ORIGINAL

#21147

IN THE UNITED STATES DISTRICT COURT
FOR THE NORTHERN DISTRICT OF TEXAS
DALLAS DIVISION

VINYLEX CORPORATION,	§	
	§	**Civil Action No.**
Plaintiff,	§	
	§	3-08CV0672-K
v.	§	
	§	
BLACK & DECKER (U.S.) INC. and KAWASAKI MOTORS CORP., U.S.A.,	§	
	§	**JURY TRIAL DEMANDED**
Defendants.	§	

COMPLAINT FOR PATENT INFRINGEMENT

Plaintiff Vinylex Corporation, for its Complaint for Patent Infringement against Defendants Black & Decker (U.S.) Inc. and Kawasaki Motors Corp., U.S.A. (hereinafter referred to collectively as "Defendants") states as follows:

PARTIES

1. Plaintiff Vinylex Corporation ("Vinylex") is a corporation organized and existing under the laws of the State of Tennessee and has a principal place of business located at 1420 Vinylex Drive, Carrollton, Texas 75006.

2. Upon information and belief, Defendant Black & Decker (U.S.) Inc. ("Black & Decker") is a corporation organized and existing under the laws of the State of Maryland and has its corporate headquarters located at 701 East Joppa Road TW285, Towson, MD 21286.

3. Upon information and belief, Defendant Kawasaki Motors Corp., U.S.A. ("Kawasaki") is a corporation organized and existing under the laws of the State of Delaware and has its corporate headquarters located at 9950 Jeronimo Road, Irvine, CA 92618.

JURISDICTION AND VENUE

4. This action arises under the patent laws of the United States, 35 U.S.C. §§ 271 and 281, et seq. This Court has subject matter jurisdiction over this action pursuant to 28 U.S.C. §§ 1331 and 1338(a).

5. Black & Decker regularly conducts business in the State of Texas and this judicial district, is registered to do business in the State of Texas and has appointed CT Corporation System, 350 N. St. Paul St., Dallas, TX 75201, as its registered agent for service of process.

6. Kawasaki regularly conducts business in the State of Texas and this judicial district, is registered to do business in the State of Texas and has appointed CT Corporation System, 350 N. St. Paul St., Dallas, TX 75201, as its registered agent for service of process.

7. On information and belief, Defendants are subject to the specific and general jurisdiction of this Court, and at least a part of Defendants' acts of patent infringement alleged herein occurred in this judicial district.

8. Venue is proper in this district and division pursuant to 28 U.S.C. §§ 1391(b) and (c) and 1400(b).

FACTUAL BACKGROUND

9. On November 15, 1994, U.S. Patent No. 5,364,307 ("the '307 Patent"), entitled "Coaxial Drive Cable Centering Apparatus," was duly and legally issued to Vinylex. Vinylex is, and at all relevant times has been, the owner of the entire right, title and interest in and to the '307 Patent. A copy of the '307 Patent is attached as Exhibit A.

10. On February 4, 1997, U.S. Patent No. 5,599,233 ("the '233 Patent"), entitled "Coaxial Drive Cable Centering Apparatus," was duly and legally issued to Vinylex. Vinylex is,

and at all relevant times has been, the owner of the entire right, title and interest in and to the '233 Patent. A copy of the '233 Patent is attached as Exhibit B.

11. At all times pertinent hereto, Vinylex has complied with the patent marking requirements of 35 U.S.C. § 287 with respect to the Vinylex Patents.

COUNT I
Infringement of the '307 Patent

12. Vinylex realleges and incorporates by reference the allegations of paragraphs 1-11 above.

13. On information and belief, Defendants have been and are infringing one or more claims of the '307 Patent in violation of 35 U.S.C. § 271 by, without authority, making, using, offering to sell, selling and/or importing, within and to the United States, products, including weed and grass trimmers and edgers, embodying the patented invention of the '307 Patent, or equivalents thereof.

14. On information and belief, Defendants have actively induced others to infringe, and engaged in activity constituting contributory infringement of, one or more claims of the '307 Patent.

15. Vinylex has been damaged by Defendants' infringement of the '307 Patent and is entitled to an award of damages adequate to compensate for the infringement, together with interest and costs.

16. Unless they are enjoined, Defendants will continue to infringe the '307 Patent and irreparably harm Vinylex.

17. On information and belief, this is an exceptional case within the meaning of 35 U.S.C. § 285 and, therefore, Vinylex is entitled to recover its reasonable attorneys fees incurred in this case.

COUNT II
Infringement of the '233 Patent

18. Plaintiff Vinylex realleges and incorporates by reference the allegations of paragraphs 1-11 above.

19. On information and belief, Defendants have been and are infringing one or more claims of the '233 Patent in violation of 35 U.S.C. § 271 by, without authority, making, using, offering to sell, selling and/or importing, within and to the United States, products, including weed and grass trimmers and edgers, embodying the patented invention of the '233 Patent, or equivalents thereof.

20. On information and belief, Defendants have actively induced others to infringe, and engaged in activity constituting contributory infringement of, one or more claims of the '233 Patent.

21. Vinylex has been damaged by Defendants' infringement of the '233 Patent and is entitled to an award of damages adequate to compensate for the infringement, together with interest and costs.

22. Unless they are enjoined, Defendants will continue to infringe the '233 Patent and irreparably harm Vinylex.

23. On information and belief, this is an exceptional case within the meaning of 35 U.S.C. § 285 and, therefore, Vinylex is entitled to recover its reasonable attorneys fees incurred in this case.

PRAYER FOR RELIEF

WHEREFORE, Vinylex respectfully prays for:

A. judgment that Defendants Black & Decker and Kawasaki have infringed U.S. Patents No. 5,364,307 and No. 5,599,233;

B. a permanent injunction enjoining and restraining Defendants Black & Decker and Kawasaki, their respective parents, subsidiaries and affiliates, and their respective officers, directors, agents, servants, and employees, and all persons acting for, with, through, or in active concert or participation with, them, from infringing, inducing the infringement of, or contributorily infringing the claims of U.S. Patents No. 5,364,307 and No. 5,599,233;

C. an award of damages adequate to compensate Vinylex for the infringement, inducement of infringement of, and contributory infringement of, U.S. Patents No. 5,364,307 and No. 5,599,233 by Defendants Black & Decker and Kawasaki;

D. judgment that Vinylex recover pre-judgment and post-judgment interest, costs and treble damages under 35 U.S.C. § 284;

E. judgment that this is an exceptional case under 35 U.S.C. § 285 and that Vinylex be awarded its reasonable attorneys fees incurred in this action; and,

G. such other and further relief as the Court deems just and proper.

DEMAND FOR JURY TRIAL

Pursuant to Rule 38(b), Fed. R. Civ. P., Plaintiff Vinylex hereby demands a trial by jury on all issues so triable in this action.

Dated: April 17, 2008

Respectfully submitted,

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ATTORNEYS FOR PLAINTIFF VINYLEX CORPORATION

EXHIBIT A

US005364307A

United States Patent [19]

Shaulis

[11] **Patent Number: 5,364,307**

[45] **Date of Patent: Nov. 15, 1994**

[54] **COAXIAL DRIVE CABLE CENTERING APPARATUS**

[75] Inventor: **John E. Shaulis**, Carrollton, Tex.

[73] Assignee: **Vinylex Corporation**, Knoxville, Tenn.

[21] Appl. No.: **509,893**

[22] Filed: **Apr. 16, 1990**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 212,077, Jun. 22, 1988, abandoned, which is a continuation of Ser. No. 786,146, Oct. 8, 1985, abandoned, which is a continuation of Ser. No. 496,826, May 23, 1983, abandoned.

[51] **Int. Cl.**[5] **A01G 3/06**; F16C 1/06

[52] **U.S. Cl.** **464/52**; 30/276; 56/12.7

[58] **Field of Search** 464/52, 81, 112, 182, 464/183, 181; 138/38, 108; 30/276; 56/12.7

[56] **References Cited**

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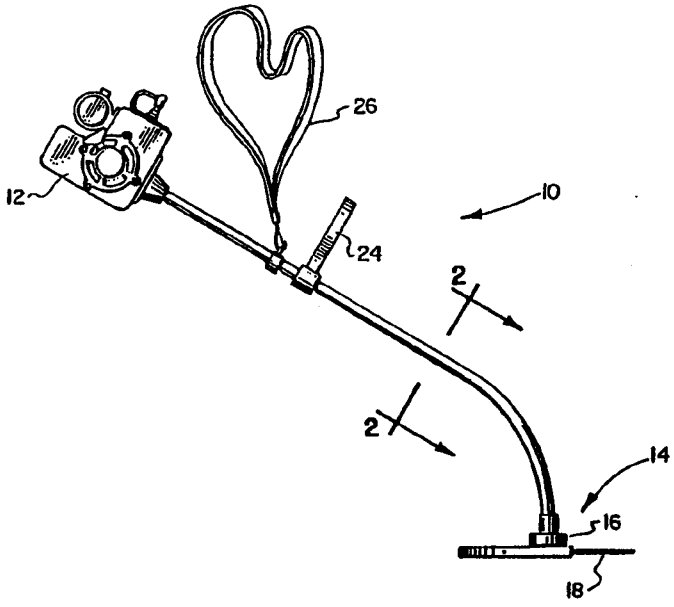
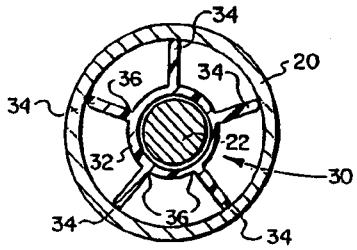
Primary Examiner—Daniel P. Stodola
Attorney, Agent, or Firm—Kenneth R. Glaser

[57] **ABSTRACT**

Flexible centering apparatus for centering a flexible drive cable within a cylindrial cable housing, the centering apparatus formed of an elongated finned sleeve in which radially disposed fins engage the cable housing, the fins being free and unattached at their outer ends. In one embodiment, the centering apparatus is of uniform construction; in another embodiment, the centering apparatus is of dual durometer construction.

7 Claims, 1 Drawing Sheet





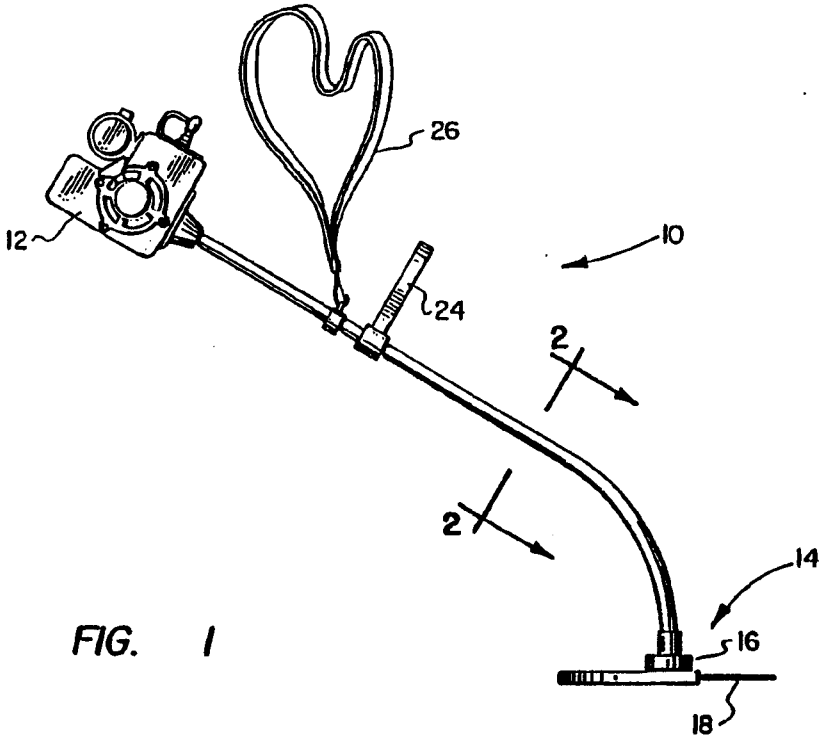


FIG. 1

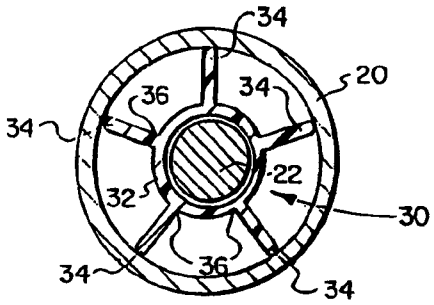


FIG. 2

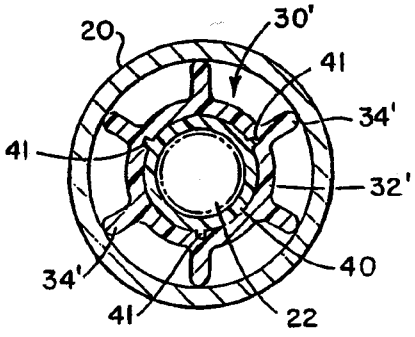


FIG. 4

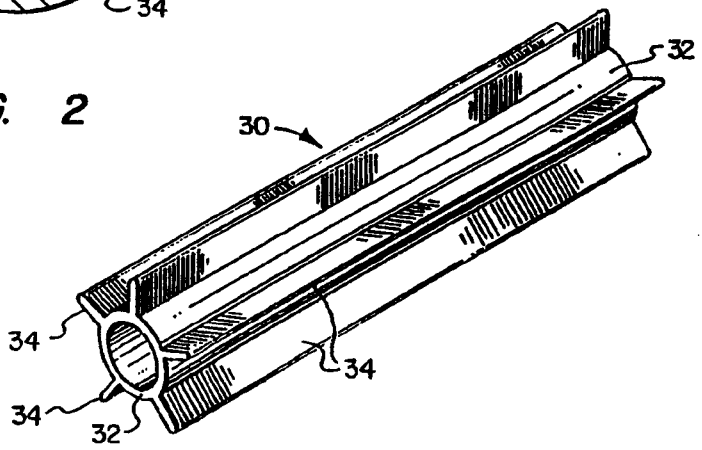


FIG. 3

COAXIAL DRIVE CABLE CENTERING APPARATUS

This application is a continuation-in-part of now abandoned application Ser. No. 07/212,077, filed Jun. 22, 1988, which was a continuation of now abandoned application Ser. No. 06/786,146, filed Oct. 8, 1985, which was a continuation of now abandoned application Ser. No. 06/496,826, filed May 25, 1983.

FIELD OF THE INVENTION

The present invention relates to a device for concentrically centering a flexible torque transmitting drive cable for rotation within a cylindrical cable housing, and more particularly to an apparatus of this sort having a plurality of fins extending radially from a cylindrical sleeve portion to engage the inner surface of the cylindrical drive cable housing in order to retain the drive cable in concentric rotation with the cylindrical housing.

DESCRIPTION OF THE PRIOR ART

Frequently, in applications utilizing a flexible, torque transmitting rotary drive cable, the housing for such cable is also a structural member of the particular device interconnecting the drive and the driven members, and as such, is necessarily a larger and heavier member and has a much larger inside diameter than the outside diameter of the flexible drive cable. In devices such as this, when an excessive amount of torque is applied to the driven end of the cable, the drive cable tends to buckle and otherwise twist from a normally linear centerline or axis of rotation (or alternatively, an axis of rotation having a smooth, uninterrupted curved centerline) to a spiraled axis of rotation, the deviation from the normal centerline being limited by the distance relationship between the outside diameter of the drive cable and the inside diameter of the structural cable housing. This construction has obvious disadvantages in the form of excessive flexing of the drive cable causing accelerated material fatigue thereof. Additionally, when the drive cable buckles at high speed rotation, the "chattering" of the drive cable within the housing creates excessive friction between the rotating cable and the housing which tends to shorten the useful life of the drive cable and housing.

Attempts have been made to lessen this adverse effect by enclosing the torque transmitting drive cable within a non-metallic coaxial conduit. This has had a minimal positive effect in preventing the drive cable from "whipping" about within the structural housing, but for the most part, has been effective in reducing the noise generated by the cable rotating within the housing. Further attempts to stabilize the center of rotation of the drive cable within the housing have been in the form of periodic spacer elements positioned about the non-metallic sleeve intermittently along the length of the interface between the drive cable and the cable housing. These intermittently spaced spacer elements have also helped somewhat by drastically changing the period of resonant frequency of vibration of the drive cable as it rotates within the housing. However, during use, unless these various spacers are permanently affixed to the non-metallic drive cable sleeve, they will slide axially along the sleeve, thereby negativing any positive effect that they otherwise would have.

It is therefore an object of the present invention to provide improved apparatus for centering a flexible torque transmitting drive cable for concentric rotation within a cylindrical shaft housing that retains the drive cable concentric throughout its entire length against the natural tendency of the drive cable to buckle and twist when subjected to excessive torque.

SUMMARY OF THE INVENTION

The present invention provides apparatus for centering a flexible torque transmitting drive cable for concentric rotation within a cylindrical cable housing. The centering apparatus comprises a cylindrical sleeve portion which is adapted to receive the drive cable for rotation therein. The cylindrical sleeve portion is formed with a plurality of support members extending normal from the surface thereof (i.e., radially from a theoretical geometric center of the cylindrical sleeve portion) in a manner to engage the inside cylindrical surface of the drive cable housing to retain the cylindrical sleeve portion (and thus the torque transmitting drive cable) in continuous uniform coaxial alignment with the cylindrical drive cable housing.

The rotating drive cable is fully supported along its entire length within the cable housing by the centering apparatus of the invention to prevent the drive cable from buckling or otherwise twisting under excessive torque. In accordance with a first preferred embodiment of the invention, the centering apparatus is of uniform construction along its entire length. In accordance with an alternate embodiment, the centering apparatus is formed of an inner sleeve of one durometer hardness and an outer, finned sheath of a different durometer hardness, the dual durometer construction maintaining required wear resistance, heat resistance and rigidity, while at the same time being effective to reduce effects of vibration.

BRIEF DESCRIPTION OF THE DRAWINGS

For a detailed description of the preferred embodiments of the invention, reference is made to the accompanying drawings in which:

FIG. 1 is an orthographic front view of a device that utilizes the coaxial drive cable centering apparatus of the present invention;

FIG. 2 is a cross sectional view of the coaxial drive cable centering apparatus as used in the device in FIG. 1, taken along lines 2—2 in FIG. 1;

FIG. 3 is a pictorial view of Just a length of the coaxial drive cable centering apparatus of the present invention, it of course being understood that the entire length of the centering apparatus extends the entire length of the cable housing; and

FIG. 4 is a depiction of an alternate embodiment of the coaxial drive centering apparatus of the invention in a cross sectional view similar to that shown in FIG. 2.

DETAILED DESCRIPTION OF THE INVENTION

Turning now to the drawings, wherein like parts are indicated throughout the specification and drawings with the same reference numerals, and more specifically to FIG. 1, a mechanical device utilizing the coaxial drive cable centering apparatus of the present invention is shown. In this particular application, the device 10 takes the form of a portable sling-held type lawn mowing and edging tool. This mowing and edging tool 10 comprises a motor driving unit 12, which may be either

gasoline powered or electric (a gasoline powered motor is shown in FIG. 1), which is connected to a driven unit 14 comprising a rotary head 16 having a flexible cutting line 18 affixed thereto for rotating with the head in a manner to cut or trim grass, weeds, etc. along sidewalks, around trees and poles, etc., generally where conventional rigid cutting elements may not be used.

The motor driving unit 12 and the driven unit 14 are interconnected by a casing 20 which, as shown in FIG. 1, takes the form of a cylindrical housing wherein a flexible torque transmitting drive cable is rotatably housed for transmitting rotational movement from the motor driving unit to the driven unit, and ultimately to the flexible cutting line 18. This flexible torque transmitting drive cable is best shown in FIG. 2 at 22 to be concentrically positioned within the casing 20. The lawn mowing and edging tool 10 also includes a handle 24 and a strap device 26 for enabling an operator to manually move the device about and cut or trim around curbs, trees, walls, etc., as desired.

With this background in mind, reference is now made to FIG. 3, wherein a length of the coaxial drive cable centering apparatus of the present invention is shown, generally illustrated by the numeral 30. Only a short section of the cable centering apparatus 30 is shown in FIG. 3, with the understanding that when used with the mowing and edging tool 10 of FIG. 1, the cable centering apparatus extends the entire length of the casing 20 from the motor driving unit 12 to the driven unit 14.

Returning again to FIG. 3, the coaxial drive cable centering apparatus 30 of the present invention is shown to comprise a cylindrical sleeve portion 32, to which are attached, or preferably formed therewith, a plurality of radially extending support members 34, commonly called fins. These support members or fins 30 extend normally from the outer surface of the cylindrical sleeve portion 32. Alternately stated, these support members 34 extend radially from the theoretical geometric center of the cylindrical sleeve portion 32, each fin defining a plane passing through the theoretical geometrical centerline of the cylindrical sleeve. In this preferred embodiment, it has been determined that five support members or fins 34 are sufficient to retain the cylindrical sleeve portion 32 in concentric relationship with the flexible drive cable housing 20 (see FIG. 2). It is to be understood, however, that any number of fins 34 in excess of two may be utilized in the instant invention without departing from the spirit and scope of the invention as set forth in the appended claims.

Referring now to FIG. 2, the coaxial drive cable centering apparatus 30 of the present invention is shown in section in functional position within the flexible drive cable housing 20. Also shown is the flexible torque transmitting drive cable 22 which rotatably connects the motor driving unit 12 with the driven unit 14 of the lawn mowing and edging tool shown in FIG. 1. Each of the radially extending support members 34 comprises a fin extending normal to the outer surface of the cylindrical sleeve 32 at their respective points of union 36. As shown, each of these fins 34 comprises an elongate plane of uniform thickness across the entire surface area thereof. As shown, the thickness of these radially extending fins 34 approximates, but is not greater than, the thickness of the wall of the cylindrical sleeve 32.

As best shown in FIG. 2, the coaxial drive cable centering apparatus 10 of the present invention is positioned within the flexible drive cable housing 20, and the flexible torque transmitting drive cable 22 is then positioned concentrically within the cylindrical sleeve 32 for functional rotation therein. It will be appreciated that in this preferred embodiment of the present invention, the diametrical tolerances of the cable centering apparatus are determined by both the particular application and the particular method of installing the device within a metallic structural cable housing 20. By maintaining dimensional tolerances of the centering apparatus 30, and specifically the theoretical outside diameter thereof, the coaxial drive cable centering apparatus 30 is preferably constrained against any rotational movement within the cable housing 20, in order to more effectively maintain the concentric relationship of the cylindrical sleeve portion 32 (and therefore the flexible torque transmitting drive cable 22) relative to the flexible drive cable housing. In this regard, it should also be noted that the inside diameter of the cylindrical sleeve portion 32 is slightly larger than the outside diameter of the flexible torque transmitting drive cable 22 in order to permit free rotation of the drive cable within the sleeve.

It will be appreciated by those skilled in the art that the instant coaxial drive cable centering apparatus maintains the drive cable 22 in concentric relationship with the cable housing 20 throughout the entire length of the cable housing. This is especially important when, as shown in FIG. 1, the cable housing 20 is curved in order to direct or otherwise change the axis of rotation of the flexible cutting line 18 about the rotary head 16, relative to the axis of rotation of the driving member (not shown) of the motor driving unit 12. Those skilled in the art will also appreciate that the plurality of radially extending support members 34 function to maintain this relative concentricity even through extreme curvatures of the flexible drive cable housing 20 having a relatively short radius of curvature as shown in the device depicted in FIG. 1.

It should be pointed out that because the coaxial drive cable centering apparatus of the present invention extends the entire distance between the motor driving unit 12 and the driven unit 14, the flexible torque transmitting drive cable 22 is totally supported throughout its entire length, thereby maintaining uniform concentricity of the drive cable within the cable housing, even under extreme conditions of high speed rotation of the drive cable.

Additionally, it is contemplated that the present invention could also be formed with a second, outer cylindrical sleeve concentric with the inner cylindrical sleeve 32, and formed with the outer edges of the radially extending fins 34.

In one preferred embodiment, the coaxial drive cable centering apparatus of the present invention is formed entirely of a flexible, yet structurally stable material, such as nylon. Additionally, the cable centering apparatus is formed by extruding the apparatus in continuous length, thereafter cutting the apparatus to length for the particular application. Of course, the coaxial drive cable centering apparatus may be formed of any other comparable material, and may be formed by bonding the plurality of fins to the cylindrical sleeve portion as necessary. It is to be understood that the product of such manufacturing process is to be considered well within the scope of the instant invention.

In accordance with an alternate embodiment of the coaxial drive cable centering apparatus of the present invention, and with reference now to FIG. 4, the centering apparatus of this alternate construction (now designated for comparison by reference number 30') is

comprised, as previously described, of an elongated cylindrical sleeve 32' having a similar configuration as the sleeve 32 depicted in FIG. 3, but in this embodiment having an equal number, specifically six, radially disposed, circumferentially resilient fins 34'. In addition, however, an inner sleeve or sheath 40 is provided at, and along the entire length of, the inner circumference of outer sleeve 32', the sheath 40 being suitably interlocked with the sleeve 32' to prevent relative rotation therebetween. In the example depicted, this is accomplished by radially projecting and symmetrically disposed bosses 41' received in corresponding notches in the sleeve 32' preferably at the location of three of the fins 34'.

In accordance with a unique feature of this embodiment, the outer sleeve 32' is formed of a lower durometer hardness material than the durometer hardness of the inner sleeve 40'. For example, the sleeve 40 can be formed of nylon having a durometer hardness of at least Rockwell No. R78, while the sleeve 32 may be formed of a polyolefin material having a durometer hardness, preferably between Shore No. A90 and Shore No. D65, but no more than Rockwell No. R70. In one embodiment, the sleeve 40 was formed of a hardness of approximately Rockwell No. R108, and the sleeve 32 was of a durometer hardness of approximately Rockwell No. R65. Due to this dual durometer construction, the overall desired rigidity, high wear, heat resistance and self lubrication necessary for the long wear and effective functionality of the coaxial drive centering apparatus is provided by inner sleeve 40, while the outer sheath 32', being of a lower durometer hardness, has been determined to be effective in dampening the effects of vibration and resulting noise resulting from the cable rotation.

Those skilled in the art will readily appreciate that the overall designs of each of the disclosed embodiments of the coaxial drive cable centering apparatus of the present invention are particularly advantageous for use in connection with a portable sling-held type lawn mowing and edging tool, as shown in FIG. 1, for example.

Although preferred embodiments of the present invention have been disclosed in detail herein, it should be understood that various substitutions and modifications may be made to such preferred embodiments without departing from the scope and spirit of the present invention as recited in the appended claims.

What is claimed is:

1. In combination with rotary power transmitting apparatus of the type including drive means, means to be rotatably driven, and a flexible, torque transmitting cable between said drive means and said rotatably driven means mounted for rotation within a generally cylindrical shaped cable housing, a flexible centering device extending through said cable housing for concentrically centering said cable with respect to said cable housing, said centering device comprising:

an elongated sleeve defining a cylindrical passageway through which said cable passes, the interior wall portion of said passageway having a continuous, circular cross-section, and

a plurality of radially extending fins integrally formed with said elongated sleeve and extending radially outward from said elongated sleeve a sufficient distance to contact the interior surface of said cable housing solely at the outer ends of said fins and to concentrically center said cylindrical passageway with respect to the interior of said cable housing,

said fins defining spaces between each other and between the interior surface of said cable housing and said elongated sleeve,

the wall thickness of said fins being approximately equal to the wall thickness of said elongated sleeve, and

said fins being unconnected with one another at their outer ends;

said centering device being dimensionally formed to be constrained against rotational movement within said cable housing.

2. The flexible centering device as set forth in claim 1 wherein said elongated sleeve extends the entire length of said cable housing.

3. The flexible centering device as set forth in claim 1 wherein each of said fins is of uniform thickness.

4. The flexible centering device as set forth in claim where said flexible centering device is of nylon.

5. In combination:

(a) power drive means, means driven by said power drive means, and a flexible, drive cable coupling said driven means with said power drive means;

(b) an elongated cable housing extending between said power drive means and said driven means, said drive cable extending through said cable housing;

(c) a flexible centering device extending through, and being dimensionally formed to be constrained against rotational movement with respect to, said cable housing for essentially concentrically centering said cable with respect to said cable housing, said centering device comprising:

(i) an elongated nylon sleeve defining an essentially cylindrical shaped passageway through which said cable passes, the interior wall portion of said sleeve having a continuous, circular cross-section, and

(ii) a plurality of radially extending fins formed with said elongated sleeve and extending radially outward from said elongated sleeve a sufficient distance to contact the interior surface of said cable housing solely at the outer ends of said fins and to concentrically center said essentially cylindrical shaped passageway with respect to the interior of said cable housing,

(iii) said fins defining spaces between each other and between the interior surface of said cable housing and said elongated sleeve, and

(iv) said fins being unconnected with one another at their outer ends.

6. The combination as set forth in claim 5 wherein said elongated cable housing has an arcuate bend between said power drive means and said driven means, and said flexible centering device maintains the essential concentrical centering of said cable along said bend.

7. The combination as set forth in claim 5 wherein the wall thickness of each of said fins is approximately equal to the wall thickness of said elongated sleeve.

* * * * *

UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION

PATENT NO. : 5,364,307

DATED : November 15, 1994

INVENTOR(S) : John E. Shaulis

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Column 6, line 22, after "claim" insert -- 1 --

Signed and Sealed this

Eleventh Day of April, 1995

Attest:

BRUCE LEHMAN

Attesting Officer

Commissioner of Patents and Trademarks

EXHIBIT B

US005599233A

United States Patent [19]

Shaulis

[11] **Patent Number: 5,599,233**

[45] **Date of Patent: *Feb. 4, 1997**

[54] **COAXIAL DRIVE CABLE CENTERING APPARATUS**

[75] Inventor: **John E. Shaulis**, Carrollton, Tex.

[73] Assignee: **Vinylex Corporation**, Knoxville, Tenn.

[*] Notice: The term of this patent shall not extend beyond the expiration date of Pat. No. 5,364,307.

[21] Appl. No.: **290,542**

[22] Filed: **Aug. 15, 1994**

Related U.S. Application Data

[63] Continuation of Ser. No. 509,893, Apr. 16, 1990, Pat. No. 5,364,307, which is a continuation-in-part of Ser. No. 212,077, Jun. 28, 1988, abandoned, which is a continuation of Ser. No. 786,146, Oct. 8, 1985, abandoned, which is a continuation of Ser. No. 496,826, May 23, 1983, abandoned.

[51] **Int. Cl.**[6] **A01G 3/06**; F16C 1/06

[52] **U.S. Cl.** **464/52**; 30/276; 56/12.7

[58] **Field of Search** 464/52, 81, 112, 464/181, 182, 183; 138/38, 108; 30/276; 56/12.7

[56] **References Cited**

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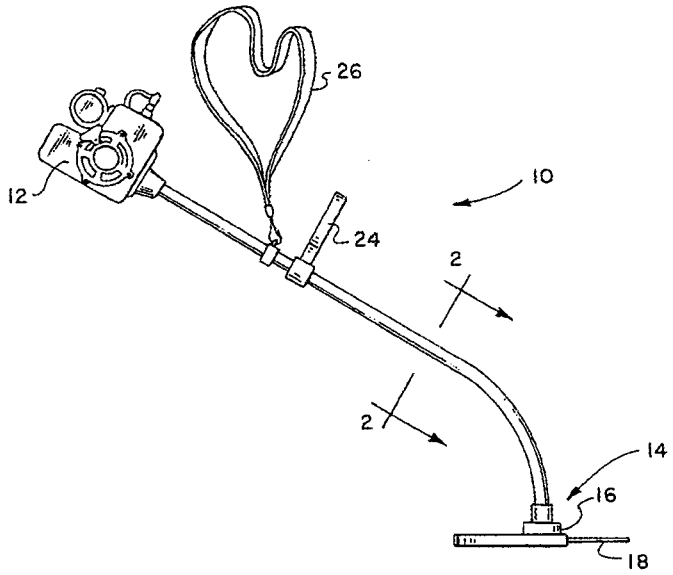
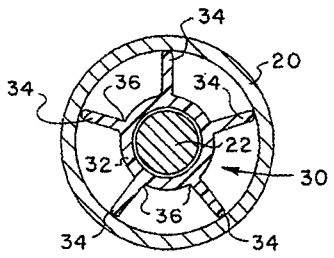
Primary Examiner—Daniel P. Stodola
Assistant Examiner—William A. Rivera
Attorney, Agent, or Firm—Akin, Gump, Strauss, Hauer & Feld, L.L.P.

[57] **ABSTRACT**

Flexible centering apparatus for centering a flexible drive cable within a cylindrial cable housing, the centering apparatus formed of an elongated finned sleeve in which radially disposed fins engage the cable housing, the fins being free and unattached at their outer ends. In one embodiment, the centering apparatus is of uniform construction; in another embodiment, the centering apparatus is of dual durometer construction.

4 Claims, 1 Drawing Sheet





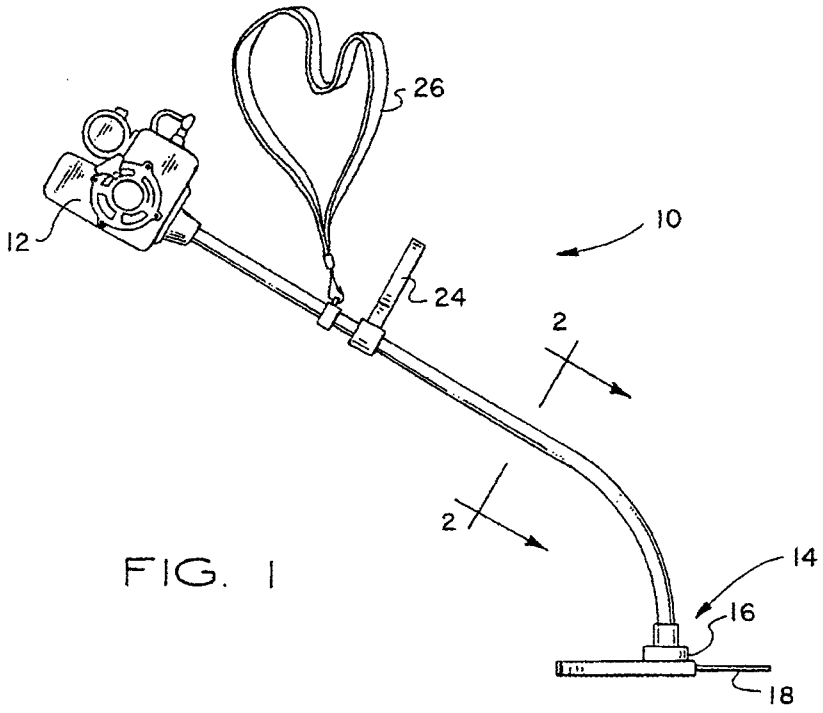


FIG. 1

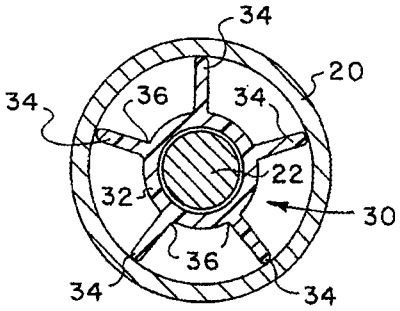


FIG. 2

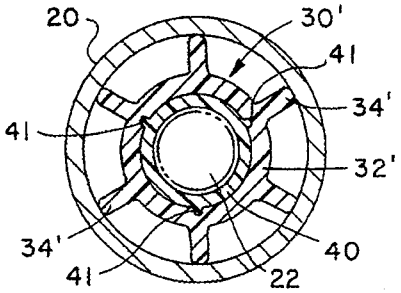


FIG. 4

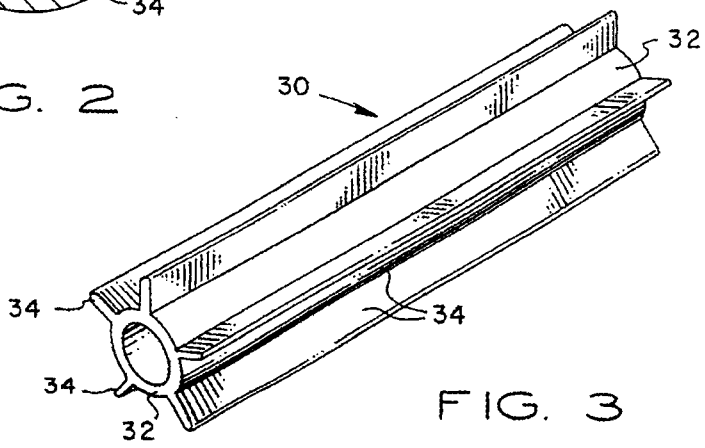


FIG. 3

COAXIAL DRIVE CABLE CENTERING APPARATUS

This is a continuation application of Ser. No. 07/509,893, filed Apr. 16, 1990, now U.S. Pat. No. 5,364,307, which was a continuation-in-part of now abandoned application Ser. No. 07/212,077, filed Jun. 28, 1988, which was a continuation of now abandoned application Ser. No. 06/786,146, filed Oct. 8, 1985, which was a continuation of now abandoned application Ser. No. 06/496,826, filed May 23, 1983.

FIELD OF THE INVENTION

The present invention relates to a device for concentrically centering a flexible torque transmitting drive cable for rotation within a cylindrical cable housing, and more particularly to an apparatus of this sort having a plurality of fins extending radially from a cylindrical sleeve portion to engage the Inner surface of the cylindrical drive cable housing in order to retain the drive cable in concentric rotation with the cylindrical housing.

DESCRIPTION OF THE PRIOR ART

Frequently, in applications utilizing a flexible, torque transmitting rotary drive cable, the housing for such cable is also a structural member of the particular device interconnecting the drive and the driven members, and as such, is necessarily a larger and heavier member and has a much larger inside diameter than the outside diameter of the flexible drive cable. In devices such as this, when an excessive amount of torque is applied to the driven end of the cable, the drive cable tends to buckle and otherwise twist from a normally linear centerline or axis of rotation (or alternatively, an axis of rotation having a smooth, uninterrupted curved centerline) to a spiraled axis of rotation, the deviation from the normal centerline being limited by the distance relationship between the outside diameter of the drive cable and the inside diameter of the structural cable housing. This construction has obvious disadvantages in the form of excessive flexing of the drive cable causing accelerated material fatigue thereof. Additionally, when the drive cable buckles at high speed rotation, the "chattering" of the drive cable within the housing creates excessive friction between the rotating cable and the housing which tends to shorten the useful life of the drive cable and housing.

Attempts have been made to lessen this adverse effect by enclosing the torque transmitting drive cable within a non-metallic coaxial conduit. This has had a minimal positive effect in preventing the drive cable from "whipping" about within the structural housing, but for the most part, has been effective in reducing the noise generated by the cable rotating within the housing. Further attempts to stabilize the center of rotation of the drive cable within the housing have been in the form of periodic spacer elements positioned about the non-metallic sleeve intermittently along the length of the interface between the drive cable and the cable housing. These intermittently spaced spacer elements have also helped somewhat by drastically changing the period of resonant frequency of vibration of the drive cable as it rotates within the housing. However, during use, unless these various spacers are permanently affixed to the non-metallic drive cable sleeve, they will slide axially along the sleeve, thereby negativing any positive effect that they otherwise would have.

It is therefore an object of the present invention to provide improved apparatus for centering a flexible torque transmitting drive cable for concentric rotation within a cylindrical shaft housing that retains the drive cable concentric throughout its entire length against the natural tendency of the drive cable to buckle and twist when subjected to excessive torque.

SUMMARY OF THE INVENTION

The present invention provides apparatus for centering a flexible torque transmitting drive cable for concentric rotation within a cylindrical cable housing. The centering apparatus comprises a cylindrical sleeve portion which is adapted to receive the drive cable for rotation therein. The cylindrical sleeve portion is formed with a plurality of support members extending normal from the surface thereof (i.e., radially from a theoretical geometric center of the cylindrical sleeve portion) in a manner to engage the inside cylindrical surface of the drive cable housing to retain the cylindrical sleeve portion (and thus the torque transmitting drive cable) in continuous uniform coaxial alignment with the cylindrical drive cable housing.

The rotating drive cable is fully supported along its entire length within the cable housing by the centering apparatus of the invention to prevent the drive cable from buckling or otherwise twisting under excessive torque. In accordance with a first preferred embodiment of the invention, the centering apparatus is of uniform construction along its entire length. In accordance with an alternate embodiment, the centering apparatus is formed of an inner sleeve of one durometer hardness and an outer, finned sheath of a different durometer hardness, the dual durometer construction maintaining required wear resistance, heat resistance and rigidity, while at the same time being effective to reduce effects of vibration.

BRIEF DESCRIPTION OF THE DRAWINGS

For a detailed description of the preferred embodiments of the invention, reference is made to the accompanying drawings in which:

FIG. **1** is an orthographic front view of a device that utilizes the coaxial drive cable centering apparatus of the present invention;

FIG. **2** is a cross sectional view of the coaxial drive cable centering apparatus as used in the device in FIG. **1**, taken along lines **2—2** in FIG. **1**;

FIG. **3** is a pictorial view of Just a length of the coaxial drive cable centering apparatus of the present invention, it of course being understood that the entire length of the centering apparatus extends the entire length of the cable housing; and

FIG. **4** is a depiction of an alternate embodiment of the coaxial drive centering apparatus of the invention in a cross sectional view similar to that shown in FIG. **2**.

DETAILED DESCRIPTION OF THE INVENTION

Turning now to the drawings, wherein like parts are indicated throughout the specification and drawings with the same reference numerals, and more specifically to FIG. **1**, a mechanical device utilizing the coaxial drive cable centering apparatus of the present invention is shown. In this particular application, the device **10** takes the form of a portable sling-held type lawn mowing and edging tool. This mowing

and edging tool **10** comprises a motor driving unit **12**, which may be either gasoline powered or electric (a gasoline powered motor is shown in FIG. **1**), which is connected to a driven unit **14** comprising a rotary head **16** having a flexible cutting line **18** affixed thereto for rotating with the head in a manner to cut or trim grass, weeds, etc. along sidewalks, around trees and poles, etc. , generally where conventional rigid cutting elements may not be used.

The motor driving unit **12** and the driven unit **14** are interconnected by a casing **20** which, as shown in FIG. **1**, takes the form of a cylindrical housing wherein a flexible torque transmitting drive cable is rotatably housed for transmitting rotational movement from the motor driving unit to the driven unit, and ultimately to the flexible cutting line **18**. This flexible torque transmitting drive cable is best shown in FIG. **2** at **22** to be concentrically positioned within the casing **20**. The lawn mowing and edging tool **10** also includes a handle **24** and a strap device **26** for enabling an operator to manually move the device about and cut or trim around curbs, trees, walls, etc., as desired.

With this background in mind, reference is now made to FIG. **3**, wherein a length of the coaxial drive cable centering apparatus of the present invention is shown, generally illustrated by the numeral **30**. Only a short section of the cable centering apparatus **30** is shown in FIG. **3**, with the understanding that when used with the mowing and edging tool **10** of FIG. **1**, the cable centering apparatus extends the entire length of the casing **20** from the motor driving unit **12** to the driven unit **14**.

Returning again to FIG. **3**, the coaxial drive cable centering apparatus **30** of the present invention is shown to comprise a cylindrical sleeve portion **32**, to which are attached, or preferably formed therewith, a plurality of radially extending support members **34**, commonly called fins. These support members or fins **34** extend normally from the outer surface of the cylindrical sleeve portion **32**. Alternately stated, these support members **34** extend radially from the theoretical geometric center of the cylindrical sleeve portion **32**, each fin defining a plane passing through the theoretical geometrical centerline of the cylindrical sleeve. In this preferred embodiment, it has been determined that five support members or fins **34** are sufficient to retain the cylindrical sleeve portion **32** in concentric relation ship with the flexible drive cable housing **20** (see FIG. **2**). It is to be understood, however, that any number of fins **34** in excess of two may be utilized in the instant invention without departing from the spirit and scope of the invention as set forth in the appended claims.

Referring now to FIG. **2**, the coaxial drive cable centering apparatus **30** of the present invention is shown in section in functional position within the flexible drive cable housing **20**. Also shown is the flexible torque transmitting drive cable **22** which rotatably connects the motor driving unit **12** with the driven unit **14** of the lawn mowing and edging tool shown in FIG. **1**. Each of the radially extending support members **34** comprises a fin extending normal to the outer surface of the cylindrical sleeve **32** at their respective points of union **36**. As shown, each of these fins **34** comprises an elongate plane of uniform thickness across the entire surface area thereof. As shown, the thickness of these radially extending fins **34** approximates, but is not greater than, the thickness of the wall of the cylindrical sleeve **32**.

As best shown in FIG. **2**, the coaxial drive cable centering apparatus **10** of the present invention is positioned within the flexible drive cable housing **20**, and the flexible torque transmitting drive cable **22** is then positioned concentrically within the cylindrical sleeve **32** for functional rotation therein. It will be appreciated that in this preferred embodiment of the present invention, the diametrical tolerances of the cable centering apparatus are determined by both the particular application and the particular method of installing the device within a metallic structural cable housing **20**. By maintaining dimensional tolerances of the centering apparatus **30**, and specifically the theoretical outside diameter thereof, the coaxial drive cable centering apparatus **30** is preferably constrained against any rotational movement within the cable housing **20**, in order to more effectively maintain the concentric relationship of the cylindrical sleeve portion **32** (and therefore the flexible torque transmitting drive cable **22**) relative to the flexible drive cable housing. In this regard, it should also be noted that the inside diameter of the cylindrical sleeve portion **32** is slightly larger than the outside diameter of the flexible torque transmitting drive cable **22** in order to permit free rotation of the drive cable within the sleeve.

It will be appreciated by those skilled in the art that the instant coaxial drive cable centering apparatus maintains the drive cable **22** in concentric relationship with the cable housing **20** throughout the entire length of the cable housing. This is especially important when, as shown in FIG. **1**, the cable housing **20** is curved in order to direct or otherwise change the axis of rotation of the flexible cutting line **18** about the rotary head **16**, relative to the axis of rotation of the driving member (not shown) of the motor driving unit **12**. Those skilled in the art will also appreciate that the plurality of radially extending support members **34** function to maintain this relative concentricity even through extreme curvatures of the flexible drive cable housing **20** having a relatively short radius of curvature as shown in the device depicted in FIG. **1**.

It should be pointed out that because the coaxial drive cable centering apparatus of the present invention extends the entire distance between the motor driving unit **12** and the driven unit **14**, the flexible torque transmitting drive cable **22** is totally supported throughout its entire length, thereby maintaining uniform concentricity of the drive cable within the cable housing, even under extreme conditions of high speed rotation of the drive cable.

Additionally, it is contemplated that the present invention could also be formed with a second, outer cylindrical sleeve concentric with the inner cylindrical sleeve **32**, and formed with the outer edges of the radially extending fins **34**.

In one preferred embodiment, the coaxial drive cable centering apparatus of the present invention is formed entirely of a flexible, yet structurally stable material, such as nylon. Additionally, the cable centering apparatus is formed by extruding the apparatus in continuous length, thereafter cutting tile apparatus to length for the particular application. Of course, the coaxial drive cable centering apparatus may be formed of any other comparable material, and may be formed by bonding the plurality of fins to the cylindrical sleeve portion as necessary. It is to be understood that the product of such manufacturing process is to be considered well within the scope of the instant invention.

In accordance with an alternate embodiment of the coaxial drive cable centering apparatus of the present invention, and with reference now to FIG. **4**, the centering apparatus of this alternate construction (now designated for comparison by reference number **30'**) is comprised, as previously described, of an elongated cylindrical sleeve **32'** having a similar configuration as the sleeve **32** depicted in FIG. **3**, but in this embodiment having an equal number,

specifically six, radially disposed, circumferentially resilient fins **34'**. In addition, however, an inner sleeve or sheath **40** is provided at, and along the entire length of, the inner circumference of outer sleeve **32'**, the sheath **40** being suitably interlocked with the sleeve **32'** to prevent relative rotation therebetween. In the example depicted, this is accomplished by radially projecting the symmetrically disposed bosses **41** received in corresponding notches in the sleeve **32'** preferably at the location of three of the fins **34'**.

In accordance with a unique feature of this embodiment, the outer sleeve **32'** is formed of a lower durometer hardness material than the durometer hardness of the inner sleeve **40**. For example, the sleeve **40** can be formed of nylon having a durometer hardness of at least Rockwell No. R78, while the sleeve **32** may be formed of a polyolefin material having a durometer hardness, preferably between Shore No. A90 and Shore No. D65, but no more than Rockwell No. R70. In one embodiment, the sleeve **40** was formed of a hardness of approximately Rockwell No. R108, and the sleeve **32** was of a durometer hardness of approximately Rockwell No. R65. Due to this dual durometer construction, the overall desired rigidity, high wear, heat resistance and self lubrication necessary for the long wear and effective functionality of the coaxial drive centering apparatus is provided by inner sleeve **40**, while the outer sheath **32'**, being of a lower durometer hardness, has been determined to be effective in dampening the effects of vibration and resulting noise resulting from the cable rotation.

Those skilled in the art will readily appreciate that tile overall designs of each of the disclosed embodiments of the coaxial drive cable centering apparatus of the present invention are particularly advantageous for use in connection with a portable sling-held type lawn mowing and edging tool, as shown in FIG. **1**, for example.

Although preferred embodiments of the present invention have been disclosed in detail herein, it should be understood that various substitutions and modifications may be made to such preferred embodiments without departing from the scope and spirit of the present invention as recited in the appended claims.

What is claimed is:

1. In combination with rotary power transmitting apparatus of the type including drive means, means for being rotatably driven by said drive means, and a flexible, torque transmitting cable between and operably connected to said drive means and said rotatably driven means and mounted for rotation within a generally cylindrical shaped cable housing, said drive means rotating said cable and thereby said rotatably driven means, a flexible centering device extending through said cable housing for concentrically centering said cable with respect to said cable housing, said centering device comprising:

an elongated sleeve defining a generally circular cylindrical passage-way through which said cable passes, said cable being supported by said elongated sleeve in said cylindrical passageway for rotation relative to said elongated sleeve and

a plurality of fins extending radially outwardly from said elongated sleeve and with respect to said cylindrical passageway a sufficient distance to contact the interior surface of said cable housing solely at the outer ends of said fins and to concentrically center said cylindrical passageway with respect to the interior of said cable housing,

adjacent ones of said fins defining a space between one another and between the interior surface of said cable housing and said elongated sleeve,

said fins being unconnected with one another at their outer ends,

said fins each extending continuously longitudinally over a major portion of the length of said elongated sleeve,

said centering device being dimensionally formed to be constrained against rotational movement within said cable housing.

2. In combination with rotary power transmitting apparatus of the type including drive means, means for being rotatably driven by said drive means, and a flexible, torque transmitting cable between and operably connected to said drive means and said rotatably driven means and mounted for rotation within a generally cylindrical shaped cable housing, said drive means rotating said cable and thereby said rotatably driven means, a flexible spacing device extending through said cable housing for spacing said cable from said cable housing, said spacing device comprising:

an elongated sleeve member defining a generally circular cylindrically shaped passageway through which said cable passes, said cable being supported by said elongated sleeve member in said cylindrical passageway for rotation relative to said elongated sleeve member, and

a plurality of projections extending radially outwardly from said elongated sleeve member and with respect to said cylindrical passageway to contact the interior surface of said cable housing, said projections defining respective spaces between one another and the cable housing and each of said projections extending substantially continuously longitudinally over a major portion of the entire length of said elongated sleeve.

3. The combination as set forth in claim **2** wherein said elongated sleeve member comprises a single sleeve of uniform construction.

4. In combination:

(a) power drive means, means for being driven by said power drive means, and a flexible, drive cable coupling said driven means with said power drive means, said power drive means rotating said cable and thereby said driven means;

(b) an elongated cable housing extending between said power drive means and said driven means, said cable extending through said cable housing;

(c) a flexible centering device extending through said cable housing for essentially concentrically centering said cable with respect to said cable housing, said centering device comprising:

(i) an elongated sleeve member defining a generally circular cylindrically shaped passageway through which said cable passes, said cable being supported by said elongated sleeve member in said passageway for rotation relative to said elongated sleeve member, said elongated sleeve member having an interior wall portion of generally continuous, circular cross-section, and

(ii) a plurality of spaced apart fins external to said elongated sleeve member and extending radially outwardly therefrom to contact the interior surface of said cable housing at the outer ends of said fins while the cable is essentially centered within the cable housing but adapted to engage only the interior wall portion of said elongated sleeve member, each of said fins extending substantially continuously longitudinally over a major portion of the length of said elongated sleeve member.

* * * * *

ORIGINAL

CIVIL COVER SHEET

The JS-44 civil cover sheet and the information contained herein neither replace nor supplement the filing and service of pleadings or other papers as required by law, except as provided by local rules of court. This form, approved by the Judicial Conference of the United States in September 1974, is required for the use of the Clerk of Court for the purpose of initiating the civil docket sheet. (SEE INSTRUCTIONS ON THE REVERSE OF THE FORM.)

I. (a) PLAINTIFFS

Vinylex Corporation

(b) COUNTY OF RESIDENCE OF FIRST LISTED PLAINTIFF _____
(EXCEPT IN U.S. PLAINTIFF CASES)

DEFENDANTS

Black & Decker (U.S.) Inc. and Kawasaki Motors Corp. U.S.A.

COUNTY OF RESIDENCE OF FIRST LISTED DEFENDANT _____
(IN U.S. PLAINTIFF CASES ONLY)
NOTE: IN LAND CONDEMNATION CASES, USE THE LOCATION OF THE TRACT OF LAND INVOLVED.

(c) ATTORNEYS (FIRM NAME, ADDRESS, AND TELEPHONE NUMBER)

John P. Pinkerton, Gardere Wynne Sewell LLP, Suite 3000, 1601 Elm Street, Dallas, Texas 75201 (214) 999-3000

ATTORNEYS (IF KNOWN)

3-08CV0672-K

II. BASIS OF JURISDICTION (PLACE AN "X" IN ONE BOX ONLY)

- ☐ 1 U.S. Government Plaintiff
- X 3 Federal Question (U.S. Government Not a Party)
- ☐ 2 U.S. Government Defendant
- ☐ 4 Diversity (Indicate Citizenship of Parties in Item III)

III. CITIZENSHIP OF PRINCIPAL PARTIES (For Diversity Cases Only) (PLACE AN "X IN ONE BOX FOR PLAINTIFF AND ONE BOX FOR DEFENDANT)

	PTF	DEF		PTF	DEF
Citizen of This State	☐ 1	☐ 1	Incorporated *or* Principal Place of Business In This State	☐ 4	☐ 4
Citizen of Another State	☐ 2	☐ 2	Incorporated *and* Principal Place of Business In Another State	☐ 5	☐ 5
Citizen or Subject of a Foreign Country	☐ 3	☐ 3	Foreign Nation	☐ 6	☐ 6

IV. ORIGIN (PLACE AN "X" IN ONE BOX ONLY)

X 1 Original Proceeding | ☐ 2 Removed from State Court | ☐ 3 Remanded from Appellate Court | ☐ 4 Reinstated or Reopened | ☐ 5 Transferred from another district (specify) | ☐ 6 Multidistrict Litigation | ☐ 7 Appeal to District Judge from Magistrate Judgment

V. NATURE OF SUIT (PLACE AN "X" IN ONE BOX ONLY)

CONTRACT
- ☐ 110 Insurance
- ☐ 120 Marine
- ☐ 130 Miller act
- ☐ 140 Negotiable Instrument
- ☐ 150 Recovery of Overpayment & Enforcement of Judgment
- ☐ 151 Medicare Act
- ☐ 152 Recovery of Defaulted Student Loans (Excl. Veterans)
- ☐ 153 Recovery of Overpayment of Veteran's Benefits
- ☐ 160 Stockholder's Suits
- ☐ 190 Other Contract
- ☐ 195 Contract Product Liability

TORTS

PERSONAL INJURY
- ☐ 310 Airplane
- ☐ 315 Airplane Product Liability
- ☐ 320 Assault, Libel & Slander
- ☐ 330 Federal Employers' Liability
- ☐ 340 Marine
- ☐ 345 Marine Product Liability
- ☐ 350 Motor Vehicle
- ☐ 355 Motor Vehicle Product Liability
- ☐ 360 Other Personal Injury

PERSONAL INJURY
- ☐ 362 Personal Injury – Med. Malpractice
- ☐ 365 Personal Injury – Product Liability
- ☐ 368 Asbestos Personal Injury Product Liability

PERSONAL PROPERTY
- ☐ 370 Other Fraud
- ☐ 371 Truth in Lending
- ☐ 380 Other Personal Property Damage
- ☐ 385 Property Damage Product Liability

FORFEITURE/PENALTY
- ☐ 610 Agriculture
- ☐ 620 Other Food & Drug
- ☐ 625 Drug Related Seizure of Property 21 USC 881
- ☐ 630 Liquor Law
- ☐ 640 R.R. & Truck
- ☐ 650 Airline Regs.
- ☐ 660 Occupational Safety/Health
- ☐ 690 Other

BANKRUPTCY
- ☐ 422 Appeal 28 USC 158
- ☐ 423 Withdrawal 28 USC 157

PROPERTY RIGHTS
- ☐ 820 Copyrights
- X 830 Patents
- ☐ 840 Trademark

OTHER STATUTES
- ☐ 400 State Reapportionment
- ☐ 410 Antitrust
- ☐ 430 Banks and Banking
- ☐ 450 Commerce/ICC Rates/etc.
- ☐ 460 Deportation
- ☐ 470 Racketeer Influenced and Corrupt Organizations
- ☐ 810 Selective Service
- ☐ 850 Securities/Commodities/ Exchange
- ☐ 875 Customer Challenge 12 USC 3410
- ☐ 891 Agricultural Acts
- ☐ 892 Economic Stabilization Act
- ☐ 893 Environment Matters
- ☐ 894 Energy Allocation Act
- ☐ 895 Freedom of Information Act
- ☐ 900 Appeal of Fee Determination Under Equal Access to Justice
- ☐ 950 Constitutionality of State Statutes
- ☐ 890 Other Statutory Actions

REAL PROPERTY
- ☐ 210 Land Condemnation
- ☐ 220 Foreclosure
- ☐ 230 Rent Lease & Ejectment
- ☐ 240 Torts to Land
- ☐ 245 Tort Product Liability
- ☐ 290 All other Real Property

CIVIL RIGHTS
- ☐ 441 Voting
- ☐ 442 Employment
- ☐ 443 Housing/ Accommodations
- ☐ 444 Welfare
- ☐ 440 Other Civil Rights

PRISIONER PETITIONS
- ☐ 510 Motions to Vacate Sentence
- Habeas Corpus:
- ☐ 530 General
- ☐ 535 Death Penalty
- ☐ 540 Mandamus & Other
- ☐ 550 Civil Rights

LABOR
- ☐ 710 Fair Labor Standards Act
- ☐ 720 Labor/Mgmt. Relations
- ☐ 730 Labor/Mgmt. Reporting & Disclosure Act
- ☐ 740 Railway Labor Act
- ☐ 790 Other Labor Litigation
- ☐ 791 Empl. Ref. Inc. Security Act

SOCIAL SECURITY
- ☐ 861 HIA (1395ff)
- ☐ 862 Black Lund (923)
- ☐ 863 DIWC/DIWW (405(g))
- ☐ 864 SSID Title XVI
- ☐ 865 RSI (405(g))

FEDERAL TAX SUITS
- ☐ 870 Taxes (U.S. Plaintiff or Defendant)
- ☐ 871 RS – Third Party 26 USC 7609

VI. CAUSE OF ACTION (CITE THE U.S. STATUTE UNDER WHICH YOU ARE FILING AND WRITE A BRIEF STATEMENT OF CAUSE. DO NOT CITE JURISDICTIONAL STATUTES UNLESS DIVERSITY.)

Patent infringement under Title 35 of the US Code

VII. REQUESTED IN COMPLAINT: ☐ CHECK IF THIS IS A CLASS ACTION UNDER F.R.C.P. 23 **DEMAND $** CHECK YES only if demanded in complaint

JURY DEMAND: X YES NO

VIII. RELATED CASE(S) IF ANY: (See instructions): JUDGE _____ DOCKET NUMBER _____

DATE: April 17, 2008

SIGNATURE OF ATTORNEY OF RECORD: John P. Pinkerton

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RECEIPT # _____ AMOUNT _____ APPLYING IFP _____ JUDGE _____ MAG. JUDGE _____