UNITED STATES DISTRICT COURT
MIDDLE DISTRICT OF FLORIDA
TAMPA DIVISION

NITE GLOW INDUSTRIES, INC,)
)
Plaintiff,)
CASE NO.:
)
v.)
)
WALMART, INC,)
)
Defendant.)
_____)

COMPLAINT AND DEMAND FOR JURY TRIAL
(PRELIMINARY AND PERMANENT INJUNCTIVE RELIEF SOUGHT)

Plaintiff, Nite Glow Industries, Inc. ("Nite Glow"), I Did It, Inc., sues Defendant, Walmart, Inc. ("Walmart"), for infringement of Nite Glow's United States Patent No. 6,925,965 B1 (the "'965 Patent") and alleges the following:

JURISDICTION AND VENUE

1. This is an action for preliminary and permanent injunctive relief, equitable relief, damages, costs, and expert fees resulting from Defendant's infringement of Nite Glow's rights granted under the patent laws of the United States, Title 35, United States Code.

2. This lawsuit is a civil action for patent infringement arising under the patent laws of the United States, 35 U.S.C. § 101 et seq. The Court has subject-matter jurisdiction pursuant to 28 U.S.C. §§ 1331, 1332, 1338(a), and 1367.

3. Defendant is subject to jurisdiction in the State of Florida because it has, through retail distributors, distributed and is currently distributing, offered for sale and is currently offering for sale, and sold and is selling, goods in the State of Florida which infringe Nite Glow's '965 patent, and because Defendant has engaged in business in the State of Florida. Defendant places infringing products into the stream of commerce with the knowledge and understanding that such products are sold in the State of Florida, including in this judicial district.

4. In particular, Defendant's sells the infringing product through regular and established places of business in the Defendant's retail stores in the State of Florida, located within this judicial district.

5. Additionally, upon information and belief, Defendant derives substantial revenue from the sale of infringing products within this District, expects its actions to have consequences within this judicial district, and derives substantial revenue from interstate commerce.

6. Defendant also maintains and operates a website, www.Walmart.com, through where customers where may buy the infringing product and which Florida

residents, including those within the Tampa Division of this judicial district, may access.

7. Defendant is also subject to jurisdiction in the State of Florida because it has committed tortious acts in this state and has caused, and continues to cause, injury Nite Glow in this judicial district.

8. Venue is proper in this judicial district and in this division under 28 U.S.C. §§1391 and 1400 for the reasons set forth in paragraphs 3 through 7 above.

THE PARTIES

9. Nite Glow is a Florida corporation, with its principal place of business located in Largo, Florida, which is within the geographical jurisdiction of the Tampa Division of this Court.

10. Walmart is a Delaware corporation, with its principal place of business located in Bentonville, Arkansas.

THE '965 PATENT AND DISCLOSURE OF THE INVENTION

11. On September 8, 2004, Marni Markell caused to be filed a patent application for her omnidirectional reflective pet leash invention.

12. On August 9, 2005, the '965 Patent, entitled "Omnidirectional Reflective Pet Leash" issued to Ms. Markell. A copy of the '965 Patent is attached hereto as Exhibit "A." The '965 Patent contains eleven (11) claims covering a

braided pet leash with reflective tape adhered to the braided strands of the leash that reflect an incoming light beam back in the direction it was emanated.

13. Ms. Markell assigned all rights, title, and interest in the '965 Patent to Nite Glow, which is the lawful owner of right, title, and interest in and to the '965 Patent.

14. In 2005, Ms. Markell's Omnidirectional Reflective Pet Leash product detailed in the '965 patent debuted at the Global Pet Expo in Orlando, FL which is "the pet industry's premier event featuring the newest, most innovative pet products on the market today" (https://www.globalpetexpo.org/show-info). "With nearly 1,000 entries, the Global Pet Expo is the largest new products showcase at any pet product industry trade show in the world. The New Products Showcase "Best in Show" awards are the most coveted awards given in the industry." At the show, Ms. Markell's Omnidirectional Reflective Pet Leash product won Best of Show, First Place in the Dog Products category. A photo of the award is below.

15. On September 1, 2005 Nite Glow granted United Pet Group Inc. ("UPG") a license to make, have made, use, sell, offer to sell, import and export products patented in the '965 Patent.

16. UPG proceeded to make and sell the Omnidirectional Reflective Pet Leash product detailed in the '965 patent under the product name "Night Glow", with necessary Patent Marking under 35 U.S.C. § 287(a). A photograph of the label for the Night Glow product is attached as Exhibit B and reproduced below:

17. Upon information and belief, UPG entered into an exclusive distribution agreement with Defendant to sell and distribute the patented pet leashes at their retail locations and online under the Defendant's brand name "Vibrant Life™".

18. All conditions precedent to the maintenance of this action have occurred, have been performed, or have been excused or waived.

COUNT I
INFRINGEMENT OF THE '965 PATENT

19. Nite Glow realleges and incorporates by reference the allegations contained within paragraphs 1 through 18 above, as if set forth fully herein.

20. Upon information and belief, Defendant ended their distribution of the product line with UPG and began importing into the U.S., and advertised, marketed, offered for sale, and/or sold the "Infringing Product" identified by the same name as Vibrant Life™ brand at its retail locations and online, however, manufactured and supplied from a different source(s). A photograph of the Infringing Product is attached as Exhibit C and reproduced below:

21. The products sold by the Defendant are specifically produced for the Defendant as the packaging for the product states the full line of Vibrant Life Products are for available on Walmart.com, without specifying any other locations the product is available for purchase. Additionally, Walmart is listed as the lone distributor of the product on the packaging.

22. The Infringing Product consists of a braided pet leash with reflective strips adhered to the braided strands of the leash.

23. Defendant has been and continues directly infringing claims 1, 5, 10 and 11, literally and under the doctrine of equivalents, of the '965 Patent by

importing, offering to sell, and selling the Infringing Product in violation of under 35 U.S.C. § 271 (a).

24. Defendant's Infringing Product, like the invention claimed in Nite Glow's '965 Patent, is described as a "Reflective Rope Dog Leash for Dogs is the perfect everyday leash for walking your furry friend …. The braided rope design will have your dog strutting down the block in style while the reflective material brings an extra layer of safety to your outings." *See* https://www.Defendant.com/ip/Vibrant-Life-Reflective-Rope-Dog-Leash-Pink-5-feet/357038967

25. As shown in the in photo below, the Infringing Product includes a generally a braided rope comprising a braided sleeve with of 4 narrow strips braided at a shallow cylindrical angle, surrounding a black braided rope core:

26. The reflective material in the Infringing Product utilizes 0.25 inch retroreflective strips bonded to the four braided strips to provide the reflective effect.

27. The photo below of the Infringing Product shows proximal end formed into a braided handle and distal end formed into a loop and attached to metal clip. The metal clip is operable with the core and sleeve to form a pet collar.

28. As demonstrated by paragraphs 23 through 30 above, Defendant's Infringing Product contains all the limitations of claims 1 and 2 of Nite Glow's '965 Patent.

29. Defendant's infringement of Nite Glow's '965 Patent has caused, and is causing, Nite Glow to suffer injury and economic damages, including depriving Nite Glow of its statutory right to exclusively control the importing, manufacture, offering for sale, sale, and use of products practicing the inventions claimed in the Nite Glow's '965 Patent and to enjoy the market position attendant to that right.

30. Upon information and belief, Defendant's infringing acts were willful, deliberate, and taken in reckless disregard of the '965 Patent despite having been

put on notice through Night Glow's patent marking on the products they sold in through their retail and online stores. Defendant took these actions knowing the objectively high likelihood that such actions constituted infringement of the '965 Patent. As Defendant's willful acts render this an exceptional case, Nite Glow is entitled to enhanced damages and reasonable attorney fees under 35 U.S.C. § 284.

31. Upon information and belief, Defendant's infringement of the '965 Patent will continue unless enjoined by this Court.

32. Defendant's infringement of Nite Glow's '965 Patent is causing and will continue to cause Nite Glow irreparable harm unless Defendant's infringing activities are enjoined by this Court and Nite Glow lack an adequate remedy at law to prevent injuries it is suffering from Defendant's infringement.

33. Given Walmart's clear and direct infringement of Nite Glow's patent rights, Nite Glow is substantially likely to prevail upon the merits of this action.

34. The balance of hardships and the public interest requires that Defendant immediately cease its infringing activities.

WHEREFORE, Nite Glow respectfully requests this Court to

(A) enter judgment in favor of Nite Glow and against Walmart;

(B) grant Nite Glow preliminary and permanent injunctive relief barring the activities of Walmart that infringe upon Nite Glow's patent rights in Nite Glow's '965 Patent;

(C) award Nite Glow damages equal to Walmart's profits and all damages sustained by Nite Glow as a result of Walmarts's wrongful acts;

(D) award Nite Glow damages equal to treble Walmart's profits or Nite Glow's damages, whichever is greater, on account of Walmart's willful infringement;

(E) award of punitive damages and Nite Glow's costs, attorneys' fees, and interest;

(F) award Nite Glow prejudgment interest, post-judgment interest, costs, and expert fees; and

(G) grant to Nite Glow all other relief this Court deems just and appropriate.

DEMAND FOR JURY TRIAL

Nite Glow hereby demands a jury trial on all issues so triable.

Dated: April 2, 2024

Respectfully submitted:

/s/ Justin Luby
Justin Luby, Esq.
Fla. Bar No.: 108558
Nioti@koulianoslaw.com
Law Office of Jocic & Koulianos p.a.
2965 US Alt 19
Palm Harbor, Fla. 34683
(727) 937-1669
Co-Counsel for Plaintiff

/s/ Panormitis Koulianos
Panormitis "Nioti" Koulianos, Esq.
Fla. Bar No.: 1002302
Nioti@koulianoslaw.com
Law Office of Jocic & Koulianos p.a.
2965 US Alt 19
Palm Harbor, Fla. 34683
(727) 937-1669
Co-Counsel for Plaintiff

Exhibit A

US006925965B1

(12) **United States Patent**
Hurwitz

(10) **Patent No.: US 6,925,965 B1**
(45) **Date of Patent: Aug. 9, 2005**

(54) **OMNIDIRECTIONAL REFLECTIVE PET LEASH**

(75) Inventor: **Marni Markell Hurwitz**, Far Hills, NJ (US)

(73) Assignee: **Nite Glow Industries, Inc.**, Far Hills, NJ (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **10/935,687**

(22) Filed: **Sep. 8, 2004**

Related U.S. Application Data

(60) Provisional application No. 60/591,938, filed on Jul. 28, 2004.

(51) **Int. Cl.**[7] **A01K 27/00**
(52) **U.S. Cl.** **119/793**; 119/795
(58) **Field of Search** 119/769, 793, 797, 119/798, 755, 859, 858

(56) **References Cited**

U.S. PATENT DOCUMENTS

2,989,802	A *	7/1942	Nesbitt	119/795
3,176,584	A	4/1965	Vries	88/82
3,190,178	A	6/1965	McKenzie	88/82
3,512,275	A *	5/1970	Wellinger	40/330
3,702,054	A *	11/1972	Schantz et al.	434/57
3,871,336	A	3/1975	Bergman	119/106
3,999,521	A	12/1976	Pulello	119/96
4,095,559	A	5/1977	McGrath	350/105
4,167,156	A *	9/1979	Kupperman et al.	119/795
4,175,201	A	11/1979	Chao et al.	119/106
4,377,988	A *	3/1983	Tung et al.	119/654
4,384,548	A *	5/1983	Cohn	350/518
4,407,233	A	10/1983	Bozzacco	119/106
4,513,692	A	4/1985	Kuhnsman et al.	119/109
4,576,850	A	3/1986	Martens	428/156
4,582,885	A	4/1986	Barber	526/28
4,600,643	A *	7/1986	Dunlet	428/375
4,668,558	A	5/1987	Barber	428/156
4,763,585	A	8/1988	Bingham	350/105
4,858,282	A *	8/1989	DuPont, Jr.	24/712
4,887,552	A	12/1989	Clayden	119/109
4,895,110	A	1/1990	LoCascio	119/106
4,957,338	A	9/1990	Kinsey, Jr.	350/105

(Continued)

FOREIGN PATENT DOCUMENTS

JP	406023814 A *	1/1994	A01K 27/00

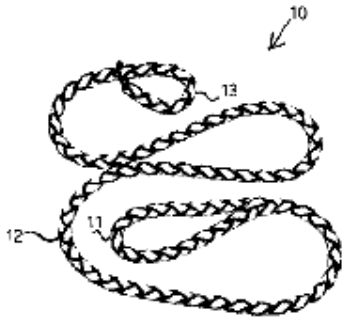
(Continued)

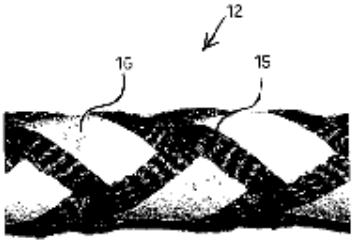
Primary Examiner—Son T. Nguyen
(74) *Attorney, Agent, or Firm*—Ernest D. Buff & Associates, LLC; Ernest D. Buff; Dave Narasimhan

(57) **ABSTRACT**

A flexible omnidirectionally reflective pet leash having a handle, central pet leash, and pet collar sections that reflect an incoming light beam back in the same direction as it was emanated. The reflected light beam provides accurate illumination of the pet owner's hand, pet leash and the location of the pet during dusk or nighttime hours. This flexible omnidirectionally reflective pet leash is created by surrounding a central braided rope of nylon or polyethylene fibers with a cylindrically braided reflective sleeve composed of narrow width reflective strips that comprise narrow woven, braided or knitted nylon or polypropylene straps thermally bonded to a flexible polymeric sheet with attached retroreflectors of the corner cube or microsphere configuration. This omnidirectionally reflective pet leash reflects light over a larger angle of acceptance, illuminating pet owner's hand, pet leash and the pet's collar, thereby providing an improved measure of safety for both the pet and the pet handler.

11 Claims, 4 Drawing Sheets





U.S. PATENT DOCUMENTS

5,048,456	A	9/1991	Heyman et al.	119/106
5,065,098	A	11/1991	Kali et al.	359/530
5,117,201	A	5/1992	Huang et al.	329/329
5,140,946	A	8/1992	Pennock et al.	119/106
5,200,262	A	4/1993	Li	428/206
5,213,457	A	9/1993	Spencer	119/795
5,283,101	A	2/1994	Li	428/141
5,370,582	A	12/1994	Wade	119/859
5,429,075	A	7/1995	Passarella et al.	119/795
5,523,827	A	6/1996	Coley	362/103
5,535,108	A	7/1996	Tangen	362/106
5,558,044	A	9/1996	Nasser, Jr. et al.	119/796
5,711,255	A *	1/1998	Rudolph	119/793
5,762,029	A	6/1998	DuBois et al.	119/796
5,777,790	A	7/1998	Nakajima	359/536
5,850,807	A	12/1998	Keeler	119/799
5,882,796	A	3/1999	Wilson et al.	428/411.1
5,910,838	A	6/1999	Tsay et al.	359/534
5,926,314	A	7/1999	Smith et al.	359/530
5,962,108	A	10/1999	Nestegard et al.	428/172
5,967,095	A	10/1999	Greves	119/795
6,012,256	A	6/2000	Edwards	119/792
6,170,968	B1	1/2001	Caswell	362/168
6,389,849	B1	9/2001	Mauvais et al.	119/796
6,557,498	B1	5/2003	Smienciak et al.	119/858
6,731,363	B2 *	8/2004	Okano	428/357
6,803,367	B2 *	10/2004	Hampon et al.	428/361

FOREIGN PATENT DOCUMENTS

JP	410108576	A *	4/1998	A01K 27/00
JP	2003307605	A *	10/2003	G02B 5/12

* cited by examiner

Fig. 1a

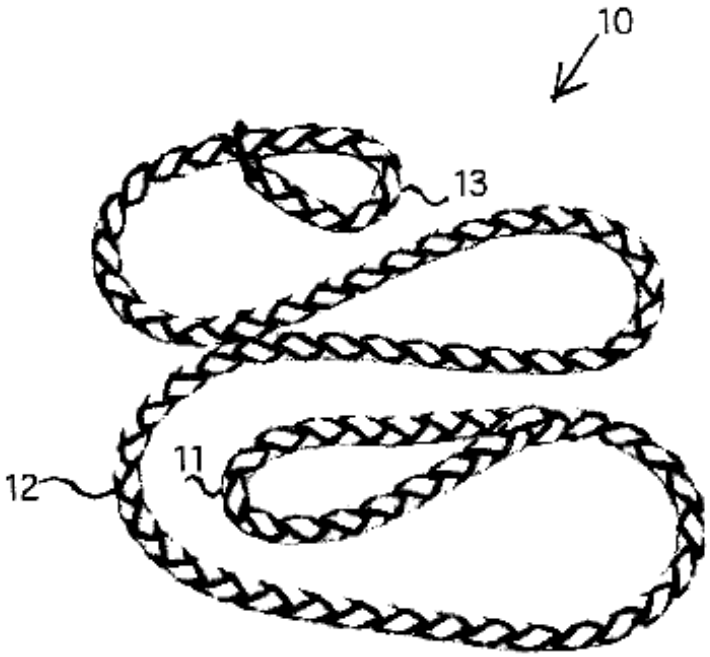


Fig. 1b

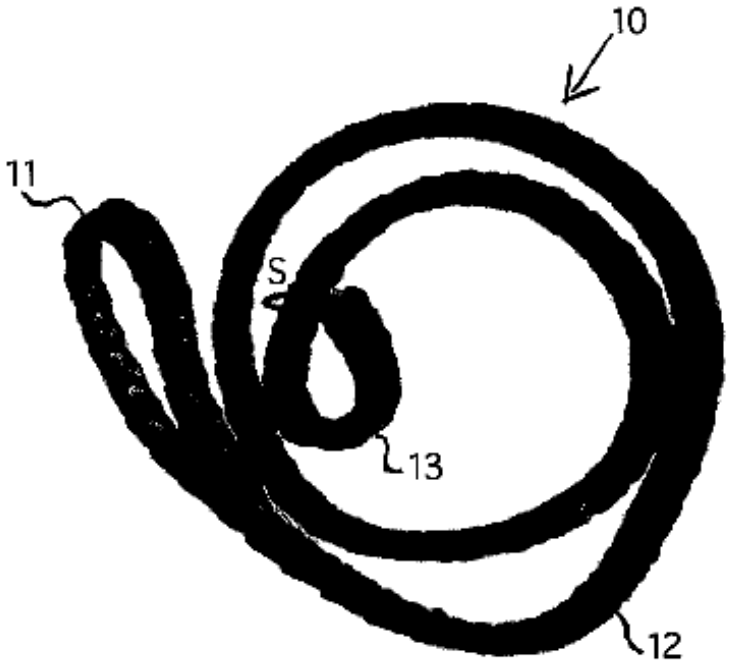


Fig. 2

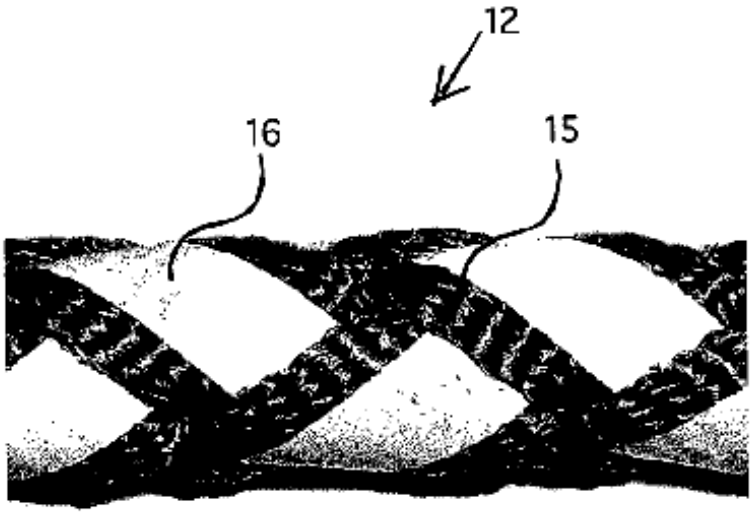
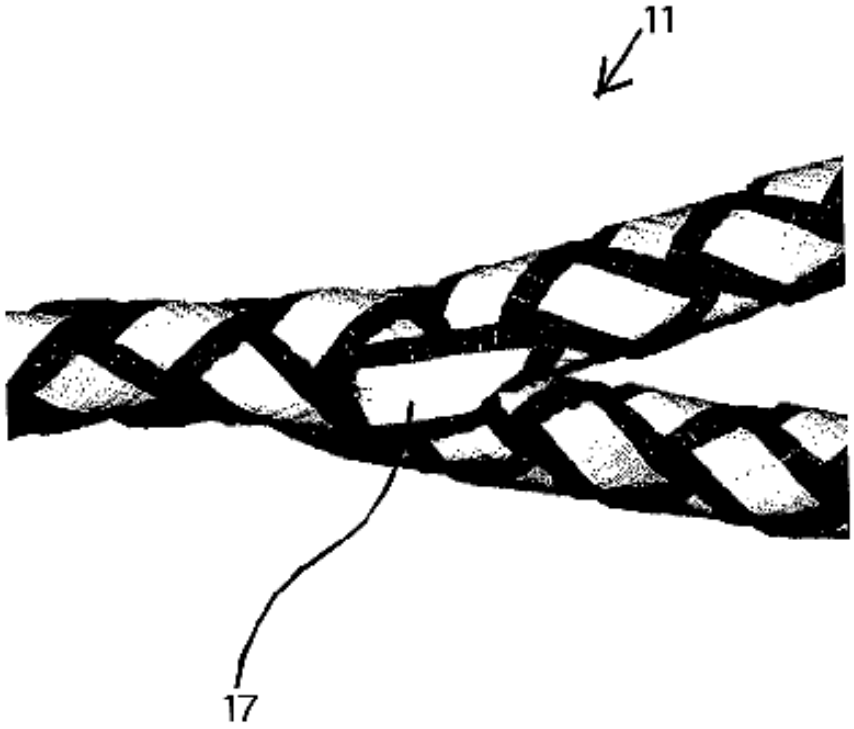


Fig. 3



OMNIDIRECTIONAL REFLECTIVE PET LEASH

This application claims the benefit of U.S. Provisional Application No. 60/591,936, filed Jul. 28, 2004.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to pet leashes; and more particularly, to an omnidirectionally reflective pet leash especially suited for use during dusk or nighttime hours to enhance safety of pets and their owners while walking in the vicinity of land vehicles.

2. Description of the Prior Art

Walking a pet during dusk or nighttime hours can be hazardous in neighborhoods where automobiles are encountered. Illuminating characteristics of the automobile headlamps, generally afford an illumination range of approximately 25 to 50 feet. This illumination range can be significantly reduced by mist or fog, or bends in the road. Despite improvements to vehicle headlights, pets and their owners are oftentimes not recognized by automobile drives until the distance between the automobile and the pet is small.

Several approaches devised by prior art workers attempt to provide solutions for this hazardous common activity. These approaches include 1) use of pet collars that are illuminated or reflective; 2) use of leashes which are illuminated or reflective; or 3) a combination of both features. None of these solutions suggest indicating the whereabouts of a pet owner, a leash and a pet attached to the leash via omnidirectional reflection.

Various types of illuminated dog collars using bulb or other powered sources are known in the art. These power-illuminated leashes require batteries, light bulbs or other lighting elements, which are not needed for reflective illumination. Accordingly, a detailed discussion thereof is not required.

U.S. Pat. No. 4,173,201 to Chao et al. discloses an illuminated collar for pets and the like. U.S. Pat. No. 4,513,692 to Kuhnsman et al. discloses an illuminated pet leash comprising a non-opaque tube that contains one or more bundles of optical fibers. U.S. Pat. No. 4,895,110 to Lo Cascio discloses a pet collar that includes a light source and a power source attached to a strap. U.S. Pat. No. 4,887,552 to Hayden discloses an electrically lighted pet leash that is composed of a transparent, flexible tube containing a string of small electric light bulbs mounted in parallel between two insulated wires. U.S. Pat. No. 5,046,456 to Heyman et al. discloses an illuminated pet collar in which multiple lights are mounted within a flexible, light-permeable tube that extends about the perimeter of the collar. A housing mounted on one end of the tube contains a circuit and a battery for operating the lights. U.S. Pat. No. 5,140,946 to Pennock et al. discloses an illuminated pet collar with miniature lights powered by a battery encased within a flexible, pliable, transparent plastic display tube, which are parallel-wired within the display tube. U.S. Pat. No. 5,370,082, to Wade discloses an animal collar that includes illuminating devices, such as light emitting diodes, liquid quartz strips or electric lamps powered by a plurality of solar cells. U.S. Pat. No. 5,429,075 to Passarella et al. discloses a pet leash and flashlight combination. U.S. Pat. No. 5,523,927 to Gokey discloses an illuminated animal collar light emitting diode placed on the outer exterior of a collar powered by a battery. U.S. Pat. No. 5,535,105, issued to Tangen, discloses a

lighted animal collar that includes a plurality of separate light emitting assemblies, or housings, at spaced intervals along the collar. U.S. Pat. No. 5,558,044 to Nasser, Jr. et al. discloses an illuminating leash handle with a flashlight. U.S. Pat. No. 5,630,382 to Barbera et al. discloses an illuminated pet harness having straps with internal cavities that contain fiber optic cores illuminated by a light bulb. U.S. Pat. No. 5,762,029 to DuBois et al. discloses a combined retractable leash and flashlight. U.S. Pat. No. 5,850,807 to Keeler discloses an illuminated pet leash, wherein illumination is remotely activated by a pet owner to locate the leash. U.S. Pat. No. 5,967,095 to Greves discloses an electroluminescence-illuminated pet flat leash strap. U.S. Pat. No. 6,170,968 to Caswell discloses a motion activated rotatable illuminator. U.S. Pat. No. 6,289,849 to Macedo et al. discloses a device for removably attaching a flashlight to a retractable dog leash. U.S. Pat. No. 6,557,498 to Smierciak et al. discloses a night safety pet illumination marker, with a pet collar having a series of light emitting diodes mounted around the perimeter of the collar and powered by battery power.

Various types of dog collars illuminated by reflection are known in the art. Representative dog collars of this variety are discussed below.

U.S. Pat. No. 3,871,336 to Bergman discloses a reflective dog collar which is not illuminated; but which utilizes a highly reflective material having the form of different color dots encapsulated in plastic. This illuminates only portions of the flat planar pet collar.

U.S. Pat. No. 3,999,521 to Puiello discloses a reflective safety harness for quadruped animals. The harness includes a pair of identical sheet elements with a light reflective surface mounted on opposite sides of the animal. At the corners of the sheet are fastened straps, which circumscribe the animal's body at the front and rear of the harness. Extending from the front strap, at the top point thereof, midway between the two elements, is a loop through which the dog's regular collar is passed. The arrangement assures immovable attachment of the harness on the dog's body. The disclosure by the '521 patent of a reflective sheet positioned on both sides of the animal does not suggest a pet collar or a leash that reflects incident light.

U.S. Pat. No. 4,157,156 to Kupperman et al. discloses a reflective animal leather leash. The elongated leather animal leash includes a sewn a transparent polyvinyl chloride strip with a light reflective prism design on one surface. The light reflective prism is bonded by dielectric heat sealing or sonic welding to an opaque polyvinyl chloride strip sewn to the leather strip, resulting in a leash having a light reflective surface. Since the strip has a reflective surface on only one side of the leash, it does not reflect light in every direction. The flat leather leash is not easily twistable and is not readily bent without separating the transparent and opaque polyvinyl chloride layers.

U.S. Pat. No. 4,384,548 to Cohn discloses a safety device for animals. A pet collar uses "retro-reflective" threads with glass reflective elements in a flexible webbing to form a pet leash. The threads are said to reflect incident light directly back toward the source. Disposition of reflective threads in the webbing forming the collar is sparse. As a result, the quantum of incident light reflected is small; and an insignificant quantum of incident light is reflected back to the source.

U.S. Pat. No. 4,407,233 to Bozzacco discloses a safety collar for pets. The collar has highly reflective flexible elements with a length large enough to extend beyond the outer surface of the pet's hair. It uses flexible elements with

Scotchlite reflecting strips attached to a collar. A reflective pet leash is not disclosed, and the flexible elements do not reflect light in every direction.

U.S. Pat. No. 5,213,157 to Spencer discloses a material with enhanced visibility characteristics. This flexible visibility enhancing materia. combines the advantages of a light reflective component and a luminescent component. The material includes a first layer of prismatic light reflective plastic material having an underlying surface formed with a plurality of minute prism-like formations projecting therefrom at regular spaced intervals, and an overlying substantially smooth light transmissive surface. Bonded, i.e. by heat-sealing, to the first layer is a second layer of plastic luminescent material. The second layer is contiguously and integrally attached to the underlying surface of the prism-like formations and generally coextensive therewith. The visibility enhancing material simultaneously radiates luminescent light from the second layer through the underlying surface of prism-like formations and through the smooth light transmissive surface and reflects light from the prism-like formations through the smooth light transmissive surface. In one embodiment, a leash for controlling and restraining a pet animal includes a flexible elongate member comprised of the visibility enhanced material. In another embodiment, the second layer is replaced with a layer of luminescent material, which can be selectively energized to become luminous. Since the transparent reflective material is a molded plastic of prismatic construction it is rigid and is not flexible and does not form a leash that is capable of being twisted and bent. Further any twisting and bending action separates the reflective element from the luminescent element.

U.S. Pat. No. 5,237,118 to Spencer et al. discloses a visibility enhancing material. The flexible visibility enhancing material combines the advantages of a light reflective component and a luminescent component. The material includes a first layer of prismatic light reflective plastic material having an underlying surface formed with a plurality of minute prism like formations projecting therefrom at regular spaced intervals, and an overlying substantially smooth light transmissive surface. A second layer of plastic luminescent material is contiguously and integrally attached to the underlying surface of the prism-like formations and generally coextensive therewith. The visibility enhancing material simultaneously radiates luminescent light from the second layer through the underlying surface of the prism-like formations and through the smooth light transmissive surface, and reflects light from the prism-like formations through the smooth light transmissive surface. In one embodiment, a leash for controlling and restraining a pet animal includes a flexible elongate member comprised of the visibility enhanced material. Since the transparent reflective material is a molded plastic of prismatic construction, it is rigid and is not flexible and does not form a leash that is capable of being twisted and bent. Furthermore, any twisting and bending action will result in separation of the reflective element from the luminescent element.

U.S. Pat. No. 6,070,550 to Edwards discloses an illuminating dog safety system. This illuminating dog safety system is designed for allowing an animal to be more visible at night. The device includes a collar that is worn around a neck of an animal. The collar has a reflective strip extending a majority of its length. A harness is provided that is adapted to be worn around a torso of the animal. The harness is comprised of an upper strap member, a lower strap member, and a longitudinal extension there between. The upper strap member, the lower strap member, and the longitudinal extension each have a reflective strip extending a majority of a length thereof. A leash is provided that is adapted for securement to the collar. The leash has a reflective strip extending a majority of its length. All these strip elements are made from flat elements, as shown in FIG. 3 of the patent disclosure. Twisting the elements does not provide the reflectivity needed for adequate visibility at night.

Numerous patents disclose reflective materials. Some of these patents disclose reflective elements having corner cube shapes embedded in a rigid or flexible polymeric strips and monolayers of spherical beads, i.e. primarily glass beads bonded to a reflective sheet.

U.S. Pat. No. 3,176,584 to DeVries et al. discloses that a reinforcing layer may be incorporated into an embedded lens retroreflective sheeting. The reinforcing layer may be of a similar composition as the binder in which the microspheres are embedded. The layer may be applied to the back side of the specularly reflective layer via spraying, i.e., by a solvent-coating technique. Examples of the reinforcing layer materials disclosed include methyl methacrylate, flexible epoxy resins, chloro sulfonated polyethylene, polystyrene, polypropylene, polycarbonate resin, ethyl cellulose, and cellulose acetate-butyrate. The reflective layer is typically very thin and fragile, i.e. in the order of 0.06 microns thick, and must be dispersed in special relationship to the microspheres in order for the sheeting to provide useful retroreflection.

U.S. Pat. No. 3,190,178 to McKenzie discloses a reflex reflective sheeting. It uses a monolayer of microspheres embedded in a polymer to reflect the incoming light beam in the same direction as the incident beam. Since the sheet is formed by melting of the polymeric binder, it is rigid and therefore unsuitable for flexible pet leashes.

U.S. Pat. No. 4,025,159 to McGrath discloses cellular retroreflective sheeting. The cellular retroreflective sheeting comprises a base layer of retroreflective elements and a transparent cover film supported in spaced relation away from the base layer by a network of narrow intersecting bonds. These bonds form hermetically sealed cells within which retroreflective elements are isolated from retroreflective elements of different cells. The resultant sheeting achieves greater durability through use of bonds that are cured in situ after they have been thermoformed into sealing contact between the cover film and base layer. The base material is coated with the binder, subjected to heat and pressure to displace the binder around the embedded microspheres or corner cubes forming the bonded network. Retroreflective articles so constructed may be rigid and inflexible.

U.S. Pat. No. 4,576,850 to Martens, and U.S. Pat. Nos. 4,582,885, 4,668,558 to Barber disclose a shaped plastic articles having replicated microstructure surfaces. This shaped plastic article is made by crosslinked polymer with hard and soft segments having a microstructure-bearing surface that is replicated, with a castable fluid, and radiation hardened. Articles formed by this process exhibit, a retroreflective cube-corner sheeting, Fresnel lens or video disc. All these formed articles are rigid and therefore unsuitable for use in pet leashes. Moreover, these articles also exhibit low tear strength.

U.S. Pat. No. 4,763,985 to Bingham discloses a launderable retroreflective appliqué that comprises a layer of transparent microspheres, a specular reflective layer optically connected to each microsphere, and a binder layer into which the microspheres are partially embedded. Resins disclosed as being suitable for use as binder layers include polyurethane, polyesters, polyvinyl acetate, polyvinyl chlo-

ride, acrylics, or combinations thereof. The specular reflective layers are composed of two succeeding layers of dielectric materials. The layers have varying refractive indexes and are composed of a variety of binary metal compounds including oxides, sulfides, and fluorides.

U.S. Pat. No. 4,957,335 to Kaney discloses microsphere-based retro-reflective articles having high retroreflective brightness at narrow divergence or observation angles, i.e. up to 0.5 degrees. The article is made by selection of microspheres having defined combinations of average diameter and average refractive index. This patent teaches (column 4, lines 18–23) that variation in the size of the microspheres will increase the observation angle or divergence angle of the resultant retro-reflective article.

U.S. Pat. No. 5,066,098 to Kult et al. discloses cellular encapsulated-lens high whiteness retroreflective sheeting with a flexible cover sheet. This cellular, encapsulated-lens retroreflective sheeting comprises a base sheet of a monolayer of retroreflective elements that is partially embedded in a binder layer which typically is white. A cover sheet is disposed in spaced relation from the layer of retroreflective elements. A network of narrow intersecting bonds, or seal legs, that extend between the cover sheet and the base sheet with binder material are thermoformed at the point of contact between the base sheet and cover sheet. Such a rigid, reflective sheet is unsuitable for pet leashes, which require structures that can twist and flex.

U.S. Pat. No. 5,117,304 to Huang et al. discloses a retroreflective article. The retroreflective article has corner cubes and is flexible, and can be applied over irregular surfaces by using an optically clear, aliphatic polyurethane polymer. The aliphatic polymer has a plurality of hard chain segments having the formula $C(O)N(H)\ C_6H_{10}\ N(H)\ C(O)$.

U.S. Pat. No. 5,200,262 to Li discloses a launderable retroreflective appliqué. The appliqué employs a reflector that comprises elemental aluminum or elemental silver on the backside of the microspheres. The appliqué comprises a monolayer of metal coated microspheres partially embedded in and partially protruding from a binder layer. The binder layer comprises a flexible polymer having hydrogen functionalities and one or more isocyanate-functional silane coupling agents. The disclosed flexible polymers that possess hydrogen functionalities are crosslinked. Flexible urethane-based polymers, such as isocyanate-cured polymers or one or two component polyurethanes and polyols.

U.S. Pat. No. 5,283,101 to Li discloses a launderable retroreflective appliqué comprising a binder layer formed from an electron-beam curable polymer and typically one or more crosslinkers and silane coupling agents. Electron-beam curable polymers include chlorosulfonated polyethylenes, ethylene copolymers comprising at least about 70 weight percent of polyethylene, such as ethylene/vinyl acetate, ethylene/acrylate, and ethylene/acrylic acid, and poly(ethylene-co-propylene-co-diene) polymers. Glass microspheres are embedded in the cured binder layer, and a specular reflective metal layer is disposed on the embedded portions thereof. When the appliqué is inverted, light comes through the binder layer.

U.S. Pat. No. 5,777,790 to Nakajima discloses a microsphere-based retroreflective article. The retroreflective article comprises a monolayer of microspheres partially embedded in and protruding from a binder layer and specular reflector underlying the microspheres. The monolayer of microspheres comprises a mixture of a first class of microspheres having a first refractive index and a second class of microspheres having a second refractive index. The second refractive index is higher than the first refractive index. As a result, the sheeting exhibits superior observation angle angularity.

U.S. Pat. No. 5,882,796 to Wilson et al. discloses bonded structured retroreflective sheeting. The structured retroreflective sheeting includes an array of corner cube structured retroreflective elements, a thermoplastic sealing film located proximate the structured elements, and bonding agent between the sealing film and the structured retroreflective elements. The bonding agent bonds the sealing film to the structured retroreflective film. This bonded structure is rigid and is unlikely to survive the flexing and twisting movements of a pet leash.

U.S. Pat. No. 5,936,774 to Smith et al. discloses a retroreflective cube corner article having scalene base triangles. The cube corner retroreflective article exhibits a wide range of retroreflective entrance angularity in at least one plane, and preferably in two or more planes. The structured surface has an array of cube corner elements formed by three intersecting sets of substantially parallel grooves. Each cube corner element includes a base triangle bonded by one groove from each of the three intersecting groove sets, the base triangle being scalene. The corner cube reflector is rigid and cannot be used for producing reflective leashes.

U.S. Pat. No. 5,962,108 to Nestegard et al. discloses a retroreflective polymer coated flexible fabric material and method of manufacture. The retroreflective polymeric coated flexible fabric material has a retroreflective layer and a polymeric compatibilizing layer welded to a polymeric coated outer surface of a flexible fabric material. The compatibilizing layer provides an intermediate layer between the retroreflective layer and the flexible fabric material, creating suitable bond strength between dissimilar polymers. Flexible fabric materials are polyester, nylon or cotton. The fabric is coated with highly plasticized polyvinyl chloride (PVC) or ethylene acrylic acid copolymer (EAA). These polymers are flexible, durable, and resistant to abrasion. The retroreflective prismatic elements layer includes: acrylic polymers, such as poly(methylmethacrylate); polycarbonates; cellulosics; polyesters such as poly(butyleneterephthalate); poly(ethyleneterephthalate); fluoropolymers; polyamides; polyetherketones; poly(etherimide); polyolefins, poly(styrene), poly(styrene) co-polymers, polysulfone; urethanes, including aliphatic and aromatic polyurethanes; and mixtures of the above polymers such as a poly(ester) and poly(carbonate) blend, and a fluoropolymer and acrylic polymer blend. The compatibilizing layer that is suitable for bonding between a retroreflective layer and a flexible fabric material include: polyurethane, ethylene methyl acrylate copolymer, ethylene N-butyl acrylate copolymer, ethylene ethyl acrylate copolymer, ethylene vinyl acetate copolymer, polymerically plasticized PVC, and polyurethane primed ethylene acrylic acid copolymer. Such a reflective fabric does not suggest the shape, construction or function of a pet leash.

U.S. Pat. No. 5,910,858 to Frey discloses retroreflective sheeting with a coated back surface. The retroreflective sheet has a plurality of indentations on the back surface to reflect the light, and a transparent front surface to encapsulate and protect the light reflecting indentations. This reflective sheet is rigid and is unsuitable for use in pet leashes.

Notwithstanding the efforts of prior art workers to construct pet leashes and pet collars that are illuminated by incident light, there remains a need in the art for a flexible pet leash that omnidirectionally reflects a significant quantity of incoming light back to its source. Numerous methods

for producing retroreflectors have been disclosed. A flexible pet leash having a robust construction that withstands tensile and torsional forces attending leash usage, has long been needed in the art. Also needed is a flexible, omnidirectional pet leash capable of maintaining high reflectivity when subjected to surface abrasion from frictional forces created by contact of the leash with objects having rough exteriors, such as the ground, flooring, posts, trees and the like.

SUMMARY OF THE INVENTION

The present invention provides a pet leash that is omnidirectionally reflective and reflects a significant quantum of the incident light from a car head light or other light emitting element back to the source. This omnidirectional reflectance of the pet leash is achieved by: a) creating a flexible retroreflective sheet comprising a plurality of corner cube reflectors bonded via a transparent bond to a flexible polymeric sheet, or several microspheres bonded via a transparent bond to a reflectorized flexible polymeric sheet; b) producing a narrow width strip composed of nylon or polypropylene fibers by knitting, weaving or braiding, to achieve a strip width in the range of 0.0065 inch to 0.25 inch, depending upon the size of the central cylindrical rope core; c) thermally bonding the flexible retroreflective sheet to the narrow width strip to form a narrow width reflective strip; d) cylindrically braiding, at a shallow braid angle, three or more narrow width reflective strips to surround and cover the external surface of a central cylindrical leash core made from braided nylon or polypropylene fibers; and e) forming a cylindrical retroreflective braided sleeve integrally surrounding a central cylindrical leash core to thereby create a leash having an external retroreflector surface.

The proximal end of the leash is formed into a loop that defines a leash handle. The retroreflective cylindrical braiding sleeve present on the handle is seamlessly braided, closing the loop. Thus the handle also reflects the incident light from a car's headlights back to the source illuminating the position of the hand that is holding the pet. The distal end of the leash is attached to mechanical hardware, such as a metallic ring, forming a choke collar that encircles the neck of the pet creating a retroreflective collar. In a second embodiment, the distal end of the leash has an adjustable metallic strap with one or more holes/locations that lock with a pet leash clamp forming a reflective pet collar that is non-choking.

The cylindrical character of the flexible cylindrical braided sleeve reflects a significant quantum of incident light back to the source effectively since some portion of the braided sleeve is always at angles close to normality and most of the braided cylindrical sleeve falls within the reflecting angular range of the retroreflectors. The shallow braiding angle of the cylindrical braid sleeve lays the thermally bonded narrow width strips at a shallow angle with respect to the length of the cylindrical central core. As a result the leash can be readily flexed or twisted due to the relative movement provided within the cylindrical braid sleeve structure.

BRIEF DESCRIPTION OF THE DRAWING

The invention will be more fully understood and further advantages will become apparent when reference is had to the following detailed description of the preferred embodiments of the invention and the accompanying drawings, in which:

FIG. 1a is a photograph of the leash showing a leash with the reflective cylindrical braided sleeve of narrow width strips covering a central core forming a leash handle, pet leash central section, and choke collar section, taken with camera flash light showing reflective portions as bright regions;

FIG. 1b is a photograph of the leash showing a leash with the cylindrical reflective braided sleeve of narrow width strips covering a central core forming a leash handle, pet leash central section and choke collar section, taken without camera flash light showing reflective portions as dark regions;

FIG. 2 is a photograph of the leash illustrating the reflective cylindrical braided sleeve of narrow width strips surrounding/covering a central core;

FIG. 3 is a photograph of the proximal end of the leash forming a loop that functions as a light reflecting handle with reflective cylindrical braided sleeve of narrow width strips.

DETAILED DESCRIPTION OF THE INVENTION

The present invention provides a pet leash that is flexible, twistable and omnidirectionally reflective. It has an integrally formed handle in the proximal end of the leash, which is also omnidirectionally reflective. The distal end of the pet leash has a ring that is integrally braided into the leash forming a choke pet collar. The handle, pet leash, and the choke collar of the pet leash are all omnidirectionally reflective reflecting incident light back to its source, thereby clearly defining the pet owner's hand that has the leash, the pet leash and the neck portion of the pet that carries the choke collar. This increases the margin of safety in dusk or night time environments when a car headlight can illuminate the owner walking a pet and the pet, reducing the possibility of accidents. Since the omnidirectionally reflecting pet leash reflects light over a broad range, due to its reflective cylindrical sleeve arrangement, the headlight can be at a significant angle and could still be reflected back.

The omnidirectional leash is constructed by building a cylindrically reflective sleeve from narrow width strips of nylon or polypropylene. These narrow width strips are thermally bonded to a polymeric flexible sheet with a plurality of retroreflecting elements. The retroreflecting elements may be corner cubes, in which case the polymeric flexible sheet can be non-reflective. Alternatively, the retroreflecting elements may be microspheres. If microspheres are used as retroreflective elements, the polymeric flexible sheet needs to be reflective and is typically metallized with aluminum or silver. In either case, the retroreflective elements are bonded to the flexible sheet using a transparent binder.

The flexible sheet with retroreflective elements is available from 3M corporation. The trade name for this product is SCOTCHLITE and the flexible polymer is typically PVC and the product is available in a variety of sizes. This flexible reflectorized sheet is thermally bonded to a braided, woven or knitted narrow width nylon or polypropylene strip. The strip may have a width of 0.0065 inches to 0.25 inches and is thermally bonded to a SCOTCHLITE strip having a similar width. The thermal bonding binder may be selected from a number of polymeric binders including, but not limited to, polyvinyl chloride, polyethylene, polyurethane, polyvinyl acetate or acrylates. The bonded narrow width strip is highly flexible and can be cylindrically braided, surrounding a central rope core of the leash, which substantially sustains the pet pulling tensile forces.

The cylindrical braiding employs three or more thermally bonded narrow width strips with flexible reflective strips. The cylindrical braiding is accomplished with a small angle

between narrow width strips and the longitudinal direction of the central core rope. The proximal end of the central core of the leash is fashioned to form a loop representing a handle, and the distal end is formed to go through a metallic loop to create a choke leash. The cylindrical braiding is accomplished to cover the entire length of the pet leash, including the handle and the choke collar hardware. The ends of the braid are terminated by permanent bonding.

In an alternate embodiment, the portion of the pet leash near the distal end carries an adjustable metallic tab component having one or more apertures. The distal end of the leash carries a typical pet leash clamp, which engages with one or more apertures in the metallic tab. This construction provides pet collar having a non-choke function and omnidirectional reflectivity.

FIG. **1***a* is a photograph of the pet leash at **10** showing the handle section **11**, the central pet leash section **12**, and the choke collar section **13**. A cylindrically braided sleeve, created from braided narrow width reflective strips, covers each of these sections (**11**, **12**, and **13**), providing substantially the entire surface of the leash with omnidirectional reflectivity. The leash completely reflects incident light in the same direction the light was emanated. Due to the cylindrical character of the reflective braided sleeve, some portion of the sleeve is always at normal orientation to the incoming light beam, that is, the direction at which the reflection from the retroreflective elements is maximized. Retroreflective elements reflect light over a large range of acceptance angles, but the reflection is at a lower intensity. This cylindrical construction effectively reflects the incoming camera flash light as shown in the photograph of FIG. **1***a* by the extremely bright appearance of the retroreflectors **16** (see also FIG. **2**) of the leash.

FIG. **1***b* shows a photograph of another view of the omnidirectional reflective pet leash without using a camera flash. The illumination comes from the room's light, as evidenced by the shadow, "S", of the metallic ring in FIG. **1***b*. The light here, again, is reflected back to the illuminating source, and practically no light is directed in the direction of the camera. As a result, the retroreflector bright areas of FIG. **1***a* now appear dark.

FIG. **2** is a photograph of a magnified portion of the central pet leash section **12**. The photograph shows the cylindrical reflective braided sleeve with a small braid angle of 5 to 30 degrees between the narrow width strips and the central cylindrical rope core of the leash. The central cylindrical rope core is completely covered by the cylindrical reflective braided sleeve and therefore is invisible in the photograph. The flexible retroreflective sheet is shown at **16** and the narrow width strip is shown at **15**. The flexible retroreflective sheet **16** is thermally bonded to the narrow width strip **15** prior to cylindrical braiding operation.

FIG. **3** shows the details of the handle portion **11** of the omnidirectionally reflective pet leash. The loop of the central cylindrical braided rope core is completely covered by the cylindrical reflective braided sleeve and the ends of the braid are terminated by bonding to each strip at **17**.

The key features of the omnidirectionally reflective pet leash includes, in combination, the features set forth below:

1. a pet leash comprised of a central cylindrical braided rope core composed of braided nylon or polypropylene fibers capable of sustaining tensile forces developed by pet leash loads;
2. the central cylindrical braided rope core being covered substantially with a cylindrically reflective braided sleeve formed by cylindrically braiding narrow width reflected strips, formed from knitted, woven or braided nylon, or polypropylene narrow width strips, having thermally bonded flexible retroreflector sheets bonded to the surface thereof;
3. each of the flexible retroreflector sheets being prepared by bonding corner cube geometry retroreflectors to a flexible polymeric sheet using a transparent binder;
4. such flexible retroreflector sheets alternately being prepared by bonding microsphere geometry retroreflectors to a metallized reflective flexible polymeric sheet using a transparent binder;
5. twist and flexure forces acting on the omnidirectionally reflective pet leash being accommodated by the braided construction of the cylindrical reflective sleeve;
6. the cylindrical braided sleeve-covered pet leash substantially reflecting incident light back in the same direction as the incident light, clearly indicating the whereabouts of the pet leash handle, pet leash central portion, and the pet leash collar surrounding the neck;
7. the omnidirectionally reflective pet leash providing an increased margin of safety for pets and their owners while walking in dimly lit environments, such as parking garages, or inclement weather conditions, where rapidly moving vehicles are encountered.

The omnidirectionally reflective pet leash disclosed herein can be modified in numerous ways without departing from the scope of the invention. For example, at least one strip of the central braided rope core can be composed of leather. The pet collar can be integral with the central rope core or detachable therefrom via fastening means in the conventional way. These and other modifications are intended to fall within the scope of the invention, as defined by the subjoined claims.

Having thus described the invention in rather full detail, it will be understood that such detail need not be strictly adhered to, but that additional changes and modifications may suggest themselves to one skilled in the art, all falling within the scope of the invention as defined by the subjoined claims.

What is claimed is:

1. A reflective pet leash, comprising:
   a. a central cylindrical braided rope core operable to sustain substantial tensile forces;
   b. a cylindrical reflective braided sleeve comprising three or more narrow width reflective strips that are braided at a shallow cylindrical braid angle relative to the longitudinal axis of said central cylindrical braided rope core, said cylindrical reflective braided sleeve being operable to surround said central cylindrical braided rope core thereby providing omnidirectional reflectivity;
   c. said narrow width reflective strips comprising a woven or knitted narrow width strip and a flexible retroreflective sheet, said woven or knitted narrow width strip having a show surface, and said flexible retroreflective sheet being thermally bonded onto said show surface thereof;
   d. said flexible retroreflective sheet having retroreflectors bonded thereto with a transparent bond layer; and
   e. said leash having a proximal end and a distal end, the proximal end being looped and braided to form an omnidirectionally reflective handle, and the distal end being looped and braided and attached to a metallic hardware component operable with said rope core and surrounding braided sleeve to form a pet collar having omnidirectional reflectivity.

2. A reflective pet leash as recited by claim 1, wherein said central cylindrical braided rope core comprises braided nylon fibers.

3. A reflective pet leash as recited by claim 1, wherein said central cylindrical braided rope core comprises braided polypropylene fibers.

4. A reflective pet leash as recited by claim 1, wherein said cylindrical reflective braided sleeve is braided at a braid angle of 5 to 10 degrees.

5. A reflective pet leash as recited by claim 1, wherein each of said narrow width reflective strips has a width of 0.0065 to 0.25 inches.

6. A reflective pet leash as recited by claim 1, wherein said flexible retroreflective sheet is thermally bonded to said woven or knitted narrow width strip with polyvinyl chloride.

7. A reflective pet leash as recited by claim 1, wherein said flexible retroreflective sheet is thermally bonded to said woven or knitted narrow width strip with polyvinyl acetate.

8. A reflective pet leash as recited by claim 1, wherein said flexible retroreflective sheet is thermally bonded to said woven or knitted narrow width strip with polyurethane.

9. A reflective pet leash as recited by claim 1, wherein said flexible retroreflective sheet comprises a plurality of microsphere retroreflectors bonded in a light-reflecting sheet.

10. A reflective pet leash as recited by claim 1, wherein said pet collar functions as a choke collar.

11. A reflective pet leash, comprising:

a. a central cylindrical braided rope core operable to sustain substantial tensile forces;

b. a cylindrical reflective braided sleeve comprising three or more narrow width reflective strips that are braided at a shallow cylindrical braid angle relative to the longitudinal axis of said central cylindrical braided rope core, said cylindrical reflective braided sleeve being operable to surround said central cylindrical braided rope core thereby providing omnidirectional reflectivity;

c. said narrow width reflective strips comprising a woven or knitted narrow width strip and a flexible retroreflective sheet, said woven or knitted narrow width strip having a show surface, and said flexible retroreflective sheet being thermally bonded onto said show surface thereof;

d. said flexible retroreflective sheet having retroreflectors bonded thereto with a transparent bond layer; and

e. said leash having a proximal end and a distal end, the proximal end being looped and braided to form an omnidirectionally reflective handle, and the distal end being attached to a metallic hardware component operable for attachment to a pet collar.

* * * * *

Exhibit B


PETNATION
LARGE
5 FT.
LEASH
NIGHT
GLOW
LIGHT REFLECTING
PRODUCTS
Patented Technology
Reflects Light
Protects Pets by Keeping
them Visible at Night
Strong & Comfortable
Braided Design
FIRSTRAX
18-A Journey,Suite 130
Aliso Viejo, CA 92656
www.firstrax.net
U.S.Patent No.6,925,965
MADE IN CHINA
LARGE REFLECTIVE LEASH

Exhibit C