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(71) Applicant: ENDECO CORPORATION [US/US]; 2844 Pennsylvania Street, Allentown, PA 18104 (US).

(72) Inventors: ORR, Paul, L.; 2844 Pennsylvania Street, Allentown, PA 18104 (US). LOPEZ, Dennis; 1616 Eaton Avenue, Bethlehem, PA 18018 (US). BAATZ, John; 1380 Arch Street, Emmaus, PA 18049 (US).

(74) Agents: ALTMILLER, John, C. et al.; Kenyon & Kenyon, One Broadway, New York, NY 10004 (US).

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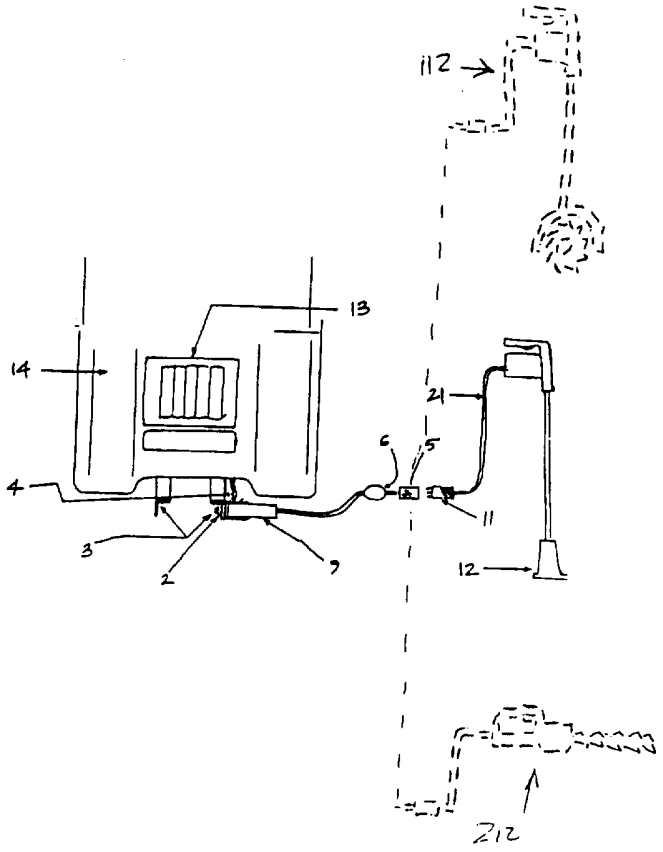
(54) Title: TRACTOR-MOUNTED DEVICE FOR LINE TRIMMER AND OTHER LAWN CARE TOOLS

(57) Abstract

The disclosure relates to a combination of a tractor (20) with a line trimmer (12) or other hand-held lawn care device which is mounted to the tractor (20) and which is powered by the tractor. A cable reel (1) is connected to the electrical system of the tractor and terminates in a receptacle (5), to which the power line (21) of the line trimmer (12) or other hand-held lawn care device is connected. Various techniques for mounting the lawn care devices to the tractor are disclosed.



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TRACTOR-MOUNTED DEVICE FOR LINE TRIMMER AND OTHER LAWN CARE TOOLS

Background of the Invention

Field of the Invention

The present invention relates to a lightweight and easy to operate devices for trimming grass and weed clearing in conjunction with tractor use. As an example, the present invention eliminates the need for gas, portable electric, or 120 volt alternating current (VAC) electrical power to operate the line trimming device and allows the line trimmer to be powered and carried by the tractor.

Description of the Related Art

Devices for trimming grass and weeds are known. For example, U.S. Patent Nos. 5,265,341 and Des. 338,676 show battery powered grass and weed trimming devices, and U.S. Patent Nos. 4,930,580; 4,629,006; and Des. 334,200 show vehicle mounted edging devices. The first patents illustrate the need for portable grass and weed trimming devices. The trimming devices claimed and disclosed in the first set of these patents, however, require the use of either complicated two stroke gas engines, hazardous 120 VAC power provided via an extension cord, or unreliable cell batteries. The second set of patents cover trimming devices which are permanently attached to a tractor and thus are limited in their flexibility in trimming around trees, poles, etc. and in restricted areas. In addition, these power sources suffer from a variety of undesirable operating characteristics. Gas engines and power cells, for instance, increase the overall weight and bulk of the lawn trimmer. Extension cords, in

particular, must be managed to avoid contact with the tractor, hazardous objects, as well as vegetation which could be damaged by the moving cord. These characteristics increase the operator effort required for trimming. Most prior art line trimmers disclose and claim devices that are hand carried to the location of use and operated as a separate entity from the tractor. This results in an additional operation and also requires the same ground to be covered twice during routine lawn maintenance; once during tractor grass cutting and again with the line trimming device. This two step operation is inefficient and undesirable. The need for secondary operations and retracing of ground may pose risks when operating gas or 120 VAC line trimmers in conjunction with tractor use. In addition, most prior art devices do not disclose means for attaching lawn trimmers to tractors or standard means for carrying lawn trimmers in a standard position. Potential harm exists to both the operator and people near the operation area when the device is unsafely attached or carried on a tractor.

Summary of the Invention

The present invention is a 12 volt direct current line trimmer or other hand-held lawn care device that is fixed to a tractor and powered by the tractor's battery. The line trimmer's power is provided from the tractor's 12 volt direct current lead acid battery. The conduit for the power source is AWG number 18 wire and is approximately 30 feet long. The cable is enclosed in a spring-retentive metal-housed cable reel which is permanently mounted to the tractor frame or body. A twist lock receptacle is permanently attached to the first end of the cable. The twist lock receptacle mates with matching twist lock plugs which are permanently wired to the line trimmer or other lawn care device. The second end of the reel cable attaches under the body of the tractor and terminates in the battery compartment. This cable is secured along its path with permanent screw-type wire clamps to the tractor's body or frame. The second end of the cable is attached to the battery post connectors using standard ring terminals crimped to the cable's internal conductors. The ring terminals attach to a terminal post connector which contact the battery terminal post.

The line trimmer is equipped with a twist lock plug that is permanently wired in series with a momentary "dead-man" trigger switch. The wiring for the line

trimmer motor is routed from the external twist lock plug to the trigger switch in the handle of the device with type SO three-conductor cable. The internal conductors are a gauge of at least AWG 18. A rigid, hollow shaft connects the handle to the head. The wiring continues through that shaft to the motor which is located in the head. The motor shaft extends outside of the case which encloses the motor and wiring. Attached to the motor shaft is a reel of monofilament line which rotates about its radial axis. When the trigger is engaged the motor imparts a rotational velocity to the monofilament reel and, in turn, the monofilament line. The rotating monofilament line, which is radially extended by centrifugal acceleration, serves as a cutting surface for weeds or grass.

Two variants exist for attaching the line trimmer to the tractor. In the first attachment variant, the line trimmer is attached to the tractor with a plurality of spring or rubber clips which provide the compressive force necessary to secure the shaft of the line trimmer to the tractor and hold it in place during the tractor's normal operation. The clips are permanently attached to the tractor frame or body. One of the clips is positioned on the tractor and designed such that it also serves as a guard for the line trimmer trigger. This minimizes unintentional engagement of the trigger while attached to the tractor.

In the second attachment variant, the line trimmer is attached to the interior of a container which is removably mounted to the side of the tractor. The container is a thermoplastic single section bin of approximately 1/8" thickness. The container consists of integral lateral, forward, rear, and lower surfaces and serves as an enclosure for the line trimmer. In order to prevent pooling of collected water, a series of drainage holes, or other drainage means are provided for in lower container surface. The container, which is laterally adjacent to the tractor body, is attached to the tractor frame via a rigid frame. A rigid bar attaches to the interior of the container and is secured to the container via the rigid frame. The rigid bar serves two purposes: to provide stiffness to the container and to serve as a mounting plate for the retaining clips or cam device. The trimmer is supported by the bottom of the container and the interior face of the rigid bar. In addition, an implement holding device is attached to

the rigid bar to further constrain movement. An example of a usable implement holding device is a compressive locking cam. Downward movement engages the trimmer shaft against the cam face and an opposing surface. Upward movement releases the shaft. By adding other implement holding devices to the rigid bar, one can carry additional tools that are frequently used in conjunction with tractor operation. Lawn edgers, leaf blowers, leaf vacuums and shredders, power drills with drill, sandingg and screwdriver bits, electric screwdrivers, ower augers, sump-type pumps, chain or circular saws, compressors, power winches, seed blowers and hedge trimmers are examples of the types of tools that could be mounted to the rigid bar. Implements that are not powered, such as brooms, rakes, shovels, etc., could be carried in the thermoplastic container.

Using either attachment variant, the operator can perform normal tractor operations with the line trimmer device mounted, disembark from the tractor, remove the line trimmer from attachment device, pull the electrical cable from the cable reel, continue trimming as far as 30 feet from the tractor, remount the line trimmer to the tractor, and continue cutting the grass with the tractor until the line trimmer is needed again. In addition, the second attachment variant allows convenient storage for other implements which are used in conjunction with tractor operation. Specifically, implements can be used that are powered by or can be modified to be powered by 12 volt direct current. The user would only be required to switch the twist lock mechanism from one implement to another. Alternatively, separate cord reels could be mounted for each implement which require direct current power.

The result is that the device of the present invention is lighter, safer and more convenient than known prior art devices for providing lawn care devices for performing lawn care operations. As a result, the present invention allows an operator to perform lawn care operations in a much more efficient, safer and economical fashion than with those devices of the prior art.

Brief Description of the Drawings

FIG. 1 is a perspective view of the tractor mounted line trimmer device

auxiliary components of the present invention;

FIG. 2 is a perspective view of the battery post terminal connection of the line trimmer cord reel;

FIG. 3 is a plan view of the auxiliary components of the tractor mounted line trimmer device and an elevational view of the line trimmer;

FIG. 4 is a perspective view of one possible configuration for the first attachment variant which consists of spring clips on an aft mounted bracket;

FIG. 5 is a elevational view of another possible configuration for the second attachment variant which consists of side mounted spring clips;

FIG. 6 shows the type of spring clip that could be used to secure the trimmer device to the mounting frame listed above and thus to the tractor itself;

FIG. 7 shows a rearward elevational view of the second attachment variant which consists of a laterally mounted container;

FIG. 8 shows a elevational view of the second attachment variant which details the cam locking mechanism; and

FIG. 9 shows a cross-sectional elevational view of the line trimmer device itself as well as the internal wiring and various components of the line trimmer device.

Detailed Description of the Preferred Embodiments

Turning now to the drawings in more detail, in FIG. 1 a cable reel 1 is secured to the support brackets 3 with two bolts 2. The cable reel 1 consists of an outer shell which encloses a spring loaded spool (not visible) with approximately thirty feet of output cable 10 coiled on the spool. The output cable 10 is electrically wired to a fixed three-conductor input cable 4. Both the output cable 10 and input cable 4 consist of three internal conductors which are enclosed in a sheathing. A plastic ball 6 encases the output cable 10 near the end of the twist lock plug 5. The plastic ball 6 prevents the output cable 10 from retracting into the cable reel 1. The cable reel 1 is secured to a formed steel mounting bracket 9 with a central bolt 13 that penetrates the cable reel 1 completely. FIG. 1 also shows the tractor battery 7 and battery terminal connectors 8 to which the input cable 4 is attached.

The connection of input cable 4 to the terminal post 34 is best shown in FIG

2. A terminal post connector 32 is in electrical contact and surrounds the terminal post 4 of the battery 7. A securing bolt 33 and a securing nut 35 tangentially compresses the terminal post connector 32 around the terminal post 4. A ring connector 31 surrounds the securing bolt 33 and is placed between the terminal post connector 32 and the securing nut 35. The axial compressive force provided by the securing bolt 33 and the securing nut 35 ensures electrical and mechanical contact between the ring connector 31 and the terminal post connector 32. The ring connector 31 is crimped to an end of the input cable 4.

FIG. 3 shows a plan view of the tractor 14, cord reel 9, bolted connection 2, mounting brackets 3, and input power cable 4. This figure in conjunction with drawing FIG. 1 shows one of the possible mounting arrangements. FIG. 3 also shows a elevational view of the line trimmer 12 and the twist lock plug 11 and receptacle 5. The twist lock plug 11 and receptacle 5 are used to secure the electrical connection of the line trimmer device 12 to the cable reel's 9 output cable 10. These three-pronged plug and receptacle sets require that the operator insert the prongs of the plug end into the receptacle end and twist the plug or receptacle end 90 degrees in the clockwise direction, while holding the other half of the set in place. Once twisted the plug and receptacle remain joined, even under a great deal of tension, until the plug or receptacle is twisted 90 degrees in the counter clockwise direction, unlocking the set. Once the set is unlocked the plug and receptacle set can be separated by pulling them apart.

The first attachment variant is best observed in the perspective view of FIG. 4. The bracket 15 is formed so that the line trimmer 12 clears the brackets 3, and the tractor body 14. The line trimmer is secured with spring clips 16 or cam lock device 48 which provide compression about the line trimmer's shaft 25. The bracket 15 is secured to the tractor frame 20 using a double nut and bolt assembly 17 through the trimmer bracket 15 and the frame 20. The line trimmer mounting bracket is fabricated from 1/2" x 1/2" x 1/16" cold rolled steel or similar material and is formed at an angle necessary to clear the bracket 3 and tractor body 14 while keeping the line trimmer's head assembly 26 above the ground and at a safe distance from the operator.

FIG. 5 is an alternative placement of the first attachment variant. Here, the spring clips 16 or cam lock device 48 are attached to the lateral surfaces of the tractor body 14. The spring clips 16, or cam lock devices 48, are placed to prevent interference between the line trimmer 12 and the tractor's components. In addition, the spring clips 16 are placed to prevent the line trimmer 12 from touching the ground. As shown in FIG. 5, a guard 60 can be attached to tractor body 14, which guard covers the trigger element of the line trimmer 12 to prevent accidental activation of the trigger when the line trimmer 12 is stored on the tractor 14.

Under the first attachment variant, using either placement, the spring clips 16 are attached as shown in FIG. 6 and cam lock devices 48 in FIG. 8. Here the mounting surface 40 models the bracket 15 or the tractor body 14. The spring clips 16, or cam lock devices 48, are secured to the mounting surface 40 via a nut and bolt assembly 19 as shown in FIG. 6. FIG. 6 also shows the trimmer shaft 25 in the spring clip 16. The line trimmer 12 is installed on the mounting bracket clips 16 by simply pushing the shaft of the line trimmer into the throat of the spring clips 16 thereby forcing the clips to expand to enter the large radiused area into the throat area and finally out of the clip devices 16 entirely. Once removed from the tension clips 16 the line trimmer 12 can be walked to its desired location after pulling sufficient cable from the cable reel 9. When the operator has finished using the device 12 the line trimmer 12 may be resecured to the tractor 14 using the line trimmer mounting bracket 15 by allowing the cable pulled from the cable reel 9 to return to the reel and placing the shaft of the line trimmer 25 into the retaining clips 16 as noted above.

FIG. 7 is an rearward plan view of the second attachment variant. An upper support bracket 41 is secured to the tractor frame 42. A lower support bracket 43 is rigidly attached to the upper support bracket 41 near the tractor frame 42. The lower support bracket 43 attaches to the lower lateral side of the container 44. The upper support bracket 41 attaches to an external support bar 45. The external support bar 45 attaches to the container 44 and structurally enhances the rigidity of the container 44. A plurality of holes (not shown) on the lower container 44 face provide drainage for collected water.

FIG. 8 is an elevational view of the lateral interior side of the container. The internal support bar 46 is attached by attaching bolts 47 to the container 44 and the external support bar 45. A compressive locking cam 48 is attached to the internal support bar 46. The line trimmer shaft 25 is placed between the compressive locking cam 48. Downward motion locks the line trimmer shaft 25 in the compressive locking cam 48 and upward forces releases the line trimmer shaft 25. A plurality of implements having shafts or equivalents (not shown) may be held in this manner.

FIG. 9 is a cross-section view of a modified Craftsman Model 71 78352 line trimmer. Other similar line trimmers may be used in the same manner as described in this document. FIG. 9 also shows the strain relief device 22 used to prevent the permanent wiring 21 from being damaged from tension on the cable, via twist lock plug 11, during normal use. FIG. 9 shows the connection of the power conductors 21 to the momentary operating trigger switch 23 used to operate the line trimmer 12. The trigger 23 is secured to the line trimmer's 12 plastic case 24 by being contained in a molded compartment of the case 24. FIG. 9 also shows the internal wiring 29 passing through the line trimmer's shaft 25 and into the line trimmer's head assembly 26 where it is connected to the line trimmers 12 volt direct current motor 27. The line trimmer's motor is contained in the line trimmer's plastic head case 26 along with wire connections. The line trimmer plastic head case 25 provides an opening for the shaft of the line trimmer's motor 27 for attachment of the line spool 28. The line spool 28 is equipped with a standard monofilament line 30 which cuts the grass, weed or other vegetation. The line spool 28 and hence the line 30 being attached to the motor shaft spins at the motor rpm which provides the force necessary to cut the stated medium. FIG. 9 also shows a wiring key illustrating the wiring used in the line trimmer 12 device, including a ground wire.

In operation of the present invention, tractor 14 is operated to cut large areas of grass or other vegetation. When it is desired to cut small areas of grass or other vegetation, or to trim around fixed objects, the line trimmer 12 may be removed from its receptacle -- either the spring clips 16 or the container 44 -- and connected, if not already connected, to the receptacle 5 by the twist lock plug 11. Such connection

provides power to the motor 27 in line trimmer 12. Activation of switch 23 causes the line trimmer 12 to operate, and the cord reel 9 allows the operator to move in the area around the tractor 14 while operating line trimmer 12. After the operator has finished trimming, the line trimmer 12 can be placed back on tractor 14. In addition, if the operator desires to perform any other operations -- hedge trimming, lawn edging -- by connecting appropriate edging and hedge trimming implements 112 - 212 stored in the container 44 to the receptacle 5.

It is to be understood that many variations are possible under the teachings of the present disclosure. For example, any number of different securing devices could be used, and the mounting bracket for securing the hand-held lawn care devices to the tractor could be of any configuration appropriate for the type of tractor used. In addition, any hand-held lawn care device could be used with, or as a substitute for, the line trimmer described above. The present invention is not limited by the particular structures and methods described above, but is instead defined by the claims below.

Claims

1. A lawn care apparatus comprising:

a tractor, said tractor comprising a battery, said tractor further comprising a power output cable, said power output cable being electrically connected to said battery, said power output cable comprising an outlet end; and

at least one hand-held lawn care device, said at least one hand-held lawn care device comprising a power input, said power input being connectable with said outlet end to thereby power said at least one hand-held lawn care device, said at least one hand-held lawn care device being mountable on said tractor when not in use and being detached from said tractor when in use; and

an attaching mechanism for attaching said at least one hand-held lawn care device to said tractor.

2. The apparatus of claim 1, wherein:

said attaching mechanism comprise at least two retaining clips mounted to said tractor to engage said at least one hand-held lawn care device.

3. The apparatus of claim 1, wherein:

said at least one hand-held lawn care device comprises an activating trigger, and wherein said attaching mechanism comprises a guard for obstructing objects from engaging said activating trigger.

4. The apparatus of claim 1, wherein:

said attaching mechanism comprises a bin which supports and surrounds said at least one hand-held lawn care device.

5. The apparatus of claim 4, wherein:

said attaching mechanism comprises a mechanism for releasably engaging said at least one hand-held lawn care device against a side of said bin.

6. The apparatus of claim 1, wherein:

said power output cable is retractable.

7. The apparatus of claim 1, wherein:
said power output cable is coiled about a spring-retentive reel.

8. The apparatus of claim 7, wherein:
said spring-retentive reel is mounted a bracket mounted on said tractor.

9. The apparatus of claim 1, wherein:
said outlet end and said power input comprise twist-lock plugs.

10. The apparatus of claim 1, wherein:
said attachment mechanism is mounted to a bracket mounted on said tractor.

11. The apparatus of claim 1, wherein:
said attachment mechanism comprises at least one spring clip.

12. The apparatus of claim 1, wherein:
said attachment mechanism comprises at least one locking cam.

13. The apparatus of claim 1, wherein:
said at least one hand-held lawn care device comprises a line trimmer.

14. The apparatus of claim 1, wherein:
said at least one hand-held lawn care device comprises a hedge trimmer.

15. The apparatus of claim 1, wherein:
said at least one hand-held lawn care device comprises a lawn edger.

16. The apparatus of claim 1, further comprising:
a plurality of hand-held lawn care devices.

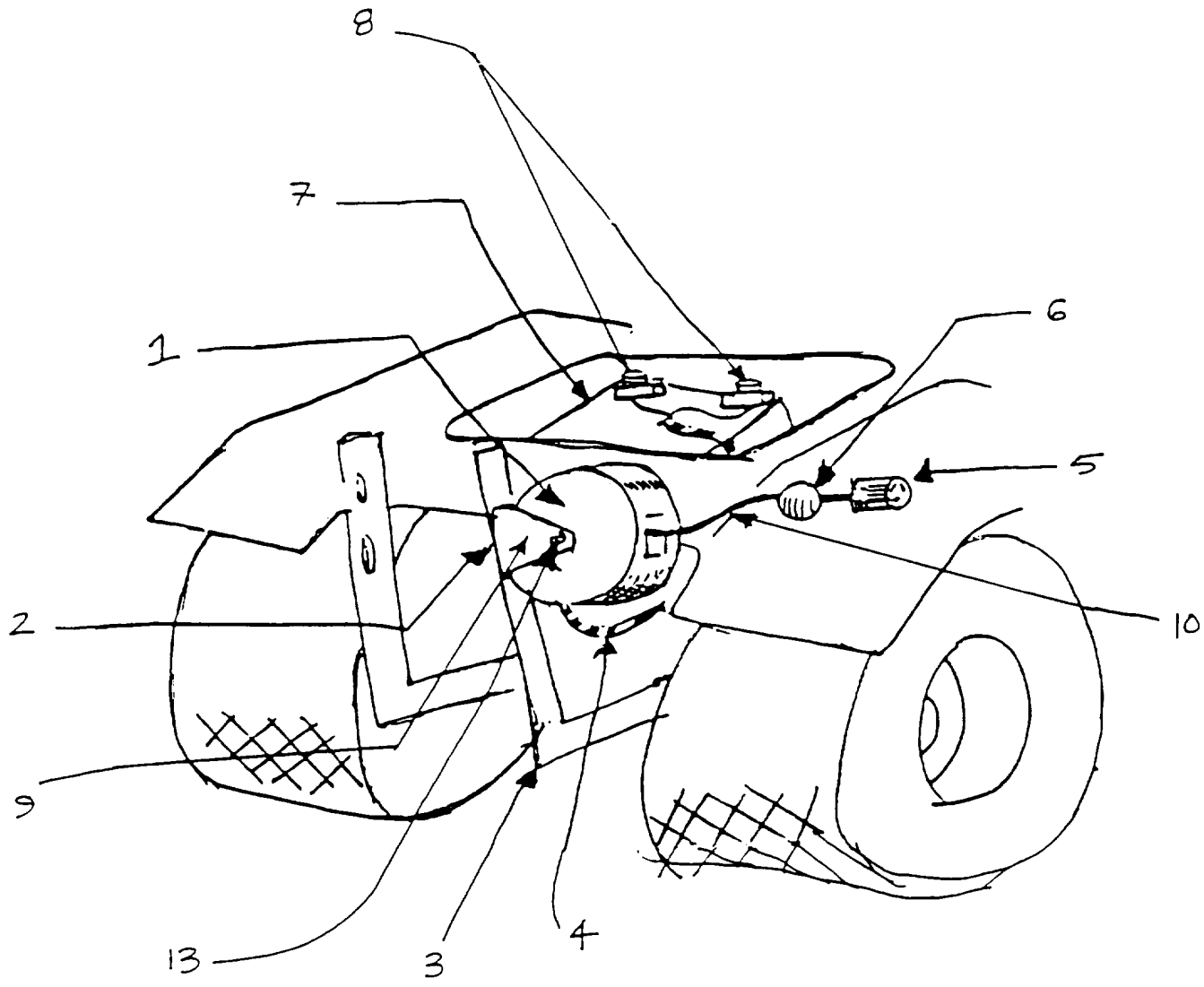

FIG. 1

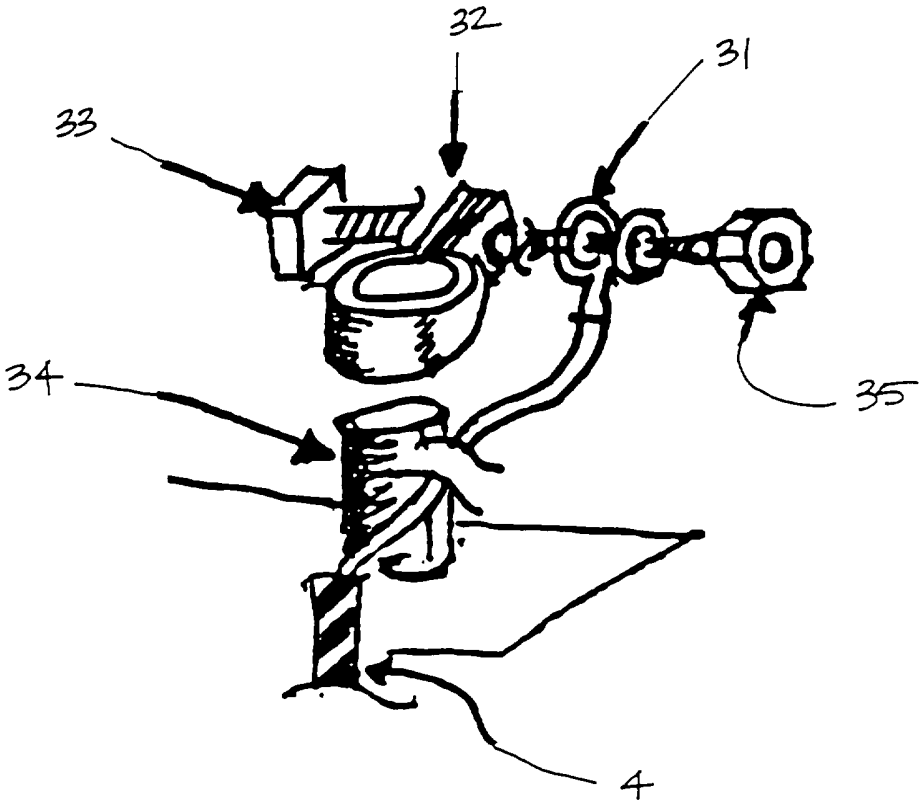

FIG. 2

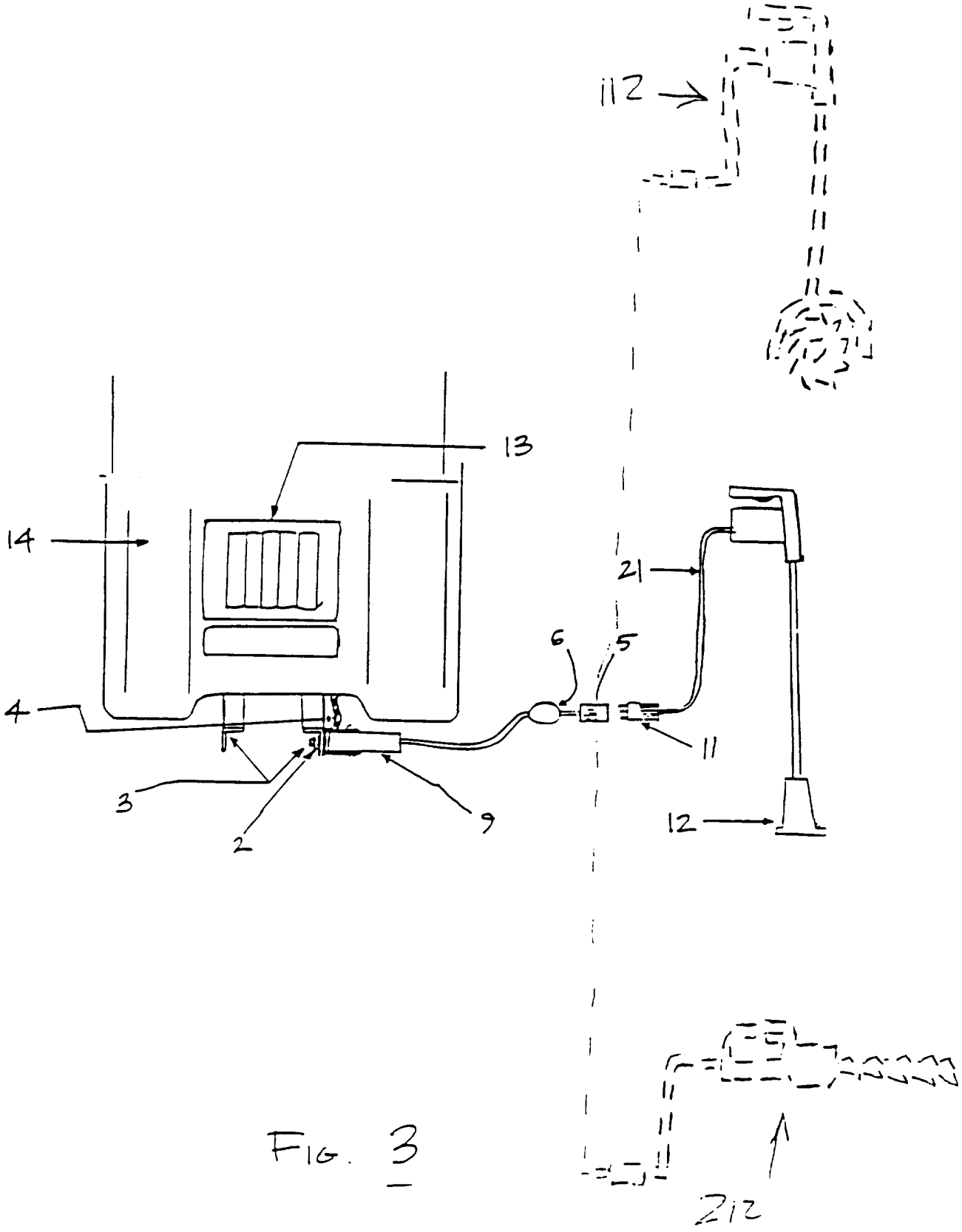

FIG. 3

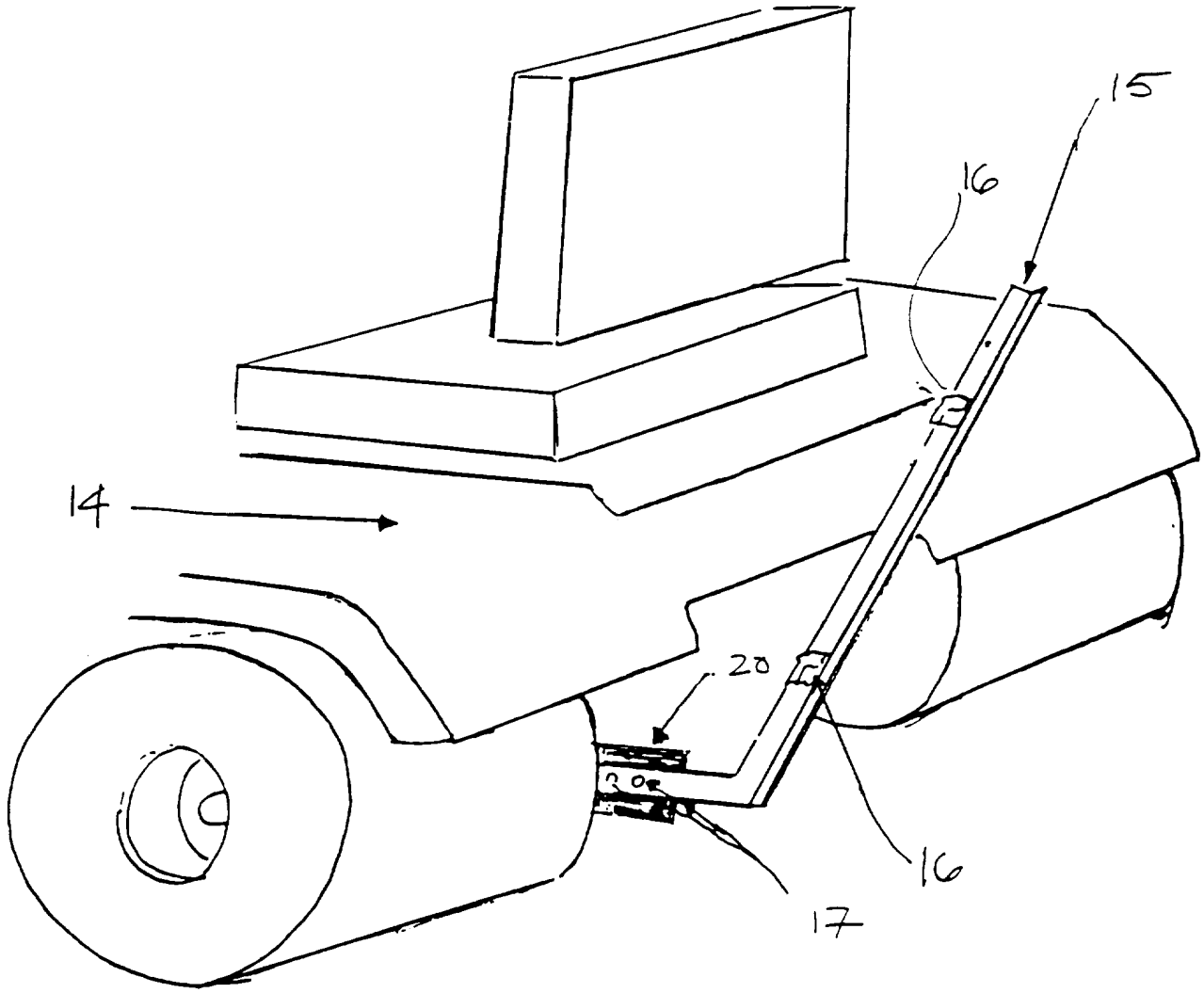

FIG. 4

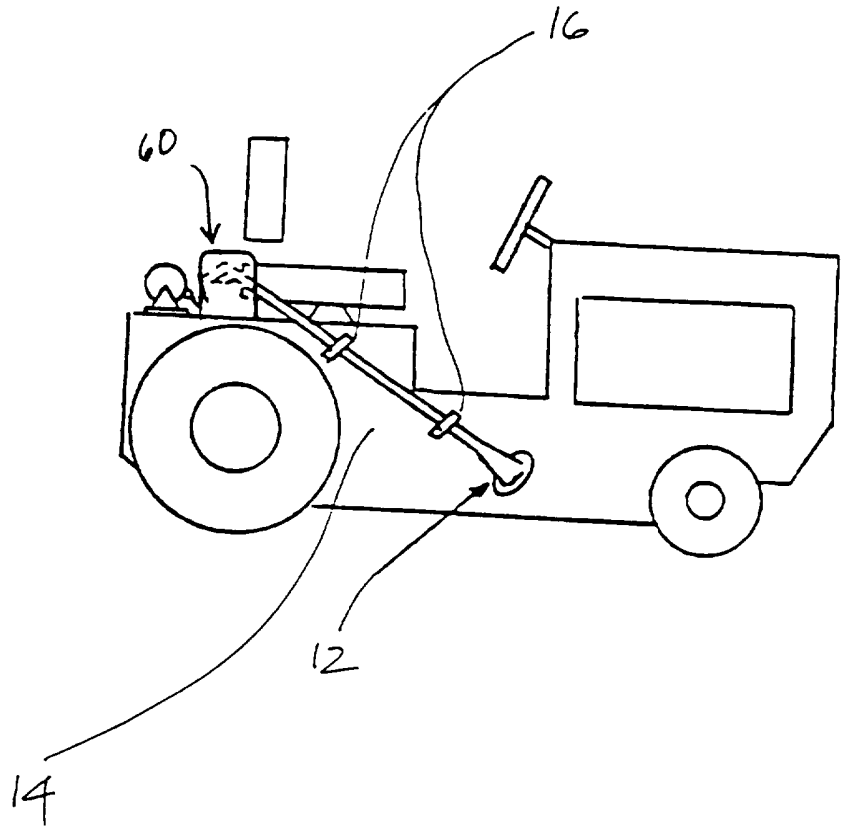

FIG. 5

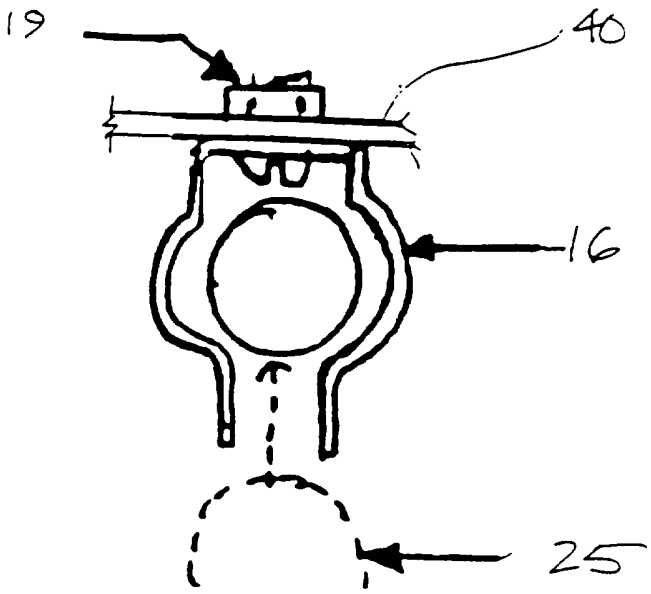

FIG. 6

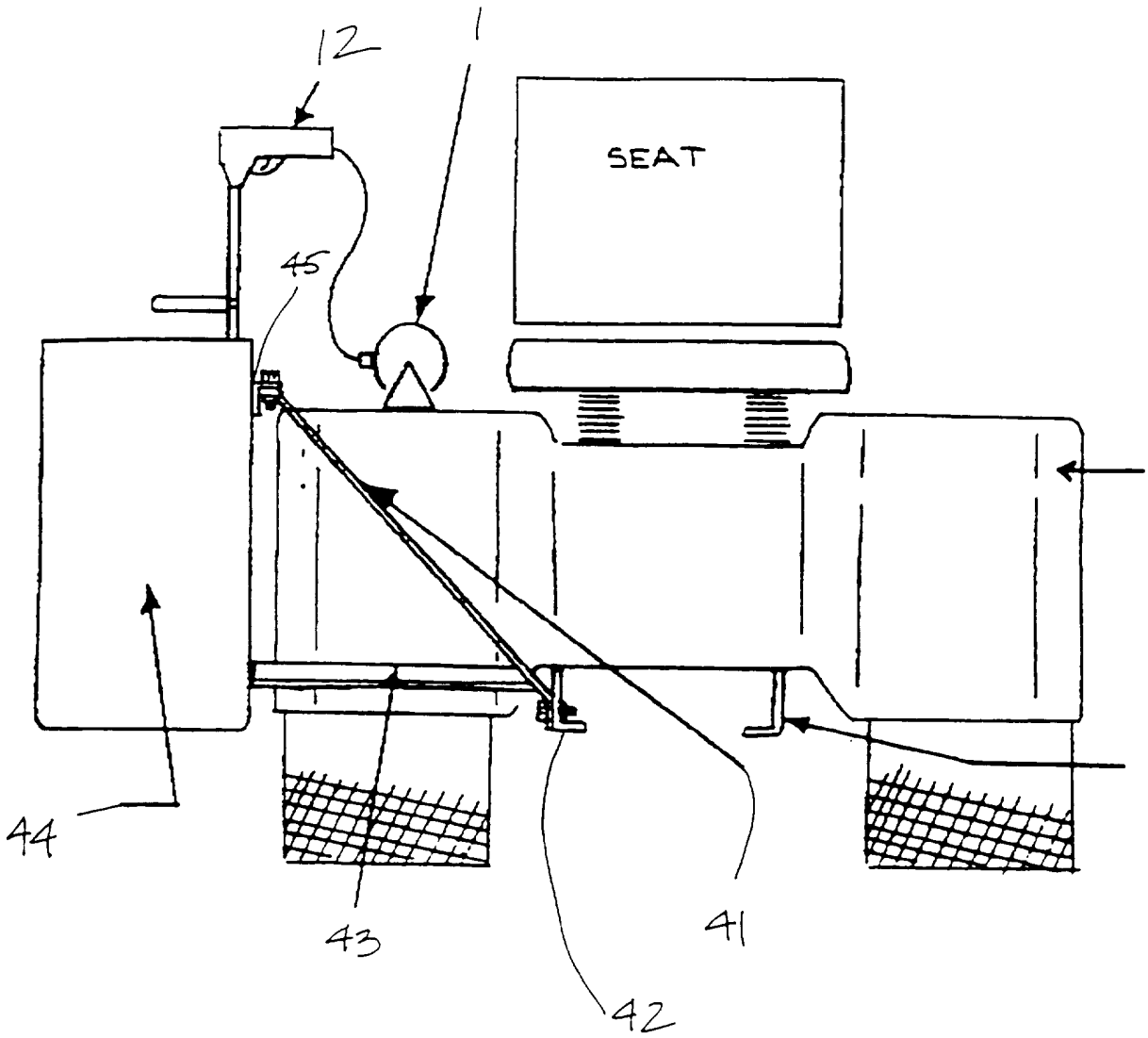

FIG. 7

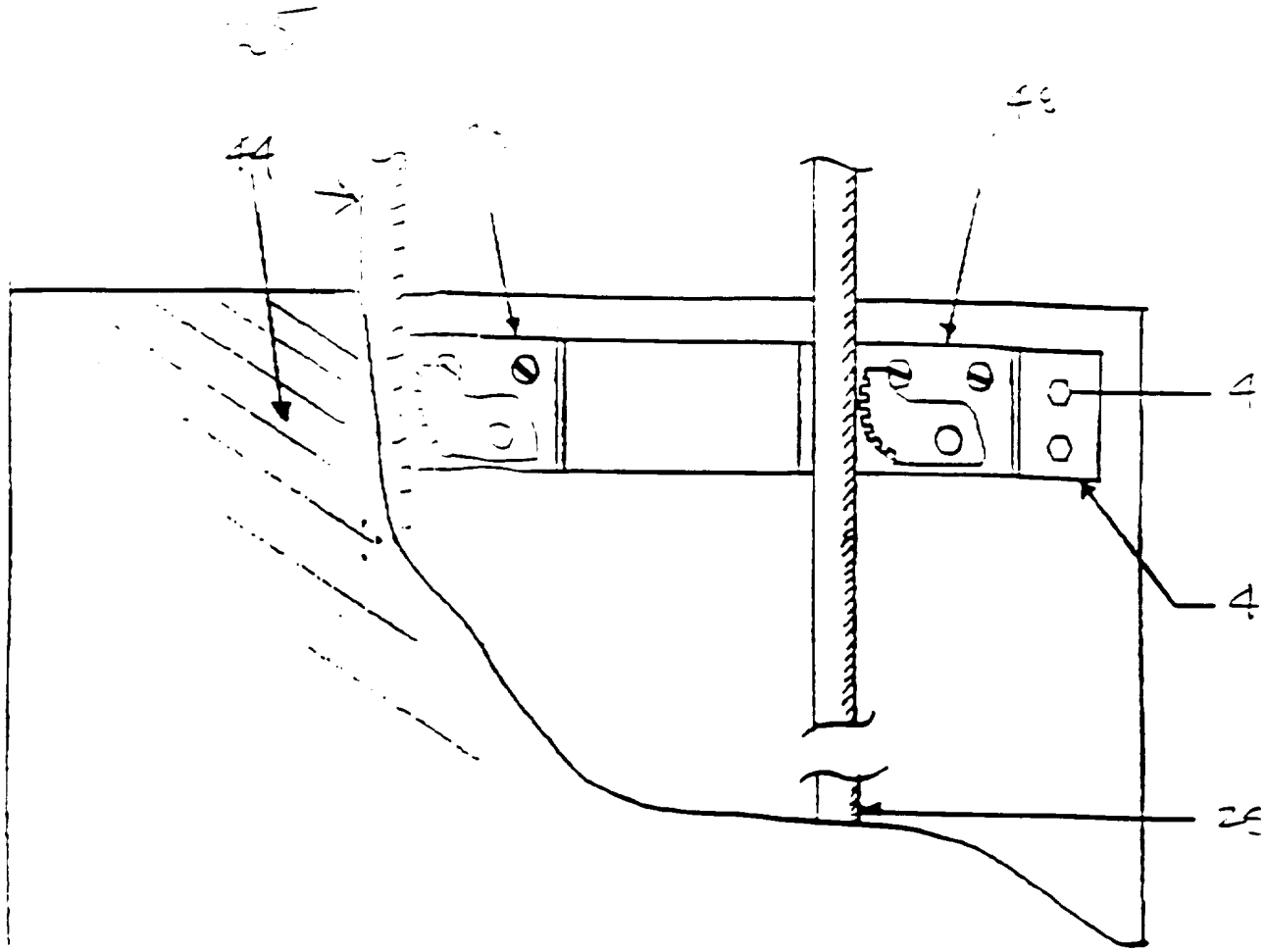

FIG. 8

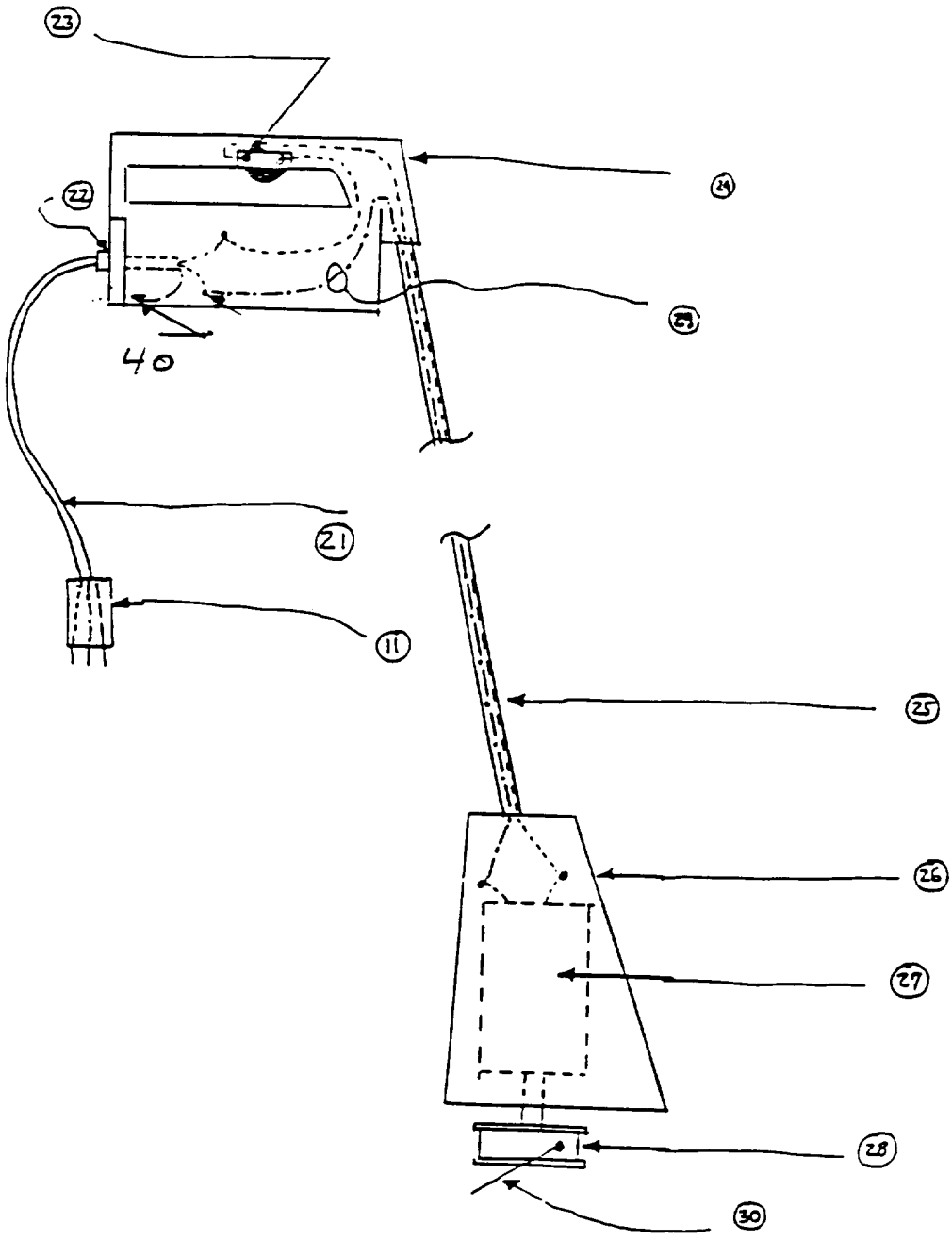

FIG. 9

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US96/03457

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) :A01D 75/00
US CL :Please See Extra Sheet.
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : Please See Extra Sheet.

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

NONE

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

NONE

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US, A, 4,152,882 (HOWARD) 08 MAY 1979, SEE FIGURES 1,2 AND 6.	1
A	US, A, 4,242,855 (BEAVER,JR.) 06 JANUARY 1981, SEE FIGURES 1 AND 2.	1
A	US, A, 4,870,811 (STEELE) 03 OCTOBER 1989, SEE FIGURES 1,2,3 AND 5.	1
A	US, A, 5,303,532 (PHILLIPS) 19 APRIL 1994, SEE FIGURE 1.	1

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
02 MAY 1996	15 MAY 1996
Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703) 305-3230	Authorized officer TERRY LEE MELIUS Telephone No. (703) 308-2168

Form PCT/ISA/210 (second sheet)(July 1992)★

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US96/03457

A. CLASSIFICATION OF SUBJECT MATTER:
US CL :

56/ 13.7, 15.9, DIG.-9

B. FIELDS SEARCHED
Minimum documentation searched
Classification System: U.S.

56/ 13.7, 16.9, DIG.-9, 13.6, 1, 12.1, 12.7, 16.7