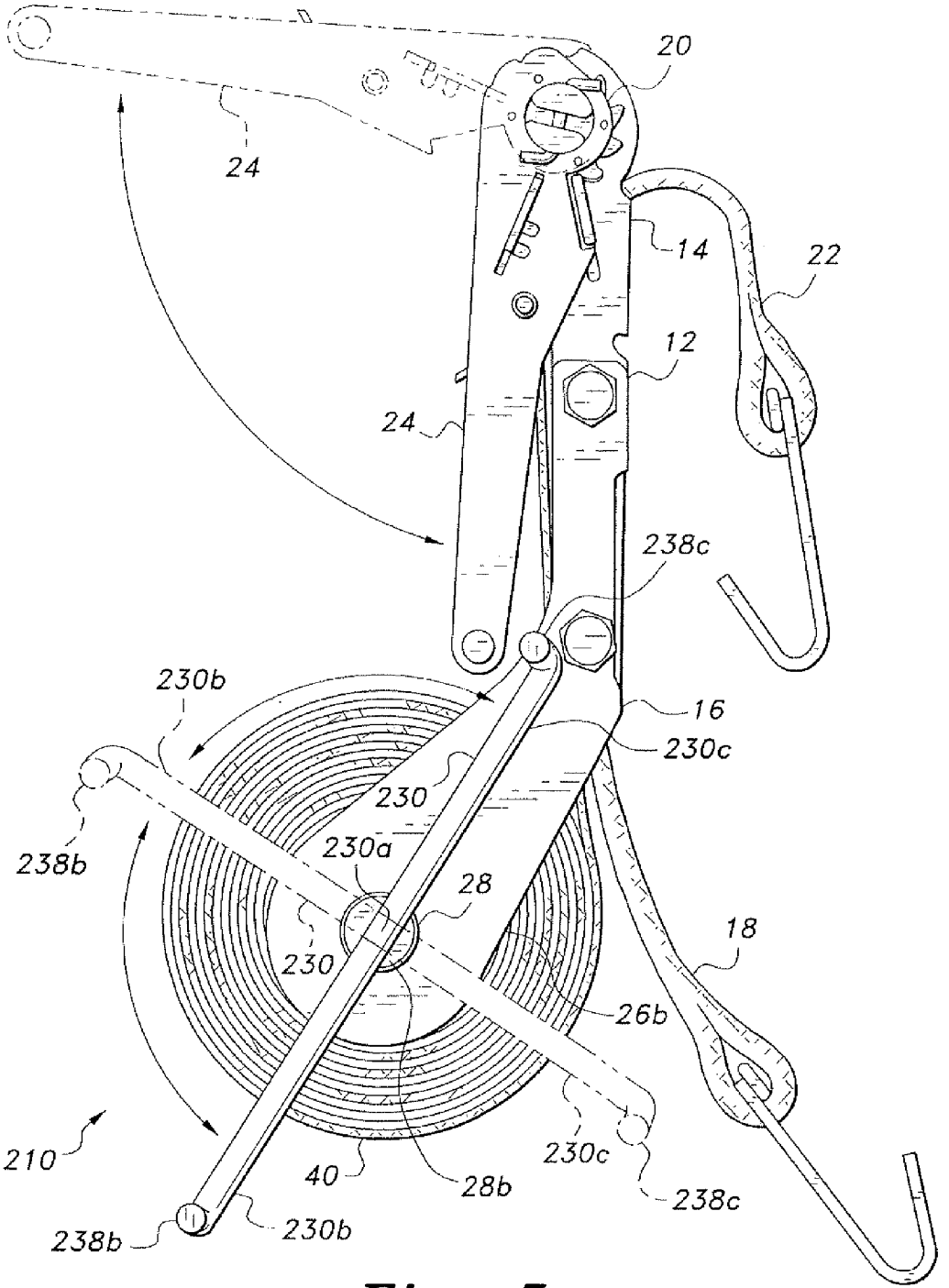

20
24
14
22
12
24
238c
230b
16
230c
230
238b
230a
28
18
230
26b
210
40
28b
230c
238c
238b
230b

Fig. 5

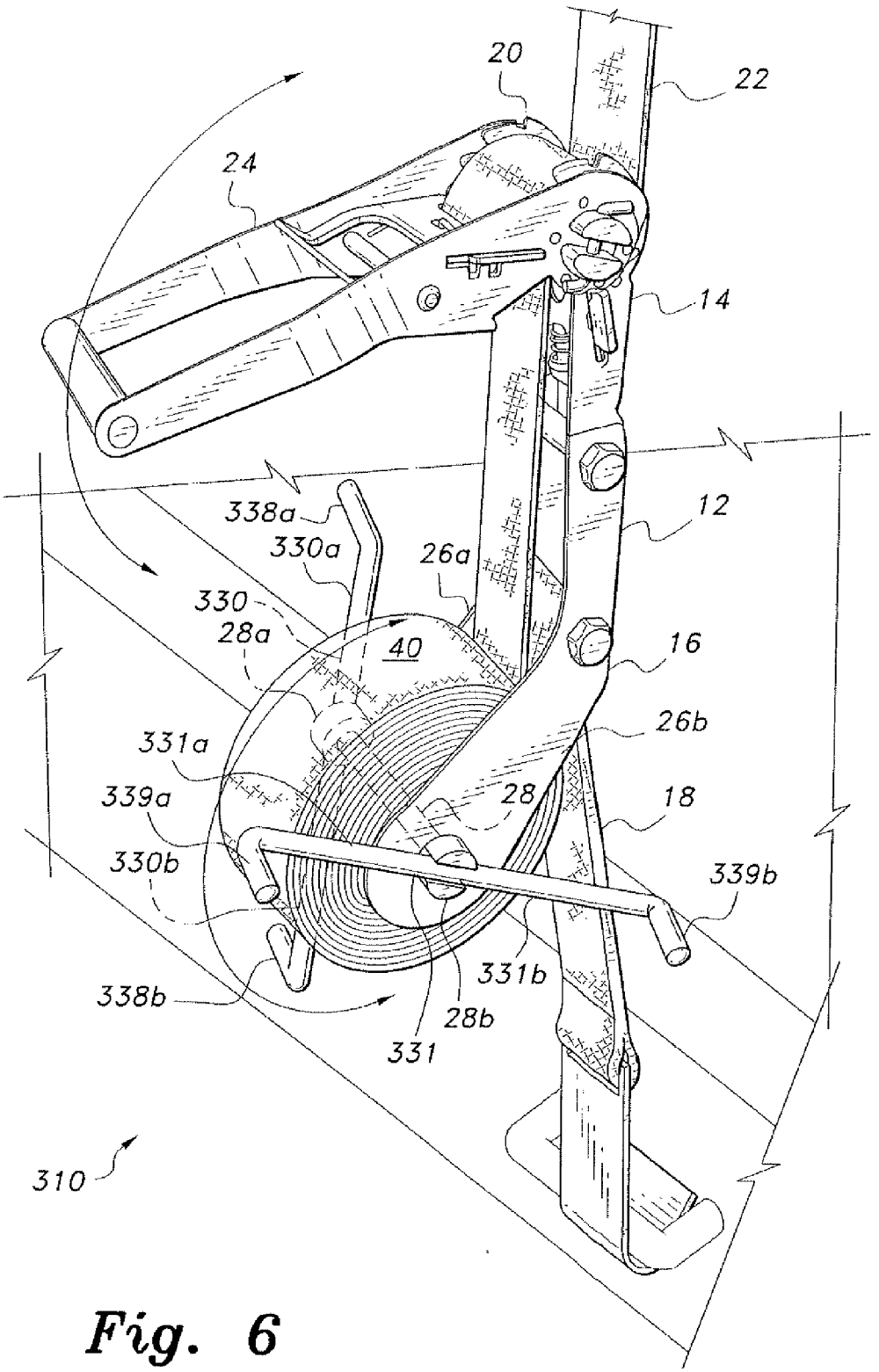

20
22
24
14
12
338a
330a
26a
330
28a
40
16
26b
331a
339a
28
18
330b
339b
331b
338b
28b
331
310

Fig. 6

TIEDOWN STRAP RATCHET WITH TAKE-UP REEL

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application claims the benefit of U.S. Provisional Patent Application Ser. No. 61/454,942, filed Mar. 21, 2011.

BACKGROUND OF THE INVENTION

[0002] 1. Field of the Invention

[0003] The present invention relates generally to straps used to secure cargo, and particularly to a tiedown strap ratchet with take-up reel that includes a lockable take-up reel for securing the free end of the strap that would otherwise extend from the ratchet.

[0004] 2. Description of the Related Art

[0005] Ratcheting load binders for tightening hold-down straps for freight or cargo carried on flatbed trailers and the like have been known for a considerable period of time. These devices may have a number of different configurations, but conventionally include a short length of strap that hooks to an anchor member on the trailer or other structure and a longer strap that passes through or around a rotary shaft turned by a ratcheting handle or lever to tighten the longer strap.

[0006] Of course, the working length of the strap required to secure the load will depend upon the dimensions of the load and the dimensions of the carrying vehicle as well. As a result, most such load binders accommodate straps having considerable length in order to secure relatively large loads. However, when smaller loads are carried, the excess strap extends from the load binder and must be dealt with in some manner. Often, several feet of the free end of the strap extend from the tiedown ratchet or load binder, and this lengthy strap extension can do considerable damage to passing vehicles, or perhaps pedestrians, if it is left to flail in the wind. Accordingly, most, if not all, jurisdictions have laws or regulations requiring the free ends of such straps to be secured in some manner.

[0007] This is conventionally accomplished by tying and tucking the free end beneath the taut portion of the strap that secures the cargo or freight. However, regardless of the care used in securing the free end, it will often work loose over a period of time as the vehicle travels. Thus, a tiedown strap ratchet with take-up reel solving the aforementioned problems is desired.

SUMMARY OF THE INVENTION

[0008] The tiedown strap ratchet with take-up reel serves as a device for tightening a tiedown strap, as well as for securing the free end of that strap. The device includes a strap take-up ratchet having a ratchet handle operating therewith for tightening the strap and holding the desired tautness of the strap. The device further includes a reel extending from the distal end of the frame, i.e., opposite the take-up ratchet, for winding the free end of the strap thereon.

[0009] The reel for the excess strap length includes at least one crank extending radially therefrom. The reel crank is of sufficient length to extend into the arc subtended by the ratchet handle during its operation. Thus, the ratchet handle interferes with the travel of the reel crank when the ratchet handle is in its stowed position, preventing the reel crank from rotating and allowing the free end or the strap to unwind from the reel. Yet when the ratchet handle is raised, its distal end clears the circular arc described by the reel crank, allowing the reel crank to be rotated to wind the free end of the strap onto the reel.

[0010] Various embodiments of the tiedown strap ratchet with take-up reel are disclosed herein, primarily differing in the configurations of the reel crank. In one embodiment only a single crank is provided that extends radially from one end of the reel shaft or axis. Another embodiment comprises two such cranks extending from opposite ends of the take-up reel shaft at 180° to one another. This allows either crank end to be retained by the ratchet handle, thereby allowing a maximum rotation of only 180° for the take-up reel. Yet another embodiment comprises a reel crank extending from one end of the reel shaft, the crank being double-ended, i.e., having two distal ends 180° apart. Still another embodiment comprises two such double-ended reel cranks, one crank extending from each end of the reel shaft, and their elongate axes perpendicular to one another. This limits the reel to no more than 90° of rotation when the ratchet handle is in its stowed position to interfere with the reel crank.

[0011] These and other features of the present invention will become readily apparent upon further review of the following specification and drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] FIG. **1** is a right side environmental, perspective view of a first embodiment of a tiedown strap ratchet with take-up reel according to the present invention, showing the operation thereof.

[0013] FIG. **2** is a right side elevation view of the tiedown strap ratchet of FIG. **1**, showing the lowered or stowed ratchet handle blocking the rotation of the reel crank.

[0014] FIG. **3** is a front elevation view of the tiedown strap ratchet of FIGS. **1** and **2**, showing the lowered or stowed ratchet handle blocking the rotation of the reel crank.

[0015] FIG. **4** is a right side environmental perspective view of a second embodiment of a tiedown strap ratchet with take-up reel according to the present invention, the second embodiment having two axially opposed winding cranks.

[0016] FIG. **5** is a right side elevation view of a third embodiment of a tiedown strap ratchet with take-up reel according to the present invention, the third embodiment having a double-ended winding crank at one end of the take-up reel shaft.

[0017] FIG. **6** is an environmental perspective view of a fourth embodiment of a tiedown strap ratchet with take-up reel according to the present invention, the fourth embodiment having two axially opposed, double-ended winding cranks.

[0018] Similar reference characters denote corresponding features consistently throughout the attached drawings.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0019] The tiedown strap ratchet with take-up reel secures the free end of the tiedown strap after a load has been secured. The various embodiments of the ratchet differ from one another in the different configurations of their winding cranks or arms for the take-up reels.

[0020] FIGS. **1** through **3** illustrate a first embodiment of the tiedown strap ratchet with take-up reel device **10** having a single crank arm extending from the reel shaft. The device **10** comprises a frame **12** having a ratchet end **14** and opposite

anchor strap end **16**, and an anchor strap **18** extending from the anchor strap end **16**. The opposite ratchet end **14** has a ratchet mechanism **20** installed therein that serves to tighten the working portion **22** of the tiedown strap extending therefrom. A ratchet handle **24** extends radially from the ratchet mechanism **20**. The handle **24** has a selectively stowed position, as shown in solid lines in FIGS. **2** and **3** of the drawings.

[0021] Parallel, mutually opposed first and second reel arms **26***a* and **26***b* extend from the anchor strap end **16** of the frame **12**. A strap take-up shaft **28** extends across or between the distal ends of the two reel arms **26***a*, **26***b*. The rotating shaft **28** includes opposite first and second ends **28***a*, **28***b*, the first end **28***a* being shown in FIG. **3**. In the embodiment of FIGS. **1** through **3**, a take-up reel crank **30** having a single radial arm extends from the second end **28***b* of the shaft **28**, crank rotation being limited by the position of the ratchet handle **24** when the ratchet handle **24** is in its stowed position.

[0022] This limitation of the rotation of the take-up reel crank is best explained by reference to FIG. **3**. It will be seen that the frame **12** has a width **32**. The arms **26***a*, **26***b* of the take-up reel defining a width **34** substantially equal to the width **32** of the frame **12**. The ratchet handle **24** has a width **36** somewhat greater than the widths **32** and **34** of the frame and take-up reel arms **26***a*, **26***b* to provide operating clearance for movement of the ratchet handle **24**. The width of the ratchet handle is also somewhat greater than the width of the assembly, including the take-up reel crank **30**. Accordingly, the crank **30** has sufficient length to extend into the arc defined by the operation of the ratchet handle **24**. The crank **30** includes an outwardly extending distal end **38** that extends beyond the width **36** of the ratchet handle **24**. It will be seen in the side elevation view of FIG. **2** that when the ratchet handle **24** is in its stowed position, as shown in solid lines in FIG. **2**, the take-up reel crank **30** cannot continue to rotate, since it is blocked or stopped by the distal end of the ratchet handle **24**. Thus, the free end **40** of the strap that is reeled onto the take-up reel shaft **28** cannot unroll, since the shaft **28** cannot rotate beyond the stop position defined by the interference of the take-up reel crank **30** with the ratchet handle **24**.

[0023] FIG. **4** illustrates an alternative embodiment of the tiedown strap ratchet and take-up reel, designated by the reference numeral **110**. The only difference between the strap ratchet and take-up reel **10** of FIGS. **1** through **3** and the tiedown strap ratchet and take-up reel **110** of FIG. **4** is the different configuration of the take-up reel crank(s). The tiedown strap ratchet and take-up reel **110** of FIG. **4** shares like reference numerals for identical components with the strap ratchet and take-up reel **10** of FIGS. **1** through **3**.

[0024] The tiedown strap ratchet and take-up reel **110** of FIG. **4** includes first and second take-up reel crank arms, respectively **130***a* and **130***b*, extending from the opposite first and second ends **28***a* and **28***b* of the strap take-up shaft **28**. Each crank has a single arm **130***a*, **130***b* extending from its respective shaft end, with each crank arm **130***a*, **130***b* having a distal end, respectively **138***a* and **138***b*, extending outwardly therefrom. Preferably, the two crank arms **130***a*, **130***b* extend 180° radially away from one another relative to the axis of the shaft **28**. This results in either the first or the second crank arm **130***a* or **130***b* being stopped by the ratchet handle **24** when the ratchet handle **24** is lowered to its stowed position, with no more than 180° of rotation of the shaft **28** and the wound free end **40** of the strap being permitted, as either one or the other of the two crank arms **130***a* or **130***b* contact the lowered and stowed ratchet handle **24**.

[0025] FIG. **5** illustrates another embodiment, designated as tiedown strap ratchet and take-up reel **210**. As in the cases of the strap ratchet and take-up reels **10** and **110**, identical reference numerals are used for components of the ratchet and reel **210** that are common to the ratchet and reel **10** and **110**. The only difference between the ratchet and reel **210** and the ratchet and reel **10** and **110** is the configuration of the reel crank arms.

[0026] The strap ratchet and take-up reel **210** has a single crank arm **230**, but rather than having one end attached to the take-up shaft, the crank arm **230** has a central portion **230***a* with symmetrically opposed arm portions **230***b* and **230***c* extending radially outwardly from the center **230***a*. Each arm portion **230***b*, **230***e* has an outwardly extending distal end **238***b* and **238***c*. The ends **238***b* and **238***c* are stopped by the ratchet handle **24** when the handle **24** is in its lower or stowed position. As the crank arm **230** has two opposed arm portions **230***b* and **230***c* extending opposite one another, the take-up shaft **28** and the free end **40** of the strap wound thereon will be stopped at no more than 180° of rotation, thus preventing the free end **40** of the strap from unwinding.

[0027] Still another embodiment is illustrated in FIG. **6**, designated as tiedown strap ratchet and take-up reel **310**. Again, most of the components of the ratchet and reel **310** are common to the ratchet and reel **10**, **110**, and **210**, and are designated by the same reference numerals. The ratchet and take-up reel **310** is a modification of the ratchet and reel **110** of FIGS. **4** and **210** of FIG. **5**, in that the ratchet and reel **310** of FIG. **6** incorporates two double-ended crank arms, with one on each end of the strap take-up shaft **28**. A first crank arm **330** extends from the take-up shaft first end **28***a*, and a second crank arm **331** extends from the take-up shaft second end **28***b*. The centers of the two crank arms **330**, **331** are attached to the first and second ends **28***a*, **28***b* of the shaft **28**, respectively, their opposite arm portions extending outwardly therefrom. The first crank arm **330** has radially opposed crank arm portions **330***a* and **330***b*, while the second crank arm **331** has radially opposed crank arm portions **331***a* and **331***b*. The crank arms **330** and **331** have outwardly extending distal end portions. The first crank arm portions **330***a*, **330***b* has distal end portions **338***a*, **338***b*, and the second crank arm portions **331***a*, **331***b* has distal end portions **339***a*, **339***b*. Preferably, the two crank arms **330**, **331** are oriented at right angles to one another, i.e., when one crank arm is horizontal, the other is vertical. In this manner, one of the outwardly extending distal end portions **338***a*, **338***b*, **339***a*, or **339***b* will be caught by the handle **24** when the handle **24** is lowered to its stowed position, the reel arms being stopped after no more than 90° of rotation of the take-up shaft **28** and the wound free end portion **40** of the strap.

[0028] The various embodiments of the tiedown strap ratchet and take-up reel are all used similarly. Initially, the ratchet mechanism **20** is unlocked, and the working portion **22** of the strap is pulled through the mechanism as necessary to provide sufficient length to secure the cargo. The ratchet mechanism **20** is then actuated to pull the working portion **22** of the strap back through the mechanism as necessary to tighten the strap securely about the cargo. This results in an increasing free end length **40** of the strap, as it trails from the ratchet mechanism **20**.

[0029] Once the working portion **22** of the strap has been secured tightly about the cargo to the extent desired, the free end portion **40** of the strap may be wound upon the take-up reel **28**. To accomplish this, the ratchet handle **24** is left in its

raised position, as shown in solid lines in FIGS. **1**, **4**, and **6** and in broken lines in FIGS. **2** and **5** of the drawings. This allows the extreme distal end of the free portion **40** of the strap to be secured to the reel **28**, e.g., by inserting the extreme end through a slot in the reel, and then winding the free portion **40** of the strap about the reel by means of the crank arm(s) of the device. Once the free end of the strap has been wound securely about the reel, the ratchet handle **24** is lowered to its stowed position as shown in solid lines in FIGS. **2** and **5** of the drawings, thereby blocking further rotation of the crank arm (s) to prevent rotation of the reel **28** with resultant unrolling of the free end **40** of the strap. Loosening and/or removal of the strap is accomplished by raising the ratchet handle **24** and releasing the ratchet mechanism **20**, thereby allowing the strap to pass through the ratchet mechanism while simultaneously unwinding from the take-up reel or shaft **28** while the ratchet handle is raised.

[0030] The two reel take-up anus **26***a*, **26***b* may be formed as integral extensions of the frame **12** during manufacture. Alternatively, the take-up reel assembly may be provided as an accessory that may be attached (e.g., welded, riveted, etc.) to the anchor strap end of an existing tiedown strap ratchet mechanism, if desired.

[0031] The various embodiments presented herein allow the user of such a device to select the degree of security for the rolled free end of the strap, as desired. Generally, the device **10** of FIGS. **1** through **3** will provide sufficient security for the free end of the strap, even though it may allow the strap to unwind up to one full revolution of the crank arm before it contacts the ratchet handle. If several turns are wound about the take-up shaft of the device, the resulting slight amount of slack will be minimal when distributed over several feet of free strap end wound about the take-up shaft. However, in some cases a person may wish to provide greater security for the free end of the strap. Accordingly, the embodiments of FIGS. **4** and **5**, wherein one of the crank arms is stopped at no more than 180° of rotation, or the embodiment of FIG. **6**, wherein one of the crank arms will be stopped at no more than 90° of rotation, either of which serve to secure the free end of the strap to an even greater degree than does the embodiment of FIGS. **1** through **3**. In any event, any of the embodiments of the tiedown strap ratchet with take-up reel will ensure that the free end of the cargo tiedown strap cannot become loose and flail in the wind, thus assuring that the vehicle will be in compliance with any laws regarding such loose straps.

[0032] It is to be understood that the present invention is not limited to the embodiments described above, but encompasses any and all embodiments within the scope of the following claims.

I claim:

1. A tiedown strap ratchet with take-up reel, comprising:

a frame having a ratchet end and an anchor strap end opposite the ratchet end;

an anchor strap extending from the anchor strap end of the frame;

a ratchet mechanism disposed at the ratchet end of the frame;

a ratchet handle extending radially from the ratchet mechanism, the ratchet handle having a selectively stowed position adjacent the frame;

first and second take-up reel arms extending from the anchor strap end of the frame;

a strap take-up shaft disposed between the take-up reel arms, the strap take-up shaft having a first end and a second end opposite the first end; and

a take-up reel crank extending radially from the strap take-up shaft, the ratchet handle it precluding complete rotation of the take-up reel crank when the ratchet handle is in its stowed position.

2. The tiedown strap ratchet with take-up reel according to claim **1**, wherein:

the frame defines a frame width;

the ratchet handle defines a ratchet handle width, the ratchet handle width being greater than the frame width;

the take-up reel aims define a reel width, the reel width being substantially equal to the frame width; and

the take-up reel crank has a distal end extending beyond the ratchet handle width, the ratchet handle interfering with the distal end of the take-up reel crank and precluding complete rotation of the take-up reel crank when the ratchet handle is in its stowed position.

3. The tiedown strap ratchet with take-up reel according to claim **1**, wherein the take-up reel crank comprises a single arm extending radially outward from one end of the strap take-up shaft.

4. The tiedown strap ratchet with take-up reel according to claim **1**, wherein the take-up reel crank comprises:

a first arm extending radially outward from the first end of the strap take-up shaft; and

a second arm extending radially outward from the second end of the strap take-up shaft, the second arm being oriented 180° opposite the first arm.

5. The tiedown strap ratchet with take-up reel according to claim **1**, wherein the take-up reel crank comprises a single arm having a center affixed to one end of the strap take-up shaft, the arm having mutually opposed arm portions oriented 180° opposite one another and extending radially outward from the strap take-up shaft.

6. The tiedown strap ratchet with take-up reel according to claim **1**, wherein the take-up reel crank comprises:

a first arm having a center affixed to the first end of the strap take-up shaft, the first arm having mutually opposed arm portions oriented 180° opposite one another and extending radially outward from the strap take-up shaft; and

a second arm having a center affixed to the second end of the strap take-up shaft, the second arm having mutually opposed arm portions oriented 180° opposite one another and extending radially outward from the strap take-up shaft, the second arm being oriented 90° to the first arm.

7. The tiedown strap ratchet with take-up reel according to claim **1**, further including a tiedown strap having a working portion secured to the ratchet mechanism and a free end extending therefrom, the free end being selectively wound about the strap take-up shaft.

8. A tiedown strap ratchet with take-up reel, comprising:

a frame having a ratchet end and an anchor strap end opposite the ratchet end, the frame defining a frame width;

an anchor strap extending from the anchor strap end of the frame;

a ratchet mechanism disposed at the ratchet end of the frame;

a ratchet handle extending radially from the ratchet mechanism, the ratchet handle defining a ratchet handle width, the ratchet handle width being greater than the frame

width, the ratchet handle having a selectively stowed position adjacent the frame;

first and second take-up reel arms extending from the anchor strap end of the frame, the take-up reel arms defining a reel width, the reel width being substantially equal to the frame width;

a strap take-up shaft disposed between the take-up reel arms, the strap take-up shaft having a first end and a second end opposite the first end; and

a take-up reel crank extending radially from the strap take-up shaft, the crank having a distal end extending beyond the ratchet handle width, the ratchet handle interfering with the distal end of the crank and precluding complete rotation of the take-up reel crank when the ratchet handle is in its stowed position.

9. The tiedown strap ratchet with take-up reel according to claim **8**, wherein the take-up reel crank comprises a single arm extending radially outward from one end of the strap take-up shaft.

10. The tiedown strap ratchet with take-up reel according to claim **8**, wherein the take-up reel crank comprises:

a first aim extending radially outward from the first end of the strap take-up shaft; and

a second arm extending radially outward from the second end of the strap take-up shaft, the second arm being oriented 180° opposite the first arm.

11. The tiedown strap ratchet with take-up reel according to claim **8**, wherein the take-up reel crank comprises a single arm having a center affixed to one end of the strap take-up shaft, the aim having mutually opposed arm portions oriented 180° opposite one another and extending radially outward from the strap take-up shaft.

12. The tiedown strap ratchet with take-up reel according to claim **8**, wherein the take-up reel crank comprises:

a first arm having a center affixed to the first end of the strap take-up shaft, the first arm having mutually opposed arm portions oriented 180° opposite one another and extending radially outward from the strap take-up shaft; and

a second arm having a center affixed to the second end of the strap take-up shaft, the second arm having mutually opposed arm portions oriented 180° opposite one another and extending radially outward from the strap take-up shaft, the second arm being oriented 90 degrees to the first arm.

13. The tiedown strap ratchet with take-up reel according to claim **8**, further including a tiedown strap having a working portion secured to the ratchet mechanism and a free end extending therefrom, the free end being selectively wound about the strap take-up shaft.

14. A take-up reel for a tiedown strap ratchet, the tiedown strap ratchet having a frame defining a ratchet end and an anchor strap end opposite the ratchet end, an anchor strap extending from the anchor strap end of the frame, a ratchet mechanism disposed at the ratchet end of the frame, a ratchet handle extending radially from the ratchet mechanism, the ratchet handle having a selectively stowed position adjacent the frame, the take-up reel comprising:

first and second take-up reel arms extending from the anchor strap end of the frame;

a strap take-up shaft disposed between the take-up reel arms, the strap take-up shaft having a first end and a second end opposite the first end; and

a take-up reel crank extending radially from the strap take-up shaft, the ratchet handle precluding complete rotation of the take-up reel crank when the ratchet handle is in its stowed position.

15. The take-up reel for a tiedown strap ratchet according to claim **14**, wherein:

the take-up reel arms define a reel width, the reel width being substantially equal to a width of the frame; and

the take-up reel crank has a distal end extending beyond the ratchet handle, the ratchet handle interfering with the distal end of the take-up reel crank and precluding complete rotation of the take-up reel crank when the ratchet handle is in its stowed position.

16. The tiedown strap ratchet with take-up reel according to claim **14**, wherein the take-up reel crank comprises a single aim extending radially outward from one end of the strap take-up shaft.

17. The tiedown strap ratchet with take-up reel according to claim **14**, wherein the take-up reel crank comprises:

a first arm extending radially outward from the first end of the strap take-up shaft; and

a second arm extending radially outward from the second end of the strap take-up shaft, the second arm being oriented 180° opposite the first arm.

18. The tiedown strap ratchet with take-up reel according to claim **14**, wherein the take-up reel crank comprises a single arm having a center affixed to one end of the strap take-up shaft, the arm having mutually opposed arm portions oriented 180° opposite one another and extending radially outward from the strap take-up shaft.

19. The tiedown strap ratchet with take-up reel according to claim **14**, wherein the take-up reel crank comprises;

a first arm having a center affixed to the first end of the strap take-up shaft, the first arm having mutually opposed arm portions oriented 180" opposite one another and extending radially outward from the strap take-up shaft; and

a second arm having a center affixed to the second end of the strap take-up shaft, the second arm having mutually opposed arm portions oriented 180° opposite one another and extending radially outward from the strap take-up shaft, the second arm being oriented 90° to the first arm.

20. The tiedown strap ratchet with take-up reel according to claim **14**, further including a tiedown strap having a working portion secured to the ratchet mechanism and a free end extending therefrom, the free end being selectively wound about the strap take-up shaft.

* * * * *