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(54) **Vorrichtung zur Sicherung eines Gegenstands**

Device for securing an object

Dispositif de fixation d'un objet

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(73) Patentinhaber: **DEERE & COMPANY**
Moline, Illinois 61265-8098 (US)

(72) Erfinder: **Heitlinger, Martin**
76684 Östringen-Odenheim (DE)

(74) Vertreter: **Holst, Sönke et al**
Deere & Company,
European Office,
Patent Department,
Steubenstrasse 36-42
68140 Mannheim (DE)

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Beschreibung

[0001] Die Erfindung betrifft eine Vorrichtung zur Sicherung eines Gegenstands, mit einem Sicherungsbolzen und einer Sicherungsfeder, gemäß dem Oberbegriff des Anspruchs 1.

[0002] Sowohl aus der US 1,107,881 als auch der US 4,511,304 sind jeweils Vorrichtungen zum Sichern eines Gegenstands gemäß dem Oberbegriff des Anspruchs 1 bekannt.

[0003] Vorrichtungen der eingangs genannten Art sind seit langem aus dem Stand der Technik bekannt. Lediglich beispielhaft wird auf die deutsche Patentschrift 300802 verwiesen, aus welcher ein Drahtsplint mit einem federnden Sicherungsbügel bekannt ist. Dieser Splint bzw. Bolzen wird üblicherweise in eine Bohrung eines Gegenstands eingeführt, um entweder diesen Gegenstand beispielsweise gegen ein Verdrehen oder ein mit diesem Gegenstand verbundenen weiteren Gegenstand zu sichern. Diese Vorrichtung ist insoweit problematisch, als nur kleine Gegenstände gesichert werden können, da zum Einführen des Bolzens sowie zum Verdrehen der Vorrichtung der Sicherungsbügel entgegen der Federspannung ausgelenkt werden muss. Beispielsweise ist es mit einer solchen Vorrichtung nicht möglich, eine Sperrklinke eines aus der DE 39 12 414 C1 bekannten Kupplungshaken gegen ein Öffnen zu sichern, da die diesbezügliche Bohrung - mit dem dortigen Bezugszeichen 38 - relativ weit vom Außenbereich des Kupplungshakens beabstandet ist. Letztendlich wird bei einer solchen Anwendung beispielsweise eine Sicherung mit Hilfe einer Sechskantschraube und einer Sicherungsmutter erfolgen müssen. Dies ist allerdings insoweit nachteilig, als zur Entsicherung die Sicherungsmutter von der Schraube gelöst werden muss, wobei insbesondere bei landwirtschaftlichen Anwendungen die Gefahr besteht, eines der beiden Teile im Feld zu verlieren.

[0004] Der vorliegenden Erfindung liegt daher die Aufgabe zugrunde, eine Vorrichtung der eingangs genannten Art anzugeben und weiterzubilden, durch welche die vorgenannten Probleme überwunden werden. Insbesondere soll die Vorrichtung einteilig oder mehrteilig jedoch unverlierbar zusammenhängend ausgebildet und einfach zu handhaben sein.

[0005] Die Aufgabe wird erfindungsgemäß durch die Lehre des Patentanspruchs 1 gelöst. Weitere vorteilhafte Ausgestaltungen und Weiterbildungen der Erfindung gehen aus den Unteransprüchen hervor.

[0006] Erfindungsgemäß ist die Vorrichtung der eingangs genannten Art dadurch gekennzeichnet, dass die Sicherungsfeder ein Federelement aufweist, welches eine Öffnungsbewegung des von der Sicherungsfeder ausgebildeten Bogens ermöglicht, dieser jedoch entgegenwirkt, dass das Federelement eine Annäherung bzw. Positionierung des Endbereichs der Sicherungsfeder zum zweiten Ende des Sicherungsbolzens hin bewirkt und dass das Federelement derart ausgebildet ist, dass es sich bei einer Öffnungsbewegung der Sicherungsfeder

der zusammenzieht.

[0007] Der im Wesentlichen bügelartig oder bogenförmig ausgebildete Bereich der Sicherungsfeder kann einen Gegenstand von einer Seite her umschließen und es kann dennoch eine Sicherung eines Gegenstands gewährleistet werden, da - anderes als bei der aus der Patentschrift 300802 bekannten Sicherungsvorrichtung - die Sicherung eben nicht ausschließlich mit Hilfe der Federkraft der Sicherungsfeder erfolgt. Der Bogen bzw. Bügel kann an die entsprechende Anwendung oder auf den speziellen Einsatz angepasst ausgebildet werden. Eine Sicherung mit der erfindungsgemäßen Vorrichtung erfolgt vielmehr vor allem durch ein reversibles Arretieren von der Sicherungsfeder an dem zweiten Endbereich des Sicherungsbolzens. Das reversible Arretieren könnte beispielsweise durch Einklinken eines entsprechend ausgebildeten Bereichs der Sicherungsfeder an dem Sicherungsbolzen erfolgen. Sollte die Arretierung unbeabsichtigt gelöst werden, so wirken die Eigenschaften der Sicherungsfeder - insbesondere deren entsprechend ausgebildete Vorspannung - einem Herausrutschen des Sicherungsbolzens aus einer entsprechenden Bohrung entgegen. Die Sicherungsfeder weist ein Federelement auf, welches eine Öffnungsbewegung des von der Sicherungsfeder ausgebildeten Bogens ermöglicht, dieser jedoch entgegenwirkt. Dieses Federelement könnte somit die grundsätzlich von der Sicherungsfeder bereitgestellte Federwirkung zusätzlich verstärken, so dass aufgrund der hierdurch erhöhten Vorspannung ein Herausrutschen / Herausfallen des Bolzens aus einer dafür vorgesehenen Bohrung bei einem nicht arretierten Zustand der Sicherungsfeder in vorteilhafter Weise weitgehend vermieden wird.

[0008] Das Federelement ist erfindungsgemäß derart angeordnet bzw. ausgebildet, dass eine Annäherung bzw. Positionierung des Endbereichs der Sicherungsfeder zum zweiten Ende des Sicherungsbolzens hin bewirkt wird. Diese Maßnahme erleichtert letztendlich die Handhabung der erfindungsgemäßen Vorrichtung, da dann ein Arretieren einfach und ohne Werkzeug möglich ist.

[0009] Das Federelement ist erfindungsgemäß auch derart ausgebildet, dass es sich bei einer Öffnungsbewegung der Sicherungsfeder zusammenzieht. Dies bewirkt, dass das Federelement auch bei einer großen Ausdehnung bzw. Öffnungsbewegung wieder in seine ursprüngliche Form zurückkehrt.

[0010] Der Sicherungsbolzen ist bevorzugt im Wesentlichen prisma- oder zylinderförmig ausgebildet. Er kann einen wesentlich größeren Durchmesser als der des aus der Patentschrift 300802 bekannten Splints aufweisen. Insoweit können mit der erfindungsgemäßen Vorrichtung in vorteilhafter Weise auch Gegenstände mit größeren Massen gesichert werden.

[0011] Nun könnte die reversible Arretierung durch eine ösenförmige Ausbildung eines Endbereichs der Sicherungsfeder realisiert sein. Der ösenförmige Endbereich der Sicherungsfeder könnte hierzu derart auszubilden

den bzw. auszurichten sein, dass im arretierten Zustand der Vorrichtung der zweite Endbereich des Sicherungsbolzens zumindest weitgehend umgriffen oder umschlossen wird. Der Innendurchmesser des ösenförmigen Endbereichs ist hierbei gleich oder etwas größer als der Außendurchmesser des Sicherungsbolzens. Das arretierte Umgreifen bzw. Umschließen des Sicherungsbolzens könnte dadurch verbessert werden, dass im arretierten Zustand der Vorrichtung die ösenförmige Ausbildung des Endbereichs der Sicherungsfeder in eine am Endbereich des Sicherungsbolzens vorgesehene Nut oder Aussparung eingreift, welche vorzugsweise in umfangsmäßiger Richtung ausgebildet ist. In diesem Fall ist der Innendurchmesser des ösenförmigen Endbereichs gleich oder etwas größer als der Außendurchmesser des Nutbereichs des Sicherungsbolzens. Hierdurch ist eine Bewegung des ösenförmigen Endbereichs der Sicherungsfeder entlang der Sicherungsbolzenlängsachse wirksam vermieden.

[0012] Besonders bevorzugt weist der ösenförmig ausgebildete Endbereich der Sicherungsfeder einen im Wesentlichen U-förmigen Bereich auf, dessen Schenkel einen Abstand voneinander aufweisen, welcher ungefähr dem Außendurchmesser des Sicherungsbolzens oder dem Außendurchmesser der am Endbereich des Sicherungsbolzens vorgesehenen Nut entspricht. Mit anderen Worten handelt es sich in diesem konkreten Fall um eine nach einer Seite geöffneten Öse, wobei die Öffnung vorzugsweise zu dem Bügel- bzw. Bogenteil der Sicherungsfeder zeigt. Diese Ausbildung des Endbereichs der Sicherungsfeder ist in vorteilhafter Weise besonders kostengünstig herstellbar. Dementsprechend könnte das Maß der Schenkel des U-förmigen Bereichs mindestens dem einfachen Außendurchmesser des Sicherungsbolzens oder mindestens dem einfachen Außendurchmesser der am Endbereich des Sicherungsbolzens vorgesehenen Nut entsprechen, wodurch ein Umgreifen beziehungsweise Umschließen des Sicherungsbolzens gewährleistet ist. Mit einem größeren Maß des Schenkels des U-förmigen Bereichs ist eine versehentliche Lösung der Arretierung zunehmend unwahrscheinlich.

[0013] Weiterhin könnte ein Endbereich der Sicherungsfeder einen gebogenen Bereich mit einem Biegeradius aufweisen, welcher größer als der einfache Außendurchmesser des Sicherungsbolzens ist. Beim Arretieren kann die Sicherungsfeder derart vom Bediener ausgelenkt werden, dass der Endbereich der Sicherungsfeder mit diesem gebogenen Bereich auf den Sicherungsbolzen bewegbar ist, so dass der U-förmige Bereich in Eingriff mit der Nut gebracht werden kann.

[0014] In einer alternativen Ausführungsform könnte die reversible Arretierung dadurch herstellbar sein, dass am zweiten Endbereich des Sicherungsbolzens eine Bohrung vorgesehen ist, in welche der Endbereich der Sicherungsfeder einführbar ist. Die Bohrung könnte quer zur Längsrichtung des Sicherungsbolzens angeordnet sein und beispielsweise im Wesentlichen die gleiche Ori-

entierung aufweisen, wie der Teil der Sicherungsfeder, der an dem ersten Endbereich des Sicherungsbolzens zur Anlage bzw. zu Arretierung kommt. Bevorzugt ist der Endbereich der Sicherungsfeder im Wesentlichen geradlinig ausgebildet, so dass dieses Ende der Sicherungsfeder relativ einfach in die Bohrung des Sicherungsbolzens einführbar ist. Die Bohrung könnte an der Seite, an der die Sicherungsfeder in die Bohrung eingeführt wird, einen konischen Bereich aufweisen, so dass das Einführen des Sicherungsfederendes durch erleichtert wird.

[0015] Nun könnte der Sicherungsbolzen und die Sicherungsfeder grundsätzlich einteilig ausgebildet sein. Falls jedoch der Durchmesser des Sicherungsbolzens größer als der der Sicherungsfeder ist, ist eine zweiteilige Ausbildung der erfindungsgemäßen Vorrichtung geboten, um letztendlich die Federwirkung der Sicherungsfeder zu gewährleisten. Bevorzugt ist hierzu die Sicherungsfeder an dem ersten Endbereich des Sicherungsbolzens spiralförmig mindestens einmal um den Sicherungsbolzen gewickelt. Der Innendurchmesser der Federwicklung entspricht hierbei im Wesentlichen dem Außendurchmesser des Sicherungsbolzens.

[0016] Das Ende der Sicherungsfeder könnte einen gebogenen Zapfen aufweisen, welcher in eine im Wesentlichen quer zur Längsrichtung des Sicherungsbolzens vorgesehene Aussparung des Sicherungsbolzens verklemmbar ist. Eine solche Verbindung stellt in besonders vorteilhafter Weise einerseits sicher, dass die Feder oder der Bolzen nicht verloren geht und ermöglicht andererseits eine kostengünstige Herstellung.

[0017] Die Sicherungsfeder könnte an dem Sicherungsbolzen auch dadurch befestigt werden, dass der erste Endbereich des Sicherungsbolzens eine im Wesentlichen quer zur Längsrichtung des Sicherungsbolzens verlaufende Bohrung aufweist, durch welche das Ende der Sicherungsfeder sich erstreckt. Nun könnte grundsätzlich vorgesehen sein, die Sicherungsfeder mit den Sicherungsbolzen zu verschweißen und/oder die Sicherungsfeder in der Bohrung zu verklemmen. Alternativ oder zusätzlich könnte die Sicherungsfeder mit einem Überstand durch die Bohrung eingeführt werden und dieser Überstand des Sicherungsfederendes könnte beispielsweise um 90 Grad verbogen oder lediglich einmal um den Sicherungsbolzen gewunden sein. Hierdurch kann eine noch kostengünstigere Herstellung der erfindungsgemäßen Vorrichtung erreicht werden.

[0018] Damit sichergestellt ist, dass die Sicherungsfeder und/oder das Federelement stets in die ursprüngliche Form zurückgekehrt, ist das Federelement derart bemessen, dass zumindest bezüglich der Öffnungsbewegung das Hook'sche Gesetz gilt.

[0019] Das Federelement könnte mindestens eine Wicklung der Sicherungsfeder aufweisen, wobei das Federelement durch diese Maßnahme ganz besonders kostengünstig hergestellt werden kann. Ganz besonders bevorzugt sind vier spiralförmige Wicklungen vorgesehen, wodurch letztendlich - in Abhängigkeit der Materialeigenschaften der Sicherungsfeder - eine bestimmte

Federkonstante bereitgestellt werden kann. Das Feder-
element bzw. die Windung(en) ist vorzugsweise in einem
dem Sicherungsbolzen gegenüberliegenden Bereich der
Sicherungsfeder angeordnet.

[0020] Bevorzugt liegt eine Wicklung bzw. die Wick-
lungen in einer Ebene, welche im Wesentlichen parallel
zu der Ebene ist, in welcher der Bogen bzw. der Bügel
der Sicherungsfeder liegt. Alternativ könnte die Wicklung
in einer Ebene liegen, welche im Wesentlichen orthogo-
nal zu der Ebene ist, in welcher der Bogen bzw. der Bügel
der Sicherungsfeder liegt.

[0021] Es gibt nun verschiedene Möglichkeiten, die
Lehre der vorliegenden Erfindung in vorteilhafter Weise
auszugestalten und weiterzubilden. Dazu ist einerseits
auf die dem Patentanspruch 1 nachgeordneten Patent-
ansprüche und andererseits auf die nachfolgende Erläu-
terung der bevorzugten Ausführungsbeispiele der Erfin-
dung anhand der Zeichnung zu verweisen. In Verbindung
mit der Erläuterung der bevorzugten Ausführungsbei-
spiele der Erfindung anhand der Zeichnung werden auch
im Allgemeinen bevorzugte Ausgestaltungen und Wei-
terbildungen der Lehre erläutert. In der Zeichnung zeigen
jeweils in einer schematischen Darstellung in

Fig. 1 eine perspektivische Ansicht eines ersten Aus-
führungsbeispiels der erfindungsgemäßen Si-
chervorrichtung im arretierten Zustand,

Fig. 2 eine perspektivische Ansicht des Ausführungs-
beispiels aus Figur 1 in einem nicht arretierten
Zustand,

Fig. 3 eine alternative perspektivische Ansicht des
Ausführungsbeispiels aus Figur 2, wobei zur
Verdeutlichung die Feder teilweise geöffnet
dargestellt ist,

Fig. 4 eine perspektivische Ansicht der Sicherungs-
vorrichtung aus den Figuren 1 bis 3, welche in
einem Fanghaken eines Unterlenkers eines
Traktors eingesetzt ist,

Fig. 5 eine Seitenansicht eines zweiten Ausführungs-
beispiels der erfindungsgemäßen Sicherungs-
vorrichtung in einem arretierten Zustand und

Fig. 6 eine Seitenansicht eines dritten Ausführungs-
beispiels der erfindungsgemäßen Sicherungs-
vorrichtung in einem arretierten Zustand.

[0022] In den Figuren sind gleiche oder ähnliche Bau-
teile mit denselben Bezugszeichen gekennzeichnet. Die
Figuren 1 bis 3 zeigen ein erstes Ausführungsbeispiel
einer erfindungsgemäßen Vorrichtung 10 zur Sicherung
eines Gegenstands. Die Vorrichtung 10 umfasst einen
zylinderförmig ausgebildeten Sicherungsbolzen 12 und
eine Sicherungsfeder 14.

[0023] Die Sicherungsfeder 14 ist am ersten Endbe-

reich 16 des Sicherungsbolzens 12 unverlierbar befe-
stigt, was Figur 3 besonders deutlich entnehmbar ist. Die-
se Befestigung ist durch eine dreifache Wicklung der Si-
cherungsfeder 14 um den ersten Endbereich 16 des Si-
cherungsbolzens 12 in Verbindung mit einem geboge-
nen Zapfen 18 realisiert, wobei der gebogene Zapfen 18
das eine Ende der Sicherungsfeder 14 darstellt. Dieser
gebogene Zapfen 18 ist in der Aussparung 20 verklemt.
Die Aussparung 20 ist im Wesentlichen quer zur Längs-
richtung des Sicherungsbolzens 12 vorgesehen und
weist eine Breite auf, die etwas größer als der Außen-
durchmesser des gebogenen Zapfens 18 der Siche-
rungsfeder 14 ist.

[0024] Zur Montage der Sicherungsfeder 14 auf den
Sicherungsbolzen 12 wird der spiralenförmige Endbe-
reich der Sicherungsfeder 14 auf den Sicherungsbolzen
12 aufgesteckt und derart orientiert, dass der gebogene
Zapfen 18 in der Aussparung 20 - wie in Figur 3 gezeigt
- angeordnet ist. Sodann wird der erste Endbereich 16
des Sicherungsbolzens 12 zusammengedrückt, so dass
der gebogene Zapfen 18 in der Aussparung 20 ver-
klemmt wird. Hierdurch ist auf einfache, kostengünstige
und wirksame Weise eine feste Verbindung zwischen
Sicherungsfeder 14 und Sicherungsbolzen 12 gewähr-
leistet.

[0025] Das andere Ende der Sicherungsfeder 14 um-
fasst einen gebogenen Bereich 22, welcher zur reversi-
blen Arretierung der Sicherungsfeder 14 am Sicherungs-
bolzen 12 dient. Der gebogene Bereich 22 umgreift im
arretierten Zustand zumindest teilweise den Sicherungs-
bolzen 12 und ist im Wesentlichen ösenförmig ausgebil-
det. Am zweiten Endbereich 24 des Sicherungsbolzens
12 ist eine Nut 26 vorgesehen, in welche der gebogene
Bereich 22 der Sicherungsfeder 14 im arretierten Zu-
stand eingreift, siehe Figur 1. Die Nut 26 ist nicht ganz
so tief wie der Außendurchmesser der Sicherungsfeder
14 in dem gebogenen Bereich 22 ausgebildet. Dement-
sprechend entspricht der Innenradius des gebogenen
Bereichs 22 im Wesentlichen dem Außenradius des Be-
reichs des Sicherungsbolzens 12, an dem die Nut 26
vorgesehen ist. Die Nut 26 ist geringfügig breiter als der
Außendurchmesser der Sicherungsfeder 14 in dem ge-
bogenen Bereich 22. Der gebogene Bereich 22 ist in dem
Bereich, in dem er mit der Nut 26 in Eingriff kommt, im
Wesentlichen U-förmig ausgebildet. Aufgrund dieser
Ausbildung des zweiten Endbereichs 24 des Sicherungs-
bolzens im Zusammenspiel mit dem gebogenen Bereich
22 der Sicherungsfeder 14 kann der gebogene Bereich
22 im arretierten Zustand nicht entlang der Sicherungs-
bolzenlängsachse bewegt werden.

[0026] Der gebogene Bereich 22 umfasst weiterhin ei-
nen gebogenen Bereich 28, welcher einen Innenradius
aufweist, der größer als der einfache Außendurchmesser
des Sicherungsbolzens 12 ist. Zum Arretieren der in Fi-
gur 2 gezeigten Sicherungsfeder 14 ist das freie Ende
der Sicherungsfeder 14 derart in die Nähe des zweiten
Endbereichs 24 des Sicherungsbolzens 12 auszulenken
bzw. zu bringen, dass das freie Ende der Sicherungsfe-

der 14 mit ihrem gebogenen Bereich 28 auf den Sicherungsbolzen 12 aufgeschoben werden kann. Sobald der gebogene Bereich 28 im Bereich der Nut 26 ist, bewegt sich aufgrund einer entsprechenden Federvorspannung der Endbereich 22 derart, dass der U-förmige Bereich des gebogenen Bereichs 22 in Eingriff in die Nut 26 kommt. Das Lösen der Arretierung erfolgt entsprechend umgekehrt. Insoweit kann die erfindungsgemäße Vorrichtung zur Sicherung von Gegenständen in ganz besonders vorteilhafter Weise ohne jegliches Werkzeug arretiert bzw. gelöst werden.

[0027] Die Sicherungsfeder 14 weist ein Federelement 30 auf, welches aus vier Wicklungen aus dem Material der Sicherungsfeder 14 besteht. Die Wicklungen sind derart orientiert, dass sie in einer Ebene liegen, die im Wesentlichen parallel zu der Ebene ist, in der der bogenförmig ausgebildete Teil der Sicherungsfeder 14 liegt. Hierbei ist das Federelement 30 in einem Bereich des Bogens der Sicherungsfeder 14 angeordnet, der dem Sicherungsbolzen 12 gegenüber liegt. Das Federelement 30 ist derart ausgebildet, dass es einer Öffnungsbewegung des freien Endes der Sicherungsfeder 14 entgegenwirkt. Eine Öffnungsbewegung von bis zu 180 Grad ist hierbei problemlos möglich, in der Regel wird eine Öffnungsbewegung von bis zu 90 Grad zur Montage der Vorrichtung an einem Gegenstand ausreichen. Die Wicklungen des Federelements 30 sind derart ausgebildet, dass bei einer Öffnungsbewegung der Sicherungsfeder 14 das Federelement sich zusammenzieht. Das Federelement 30 ist hinsichtlich seiner Federkonstante derart bemessen, dass eine Öffnungsbewegung der Sicherungsfeder 14 von bis zu 180 Grad problemlos möglich ist und dass zumindest für eine solche Öffnungsbewegung das Hook'sche Gesetz gilt.

[0028] In Figur 4 ist der Einsatz der Vorrichtung 10 an einem Fanghaken 32 eines - nur zum Teil gezeigten - Unterlenkers 34 gezeigt, welcher beispielsweise bei einem Dreipunkt-Geräteaufbau an einem Traktor angeordnet sein könnte. Der Fanghaken 32 umfasst eine Sperrklinke 36, mit welcher eine Lagerkugel 38 am Fanghaken 32 arretiert werden kann. Die Lagerkugel 38 ist üblicherweise der Kopplungsvorrichtung eines - in Figur 4 nicht gezeigten - Arbeitsgeräts zugeordnet. Die Sperrklinke 36 kann mit dem Betätigungsteil 40 entriegelt werden, jedoch nur dann, wenn der Sicherungsbolzen 12 sich nicht durch die Gehäusebohrungen des Fanghakens 32 erstreckt. In dem in Figur 4 gezeigten Zustand des Fanghakens 32 ist die Sperrklinke 36 verriegelt. Figur 4 ist entnehmbar, dass die Sicherungsfeder 14 nahezu optimal an die Form des Fanghakens 32 angepasst ist. Aufgrund der Ausbildung der erfindungsgemäßen Vorrichtung mit der Sicherungsfeder 14 ist zumindest weitgehend sichergestellt, dass der Sicherungsbolzen 12 sich auch im nicht arretierten Zustand nicht ohne weiteres aus dem Gehäuse des Fanghakens 32 entfernen kann, da aufgrund der Federeigenschaften des Sicherungsfeder 14 im Zusammenspiel mit dem Federelement 30 das freie Ende 22 der Sicherungsfeder 14 am Gehäuse des

Fanghakens 32 anliegt.

[0029] Figur 5 zeigt ein zweites Ausführungsbeispiel der erfindungsgemäßen Vorrichtung 10. Hierbei ist die Sicherungsfeder 14 am ersten Endbereich 16 des Sicherungsbolzens 12 vergleichbar zu dem ersten Ausführungsbeispiel der Figuren 1 bis 3 befestigt.

[0030] Die reversible Arretierung ist gemäß diesem Ausführungsbeispiel dadurch herstellbar, dass am zweiten Endbereich 24 des Sicherungsbolzens 12 eine Bohrung 42 vorgesehen ist, in welche der Endbereich 44 der Sicherungsfeder 14 einführbar ist. Die Bohrung 42 ist hierbei quer zur Längsrichtung des Sicherungsbolzens 12 angeordnet und weist im Wesentlichen die gleiche Orientierung auf, wie der Teil der Sicherungsfeder 14, der an dem ersten Endbereich 16 des Sicherungsbolzens 12 zur Anlage bzw. zu Arretierung kommt. Der Endbereich 44 der Sicherungsfeder 14 ist im Wesentlichen geradlinig ausgebildet, so dass dieses Ende der Sicherungsfeder 14 relativ einfach in die Bohrung 42 des Sicherungsbolzens 12 einführbar ist. Die Bohrung weist daher an der Seite, an der die Sicherungsfeder 14 in die Bohrung 42 eingeführt wird, einen konischen Bereich 46 auf (lediglich schematisch angedeutet), so dass das Einführen des Sicherungsfederendes 44 erleichtert wird.

[0031] Figur 6 zeigt ein zu Figur 5 vergleichbares drittes Ausführungsbeispiel, bei welchem die Sicherungsfeder 14 an dem Sicherungsbolzen 12 dadurch befestigt ist, dass der erste Endbereich 16 des Sicherungsbolzens 12 eine im Wesentlichen quer zur Längsrichtung des Sicherungsbolzens 12 verlaufende Bohrung 48 aufweist, durch welche das Ende 50 der Sicherungsfeder 14 sich erstreckt. Die Sicherungsfeder ist zur unverlierbaren Arretierung an dem Sicherungsbolzen 12 in der Bohrung 48 verklemmt. Zusätzlich weist die Sicherungsfeder 14 einen Überstand bzw. überstehendes Ende 50 auf, der/das durch die Bohrung 48 eingeführt werden kann. Dieser Überstand des Sicherungsfederendes 50 ist um ca. 60 Grad verbogen. Durch das Verklemmen und/oder das Verbiegen kann eine noch kostengünstigere Herstellung der erfindungsgemäßen Vorrichtung realisiert werden.

[0032] Abschließend sei ganz besonders darauf hingewiesen, dass die voranstehend erörterten Ausführungsbeispiele lediglich zur Beschreibung der beanspruchten Lehre dienen, diese jedoch nicht auf die Ausführungsbeispiele einschränken.

Patentansprüche

1. Vorrichtung zur Sicherung eines Gegenstands (36), mit einem Sicherungsbolzen (12) und einer Sicherungsfeder (14), wobei die Sicherungsfeder (14) an einem ersten Endbereich (16) des Sicherungsbolzens (12) unverlierbar befestigt ist, wobei die Sicherungsfeder (14) sich von dem ersten Endbereich (16) des Sicherungsbolzens (12) im Wesentlichen bündelförmig oder bogenförmig zu einem zweiten Endbe-

- reich (24) des Sicherungsbolzens (12) erstreckt und hierbei im Betriebszustand einen Gegenstand (32) von einer Seite her umschließt, wobei die Sicherungsfeder (14) an dem zweiten Endbereich (24) des Sicherungsbolzens (12) reversibel arretierbar ist, **dadurch gekennzeichnet, dass** die Sicherungsfeder (14) ein Federelement (30) aufweist, welches eine Öffnungsbewegung des von der Sicherungsfeder (14) ausgebildeten Bogens ermöglicht, dieser jedoch entgegenwirkt, dass das Federelement (30) eine Annäherung bzw. Positionierung des Endbereichs der Sicherungsfeder (14) zum zweiten Ende (24) des Sicherungsbolzens (12) hin bewirkt und dass das Federelement (30) derart ausgebildet ist, dass es sich bei einer Öffnungsbewegung der Sicherungsfeder (14) zusammenzieht.
2. Vorrichtung nach Anspruch 1, **dadurch gekennzeichnet, dass** der Sicherungsbolzen (12) im Wesentlichen prisma- oder zylinderförmig ausgebildet ist und/oder dass die reversible Arretierung durch eine ösenförmige Ausbildung eines Endbereichs der Sicherungsfeder (14) realisierbar ist, welche im arretierten Zustand der Vorrichtung den zweiten Endbereich (24) des Sicherungsbolzens (12) zumindest weitgehend umgreift.
3. Vorrichtung nach Anspruch 2, **dadurch gekennzeichnet, dass** im arretierten Zustand der Vorrichtung (10) die ösenförmige Ausbildung des Endbereichs der Sicherungsfeder (14) in eine am Endbereich des Sicherungsbolzens (12) vorgesehene Nut (26) eingreift, welche vorzugsweise in umfangsmäßiger Richtung ausgebildet ist.
4. Vorrichtung nach Anspruch 2 oder 3, **dadurch gekennzeichnet, dass** der ösenförmig ausgebildete Endbereich der Sicherungsfeder (14) einen im Wesentlichen U-förmigen Bereich (22) aufweist, dessen Schenkel einen Abstand voneinander aufweisen, welcher ungefähr dem Außendurchmesser des Sicherungsbolzens (12) oder dem Außendurchmesser der am Endbereich (24) des Sicherungsbolzens (12) vorgesehenen Nut (26) entspricht und dass vorzugsweise das Maß der Schenkel des U-förmigen Bereichs (22) mindestens dem einfachen Außendurchmesser des Sicherungsbolzens (12) oder mindestens dem einfachen Außendurchmesser der am Endbereich (24) des Sicherungsbolzens (12) vorgesehenen Nut (26) entspricht.
5. Vorrichtung nach einem der Ansprüche 2 bis 4, **dadurch gekennzeichnet, dass** ein Endbereich der Sicherungsfeder (14) einen gebogenen Bereich (28) mit einem Biegungsradius aufweist, welcher größer als der einfache Außendurchmesser des Sicherungsbolzens (12) ist.
6. Vorrichtung nach Anspruch 1, **dadurch gekennzeichnet, dass** die reversible Arretierung **dadurch** herstellbar ist, dass am zweiten Endbereich (24) des Sicherungsbolzens (12) eine Bohrung vorgesehen ist, in welche der Endbereich der - vorzugsweise im Wesentlichen geradlinig ausgebildeten - Sicherungsfeder (14) einführbar ist, wobei die Bohrung insbesondere quer zur Längsrichtung des Sicherungsbolzens (12) angeordnet ist.
7. Vorrichtung nach einem der Ansprüche 1 bis 6, **dadurch gekennzeichnet, dass** die Sicherungsfeder (14) an dem ersten Endbereich (16) des Sicherungsbolzens (12) spiralenförmig mindestens einmal um den Sicherungsbolzen (12) gewickelt ist, und dass vorzugsweise das Ende der Sicherungsfeder (14) einen gebogenen Zapfen (18) aufweist, welcher in eine im Wesentlichen quer zur Längsrichtung des Sicherungsbolzens (12) vorgesehene Aussparung (20) des Sicherungsbolzens (12) verklemmbar ist.
8. Vorrichtung nach einem der Ansprüche 1 bis 7, **dadurch gekennzeichnet, dass** der erste Endbereich (16) des Sicherungsbolzens (12) eine im Wesentlichen quer zur Längsrichtung des Sicherungsbolzens (12) verlaufende Bohrung aufweist, durch welche das Ende der Sicherungsfeder sich - vorzugsweise mit einem Überstand - erstreckt, und dass ein gegebenenfalls vorgesehener Überstand der Sicherungsfeder (14) verbogen ist, wobei insbesondere die Sicherungsfeder (14) in der Bohrung verklemt angeordnet ist.
9. Vorrichtung nach Anspruch 1, **dadurch gekennzeichnet, dass** das Federelement (30) derart bemessen ist, dass zumindest bezüglich der Öffnungsbewegung das Hook'sche Gesetz gilt und/oder dass das Federelement (30) mindestens eine - vorzugsweise vier - spiralenförmige Wicklung(en) der Sicherungsfeder (14) aufweist, welche vorzugsweise in einem dem Sicherungsbolzen (12) gegenüberliegenden Bereich der Sicherungsfeder (14) angeordnet ist.
10. Vorrichtung nach Anspruch 9, **dadurch gekennzeichnet, dass** eine Wicklung in einer Ebene liegt, welche im Wesentlichen parallel oder orthogonal zu der Ebene ist, in welcher der Bogen bzw. der Bügel der Sicherungsfeder (14) liegt.

Claims

1. A device for securing an object (36), with a securing bolt (12) and a securing spring (14), wherein the securing spring (14) is fixed captive on a first end region (16) of the securing bolt (12), wherein the securing spring (14) extends essentially in the shape of a bow

or a loop from the first end region (16) of the securing bolt (12) to a second end region (24) of the securing bolt (12) and in the working state embraces an object (32) from one side, wherein the securing spring (14) can arrested reversibly on the second end region (24) of the securing bolt (12), **characterized in that** the securing spring (14) comprises a spring element (30) which enables an opening movement of the loop formed by the securing spring (14), **in that** the spring element (30) counteracts an approach or positioning of the end region of the securing spring (14) to the second end (24) of the securing bolt (12) and **in that** the spring element (30) is so formed that it contracts with an opening movement of the securing spring (14).

2. A device according to claim 1, **characterized in that** the securing bolt (12) is of substantially prismatic or cylindrical form and/or **in that** the reversible arresting is realised by a eye shaped formation of an end region of the securing spring (14), which in the arrested state of the device at least largely embraces the second end region (24) of the securing bolt (12).
3. A device according to claim 2, **characterized in that**, in the arrested state of the device (10), the eye shaped formation of the end region of the securing spring (14) engages in a groove (26) which is provided at the end region of the securing bolt (12) and is preferably formed in the peripheral direction.
4. A device according to claim 2 or 3, **characterized in that** the eye formed end region of the securing spring (14) has a substantially U-shaped region (22) whose sides have a spacing from one another which corresponds approximately to the outer diameter of the securing bolt (12) or the outer diameter of the groove (26) provided in the end region (24) of the securing bolt (12), and **in that** the size of the arms of the U-shaped region (22) preferably corresponds to at least one outer diameter of the securing bolt (12) or at least one outer diameter of the groove (26) provided in the end region (24) of the securing bolt (12).
5. A device according to any of claims 2 to 4, **characterized in that** one end region of the securing spring (14) has an arcuate region (28) with a radius of the arc which is greater than one outer diameter of the securing bolt (12).
6. A device according to claim 1, **characterized in that** the reversible arresting can be produced **in that** the a bore is provided in the second end region (24) of the securing bolt (12), into which the end region of the securing spring (14) - preferably of substantially straight form - can be introduced, the bore being in particular disposed transverse to the longitudinal di-

rection of the securing bolt (12).

7. A device according to any of claims 1 to 6, **characterized in that** the securing spring (14) is wound in spiral form at least once round the first end region (16) of the securing bolt (12), and **in that** the end of the securing spring (14) preferably has a bent tongue (18) which can be wedged in a recess (20) of the securing bolt (12) provided substantially transverse to the longitudinal direction of the securing bolt (12).
8. A device according to any of claims 1 to 7, **characterized in that** the first end region (16) of the securing bolt (12) has a bore running substantially transverse to the longitudinal direction of the securing bolt (12), through which the end of the securing spring extends - preferably with an excess length - and **in that** an excess length of the securing spring (14) which may be provided is bent, whereby in particular the securing spring (14) is wedged in the bore.
9. A device according to claim 1, **characterized in that** the spring element (30) is so dimensioned that Hooke's law applies at least in relation to the opening movement and/or that the spring element (30) has at least one - preferably four - windings of spiral form of the securing spring (14), which is preferably arranged in a region of the securing spring (14) opposite the securing bolt (12).
10. A device according to claim 9, **characterized in that** a winding lies in a plane which lies substantially parallel or orthogonal to the plane in which the bow or loop of the securing spring (14) lies.

Revendications

1. Dispositif pour fixer un objet (36), comprenant un boulon de blocage (12) et un ressort de blocage (14), le ressort de blocage (14) étant fixé de façon imperdable sur une première zone d'extrémité (16) du boulon de blocage (12), le ressort de blocage (14) s'étendant depuis la première zone d'extrémité (16) du boulon de blocage (12) principalement en forme de bride ou d'arc vers une seconde zone d'extrémité (24) du boulon de blocage (12) et entourant ici dans l'état de service un objet (32) à partir d'un côté, le ressort de blocage (14) pouvant être bloqué de façon réversible sur la seconde zone d'extrémité (24) du boulon de blocage (12), **caractérisé en ce que** le ressort de blocage (14) présente un élément de ressort (30) qui permet un mouvement d'ouverture de l'arc formé par le ressort de blocage (14), mais s'oppose à celui-ci, **en ce que** l'élément de ressort (30) entraîne un rapprochement ou un positionnement de la zone d'extrémité du ressort de blocage (14) en direction de la seconde extrémité (24) du boulon de

blocage (12) et **en ce que** l'élément de ressort (30) est conçu de telle sorte qu'il se rétracte lors d'un mouvement d'ouverture du ressort de blocage (14).

2. Dispositif selon la revendication 1, **caractérisé en ce que** le boulon de blocage (12) est conçu sensiblement en forme de prisme ou de cylindre et/ou **en ce que** le blocage réversible peut être réalisé par une réalisation en forme d'anneau d'une zone d'extrémité du ressort de blocage (14), qui, dans un état bloqué du dispositif, entoure au moins largement la seconde zone d'extrémité (24) du boulon de blocage (12). 5
3. Dispositif selon la revendication 2, **caractérisé en ce que**, dans un état bloqué du dispositif (10), la réalisation en forme d'anneau de la zone d'extrémité du ressort de blocage (14) s'engage dans une rainure (26) prévue sur la zone d'extrémité du boulon de blocage (12), laquelle est réalisée de préférence dans le sens périphérique. 10
4. Dispositif selon la revendication 2 ou 3, **caractérisé en ce que** la zone d'extrémité, conçue en forme d'anneau, de ressort de blocage (14) présente une zone (22) sensiblement en U, dont les branches présentent un espacement qui correspond à peu près au diamètre extérieur du boulon de blocage (12) ou au diamètre extérieur de la rainure (26) prévue sur la zone d'extrémité (24) du boulon de blocage (12) et **en ce que** de préférence la côte des branches de la zone (22) en U correspond au moins au simple diamètre extérieur du boulon de blocage (12) ou au moins au simple diamètre extérieur de la rainure (26) prévue sur la zone d'extrémité (24) du boulon de blocage (12). 15
5. Dispositif selon l'une quelconque des revendications 2 à 4, **caractérisé en ce qu'une** zone d'extrémité du boulon de blocage (14) présente une zone (28) courbée avec un rayon de courbure qui est supérieur au simple diamètre extérieur du boulon de blocage (12). 20
6. Dispositif selon la revendication 1, **caractérisé en ce que** le blocage réversible peut être fabriqué par le fait que sur la seconde zone d'extrémité (24) du boulon de blocage (12) est prévu un perçage dans lequel la zone d'extrémité du ressort de blocage (14), conçu de préférence sensiblement rectiligne, doit être introduite, le perçage étant disposé en particulier transversalement à la direction longitudinale du boulon de blocage (12). 25
7. Dispositif selon l'une quelconque des revendications 1 à 6, **caractérisé en ce que** le ressort de blocage (14) est enroulé sur la première zone d'extrémité (16) du boulon de blocage (12) en forme de spirale au 30

moins une fois autour du boulon de blocage (12) et **en ce que** de préférence l'extrémité du ressort de blocage (14) présente un pivot (18) courbé, qui peut être coincé dans un évidement (20), prévu essentiellement transversalement à la direction longitudinale du boulon de blocage (12), du boulon de blocage (12).

8. Dispositif selon l'une quelconque des revendications 1 à 7, **caractérisé en ce que** la première zone d'extrémité (16) du boulon de blocage (12) présente un perçage agencé sensiblement transversalement à la direction longitudinale du boulon de blocage (12), par lequel l'extrémité du ressort de blocage s'étend, de préférence avec un dépassement, et **en ce qu'un** dépassement, éventuellement prévu, du ressort de blocage (14) est plié, en particulier le ressort de blocage (14) étant disposé coincé dans le perçage. 35
9. Dispositif selon la revendication 1, **caractérisé en ce que** l'élément de ressort (30) est dimensionné de telle sorte que la loi de Hook s'applique au moins en ce qui concerne le mouvement d'ouverture et/ou l'élément de ressort (30) présente au moins un, de préférence quatre enroulement(s) en forme de spirale du ressort de blocage (14), qui est disposé de préférence dans une zone, faisant face au boulon de blocage (12), du ressort de blocage (14). 40
10. Dispositif selon la revendication 9, **caractérisé en ce qu'un** enroulement est disposé dans un plan qui est sensiblement parallèle ou perpendiculaire au plan dans lequel est disposé l'arc ou la bride du ressort de blocage (14). 45

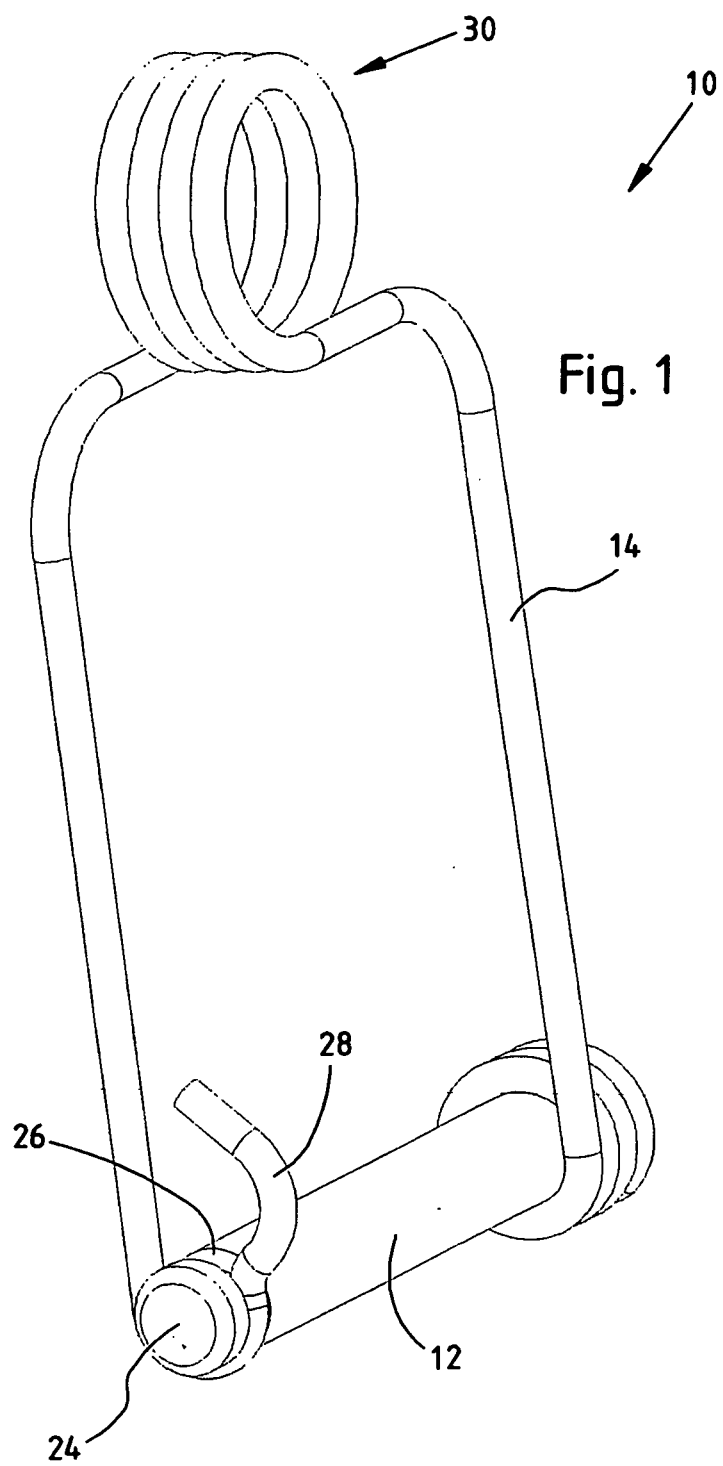
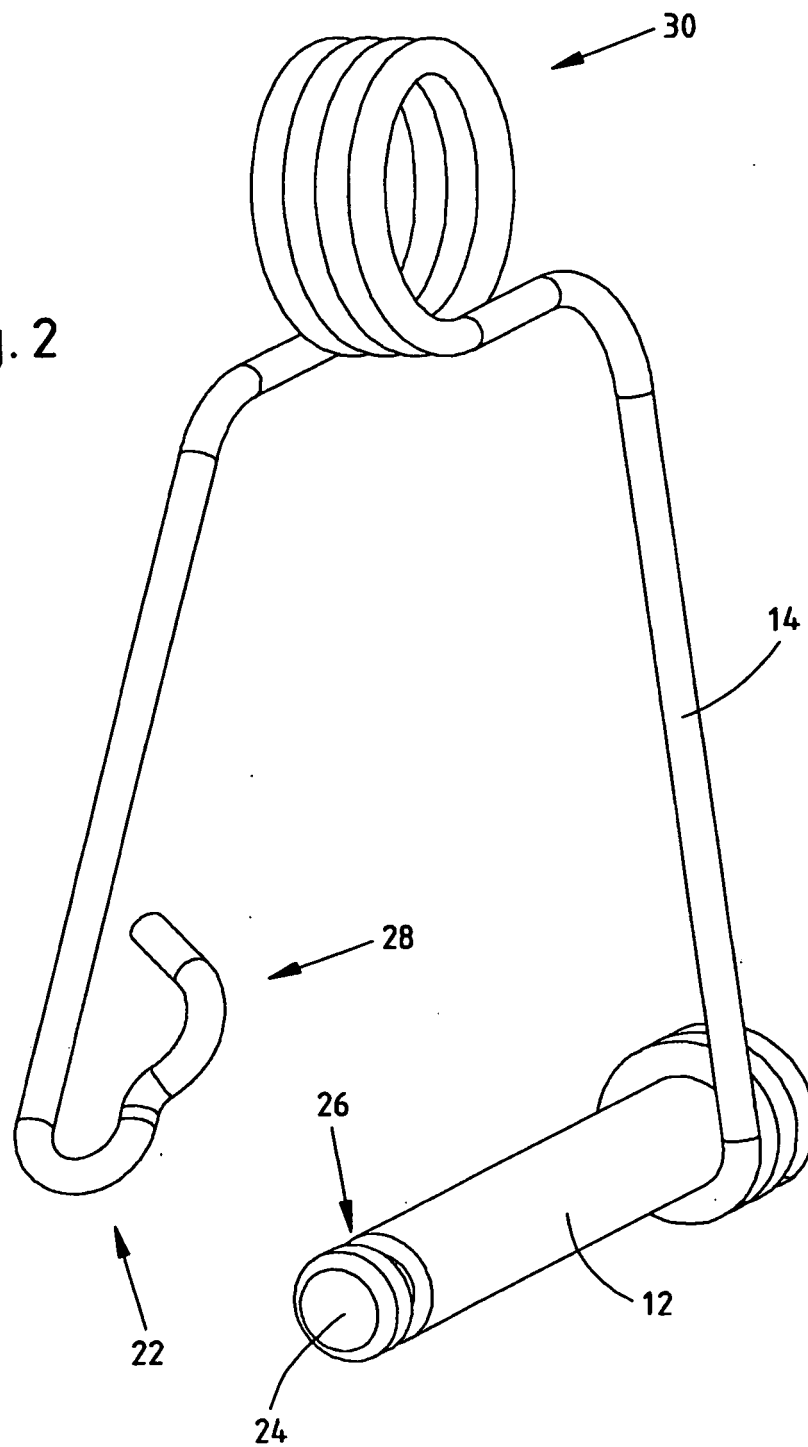


Fig. 2



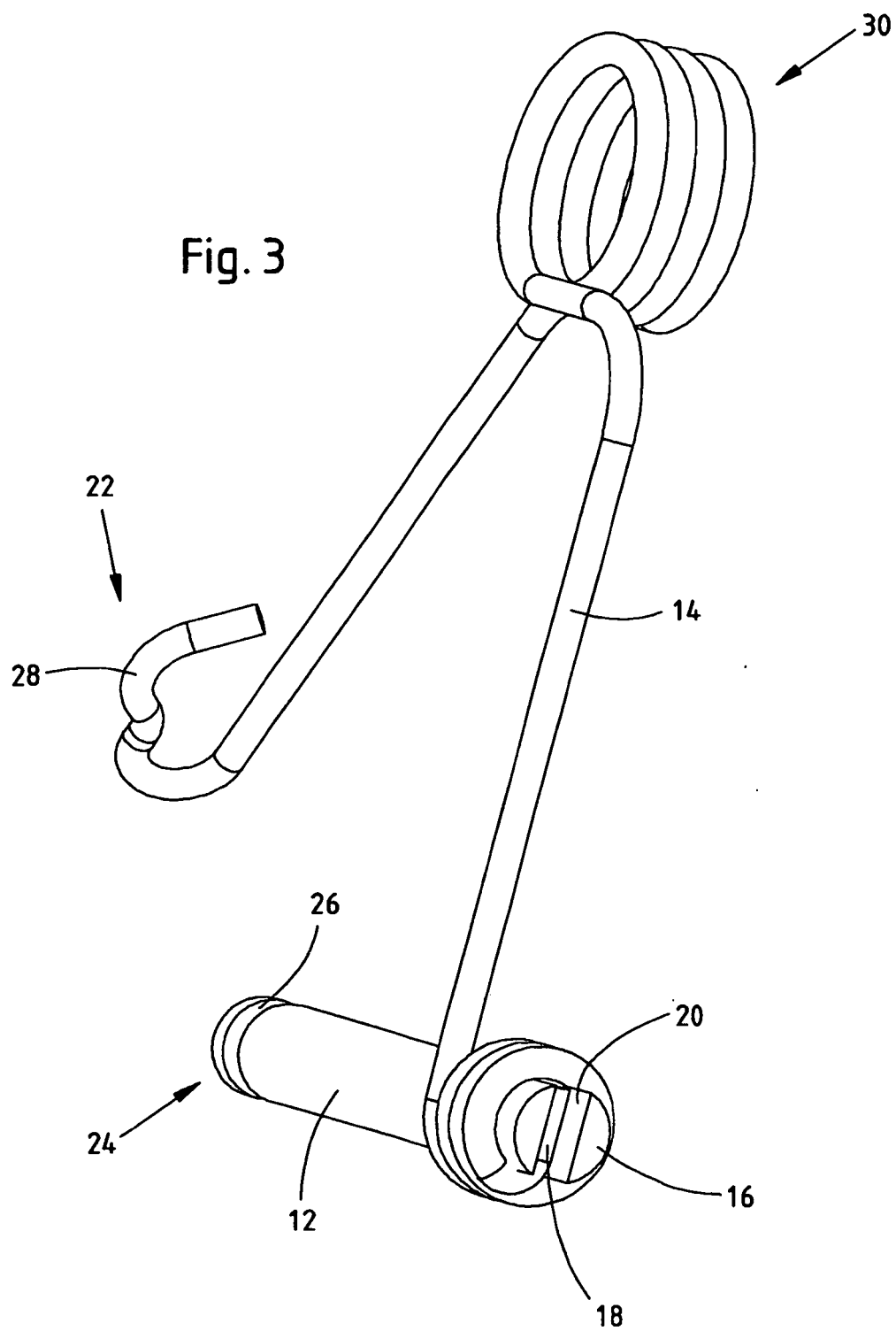
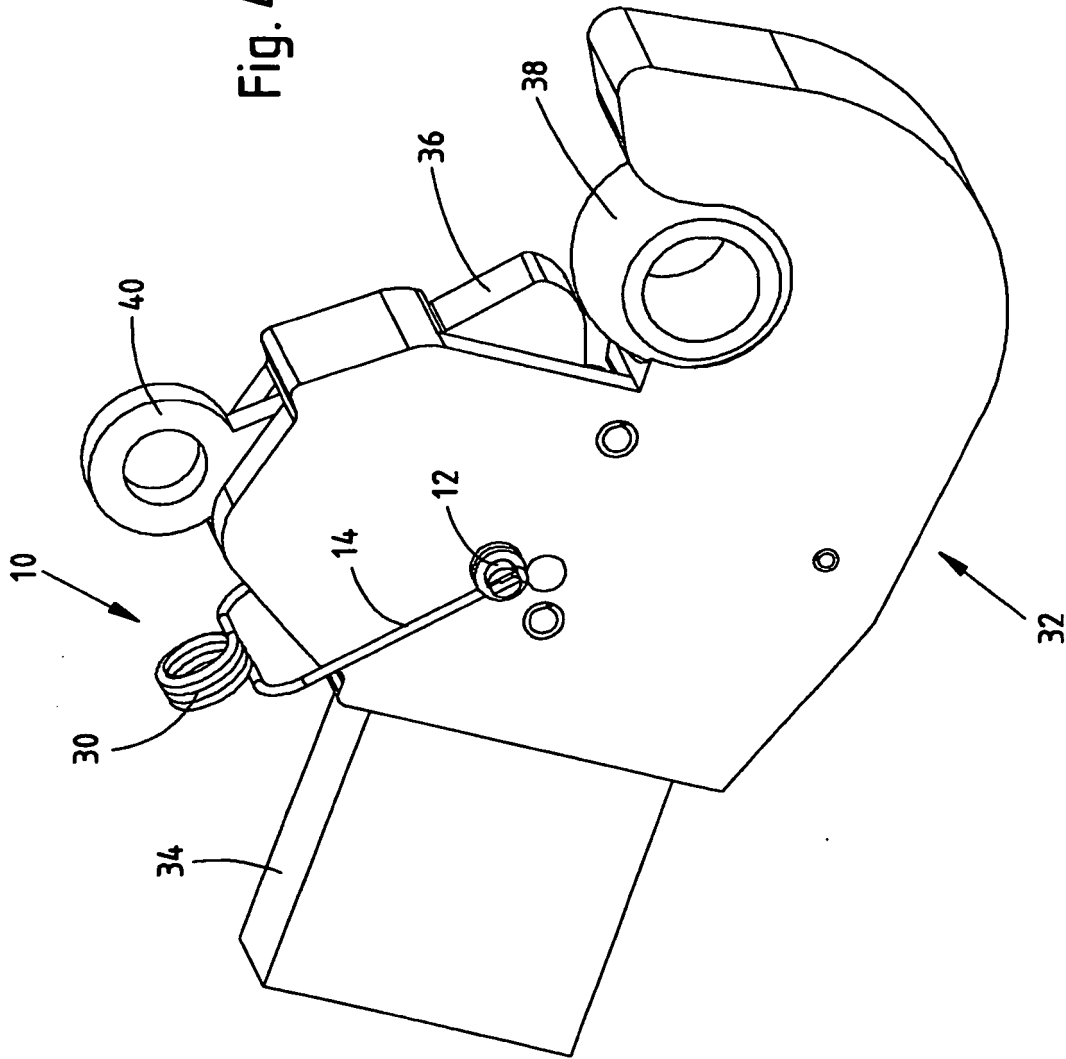


Fig. 4



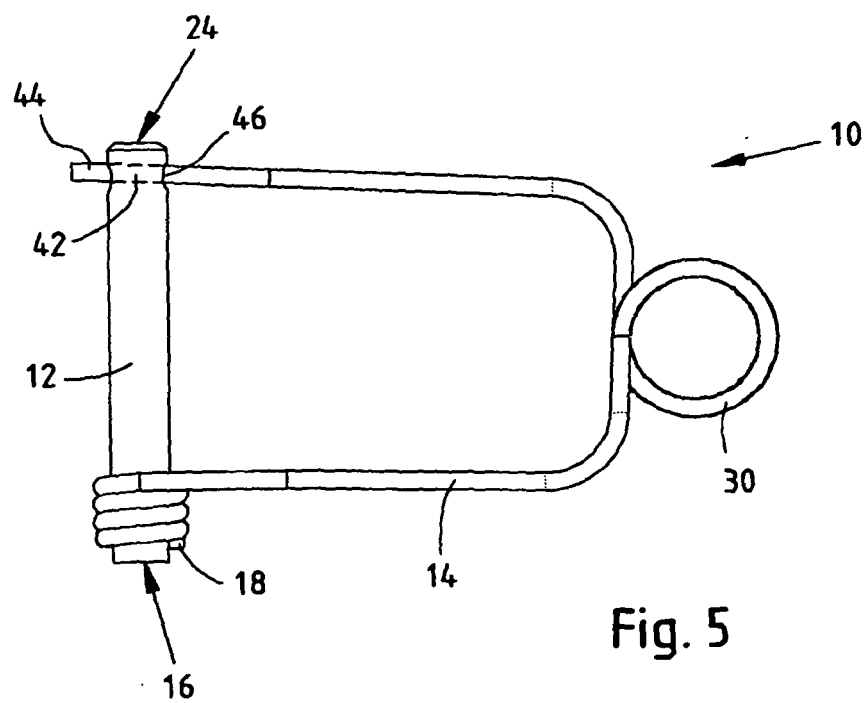
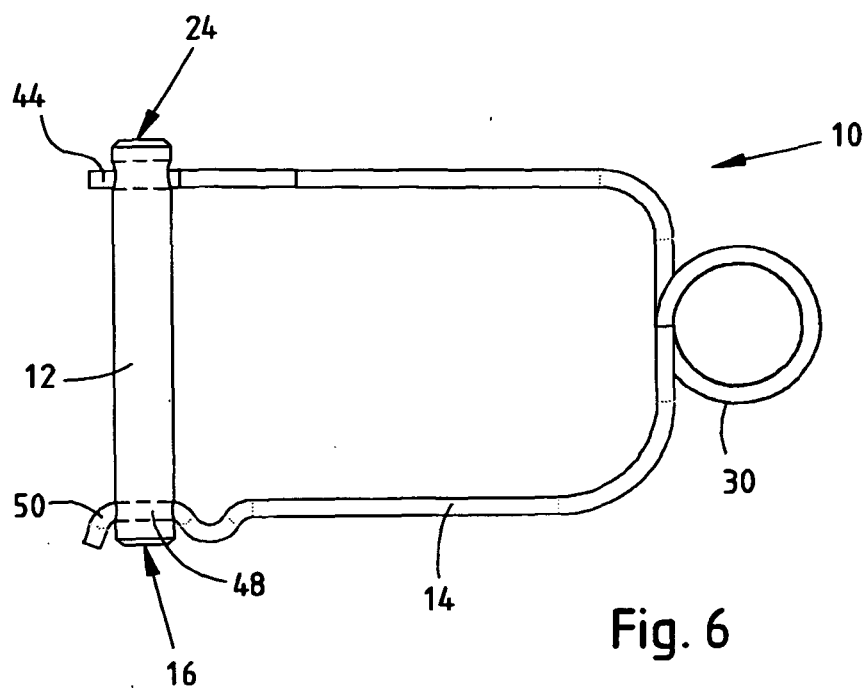


Fig. 5





US005553822A

United States Patent [19]**Barnard et al.**[11] **Patent Number:** **5,553,822**[45] **Date of Patent:** **Sep. 10, 1996**[54] **SUPPORT MEANS FOR CONDUIT**

559192 2/1944 United Kingdom 24/332

[75] Inventors: **Michael A. Barnard; Marvin L. Cox,**
both of Wichita, Kans.*Primary Examiner*—Anthony Knight
Assistant Examiner—Andrea Chop
Attorney, Agent, or Firm—Hovey, Williams, Timmons & Collins[73] Assignee: **Wescon Products Company,** Wichita,
Kans.[21] Appl. No.: **372,389**[22] Filed: **Jan. 13, 1995**[51] **Int. Cl.⁶** **F16L 3/08**[52] **U.S. Cl.** **248/302; 248/73; 74/502.4;**
74/502.6; 403/392[58] **Field of Search** 24/67.9, 332, 343,
24/563; 74/502.4, 502.6; 248/51, 52, 222.12,
231.9, 316.1, 69, 73, 302, 500; 403/229,
291, 384, 392, 395, 397[56] **References Cited****U.S. PATENT DOCUMENTS**

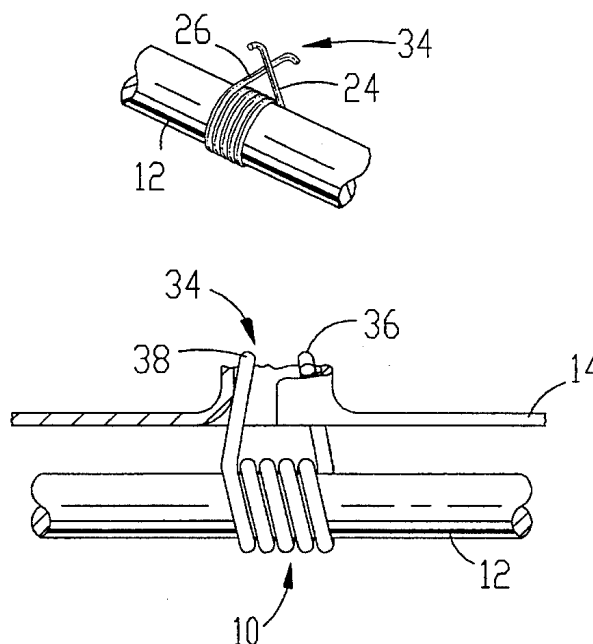
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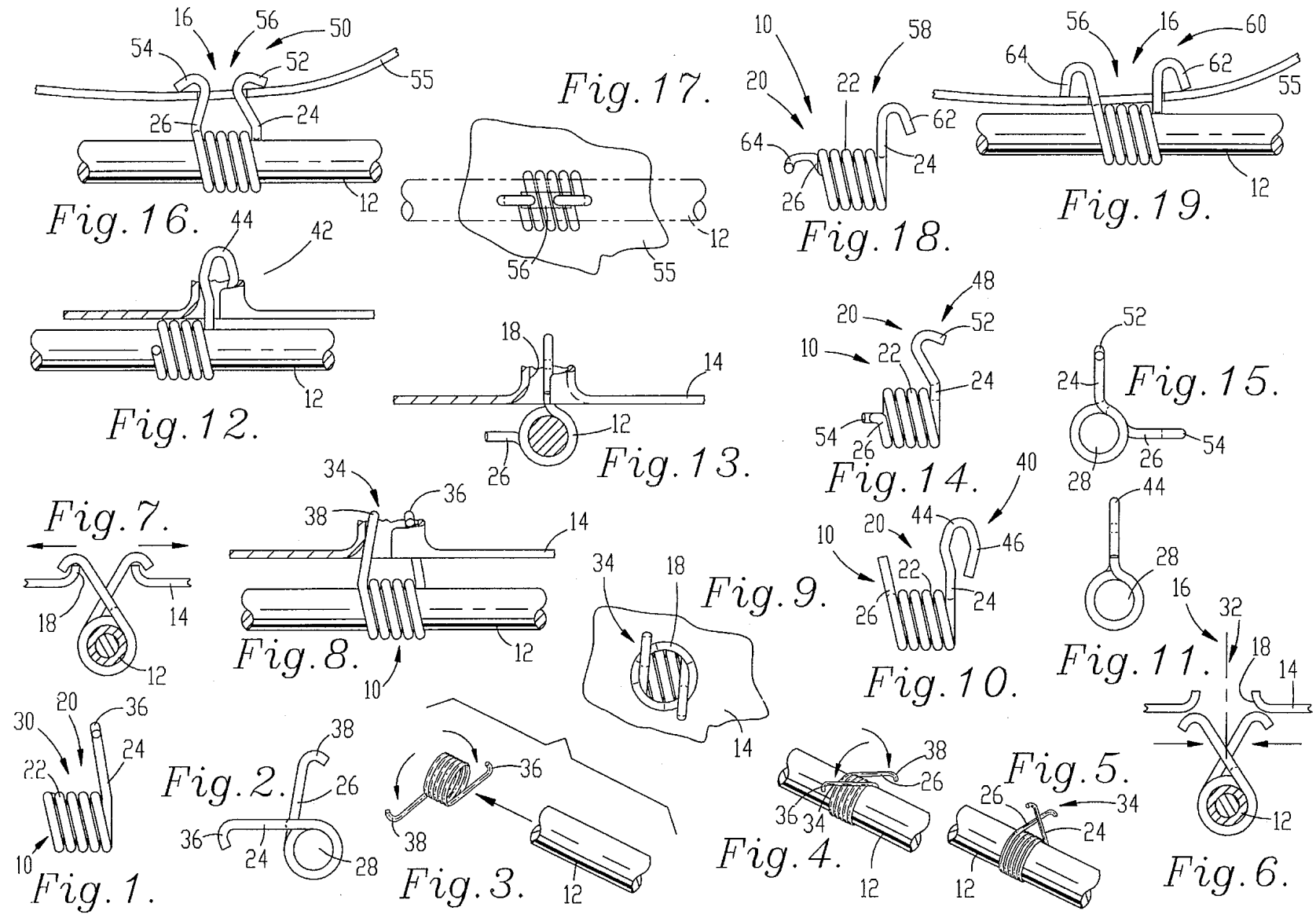
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ABSTRACT

[57] An attachment apparatus is provided for attaching an elongated shaft to a structural element, wherein the shaft defines a longitudinal axis, and the structural element includes an opening through the structural element which defines a central axis extending in a direction generally perpendicular to the axis of the shaft. The apparatus includes a helical coil of wire having a central coiled section and opposed end sections protruding from the coiled section, an inner space defined by the coiled section that is sized to grip the shaft and to prevent relative axial movement between the helical coil and the shaft when the coil is mounted on the shaft, and a fastening assembly for fastening the apparatus to the structural element when at least one end section is inserted into the opening. The apparatus is mounted on the elongated shaft by rotating the opposed end sections so that the coiled section unwinds, increasing the diameter of the inner space to a point where it is slightly larger than the cross-sectional diameter of the shaft. The elongated shaft is inserted through the inner space to a desired position relative to the apparatus, and the opposed end sections are rotated so that the coiled section rewinds, decreasing the diameter of the inner space until the shaft is firmly retained through the apparatus. In a preferred embodiment, the fastening assembly includes hook-shaped tips defined by the opposed end sections, and spaced-apart by a distance greater than the diameter of the opening.

1 Claim, 1 Drawing Sheet



SUPPORT MEANS FOR CONDUIT

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates generally to fasteners, and, more particularly, to an attachment apparatus for attaching an elongated member alongside a structural element having an opening formed therein.

2. Discussion of the Prior Art

Presently, in the construction of a walk-behind lawn mower for trimming grass, a lawn mower deck is provided which supports a controllable engine, and at least one grass cutting blade. Such lawn mowers include a handle bar allowing an operator to position the lawn mower over the grass to be trimmed. Remote engine controls are commonly placed on the handle bar so that they may be reached quickly. The linkage between the engine control and the remote control is often a mechanical linkage, such as a cable. Since cables have a tendency to buckle when placed under relatively high longitudinal compressive forces, such as those necessary to manipulate the engine controls, the cables are often placed in a conduit, sheath, or other elongated hollow shaft, sufficiently rigid to prevent such buckling. A typical conduit is constructed of a synthetic resin material, such as Polyvinyl Chloride (PVC), which provides sufficient rigidity.

A conduit provides the additional benefit of protecting the cable from corrosive environmental effects. However, due to the frictional forces exerted on the cable by the interior of the conduit, the conduit must be secured to the lawn mower so that the remote control may effectively push and pull the cable through the conduit.

It is known to provide a metallic clamp-type device which may be fastened to a shroud extending around the engine, effectively clamping and securing the conduit to the shroud while allowing the cable to be pushed and pulled within the conduit. Clamp-type devices are commonly secured to the shroud by means of a self-tapping screw, requiring an opening defined in the structural element which has a sufficient depth, or side wall, that provides a surface for the screw to tap itself upon. Extruded holes, holes which have been stamped or punched through a relatively flat element, turning the edges of the element inward, provide an opening with sufficient depth for self-tapping screws.

In assembly, clamp-type devices require that the conduit be positioned in the clamping area of the device, and retained, usually by hand, while the device is fastened to the structural element. If the conduit is positioned incorrectly, the remote engine control will not be allowed to move through its full range of motion, reducing its effectiveness in controlling the engine. Therefore, it is important to correctly position the conduit with respect to the engine. Because such clamp-type devices require that the assembler use one hand to position the conduit, and the other hand to secure the device, assembly becomes a difficult and time-consuming process, increasing production time, and labor costs associated with producing a lawn mower.

It is also known to provide a strap fastener constructed of a flexible synthetic resin material which may be used to secure the conduit to the structural element. Plastic strap fasteners, which resemble those used with trash bags, are relatively inexpensive to produce, but are generally not reusable. In addition, they are limited to use with tubular or cylindrical structural elements, such as the handle bar on the lawn mower, and cannot be used to secure conduits and the

like to relatively large flat surfaces, such as the engine shroud. Additionally, plastic strap fasteners cannot be used around heated areas because they may melt, or otherwise rapidly lose structural integrity.

It is further known to provide a snap-on axial end fitting for a conduit which may be used to attach the end of the conduit perpendicular to the surface of the shroud. These fittings are commonly made of a synthetic resin material, and provide at least one flexible barb, allowing the fitting to be pushed into a receiving aperture, securing the fitting to the structural element once the barb has been pushed through the aperture.

Such an end fitting allows the conduit to be quickly positioned and secured to the element. However, because such fittings must be placed on the axial end of the conduit, the distance between the shroud and the end of the cable protruding from the conduit must be relatively small so that buckling of the exposed portion of the cable does not occur. Additionally, these fittings require a special aperture in the shroud, one which has a relatively shallow depth and a specific shape so that the barb may be allowed to effectively retain the conduit on the shroud.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide an apparatus for attaching a sleeve, conduit or other elongated shaft alongside a structural element at an opening formed in the structural element so that the shaft is secured to the element.

It is another object of the present invention to provide an attachment apparatus that permits an elongated hollow shaft to be attached to a structural element while protruding past the apparatus to protect the entire length of the cable supported within the shaft from buckling.

It is a further object of the present invention to provide an apparatus for attaching an elongated shaft to a structural element having any shape of surfaces, such as relatively flat surfaces, or relatively curved surfaces. It is yet another object of the present invention to provide an apparatus which may be fastened to a structural element with relative quickness. Yet a further object of the present invention is to provide an apparatus which may be fastened to a structural element adapted for use with a prior art fastening device.

In accordance with the present invention, an attachment apparatus is provided for attaching an elongated shaft to a structural element, wherein the shaft defines a longitudinal axis, and the structural element includes an opening through the structural element which defines a central axis extending in a direction generally perpendicular to the axis of the shaft.

The apparatus includes a helical coil of wire having a central coiled section and opposed end sections protruding from the coiled section, an inner space defined by the coiled section that is sized to grip the shaft and to prevent relative axial movement between the helical coil and the shaft when the coil is mounted on the shaft, and a fastening assembly for fastening the apparatus to the structural element when at least one end section is inserted into the opening.

The apparatus is mounted on the elongated shaft by rotating the opposed end sections so that the coiled section unwinds. Unwinding the coiled section causes the diameter of the inner space to increase. The diameter of the inner space is increased to a point where it is slightly larger than the cross-sectional diameter of the shaft.

The elongated shaft is inserted through the inner space to a desired position relative to the apparatus. Once the desired

position is achieved, the opposed end sections are rotated so that the coiled section rewinds, decreasing the diameter of the inner space. The coiled section is rewound until the diameter of the inner space is slightly smaller than the cross-sectional diameter of the shaft, causing the coiled section to create impressions on the surface of the shaft, and allowing the apparatus to be firmly seated upon the shaft. The opposed end sections are then rotated to a desired radial position with respect to the coiled section.

In a preferred embodiment, the fastening assembly is adapted for use with a relatively circular opening. The assembly includes hook-shaped tips defined by the opposed end sections, and spaced-apart by a distance greater than the diameter of the opening. The tips extend in a direction tangential to the coiled section and intersect a plane defined by the longitudinal axis of the shaft and the central axis of the opening. As the apparatus is fastened to the structural element and the tips of the two end sections are pushed into the opening in the structural element, the tips are deflected toward one another and the coiled section is forced to partially unwind until the tips are pushed completely through the opening, allowing the coiled section to rewind.

BRIEF DESCRIPTION OF THE DRAWING FIGURES

Preferred embodiments of an apparatus for attaching an elongated shaft to a structural element is described in detail below with reference to the drawing figures, wherein:

FIG. 1 is a side elevational view of an attachment apparatus constructed in accordance with a first embodiment of the present invention, depicting the apparatus in a condition prior to mounting on an elongated shaft;

FIG. 2 is an end elevational view of the attachment apparatus of FIG. 1;

FIG. 3 is a perspective view of the apparatus of FIG. 1, depicting an elongated shaft being inserted through the apparatus;

FIG. 4 is a perspective view of the apparatus of FIG. 1, depicting the apparatus during mounting on the shaft;

FIG. 5 is a perspective view of the apparatus of FIG. 1, depicting the apparatus after being mounted on the shaft;

FIG. 6 is an end elevational view of the apparatus of FIG. 1, depicting the hook-shaped tips of the apparatus being inserted into an opening of a structural element;

FIG. 7 is an end elevational view of the apparatus of FIG. 1, depicting the apparatus fastened to the structural element;

FIG. 8 is a side elevational view of the assembly shown in FIG. 7;

FIG. 9 is a top plan view of the assembly shown in FIG. 7;

FIG. 10 is a side elevational view of an attachment apparatus constructed in accordance with a second embodiment of the present invention, depicting the apparatus in a condition prior to mounting the apparatus on an elongated shaft;

FIG. 11 is an end elevational view of the attachment apparatus of FIG. 10;

FIG. 12 is a side elevational view of the apparatus of FIG. 10, depicting the apparatus mounted on an elongated shaft and fastened to a structural element;

FIG. 13 is an end elevational view of the assembly shown in FIG. 12;

FIG. 14 is a side elevational view of an attachment apparatus constructed in accordance with a third embodi-

ment of the present invention, depicting the apparatus in a condition prior to mounting the apparatus on an elongated shaft;

FIG. 15 is an end elevational view of the attachment apparatus of FIG. 14.

FIG. 16 is a side elevational view of the apparatus of FIG. 14, depicting the apparatus mounted on an elongated shaft and fastened to a structural element;

FIG. 17 is a top plan view of the assembly shown in FIG. 16;

FIG. 18 is a side elevational view of the attachment apparatus of FIG. 14, depicting another embodiment of the hook-shaped ends; and

FIG. 19 is a side elevational view of the apparatus of FIG. 18, depicting the apparatus mounted on an elongated shaft and fastened to a structural element.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Preferred embodiments of an attachment apparatus for attaching an elongated shaft to a structural element are illustrated in the drawing figures. As shown in FIG. 8, the elongated shaft 12 defines a longitudinal axis, and the structural element 14 includes an opening 16 defined therein, extending through the structural element 14 in a direction generally perpendicular to the surface of the element 14.

The shaft 12 has a relatively tubular construction, such as a conduit, with an interior space adapted for carrying a control linkage, such as a cable, as shown in FIG. 7. The control linkage connects a remote engine control with an engine, such as a lawn mower engine, allowing an operator to control the condition of the engine by manipulating the remote control. The frictional forces which result from pushing and pulling the cable through the shaft 12 require that the shaft 12 be rigidly attached to the structural element 14.

As shown in FIG. 8, the structural element 14 presents a relatively flat surface, such as that presented by an engine shroud commonly found on a lawn mower. Alternatively, the structural element may present a relatively rounded surface, so long as an opening is provided in the element within which the apparatus may be received.

As shown, for example, in FIG. 5, the attachment apparatus is configured to attach the elongated shaft to the structural element 14 and includes a helical coil of wire 20 having a central coiled section 22 and opposed end sections 24, 26 protruding from the coiled section 22. An inner space 28 is defined by the coiled section 22 and is sized to grip the elongated shaft 12 and to prevent relative axial movement between the helical coil 20 and the shaft 12 when the coil 20 is mounted on the shaft 12. A fastening means is defined by at least one of the end sections for fastening the apparatus to the structural element 14.

There exist several embodiments of the attachment apparatus 10. With reference to FIGS. 1-9, a first embodiment 30 is fastenable to the structural element 14 which has a relatively circular opening 32, and includes a fastening means 34 having the opposed end sections 24, 26 presenting hook-shaped tips 36, 38 spaced apart by a distance greater than the diameter of the circular opening 32. The opposed end sections 24, 26 of the coil 20 extend in a direction generally tangent to the coiled section 22. As shown in FIG. 6, when the first embodiment 30 is fastened to the structural

element 14 having the circular opening 32, the tips 36, 38 intersect a plane defined by the longitudinal axis of the shaft 12 and the axis of the opening 32 in the structural element 14.

The first embodiment 30 is mounted on the elongated shaft 12 in a two step process. First, as depicted in FIG. 3, the opposed end sections 24, 26 are rotated in a first direction so that the coiled section 22 unwinds, thereby increasing the diameter of the inner space 28 to a point where the diameter of the inner space 28 is slightly larger than the cross-sectional diameter of the shaft 12. The elongated shaft 12 is then inserted through the inner space 28 to a desired position relative to the first embodiment 30 of the apparatus

The second step is depicted in FIG. 4. Once the shaft 12 is placed in the desired position, the opposed end sections 24, 26 are rotated in a second direction to predetermined positions relative to each other so that the coiled section 22 is rewound, decreasing the diameter of the inner space 28. Rotating the opposed end sections 26 to the predetermined positions decreases the diameter of the inner space 28 so that it is slightly smaller than the cross-sectional diameter of the shaft 12. This causes the coiled section 22 to create impressions on the surface of the shaft 12, allowing the first embodiment 30 to be permanently and firmly seated upon the shaft

Once the rotational force exerted on the opposed end sections 24, 26 is removed, they take desired radial positions with respect to the coiled section 22, as depicted in FIG. 5. The other embodiments of the attachment apparatus 10 are mounted on the shaft 12 in substantially the same manner, therefore, the method of mounting the attachment apparatus 10 will not be discussed further.

The ability to firmly mount the attachment apparatus 10 on the shaft 12 in a desired relationship relative to each other allows the shaft 12 to be accurately positioned on the lawn mower more quickly than the prior art fasteners. The ability to mount the apparatus 10 on the shaft 12 while having the shaft 12 extend through the apparatus 10 yields an accurate quick-mounting apparatus that may be used where the distance between the structural element 14 and the lawn mower engine is relatively large, thereby, preventing undesired buckling of the control cable.

Each turn of the coiled section 22 represents an active coil. The number of active coils in the coiled section 22 is directly proportional to the firmness and rigidity with which the attachment apparatus 10 may be mounted on the shaft 12. Increasing the number of active coils also increases the amount the end sections 24, 26 must be rotated to enlarge the diameter of the inner space 28 so that the shaft 12 may be inserted, thereby, increasing the difficulty of mounting the attachment apparatus 10 on the shaft 12.

A coiled section presenting between three and seven active coils provides a satisfactory balance of this need for firmness, and ease of mounting. Each of the embodiments of the attachment apparatus 10 use substantially the same number of active coils, therefore, the number of active coils will not be discussed further.

The diameter and material of the wire of the helical coil 20 is also an important aspect of the preferred attachment apparatus 10. For instance, as the diameter of the wire is increased, the elasticity of the wire is decreased, and as the diameter of the wire is decreased, the strength of the wire is decreased. Due to the need for rotating the end sections 24, 26 to mount the attachment apparatus 10 on the shaft 12, the wire must be able to withstand the rotating while being sufficiently strong to attach the shaft 12 to the structural

element 14 and withstand the vibrational forces exerted by the engine and longitudinal forces exerted by pushing and pulling the cable through the shaft 12.

Music or piano wire having a diameter of between approximately 0.762 mm (0.03 inches) and 1.27 mm (0.05 inches) is suitable in providing a sufficiently elastic and yet strong wire from which to make the helical coil 20. Each of the embodiments of the attachment apparatus 10 use wire having substantially the same diameter, therefore, the size of the wire diameter will not be discussed further.

Since the attachment apparatus 10 will be exposed to nature's elements, the wire must also be corrosion resistant. Zinc plating the piano wire through hydrogen embrittlement, or black chromate plating the wire provides a wire that is sufficiently corrosion resistant. These processes do not substantially affect the elasticity nor the strength of the wire. Each of the embodiments of the attachment apparatus 10 use wire which is corrosion resistant, therefore, the corrosion resistance of the wire will not be discussed further.

The first embodiment 30 is fastened to the structural element 14 having the circular opening 32 by inserting the tips 36, 38 through the circular opening 32. The tips 36, 38 are oriented so that as they are pushed through the circular opening 32, they are deflected toward one another in a direction forcing the coiled section 22 to unwind. The coiled section 22 rewinds once the tips 36, 38 are pushed fully through the circular opening

Such an orientation of the tips 36, 38 is important. If they were oriented so that the tips 36, 38 were deflected in a direction causing the coiled section 22 to wind tighter around the elongated shaft 12, too much force would be required to push the tips 36, 38 into the opening 32. Additionally, the tips 36, 38 would not fully return to their previous position relative to each other. This would yield the undesired result of having an apparatus which could not be easily inserted into an opening, but could possibly be pulled out of the opening, thereby not effectively attaching the shaft 12 to the structural element 14.

A second embodiment 40 of the attachment apparatus 10 is depicted in FIGS. 10-13. The second embodiment 40 is also fastenable to the structural element 14 having the circular opening 32. However, the second embodiment 40 includes a fastening means 42 having the end section 24 of coil 20 presented as an inverted U-shaped snap-hook 44 with a bowed-edge 46 and a width that is greater than the diameter of the circular opening 32. The end section 24 of the coil 20 extends in a direction generally radial to the coiled section 22 within a plane defined by the longitudinal axis of the shaft 12 and the axis of the opening 32 in the structural element 14.

The second embodiment 40 is fastened to the structural element 14 having the circular opening 32 by pushing the snap-hook 44 through the opening 32. As the snap-hook 44 comes into contact with the side walls 18 of the opening 32, the bowed-edge 46 is deflected, thereby compressing the snap-hook 44. Once inside the opening the snap-hook 44 re-expands. The shape of the bowed-edge 46 preferably allows the snap-hook 44 to removably fasten the second embodiment 40 to the structural element 14. However, the snap-hook may be formed in a shape that prevents removal.

A third embodiment 48 of the attachment apparatus 10 is depicted in FIGS. 14-17 and includes a fastening means 50 having the opposed end sections 24, 26 of the helical coil 20 presenting hook-shaped tips 52, 54. When the third embodiment 48 is mounted on the shaft 12, the tips 52, 54 extend in a direction generally radial to the coiled section 22 within

a plane intersecting the longitudinal axis of the elongated shaft 12. The tips 52, 54 are spaced apart from each other so that the third embodiment 48 may be fastened to the structural element having the circular opening 32, or, alternatively, it may be fastened to a structural element 55 having an elongated opening 56. 5

FIGS. 16 and 17 depict the third embodiment 48 fastened to structural element 55 having the elongated opening 56. The third embodiment 48 is fastened to the structural element 55 by inserting the hook-shaped tips 52, 54 into the elongated opening 56, so that as the tips 52, 54 are pushed through the elongated opening 56, they are deflected toward one another in a direction along the longitudinal axis of the elongated shaft 10

FIGS. 18-19 depict a forth embodiment 58 of attachment apparatus 10 which is fastenable to the structural element 55 having the elongated opening 56, and includes a fastening means 60 having the opposed end sections 24, 26 of the helical coil 20 presenting hook-shaped tips 62, 64. When the forth embodiment 58 is mounted on the shaft 12, the tips 62, 64 extend in a direction generally radial to the coiled section 22 within a plane intersecting the longitudinal axis of the elongated shaft 12. The hook-shaped tips 62, 64 are spaced apart from one another by a distance greater than the length of the elongated opening 15

The forth embodiment 58 of apparatus 10 is fastened to the structural element 55 having the elongated opening 56 by inserting the tips 62, 64 into the opening 56. As the tips 62, 64 are pushed through the elongated opening 56, they are deflected toward one another in a direction along the longitudinal axis of the shaft 20

Although the invention has been described in the above preferred embodiment with reference to the illustrated figures, it is understood that substitutions may be made and

equivalents employed herein without departing from the scope of the invention as set forth in the claims.

What is claimed is:

1. In combination:

an elongated shaft defining a longitudinal axis;

a structural element including an opening of a predetermined diameter and defining a central axis extending in a direction perpendicular to the longitudinal axis; and

a fastening means for fastening the shaft to the structural element, the fastening means including a helical coil of wire including a central coiled section having three to seven coils, and two opposed end sections extending tangentially from the coiled section,

the coiled section being sized of a diameter smaller than the shaft to grip the shaft and to prevent relative axial movement between the helical coil and the shaft when the coil is mounted on the shaft,

the end sections including hook-shaped tips that are spaced apart from one another by a distance greater than the predetermined diameter of the opening so that the tips, when received in the opening, fasten the elongated shaft to the structural element,

the opposed end sections of the coil each intersecting a plane defined by the longitudinal axis of the shaft and the central axis of the opening so that as the tips of the two end sections are pushed through the opening in the structural element, the tips are deflected toward one another and the coiled section is forced to partially unwind until the tips are pushed completely through the opening.

* * * * *

A. H. BERNTSEN & P. P. KILSTOFTE.
COTTER PIN.

APPLICATION FILED MAY 22, 1911.

1,107,881.

Patented Aug. 18, 1914.

Fig. 1.

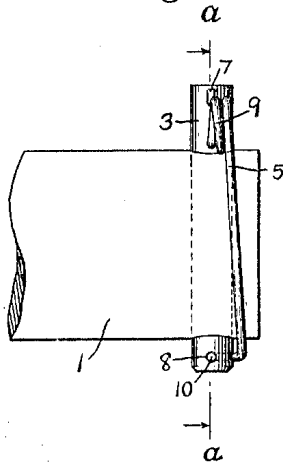


Fig. 2.

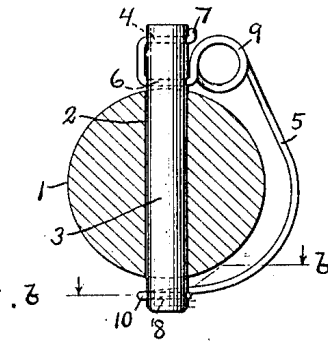
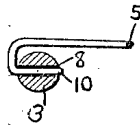


Fig. 3.



Witnesses:

Fred Palm
F. E. Dennett

Inventors:
Axel H. Berntsen
Peder P. Kilstofte

By *Flourens Bothum Lawsett & Bothum*
Attorneys.

UNITED STATES PATENT OFFICE.

AKSEL H. BERNTSEN AND PEDER P. KILSTOFTE, OF WAUPUN, WISCONSIN.

COTTER-PIN.

1,107,881.

Specification of Letters Patent.

Patented Aug. 18, 1914.

Application filed May 22, 1911. Serial No. 628,866.

To all whom it may concern:

Be it known that we, AKSEL H. BERNTSEN and PEDER P. KILSTOFTE, citizens of the United States, residing at Waupun, in the county of Fond du Lac and State of Wisconsin, have invented certain new and useful Improvements in Cotter-Pins, of which the following is a specification, reference being had to the accompanying drawing, forming a part thereof.

This invention relates to cotter pins and the objects of the invention are to provide new and improved cotter pins which may be removed without the use of tools, which are not broken and destroyed in being removed, which may, therefore, be used for a long time, though removed and replaced frequently, and which will be equally as secure as the ordinary form of cotter pins now in use.

The ordinary cotter pins now in use require the ends to be spread apart to keep them in position. The ends must be bent together again to remove the pins. Some kind of a tool is necessary to spread the ends apart and to bend them together again and the bending of the ends destroys the pins in a very short time. A single removal of such a cotter pin is frequently the entire period of the life of the pin.

This invention provides a cotter pin, which may be of any preferred or desired shape in cross section, with a latch member which serves to lock the pin in place so that it cannot become displaced, the latch being of such construction that it can be readily manipulated by the fingers to lock or unlock the pin.

Referring to the drawings which accompany this specification and form a part thereof, which drawings illustrate an embodiment of this invention, and on which drawings the same reference characters are used to designate the same elements wherever they may appear in each of the several views, Figure 1 is an elevation of a cotter pin secured to a shaft; Fig. 2 is a cross sectional view of the shaft and pin, taken on the line *a-a* on Fig. 1, looking in the direction indicated by the arrows; and Fig. 3 is a cross sectional view of the pin, taken on the line *b-b* on Fig. 2, looking in the direction indicated by the arrows.

Referring specifically to the drawings, the reference numeral 1 designates a member,

such as a shaft for example, with which it is desirable to use a cotter pin. This member 1 is provided with an aperture 2 for the reception of the pin. This aperture may be of any preferred or desired shape in cross section, and, preferably, the pin will conform to the shape of the aperture, though it need not necessarily. Figs. 1, 2 and 3 of the drawings illustrate a cylindrical pin and the member 1 is shown as provided with a cylindrical aperture.

Referring to Figs. 1, 2 and 3 of the drawings, the reference numeral 3 designates a cylindrical pin to which is secured a latch member 5. Preferably the latch member 5 is made from spring wire and it is shaped so as to pass around the member in which the pin is placed, as clearly shown by the drawings. The latch member 5 may be secured to the pin 3 in any suitable manner. As illustrated by the drawings one end of the latch member 5 may be bent into a U-shape and passed through holes 4 and 6 in the pin with the extreme end 7 bent over against the pin as shown. The other end of the pin 3 is provided with an aperture or hole 8 in which the free end of the latch member 5 is received. The latch member 5 is bent into one or more coils 9 to increase its springiness or flexibility and, preferably, its free end 10 is bent back upon itself to form a hook, as clearly shown by Fig. 3 of the drawings, so that the springiness of the latch member will hold the free extremity in the hole 8 in a manner which will be readily understood. With this construction the latch member 5 must have sufficient range of movement toward the member 1 so that its free end can be engaged in the hole 8 and disengaged therefrom. The latch member 5 can be made flexible enough so that it can be readily sprung into engagement with the pin or out of engagement therewith by the use of the fingers only and it should be noted that the latch member should have a range of flexibility sufficient to enable it to straddle the member in which the pin is to be used.

It will be readily seen that cotter pins embodying this invention may be placed in position or removed without the use of tools and that such cotter pins may be removed and replaced an indefinite number of times.

What is claimed is:

A cotter pin composed of a pin provided

with an aperture in one end thereof and a latch member secured to the other end thereof, the said latch member being provided with a spring coil 9 and having its free end bent back upon itself to form a hook to pass into the aperture in the pin from the opposite side of the pin from the spring coil 9.

In witness whereof we hereto affix our signatures in presence of two witnesses.

ASKEL H. BERNTSEN.
PEDER P. KILSTOFTE.

Witnesses:

ANTON GRAVESEN,
BEN KASTEIN.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."

United States Patent [19]
Woodruff

[11] **Patent Number:** **4,511,304**
[45] **Date of Patent:** **Apr. 16, 1985**

[54] **LATCH FOR SECURING REEL CARRYING SPINDLES TO A LOADING AND UNLOADING MECHANISM**

[75] **Inventor:** Roger D. Woodruff, Hebron, Ind.

[73] **Assignee:** Champion Corporation, Hammond, Ind.

[21] **Appl. No.:** 415,134

[22] **Filed:** Sep. 7, 1982

[51] **Int. Cl.³** B65H 75/40

[52] **U.S. Cl.** 414/546; 414/911; 242/86.5 R; 403/154; 403/317

[58] **Field of Search** 414/546, 555, 911; 242/86.5 R, 86.7; 403/154, 316, 317

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Primary Examiner—Leslie J. Paperner

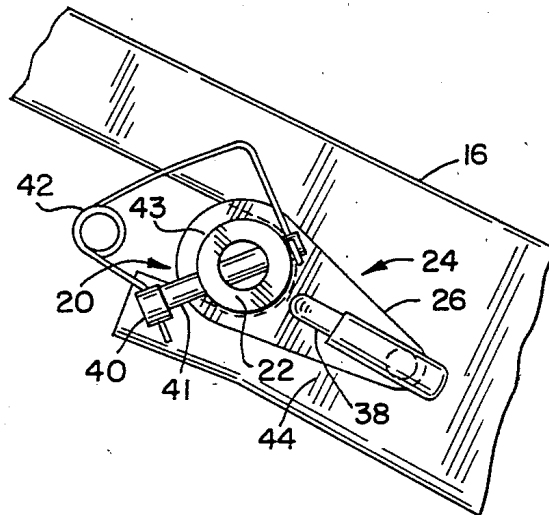
Assistant Examiner—Ken Muncy

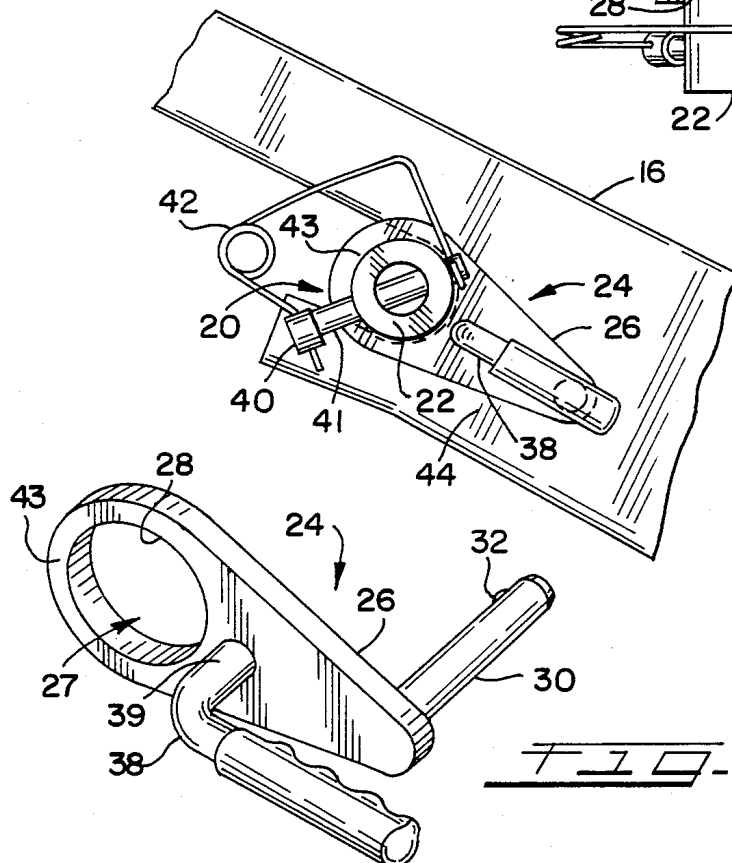
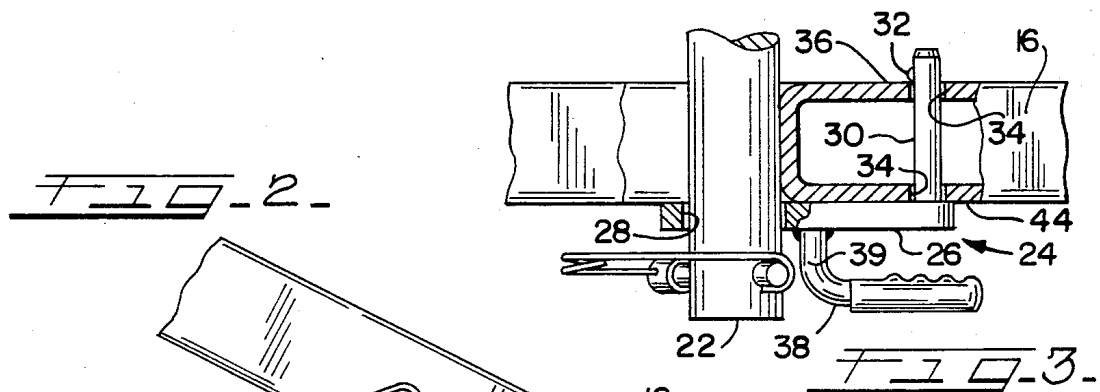
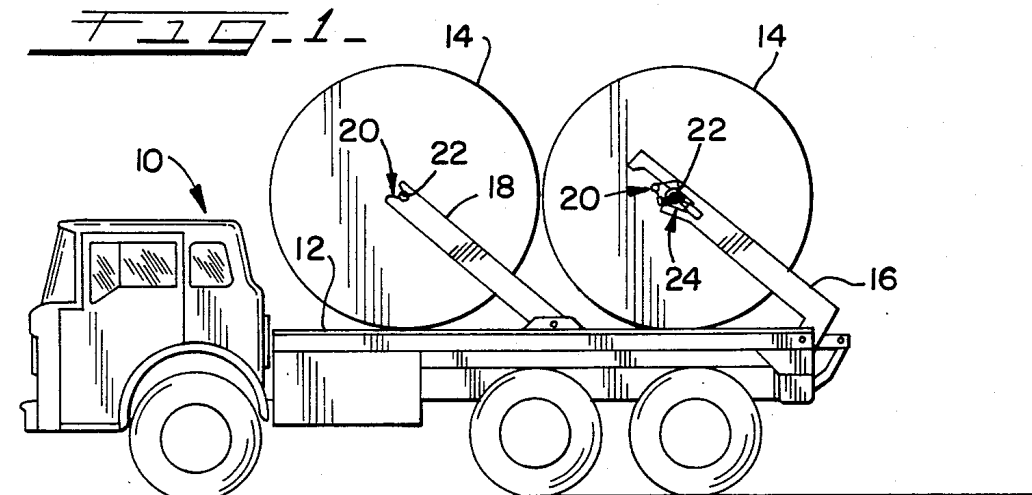
Attorney, Agent, or Firm—McDougall, Hersh & Scott

[57] **ABSTRACT**

A locking mechanism comprising a latch mechanism having a plate-like body defining a completely enclosed aperture dimensioned to receive a spindle and having a manually operable mechanism for releasably attaching the body to the arm to prevent translational movement of the body in a plane perpendicular to the spindle. Other mechanisms restrict axial movement of the spindle and prevent rotation of the spindle.

14 Claims, 4 Drawing Figures





LATCH FOR SECURING REEL CARRYING SPINDLES TO A LOADING AND UNLOADING MECHANISM

BACKGROUND OF THE INVENTION

This invention relates to a latch mechanism for captivating a spindle to pivotally mounted arms which load and unload reels carried by the spindle to and from the bed of a truck. The latch of the present invention is particularly, but not exclusively, suited for use with loading and unloading mechanisms mounted to a truck bed whereby reels of telephone cable or the like can be loaded, unloaded, and held in a position for unwinding cable.

Various types of latches have been used to captivate a spindle to pivotally mounted lift arms. Typically the lift arms have a notch or recess dimensioned to receive the spindle therein. One type of latch commonly used to captivate the spindle within the recess consists of a hook-shaped member pivotally mounted to the arm near the recess. It is rotated from a receiving position which allows the spindle to enter the recess to an operative position to captivate the spindle within the recess of the arm. An example of a latch of this type is disclosed in McVaugh U.S. Pat. No. 3,820,673.

SUMMARY OF THE INVENTION

It is a general object of this invention to provide an improved latch mechanism for captivating a reel carrying spindle within the recesses provided in the pivotally mounted lifting arms of a loading and unloading means.

A more specific object of this invention is to provide a latch mechanism which mounts to a lifting arm and completely surrounds the spindle captivating same to the lifting arm to prevent an inadvertent release of the spindle.

A still further object of this invention is to provide a latch mechanism which prevents spindle rotation while cable is being unwound from the reel.

The invention relates to a mechanism for moving structures relative to a supporting bed. This mechanism includes pivotally mounted arms having recesses defined at one end of the arms, rod means carried by the structures for engagement with the recesses in the arms whereby pivoting movement of the arms operates to lift the structures, and means for locking the rod means in engagement with the recess in each arm.

The improvement in the locking means is characterized by a latch having a plate-like body defining a completely enclosed aperture dimensioned to receive the rod means therethrough. The latch includes a manually operable means for releasably attaching the plate-like body to an arm to prevent translational movement of the body in a plane perpendicular to the rod means. A handle is mounted to the body at a location adjacent the aperture so as to abut a pin carried by the spindle to restrict the rotation of the latter.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevational view of a truck including loading and unloading arms adapted to receive a latching mechanism according to the invention.

FIG. 2 is an enlarged fragmentary view of a lifting arm as shown in FIG. 1 incorporating an embodiment of the latch mechanism of the present invention.

FIG. 3 is a top view of the structure illustrated in FIG. 2 with portions shown cut away for clarity.

FIG. 4 is a perspective view of an embodiment of the latch mechanism of the present invention.

DETAILED DESCRIPTION

FIG. 1 illustrates a truck 10 having a truck bed 12 for carrying reels 14 of cable or the like. Pivotally mounted lift arms 16 are provided for loading and unloading the reels, and transfer arms 18 are provided for receiving a reel from arms 16 and shifting the reel to a forward position on bed 12. Arms 16 and 18 include recesses 20 for engaging a spindle 22 which passes through the core of the reel carried by it during the loading and unloading operations. An improved latching mechanism 24 according to the present invention is shown in FIG. 1 mounted to arms 16 to prevent spindle 22 from disengaging recess 20.

Referring in particular to FIGS. 2-4, latch mechanism 24 includes a plate-like body 26 preferably made of a metal and having a completely enclosed aperture 27 defined by bore 28 which is dimensioned to receive spindle 22 therethrough. A rod 30 mounted to body 26 projects perpendicular to the plate-like body and preferably includes a spring loaded ball detent 32 mounted near the remote end of rod 30. A bore 34 defines a hole through arms 16 for receiving rod 30. Bore 34 is positioned on arm 16 to be engaged by rod 30 while bore 28 in body 26 simultaneously engages the spindle disposed in recess 20.

The ball detent 32 functions as a releasable stop which will abut against the inner face 36 of arm 16 to retain the body 26 to the arm. Rod 30 when inserted through bore 34 provides a means for locking the latch to the arm to prevent translational movement of the body 26 in a plane perpendicular to the spindle. A handle 38 is attached to body 26 to permit the latch to be easily engaged with the lifting arm and spindle, and easily removed therefrom. The handle is preferably made of metal and includes a first portion 39 perpendicular to the body 26 and a remote portion generally parallel to the body.

A hole near each end of spindle 22 generally perpendicular to the spindle receives a pin or abutment member 40. The pin at the trailing end of the spindle abuts outer surface of body 26 to restrict the axial movement of the spindle. A wire spring 42 has one end permanently mounted to an end of pin 40 and its other end configured to engage the other end of the pin. The wire spring is used to secure pin 40 to the spindle. The length of pin 40 is selected so that at least one section 28 of the pin extends beyond the spindle to engage portion 39 of handle 38. Thus, the pin and handle function as a means for preventing the rotation of the spindle. Unless restricted, the spindle will rotate due to the rotation of the reel carried thereby as cable is unwound.

The combination of latch 24 which prevents lateral movement of the spindle and pin 40 which prevents axial movement of the spindle is especially effective in controlling the spindle, and hence the reel, during loading and unloading operations.

In a typical application of the illustrated embodiment of the present invention, the lift arms 16 first engage a spindle projecting through the core of a cable reel. Latches 24 are inserted over each end of the spindle and engaged in the hole for receiving pin 30 in the arms. Pins 40 are then inserted through holes near the ends of spindle and secured thereto such as by springs 42. The

spindle is now locked in position to each of arms 16 such that both lateral and axial movement of the spindle are restricted.

To release the spindle from the pivoting arms, pins 40 are removed from each end of the spindle. Next, each latch 24 is removed from its operative position by manually pulling the latch laterally away from arms 16. Spring loaded ball detent 32 is preferably biased to respond to a manual withdrawing force of predetermined magnitude by receding inwardly within rod 30 to permit disengagement of the latch from arm 16. Although the latch can be manually removed from the arm, the detent prevents accidental disengagement of the latch from arm 16. Since bore 28 in the body of the latch is dimensioned to provide clearance for the spindle, the latch is not subjected to an outward force due to axial movement of the spindle. Should the spindle move axially, pin 40 at the trailing end of the spindle will engage body 26 forcing it against an external surface 44 of arm 16. The latch mechanism of the present invention positively captivates the spindle within the recesses of the arms, restricts axial movement of the spindle, and prevents the spindle from rotating as cable is unwound from the reel.

Although an embodiment of the present invention has been described above and illustrated in the drawings, the scope of the present invention is defined by the claims appended hereto.

What is claimed is:

1. In a mechanism for moving structures relative to a supporting bed, the mechanism including pivotally mounted arms having recesses defined at one end of said arms, rod means carried by the structures for engagement with said recesses in the arms whereby pivoting movement of the arms operates to lift the structures, and means for locking said rod means in engagement with said recess in each arm, the improvement in said locking means comprising a latch mechanism having a plate-like body having a completely enclosed aperture therein, said aperture dimensioned to receive said rod means therethrough, and manually operable means for releasably attaching said body to said arm, to prevent translational movement of said body in a plane perpendicular to said rod means, wherein said latch when engaged with said arm and said rod means retains said rod means within the recess of said arm.

2. A construction in accordance with claim 1 wherein said attaching means includes an attaching rod mounted to said plate-like body extending generally perpendicularly thereto, said lifting arms defining an aperture dimensioned to receive said attaching rod.

3. A construction in accordance with claim 2 further comprising a means mounted at the remote end of said

attaching rod for releasably retaining said attaching rod within the aperture in said arm.

4. A construction in accordance with claim 3 wherein said retaining means comprises a spring loaded ball detent biased to project radially outwardly beyond said attaching rod, said detent disposed to retract within said attaching rod to permit said attaching rod to be withdrawn from the aperture in said arm.

5. A construction in accordance with claim 1 wherein said rod means comprises a spindle.

6. A construction in accordance with claim 5 further comprising means for restricting axial movement of the spindle relative to said body.

7. A construction in accordance with claim 6 wherein said restricting means includes an abutment member mounted to said spindle and extending beyond the spindle to abut said body upon axial movement of said spindle.

8. A construction in accordance with claim 7 wherein said restricting means includes first and second abutment members mounted to said spindle adjacent each end of said spindle, respectively, so that said abutment members are disposed outside of said lifting arms.

9. A construction in accordance with claim 7 further comprising means for preventing said rod means from rotating.

10. A construction in accordance with claim 9 wherein said preventing means includes said abutment member and a handle mounted to said body, said abutment member extending beyond said rod means so as to abut said handle as the rod means attempts to rotate thereby preventing the rotation of said rod means.

11. A construction in accordance with claim 10 wherein said handle includes a first portion which extends generally perpendicular to said body and a remote portion which is generally parallel to said body, said first portion of the handle disposed to engage said abutment member.

12. A construction in accordance with claim 2 further comprising means for preventing said rod means from rotating.

13. A construction in accordance with claim 12 wherein said preventing means includes an abutment member and a handle mounted to said body, said abutment member extending beyond said rod means so as to abut said handle as the rod means attempts to rotate, thereby preventing the rotation of said rod means.

14. A construction in accordance with claim 13 wherein said handle includes a first portion which extends generally perpendicular to said body and a remote portion of the handle disposed to engage said abutment member.

* * * * *



US005934053A

United States Patent [19]**Fillman et al.**[11] **Patent Number:** **5,934,053**[45] **Date of Patent:** **Aug. 10, 1999**[54] **REMOVABLE BATTERY TRAY SYSTEM
FOR AN ELECTRICALLY POWERED
MOWER**[76] Inventors: **Alan R. Fillman**, 5622 Riviera Dr.,
Racine, Wis. 53406; **Timothy A. Esser**,
1925 8th Pl., Kenosha, Wis. 54601

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56/10.8, 16.7, 16.9, 12.1, 12.7, 255, 295,
DIG. 17, DIG. 20; 30/276; 280/DIG. 5;
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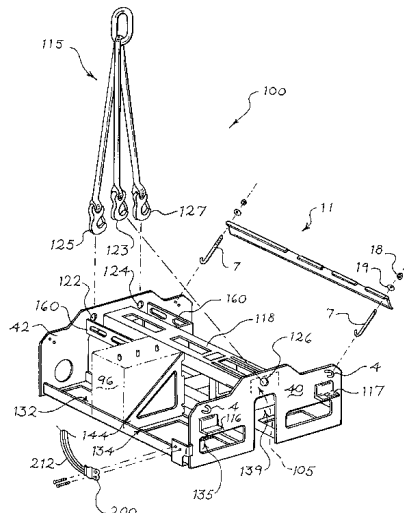
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Primary Examiner—Anthony Knight*Assistant Examiner*—Gary Grafel[57] **ABSTRACT**

A removable battery tray for an electric mower is disclosed. The battery tray fits over the frame of the mower during operation, and can be removed by a hoist or other method in order for the electric mower to continue to operate with another charged set of batteries. The battery tray also has a central power plug that is used for charging and is the only electrical disconnect required when changing the battery tray.

18 Claims, 8 Drawing Sheets

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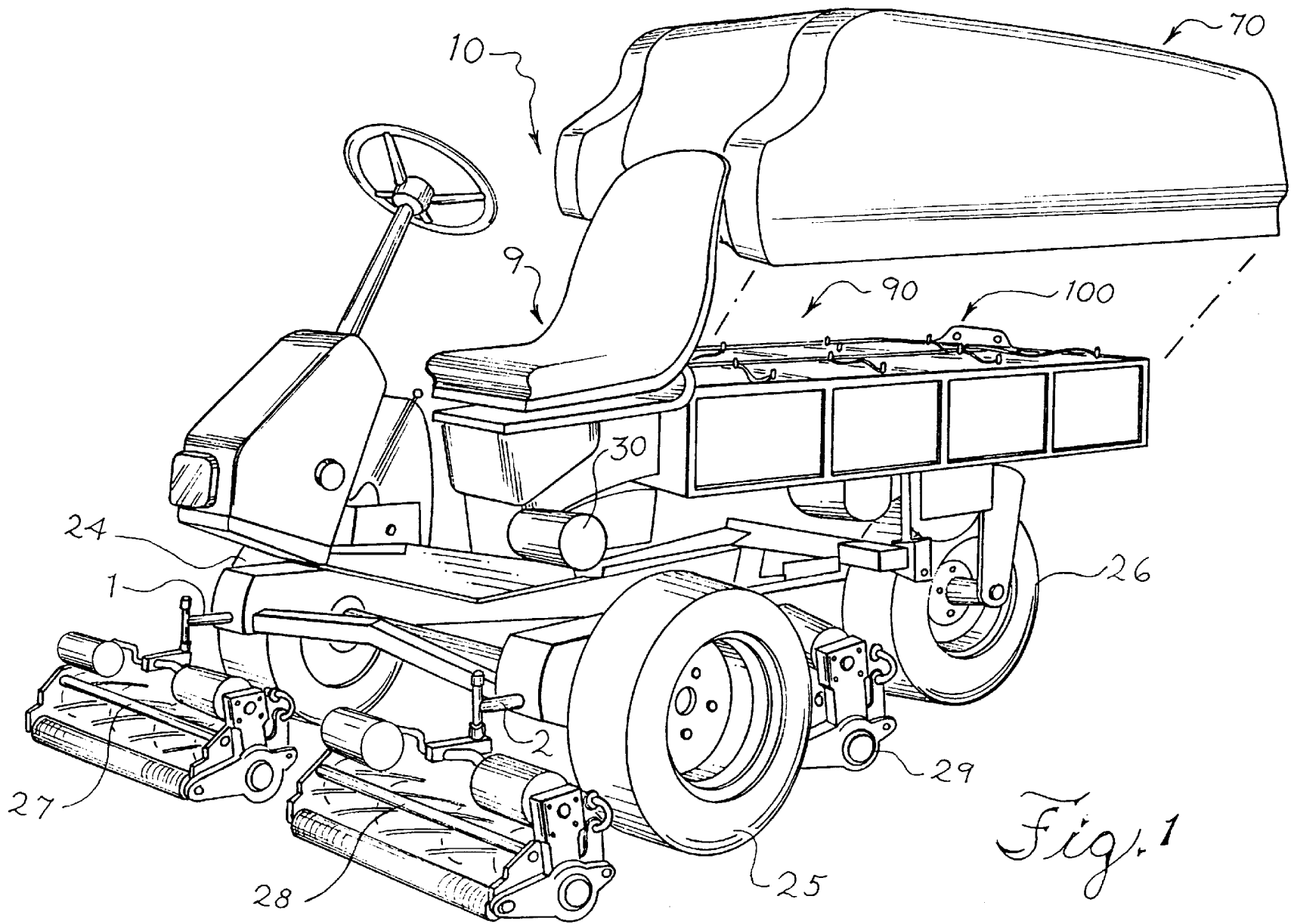
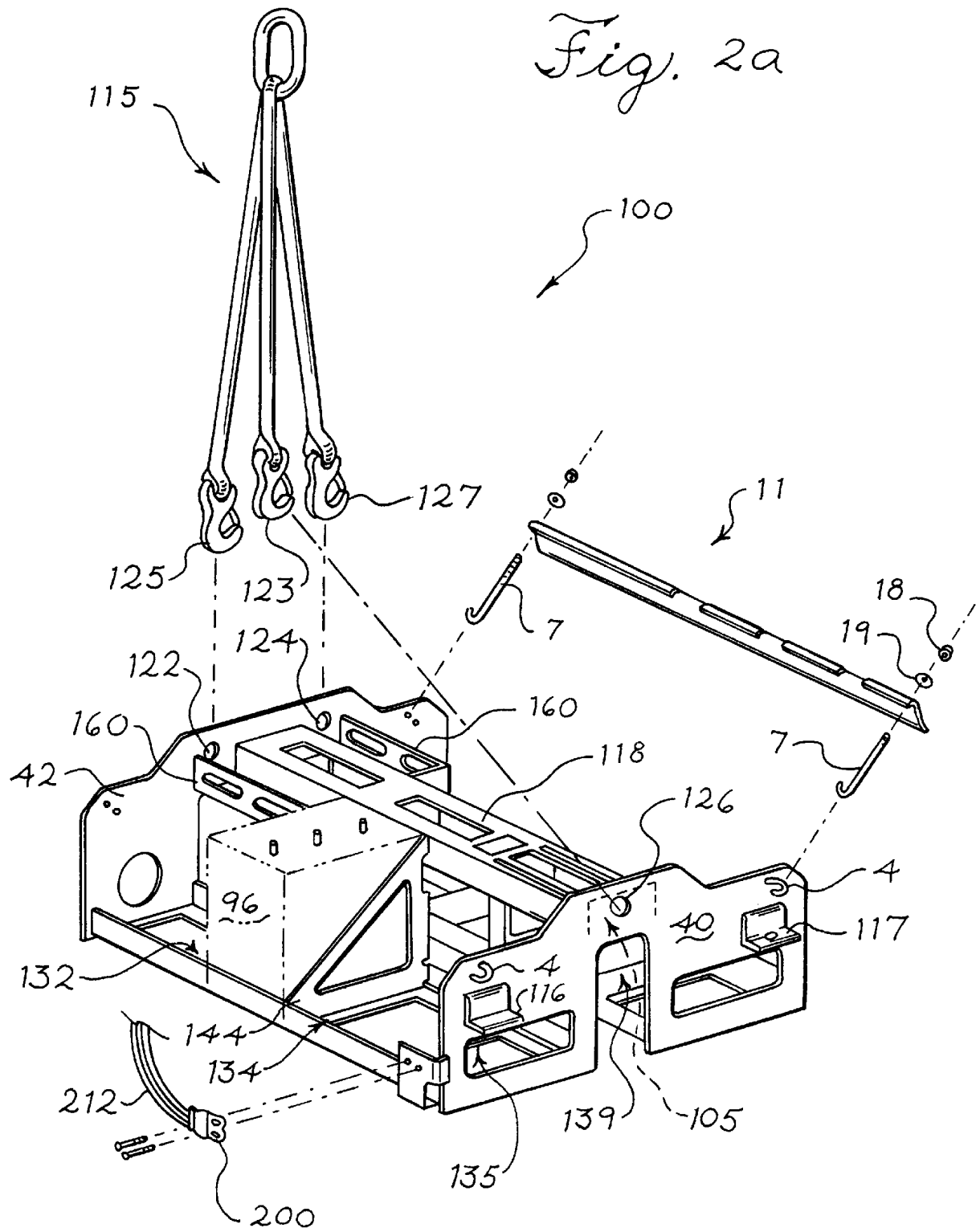
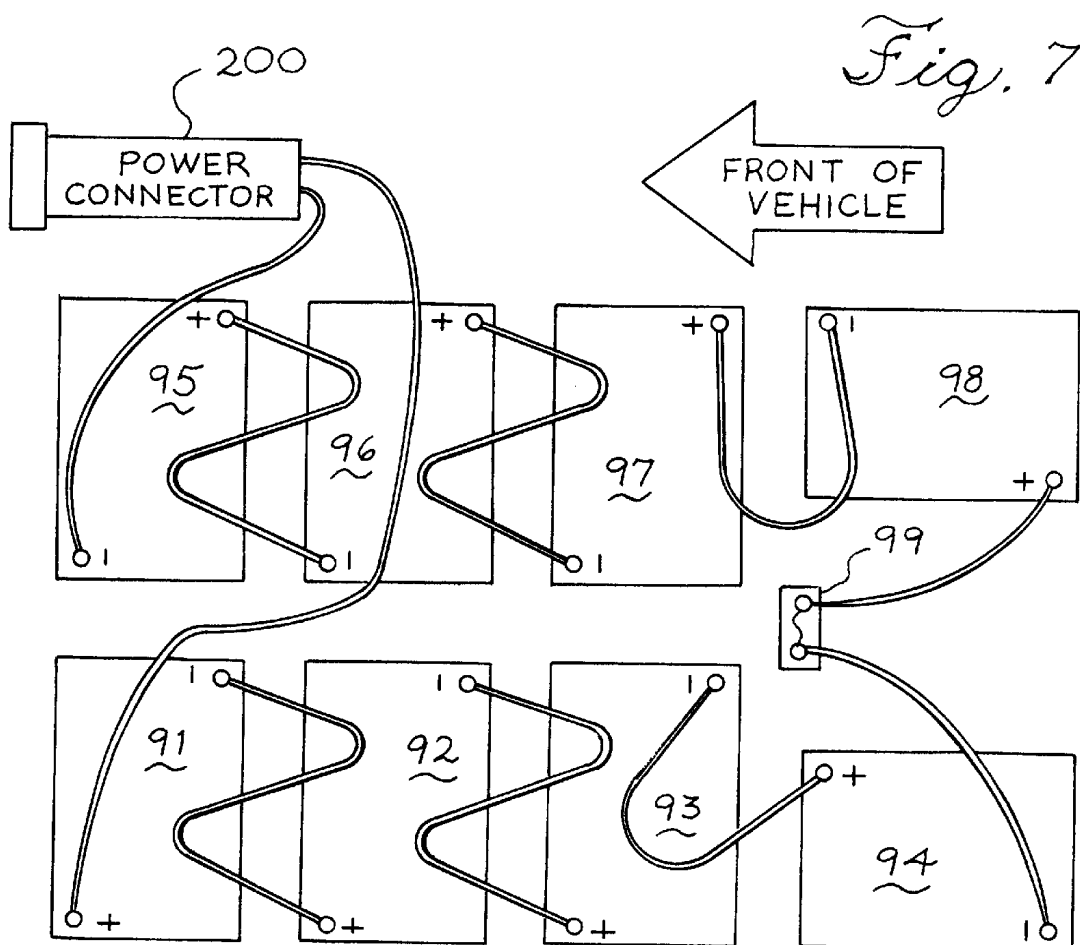
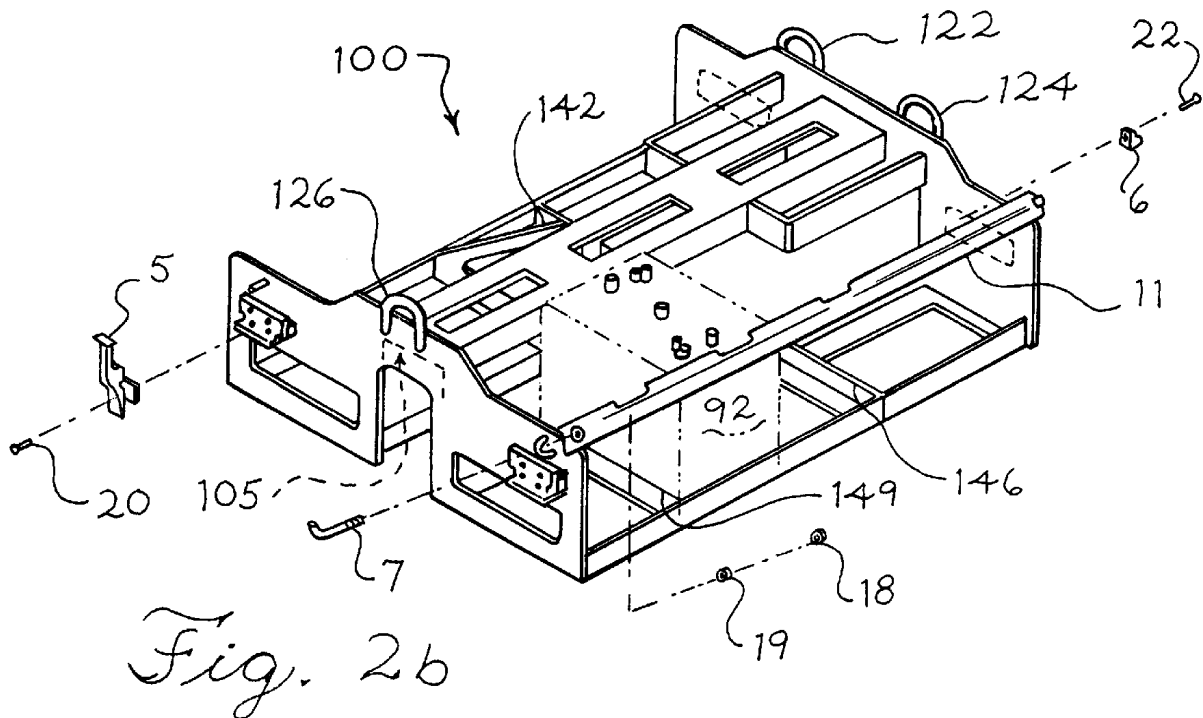
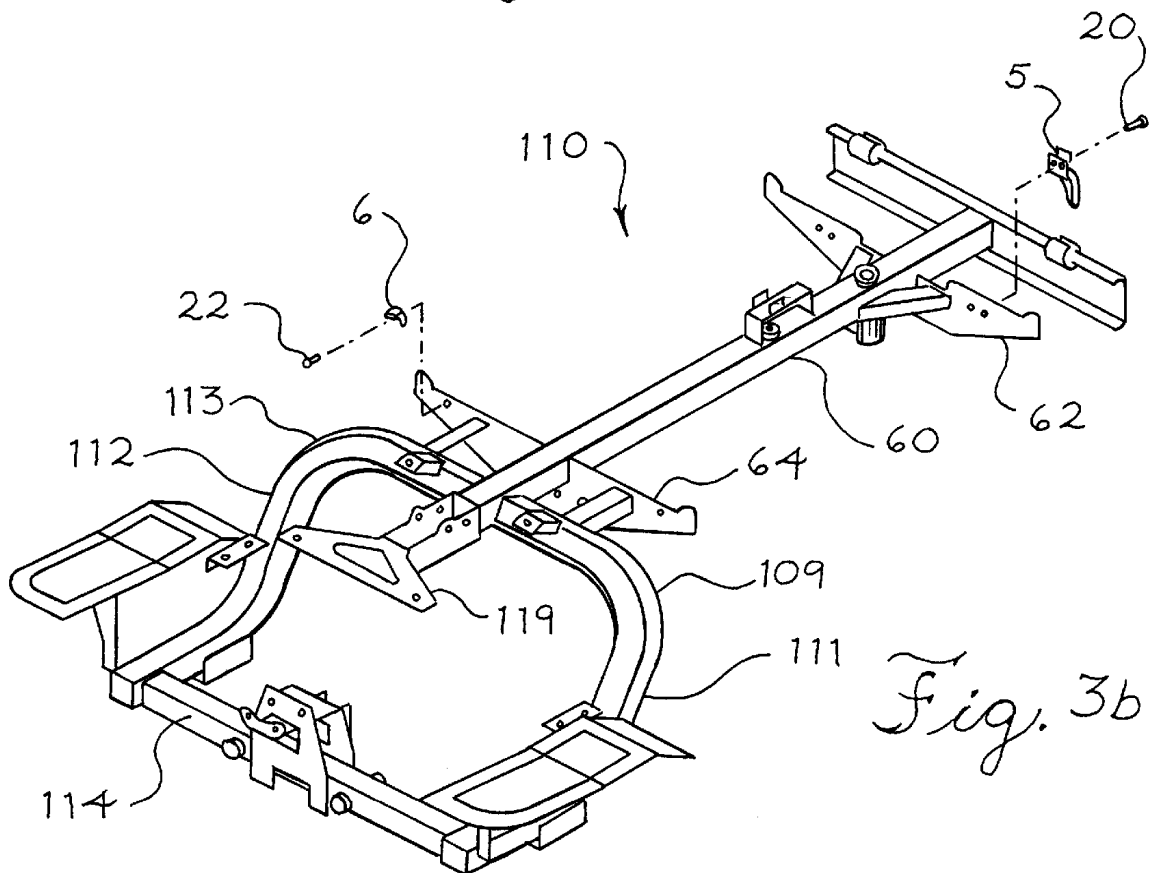
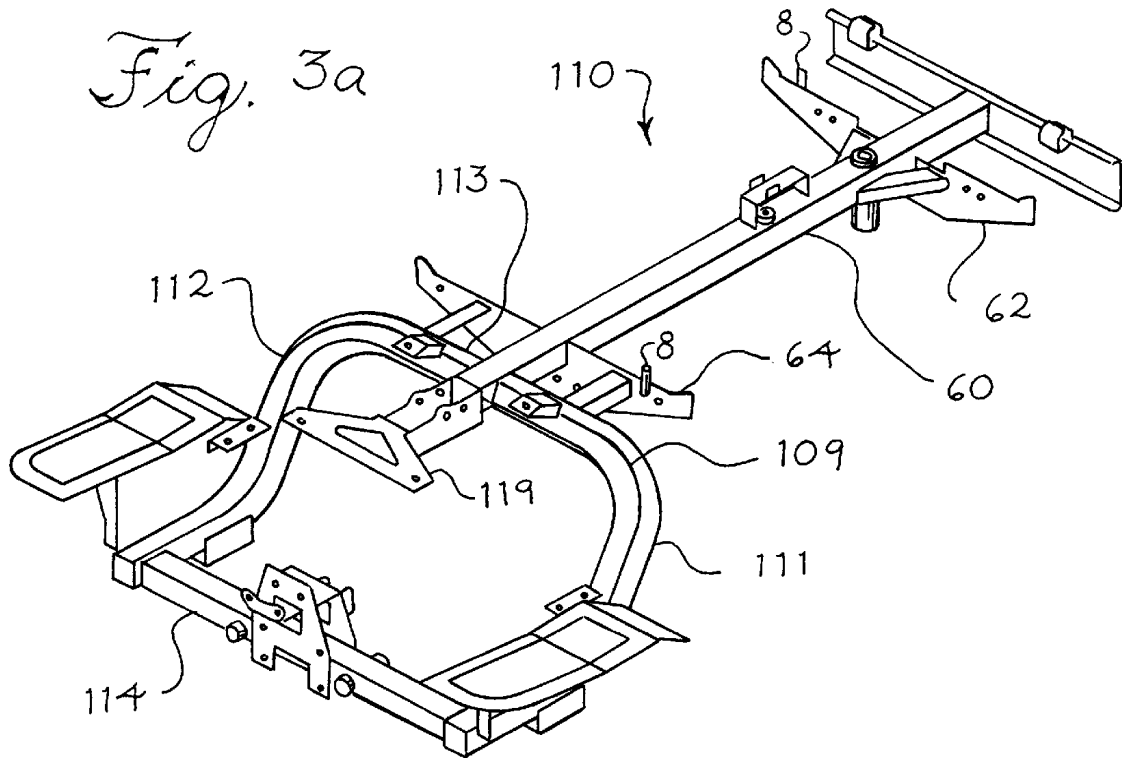
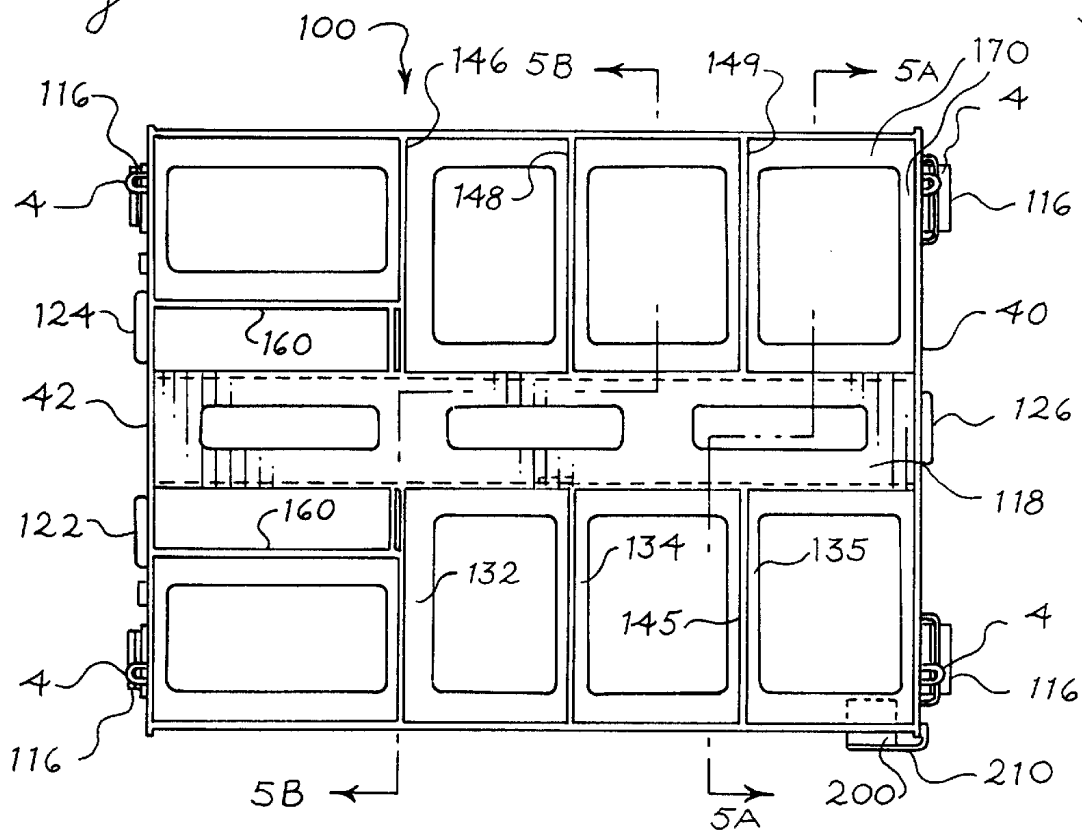
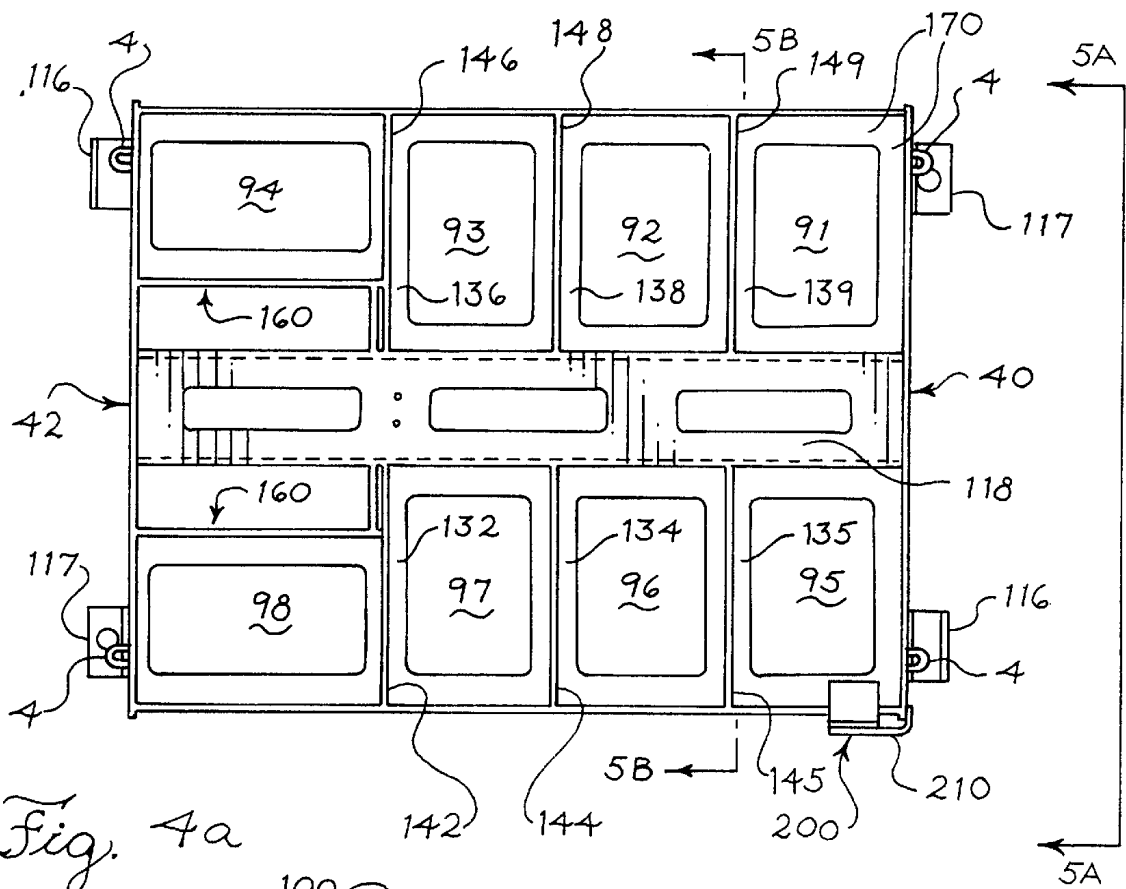


Fig. 1









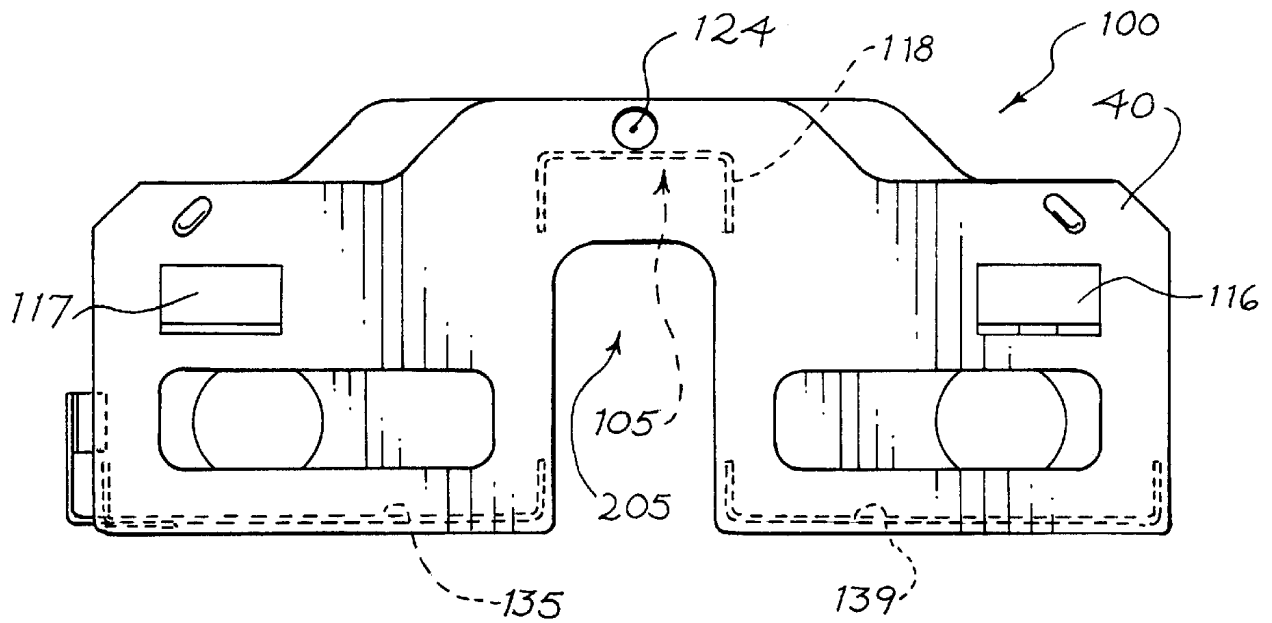


Fig. 5a

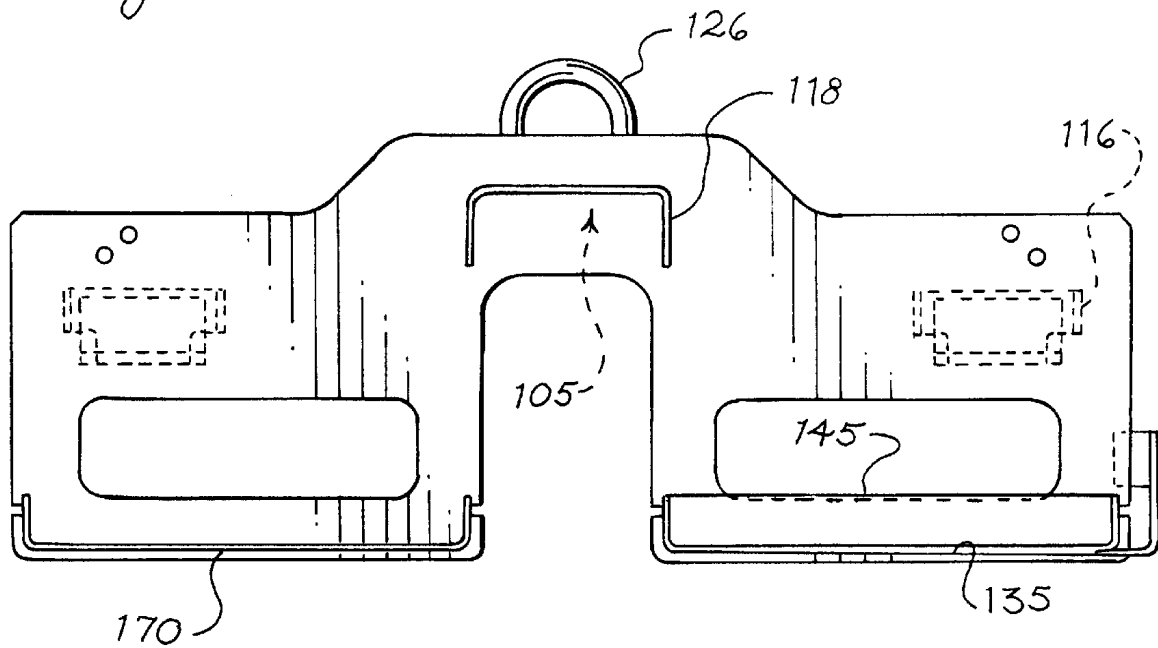


Fig. 5b

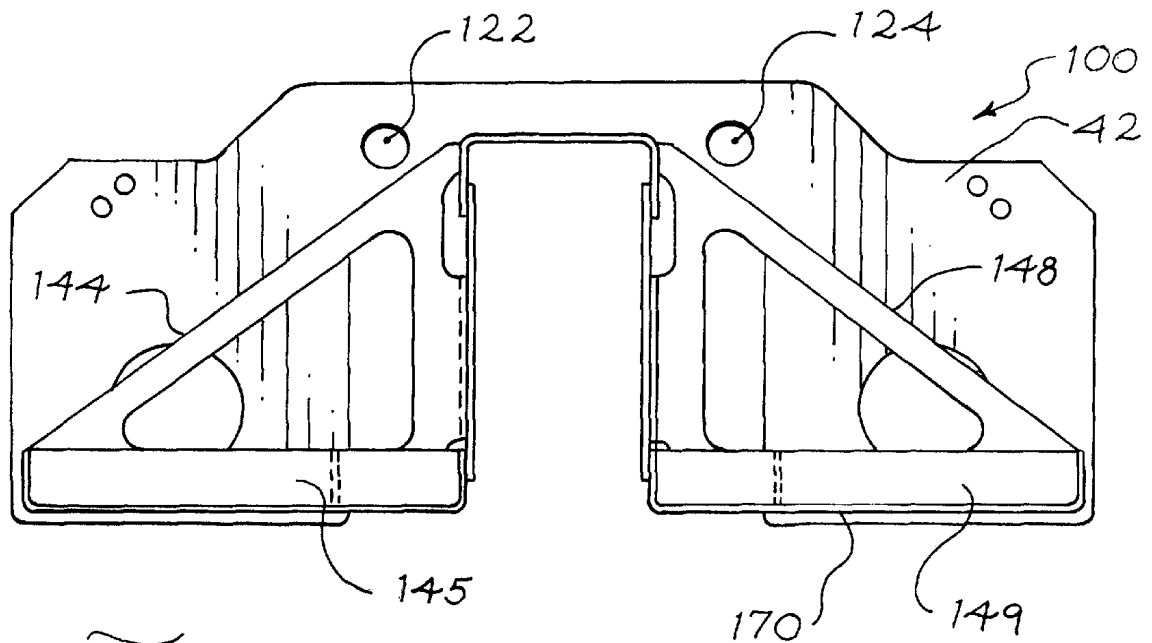


Fig. 6a

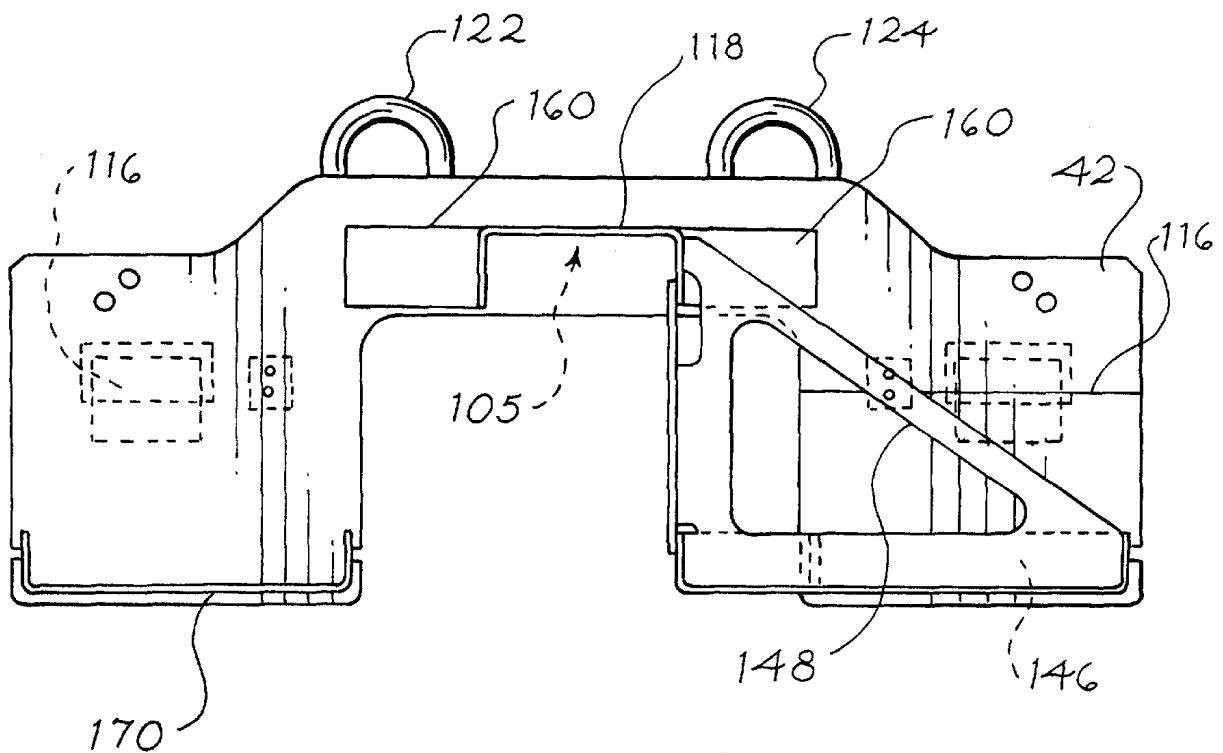


Fig. 6b

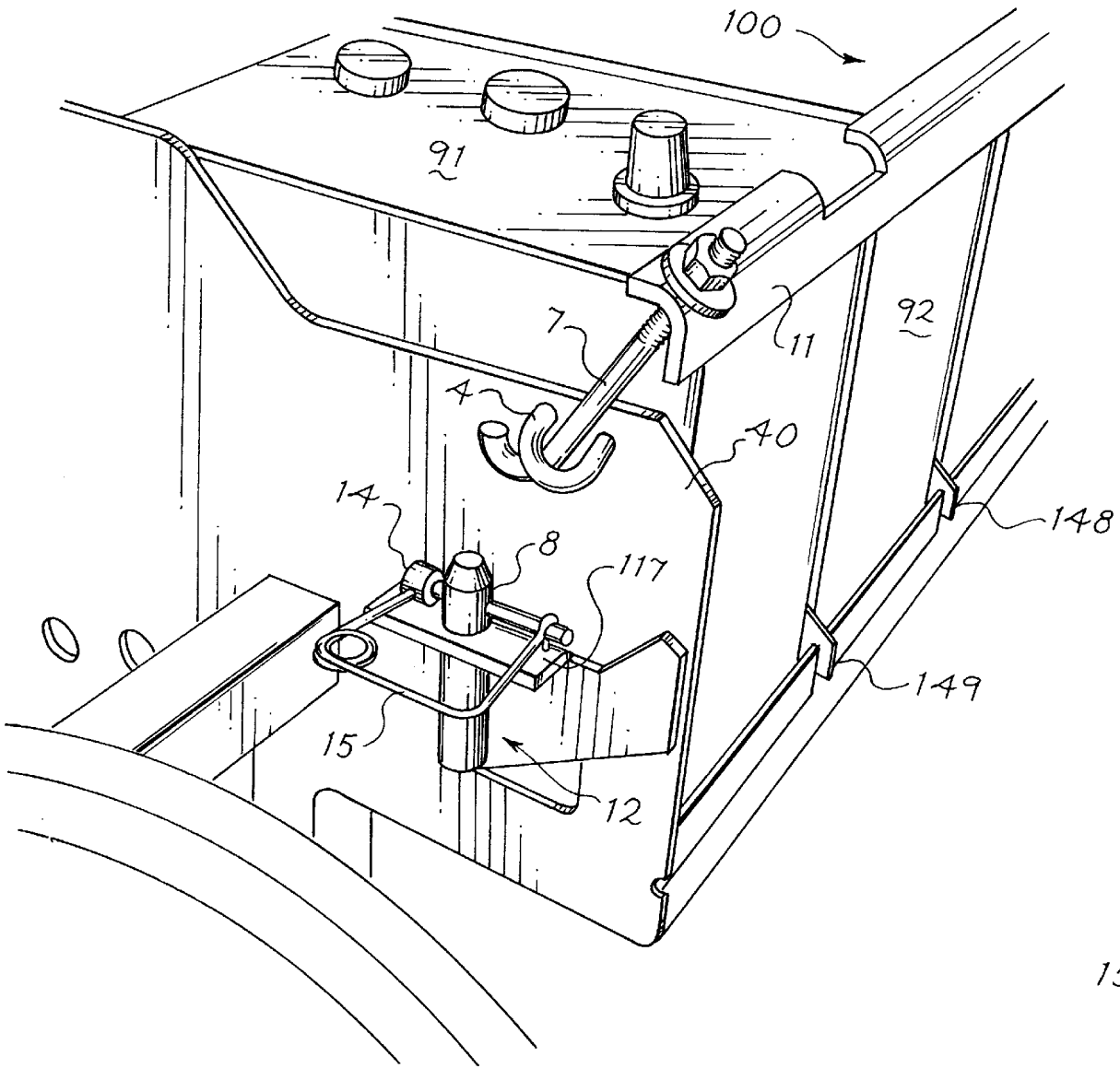


Fig. 8

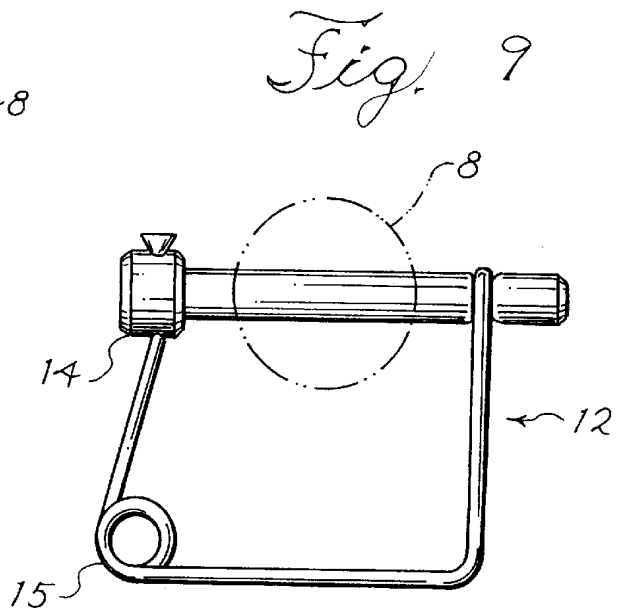


Fig. 9

REMOVABLE BATTERY TRAY SYSTEM FOR AN ELECTRICALLY POWERED MOWER

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates in general to electrically powered vehicles and relates specifically to an electrically powered mower with a removable, rechargeable battery tray system.

2. Prior Art

One application for the present invention is in electrically powered mowers that are used on golf courses, particularly for mowing the greens. Conventional electrically powered greens mowers utilize eight 6-volt lead-acid deep cycle batteries. Generally, one battery set of eight 6-volt batteries powers the mower for about three to five hours, or around fifteen to thirty greens. Once the battery set has discharged, if more mowing is required, the operator must either recharge the battery set, which may take eight to twelve hours, or replace the battery set with a fully charged, alternate battery set. The batteries in the battery set are anchored to the mower frame with metal or plastic hold-down brackets. To remove the batteries, the hold-down brackets as well as wiring to each battery must be removed. The process of exchanging the batteries is time consuming and is not conducive to efficiently mowing an entire golf course.

SUMMARY OF THE INVENTION

A removable battery tray system has been developed for an electrically powered mower.

The system incorporates a removable battery tray that houses a battery set and a detachable plug used for charging the battery set. When the battery set becomes discharged, the operator drives to a designated area, removes the battery tray containing the discharged battery set from the mower, replaces the tray with another tray housing a fully charged set of batteries and is ready to operate again.

One object of the present invention, therefore, is to allow for increased range of the mower when operating on golf course greens and tees.

Another object of the present invention is to provide an easily removable, exchangeable tray for the electric mower battery set so that when discharged, the entire battery set can be quickly and efficiently replaced with a charged battery set in another tray.

A further object of the present invention is to provide a single, detachable plug for the battery set so that all of the batteries can be easily recharged without needing to independently connect and charge each separate battery.

These and other objects, features, and advantages of the present invention will be apparent from the accompanying drawings and from the detailed description that follows.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention is illustrated by way of example and not limitation in the figures of the accompanying drawings, in which like references indicate similar elements and in which:

FIG. 1 shows a general illustration of an electric mower in accordance with the present invention with the battery tray cover removed;

FIG. 2a is a perspective view of a first embodiment of the removable battery tray;

FIG. 2b is a perspective view of a second embodiment of the removable battery tray;

FIG. 3a is a perspective view of a first embodiment of a mower frame in accordance with the present invention;

FIG. 3b is a perspective view of a second embodiment of a mower frame in accordance with the present invention;

FIG. 4a is an overhead view of a first embodiment of the removable battery tray;

FIG. 4b is an overhead view of a second embodiment of the removable battery tray;

FIG. 5a shows a first embodiment of the removable battery tray along line A—A of FIG. 4a;

FIG. 5b shows a second embodiment of the removable battery tray along line A—A of FIG. 4b;

FIG. 6a shows a first embodiment of the removable battery tray along line B—B of FIG. 4a;

FIG. 6b shows a second embodiment of the removable battery tray along line B—B of FIG. 4b;

FIG. 7 is an overhead view of one embodiment of the battery and cable configuration in the present invention;

FIG. 8 is a view of a spring lock system in operation on the removable battery tray of the present invention; and

FIG. 9 is a close up view from above of the spring pin and spring lock that may be used in accordance with the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

In the Figures, a removable battery tray **100** is provided for an electric mower **10**. FIG. 1 is a general illustration of the mower **10** utilizing the present invention. In the embodiment shown in FIG. 1, the riding greens mower **10** of the present invention includes three wheels **24**, **25**, and **26**. Two front drive wheels **24** and **25** are powered by electric drive motor **30**. The rear wheel **26** is positioned behind and between the two front drive wheels **24** and **26** and is pivotable to steer the mower **10**. The cutting units **27**, **28**, and **29** are positioned ahead of each of the wheels **24**, **25**, and **26** respectively. Ideally, the cutting units are reel cutting units, but can also be rotary cutting units, or other types of cutting units. The cutting units **27**, **28**, and **29** are mounted on lift arms **1**, **2** and **3**. The operator selectively raises and lowers the lift arms **1**, **2** and/or **3** depending on which cutting unit **27**, **28**, and/or **29**, the operator wishes to use. When in the lowered or operative position, the lifts arms **1**, **2** and **3** allow free vertical motion of the cutting units **27**, **28**, and **29** producing an even cut over an undulating surface such as an uneven golf course green. The electric drive motor **30** is powered by a battery set **90**. Ideally, more than one battery is provided in the battery set **90** to deliver optimum power to the electric mower. On small units, however, a single battery constituting the battery set **90** is possible. The batteries in the set **90** are located in the battery tray **100** shown in FIG. 1 with battery tray hood **70** removed.

Two embodiments of the removable battery tray **100** will now be disclosed. One skilled in the art will recognize that individual features of one embodiment can be interchanged with features of the other embodiment, thus providing for a multitude of embodiments while still remaining within the scope of the present invention.

The first embodiment of the removable battery tray **100** is shown in detail in FIG. 2a. The removable battery tray **100** holds the battery set **90** with individual batteries **91**, **92**, **93**, **94**, **95**, **96**, **97**, and **98**. Battery **96** is shown in phantom in the

removable battery tray 100. The removable battery tray 100 allows for easy removal of a discharged battery set 90, and easy installation of another tray 100 containing a charged battery set 90.

The removable battery tray 100 has a front frame member 40 and a rear frame member 42. The removable battery tray 100 has, mounted between both the front frame member 40 and the rear frame member 42, a longitudinal support beam 118 with a cross section in the shape of an upside down "U" 105, shown in phantom in FIG. 2a. The longitudinal support beam 118 is attached at its front end to the inside center of the front frame member 40 and at its rear end to the inside center of the rear frame member 42. The cross sectional shape of the longitudinal support beam 118 assists in securing the removable battery tray 100 to the mower frame 110 (FIGS. 1 and 3a) as will be discussed in more detail below.

Both the front frame member 40 and the rear frame member 42 have a frame support bracket 116 and a frame support bracket with a hole 117 that protrude from their external side. Only front frame support bracket 116 and front frame support bracket with a hole 117 are shown in FIG. 2a. Rear frame member 42 has frame support brackets 116 and 117 protruding on its external side in the same manner. When the removable battery tray 100 is placed on the mower frame 110, the frame support brackets 116 and 117 located on both the front frame member 40 and the rear frame member 42 provide stability for the removable battery tray 100 as will be described in more detail later.

The removable battery tray 100 has openings 122, 124 and 126 to aid in removal of the battery tray 100 from the mower frame 110. Opening 126 is located on front frame member 40 in the upper center, and openings 122 and 124 are symmetrically positioned in the rear frame member 42. Hooks 123, 125 and 127 on hoist 115 can be attached the holes 122, 124, and 126 respectively to allow easy removal of a battery tray 100 containing a used battery set 90 and installation of a second battery tray 100 containing a charged battery set 90. The openings 122, 124 and 126 along with the hooks 123, 125, and 127 comprise a means for removing the battery tray 100 from the mower frame 110 and a means for positioning the battery tray 100 on the mower frame 110. One skilled in the art will recognize, however, that there are many other equivalent means for removing and means for positioning while still remaining within the scope of the invention.

Each battery 91-98 rests in the removable battery tray 100 on support bars 132, 134, 135, 136, 138, and 139 each extending approximately half way across the removable battery tray 100 from the outside edge of the frame toward the support beam 118. The support bars may be gussets, struts, beams or together may form one integral bottom battery support member 170 (see FIGS. 4a, 4b). These support bars 132, 134, 135, 136, 138, rest and help to hold the batteries 91-98 in place in the removable battery tray 100. The support bars 132, 134, 135, 136, 138, and 139 also provide for an open, removable battery tray 100, allowing for easy debris removal. As a result it is not necessary to include a solid bottom for the removable battery tray 100. This allows for a lighter, removable battery tray 100, and therefore, easier removal of the battery tray 100 from the mower 10.

The removable battery tray 100 also has dividers 142, 144, 145, 146, 148, and 149 secured to respective support bars 132, 134, 135, 136, 138, and 139 and also secured to the longitudinal support beam 118. Divider 144 is shown in FIG. 2a. The dividers 144 and 148 145, are preferably triangular

shaped with a triangular opening in the center. The dividers 142, 145, 146, and 149 are preferably rectangular dividers (as shown in FIGS. 2b, 6a, and 6b) or triangular dividers (as shown in FIG. 8). The dividers 142, 144, 145, 146, 148, and 149 separate the batteries 91-98 and provide further support for the removable battery tray 100. Although solid dividers could be used, the triangular shaped dividers 144 and 148 are preferred since they weigh less while still providing substantial support for the removable battery tray 100 and the battery set 90. A rear bracket 160 is shown on each side of the removable battery tray 100 to hold rear batteries 94 and 98 in position.

The removable battery tray 100 includes battery hold down brackets 11 located on each side of the battery tray 100 to secure the batteries 91-98 in the tray. In FIG. 2a, only one battery hold down bracket 11 is shown for securing batteries 91-94. A similar battery hold down bracket 11 on the opposing side of the removable battery tray 100 secures batteries 95-98. In a preferred embodiment, both ends of each battery hold down bracket 11 are secured to the removable battery tray 100 by a J-bolt 7. The J-bolt 7 ideally is secured to the battery hold down bracket 11 with a flat washer 19 and a nut 18. The J-bolt 7 fastens around tray bracket 4 attached to the removable battery tray 100.

In an alternate means of attaching the battery hold down bracket 11 to the removable battery tray 100, one end of the battery hold down bracket 11 can be attached to the removable battery tray 100 by the J-bolt combination described above and the other end of the battery hold down bracket 11 can be fastened to the removable battery tray 100 by a hinge (not shown) thus allowing easy access to the batteries 91-98 without needing to disconnect both ends of the battery hold down bracket 11.

One skilled in the art will recognize that there are many other ways to secure the batteries 91-98 to the removable battery tray 100 within the scope of the present invention.

The batteries 91-98 are electrically connected to each other in series by wires 212 as shown in FIG. 7. The positive terminal of battery 91 and the negative terminal of battery 95 are connected to an electrical power connector 200 such as a plug. A fuse 99 is shown connected in series between batteries 94 and 98 to protect the battery system 90. When the electrical power connector 200 is connected to a power source, such as an electrical outlet, a generator or other acceptable device, each of the batteries 91-98 receives power and is charged. Therefore, removal of each of the batteries 91-98 individually from the tray 100 for recharging is not necessary.

When in place on the mower 10, the removable battery tray 100 is secured to the frame of the mower 110 by a lock system having a frame portion and a tray portion. In FIG. 3a, the frame portion is a vertical frame pin 8 welded to one opposing side of each support member 62 and 64 of mower frame 110. When the removable battery tray 100 is placed on the mower frame 110, the vertical frame pins 8 protrude through the holes in the frame support brackets 117 (FIG. 2a). Frame support bracket 116 rests on support members 62 and 64. The removable battery tray 100 is secured to the mower frame 110 at frame support brackets 117 or tray portions, with a spring lock system 12 shown in more detail in FIGS. 8 and 9.

In FIG. 8, the frame support bracket with hole 117 attached to front frame member 40 has a vertical frame pin 8 passing through the hole. Horizontal cross pin 14 of spring lock system 12 passes through a horizontal opening in vertical frame pin 8 and has a spring metal clip 15 attached

on opposing sides to secure the spring lock system 12 in place. FIG. 8 also shows the J-bolt 7 mechanism previously described passing through tray bracket 4 for securing the battery hold down brackets 11. The battery hold down bracket 11 shown in FIG. 8 secures batteries 91–94. Triangular dividers 149 and 148 are shown separating the batteries 91 from 92 and 92 from 93.

FIG. 9 shows an overhead view of the spring lock system 12. Vertical frame pin 8 is shown in phantom with horizontal cross pin 14 passing through the horizontal opening in vertical frame pin 8. Spring metal clip 15 as described above is attached at opposing ends to each end of the horizontal cross pin 14 to secure the spring lock system 12 in place. One spring lock system 12 is positioned on each lateral side of main frame tube 60 (FIG. 3a) in corresponding relationship with the frame support bracket with a hole 117. This arrangement allows for increased lateral support without requiring all four frame support members to have a vertical frame pin 8 and a spring lock system 12.

FIG. 3a shows the mower frame 110 of the electric mower 10 of the present invention. The mower frame 110 is generally fork shaped, and has two short, L-shaped (or curved), prong-like elements 111 and 112 extending from left and right transverse members 109 and 113 respectively. The left and right transverse members 109 and 113 are attached at their inside ends to main frame tube 60. The front two drive wheels 24 and 25 are connected to a drive axle (not shown) which is mounted between the prong-like elements 111 and 112. The front ends of the prong-like elements 111 and 112 are connected to each other by forward cross member 114. The two front cutting units or reels 27 and 28 (shown in FIG. 1) are mounted to this forward cross member 114. The main frame tube 60 extends for most of the length of the mower frame 110. The mower frame 110 also includes a seat support extension 119 for the operator's seat 9 (FIG. 1). Seat support extension 119 extends forward from the main frame tube 60 at a point where the main frame tube 60 passes between left and right transverse members 109 and 113.

The removable battery tray 100 is designed to fit over the main frame tube 60 of the mower frame 110, shown in FIG. 3a. Longitudinal support beam 118 of the battery tray 100 described above, has an upside down “U” 105 shaped cross section that fits the width of the main frame tube 60 of the mower 10. The upside down “U” 105 extends the length of the removable battery tray 100. The removable battery tray 100, therefore, is saddle shaped: batteries 91–94 are placed on one side of the longitudinal support beam 118, and batteries 95–98 are placed on the other side of the longitudinal support beam 118. When the removable battery tray 100 is in place on the frame 110, four batteries 91, 92, 93, and 94 are loaded on one side of the main frame tube 60, and four batteries 95, 96, 97, and 98 are loaded on the other side of the main frame tube 60.

Other embodiments of the removable battery tray 100 are possible if a different shaped mower frame 110 is used. For example, an open center mower frame, known in the prior art, may have a removable battery tray that nests inside the open center frame structure. One skilled in the art will recognize that depending on the structure of the mower frame, many other embodiments are also possible while still remaining within the scope of the present invention.

FIG. 4a is an overhead view of the removable battery tray 100 of the first embodiment of the invention. In FIG. 4a the support bars 132, 134, 135, 136, 138, and 139 are shown positioned in perpendicular relationship to the longitudinal

support beam 118, and rear brackets 160 are located between the rear most support bars 132 and 136 and the rear frame member 42. From the positions of the support bars 132, 134, 135, 136, 138, and 139 the positions of the eight batteries 91–98 of the battery set 90 is shown. Longitudinal support beam 118, running from front frame member 40 to rear frame member 42, separates the support bars 132, 134, and 135 from the support bars 136, 137, and 139 located on the opposing side. The frame support brackets 116 and 117 are positioned on laterally opposing external sides of both front and rear frame members 40 and 42. Tray bracket 4 for engaging J-bolt 7 (FIGS. 2a and 2b) is located on both ends of both the front frame member 40 and the rear frame member 42. The electrical power connector 200 is shown supported by electrical power connector mount bracket 210.

FIG. 5a is a front elevation view of the removable battery tray 100 as seen from line A—A in FIG. 4a. The positioning of the top of support beam 118 on the inside of front frame member 40 of the removable battery tray 100 is shown in phantom. Profiles of two support bars 135 and 139 are also shown in phantom; support bars 134 and 132 are positioned consecutively behind 135, and support bars 138 and 136 are positioned consecutively behind 139 and further towards the rear frame member 42. The upside down “U” shaped cut-out portion 205 of front frame member 40 corresponds to upside down “U” shaped cross section 105 of support beam 118 and main frame tube 60 of the mower frame 110. Frame support bracket 116 and frame support bracket with a hole 117 are located at laterally opposing external sides of front frame member 40. Hole 126 in front frame member 40 engages a hoist 115 or other appropriate mechanism to aid in removal of the removable battery tray 100 from the mower 10 or to replace the removable battery tray 100 on the mower 10.

FIG. 6a is a front elevation view of the removable battery tray 100 as seen from line B—B in FIG. 4a. Rear frame member 42 with holes 122 and 124 are shown as well as triangular dividers 146 and 148. The triangular dividers 144 and 148 are attached to corresponding support bars 134 and 138 which are (not shown) integral to the bottom battery support member 170.

The second embodiment of the removable battery tray 100 is shown in FIGS. 2b, 3b, 4b, 5b, and 6b. This embodiment of the removable battery tray 100 is similar to the first embodiment shown in FIGS. 2a, 3a, 4a, 5a, and 6a except for two differences: (1) the second embodiment employs a different structure for fastening the removable battery tray 100 to the mower frame 110 and (2) the second embodiment provides a different structure for removing the removable battery tray 100 from the mower 10.

Turning now to the alternate fastening structure shown in FIG. 2b, a hook clamp 6 is secured to the external side of rear frame member 42 of the removable battery tray 100 by a screw 22. A toggle clamp 5 having a “U” joint is secured by screw 20 in corresponding relationship on horizontal support beam 64 of mower frame 110 (FIG. 3b). When the removable battery tray 100 is placed on the frame 110, the “U” joint on the toggle clamp 5 is secured to the hook clamp 6. Similarly, another hook clamp 6 is secured to by screw 22 to support bar 62 of the mower frame 110 (FIG. 3b). Another toggle clamp 5 having a “U” joint is secured by a second screw 20 to a corresponding position on the external side of front frame member 40 of the removable battery tray 100. When the removable battery tray 100 is placed on the frame 110, the “U” joint on the toggle clamp 5 is secured to the hook clamp 6 as described before. These two laterally opposing means for securing the removable battery tray 100

to the mower frame 110 provide support to the removable battery tray 110 when installed on the mower frame 110. Of course, other means for securing the removable battery tray 100 to the frame 110 of the mower 10 including a frame portion and tray portion are possible while still remaining within the scope of the current invention.

Turning now to the alternate structure for removing the removable battery tray 100 from the mower 10, FIG. 2b, shows the removable battery tray 100 with handles 122, 124, and 126 instead of the holes in FIG. 2a. In this embodiment, the three handles 122, 124, and 126, are welded to the removable battery tray 100, one 126 on the external side of the front frame member 40, and two 122 and 124 on the external side of the rear frame member 42. These handles 122, 124, and 126 attach to the hoist 115 (shown in FIG. 2a) or other means to allow easy removal of a used set of batteries 90 loaded in battery tray 100 and installation of a charged battery set 90 in another battery tray 100. The handles 122, 124 and 126 along with the hooks 123, 125, and 127 comprise a means for removing the battery tray 100 from the mower frame 110 and a means for positioning the battery tray 100 on the mower frame 110. One skilled in the art will recognize, however, that there are many other equivalent means for removing and means for positioning while still remaining within the scope of the invention.

The system of holes 122, 124, and 126 described in FIG. 2a is preferred from a manufacturing standpoint over the handles described in FIG. 2b, however, since the holes can be cut directly into the removable battery tray 100 thus eliminating the need for welding hooks 122, 124, and 126 of FIG. 2b to the removable battery tray 100.

The embodiment shown in FIG. 3b is similar to that shown in FIG. 3a except that the welded vertical frame pin 8 and spring lock 12 system is replaced by the clamp 6 and screw 20 system corresponding with the removable battery tray 100 of FIG. 2b. Specifically, toggle clamp 5 having a "U" joint is secured by screw 20 to one lateral side of horizontal support beam 64 of mower frame 110. Hook clamp 6 is secured by screw 22 to the opposing lateral side of horizontal support beam 62 of mower frame 110. Both toggle clamp 5 having a "U" joint and hook clamp 6 interact with the removable battery tray 110 as described with respect to FIG. 2b.

As discussed with respect to FIGS. 2a and 2b, the embodiment in FIG. 3a is presently preferred over that shown in FIG. 3b since the spring lock system 12 of FIGS. 2a and 3a provides for more efficient removal and replacement of the removable battery tray 100.

FIG. 4b is similar to FIG. 4a, however, FIG. 4b corresponds to the embodiment shown in FIGS. 2b and 3b. The welded hooks 122, 124 and 126 are used for connecting the removable battery tray 100 to a hoist 115 as seen in FIG. 2b. And, in the embodiment shown in FIG. 4b, the frame support brackets 116 do not have holes since the hook clamp 6 and screw 20 system described above is used to secure the removable battery tray 100 to the mower frame 110.

As discussed above with respect to FIGS. 2a and 2b, the battery set 90 is arranged in a manner to fit the mower frame 110 of the present invention. A mower having a different mower frame could have a different battery arrangement to fit the shape of the mower frame, and therefore, a differently shaped removable battery tray. One skilled in the art will recognize that any of these variations falls within the scope of the removable battery tray invention. As discussed above, an open center mower frame on the mower would require a different removable battery tray arrangement than that

shown in FIGS. 4a and 4b. An open center frame mower might require a removable battery tray having its support around the outside of the frame instead of horizontally down the center. In such an embodiment, the batteries would rest in the tray, and the tray would attach at its edges to the open center frame of the mower.

FIG. 5b is a front elevation view of the removable battery tray 100 of FIG. 4b looking towards the front of the removable battery tray 100 along line A—A. Hook 126 and frame support brackets 116 are attached to the external side of front frame member 40. Frame support brackets 116 are shown in phantom. Upside down "U" shaped cross section 105 corresponds to support beam 118 and main frame tube 60. Support bar 135 is on the right side of FIG. 5b; the left side shows the integrated bottom battery support member 170.

In FIG. 6b is a front elevation view of the removable battery tray 100 as seen from line B—B of FIG. 4b. The two back handles 122 and 124 welded to the external side of rear frame member 42 of the removable battery tray 100 are visible as well as the triangular divider 148. Divider 146 is shown in phantom. Longitudinal support beam 118 attaches to rear frame member 42 at upside down U-shaped cross section 105. Rear brackets 160 located on either side of the longitudinal support beam 118 and attached to rear frame member 42, help hold the rear batteries 94 or 98 in position. Frame support brackets 116, shown in phantom, are attached to the rear frame member 42 and the bottom battery support member is shown at 170.

In the foregoing specification, the invention has been described with reference to specific embodiments thereof. It will, however, be evident that various modifications and changes may be made thereto without departing from the broader spirit and scope of the invention as set forth in the appended claims.

For example, features of the first embodiment disclosed can be incorporated into the second embodiment. The spring lock system of the first embodiment would work equally well on the removable battery tray of the second embodiment having the welded hooks. Likewise, the welded hooks of the second embodiment could be replaced by the holes of the first embodiment while keeping the hook clamp means for securing the removable battery tray to the mower frame.

Additionally, as discussed in detail above, an open center mower frame would require a different removable battery tray arrangement to fit that frame. Furthermore, a removable battery tray can be designed to fit an open center mower frame with horizontal cross beams for frame support. Such a removable battery tray would rest on the horizontal cross beams of the removable battery tray. Other types of frames are envisioned where the batteries in the removable battery tray are arranged like a cube, with four batteries arranged in a block and four batteries arranged in another block and located above the first four. These and other arrangements for a removable battery tray for an electrically powered mower fall within the scope of the present invention.

Other techniques for securing the removable battery tray to the mower frame are included within the scope of the present invention as are other means of removing the removable battery tray from the mower frame. The specification and drawings are, accordingly, to be regarded in an illustrative rather than a restrictive manner.

We claim:

1. An electric mower comprising:
a frame;
at least one cutting unit secured to the frame;

a plurality of wheels connected to the frame wherein at least one of the plurality of wheels is a drive wheel;
 an electric drive motor operably connected to the drive wheel, the electric drive motor powered by a battery set;
 a removable battery tray configured to be positioned on the frame and to hold the battery set;
 a front portion and a rear portion;
 a support beam having a first end and a second end, the first end of the support beam being connected to the front portion of the removable battery tray, and the second end of the support beam being connected to the rear portion of the removable battery tray;
 a plurality of bars positioned in perpendicular arrangement with respect to the support beam, the plurality of bars to provide support for the removable battery tray; and
 dividers secured to the bars to separate one battery from another in the removable battery tray.

2. The electric mower of claim 1 wherein the removable battery tray further comprises at least one bracket for securing the plurality of batteries in the removable battery tray.

3. The electric mower of claim 1 wherein the removable battery tray further comprises:

- a first handle located on the front portion; and
- a second handle located on the rear portion, whereby the first handle and the second handle aid in removal of the removable battery tray.

4. The electric mower of claim 1 wherein the front portion further comprises a first opening, and the rear portion further comprises a second opening, the first and second openings to aid in removal of the removable battery tray.

5. The electric mower of claim 1 further comprising an electrical power connector configured to be electrically connected to the battery set.

6. An electric mower comprising:

- a frame;
- a plurality of cutting units secured to the frame;
- a plurality of wheels connected to the frame wherein at least one of the plurality of wheels is a drive wheel;
- an electric drive motor operably connected to the drive wheel, the electric drive motor powered by a battery set;
- a removable battery tray configured to be positioned on the frame and to hold the battery set;
- a front portion and a rear portion;
- a support beam having a first end and a second end, the first end of the support beam being connected to the front portion of the removable battery tray, and the second end of the support beam being connected to the rear portion of the removable battery tray;
- a plurality of bars positioned in perpendicular arrangement with respect to the support beam, the plurality of bars to provide support for the removable battery tray;
- positions for the plurality of batteries in the battery set;
- at least one bracket for securing the plurality of batteries in the battery set; and
- dividers secured to the bars to separate one battery from another in the removable battery tray.

7. The electric mower of claim 6 further comprising a lock system to secure the removable battery tray to the frame, wherein the lock system includes a frame portion mounted to the frame and a tray portion mounted to the removable battery tray, and the frame portion engages the tray portion

allowing the lock system to secure the removable battery tray to the frame.

8. The electric mower of claim 6 wherein the removable battery tray is attached to the frame with a hook clamp and a screw.

9. An electric mower comprising:

- a frame;
- at least one cutting unit secured to the frame;
- a plurality of wheels connected to the frame wherein at least one of the plurality of wheels is a drive wheel;
- an electric drive motor operably connected to the drive wheel, the electric drive motor powered by a battery set;
- a removable battery tray configured to be positioned on the frame and to hold the battery set; and
- the electric mower having a spring lock system to secure the removable battery tray to the frame comprising:
 - a first pin affixed to the frame; and
 - a bracket attached to the removable battery tray, the bracket having an opening for receiving the first pin when the removable battery tray is loaded on the frame.

10. The electric mower of claim 9 wherein the first pin includes a transverse opening and further comprising a second pin configured to be placed through the opening to secure the first pin in position through the bracket.

11. The electric mower of claim 10 wherein the second pin has a front end and a back end, the front end and the back end extend on either side of the first pin and wherein the second pin includes a strip of flexible material having a first end and a second end, the first end of the flexible material attaches to the front end of the second pin and the second end of the flexible material attaches to the back end of the second pin.

12. A removable battery tray for use in an electrically powered mower comprising:

- a front member and a rear member;
- a support beam having a first end and a second end, the first end attached to a central location of the front member, and the second end attached to a central location of the rear member;
- a plurality of battery positions configured in perpendicular arrangement on either side of the support beam, each battery position including a bar located perpendicularly to the support beam and positioned to provide a support upon which the battery rests in the battery position.

13. The removable battery tray of claim 12 further comprising a divider positioned perpendicularly to the support beam and attached to the support beam to provide further bracing for the removable battery tray.

14. The removable battery tray of claim 12 further comprising a means for removing the removable battery tray from a mower frame.

15. The removable battery tray of claim 12 further comprising a means for positioning the removable battery tray on a mower frame.

16. The removable battery tray of claim 12 further comprising a plug positioned for electrical connection with a battery located in the battery positions.

17. The removable battery tray of claim 16 wherein the plug is electrically connected to a power source to provide power to the battery.

18. An electric mower comprising:

- a frame;
- at least one cutting unit secured to the frame;

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a plurality of wheels connected to the frame wherein at least one of the plurality of wheels is a drive wheel;
 an electric drive motor operably connected to the drive wheel, the electric drive motor powered by a battery set; and
 a removable battery tray configured to be positioned on the frame and to hold the battery set, the battery tray having:
 a front portion and a rear portion;
 a support beam having a first end and a second end, the first end of the support beam being connected to the

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front portion of the removable battery tray, and the second end of the support beam being connected to the rear portion of the removable battery tray; and
 a plurality of bars positioned in perpendicular arrangement with respect to the support beam and defining a plurality of battery positions, the bars each providing a support upon which a battery rests in the respective battery position.

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