March 31, 1964 A. A. CADWALLADER 3,126,757

REMOTE CONTROL APPARATUS

Filed Nov. 3, 1960

Fig. 1.

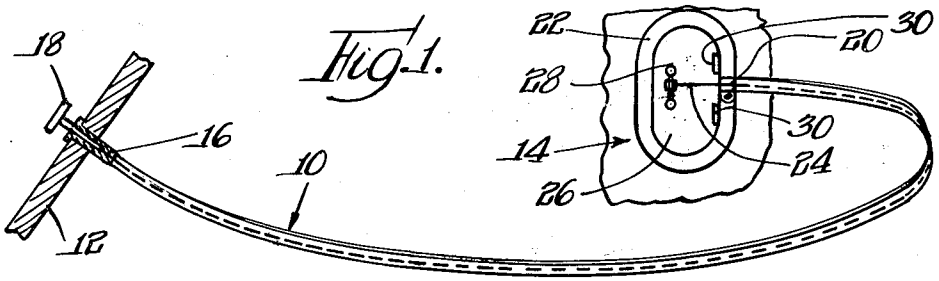
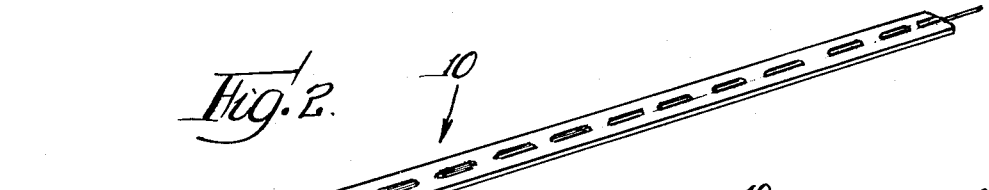


Fig. 2.



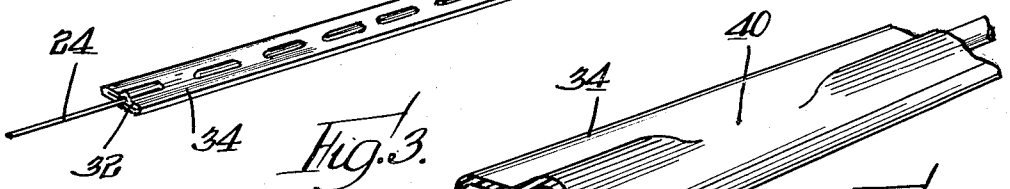


Fig. 3.

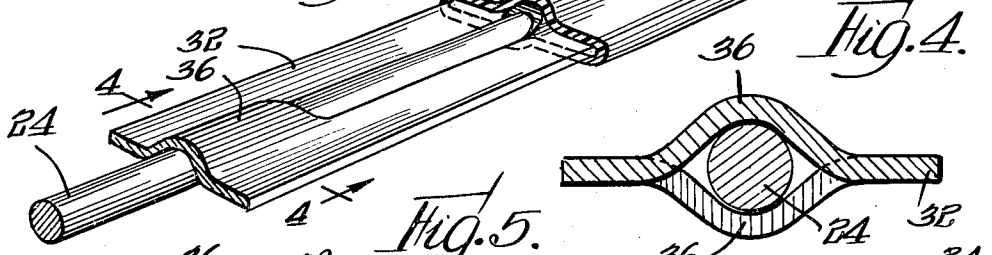


Fig. 4.

Fig. 5.

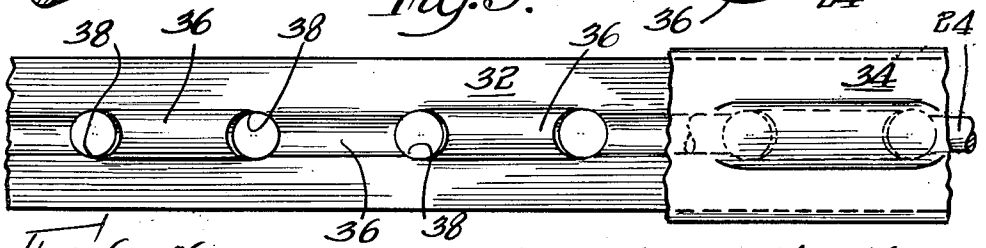


Fig. 6.

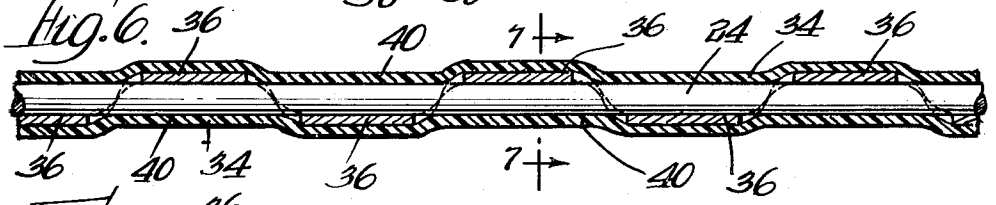
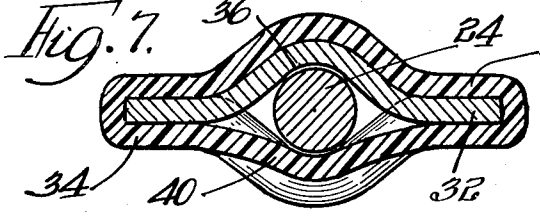


Fig. 7.



INVENTOR.

Alvin A. Cadwallader

BY

Olson & Trexler

Attys.

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REMOTE CONTROL APPARATUS

Alvin A. Cadwallader, Hatboro, Pa., assignor to Teleflex Incorporated, North Wales, Pa., a corporation of Delaware

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This invention relates to remote control apparatus.

Numerous types of remote control apparatus are known and used, one common type employing a wire operating linkage that is surrounded by a braided metal sleeve or by a corrugated metal tubing. While control apparatus so constructed have found wide employ, particularly in the automotive field, certain problems in their use do exist. For example, the guide conduit is frequently rather flexible; and upon threading the control apparatus or cable in a tortuous path, kinks develop in the wire operating linkage tending to freeze the control and rendering the apparatus inoperative. Moreover, proper lubrication of the wire linkage is oftentimes prerequisite to easy and effective functioning.

Therefore, an important object of the present invention is to provide a new and improved remote control apparatus which overcomes the limitations of the prior art by being highly resistant to kinking.

Another important object of the present invention is to provide remote control apparatus that is largely self-lubricating.

A more general object of the invention is to provide remote control apparatus of novel construction.

A further object of the invention is to provide remote control apparatus that is simple, durable and inexpensive.

A still further object of the invention is to provide remote control apparatus that is characteristically easy to operate and insures accurate control.

Additional objects and features of the invention pertain to the particular structure, arrangements and materials whereby the above objects are attained.

A structure in accord with the invention includes an elongated, flexible, shape-retentive ribbon having axially aligned tunnels upstanding from opposite sides; a flexible, force transmitting wire slidably and rotatably received in the tunnels; and an anti-friction sheath snugly fitting over the ribbon, the sheath protecting the ribbon and the wire and providing a bearing surface for the wire.

In order that the principle of the invention may be readily understood, a single embodiment thereof applied to an automotive control, but to which the application is not to be restricted, is shown in the accompanying drawing wherein:

FIG. 1 is a schematic view of the remote control apparatus of the invention, shown operating an air vent in an automobile;

FIG. 2 is an enlarged perspective view of the remote control apparatus of FIG. 1;

FIG. 3 is a further enlarged, perspective view showing the sheath cut away to reveal the force transmitting wire linkage and the shape-retentive ribbon;

FIG. 4 is an enlarged view taken through the section 4—4 of FIG. 3;

FIG. 5 is a plan view showing the form of the shape-retentive ribbon;

FIG. 6 is a side elevational, central cross-sectional view of the remote control apparatus of FIG. 1; and

FIG. 7 is an enlarged view taken through the section 7—7 of FIG. 6.

Referring now in detail to the drawing, specifically to FIG. 1, a remote control apparatus indicated generally by the numeral 10 will be seen connected between the dashboard 12 and an air vent structure 14 of an automobile. A fitting 16 is secured in a hole drilled in the dashboard 12, and the guide means or conduit portion of the control apparatus 10 is securely fastened to the fitting 16. A knob 18 is secured to the operating linkage of the control apparatus 10 and is arranged for reciprocal movement in the fitting 16.

At the remote end of the control apparatus 10, the guide means is fastened to a clamp 20 which, in turn, is mounted to a doorframe 22 of the air vent structure 14. The wire operating linkage 24 of the remote control apparatus 10 extends beyond the clamp 20 to be fastened to an air vent door 26 by using a fastener 28, fastener 28 being affixed to door 26 at a point spaced apart from the hinges 30 by which door 26 is hung. Thus, tensile forces applied to the linkage 24 by means of the knob 18 are transmitted to the door 26 for its opening. Likewise, compressive forces applied to the knob 18 are transmitted to the door 26 for closing.

In most instances, it is desirable to have the linkage 24 generally straight and free of curvatures other than those required by the specific installation, such as for example the curvature shown in FIG. 1. However, under certain other circumstances, it is advantageous to provide linkage 24 with a predetermined set or curvature, useful for establishing a pre-selected shape in the control apparatus 10.

Turning now to FIGS. 2–7 for a more detailed description of the invention, the apparatus 10 will be seen to comprise, in addition to the operating linkage 24, an elongated, flexible, shape-retentive ribbon 32 and a tough, resinous plastic sheath 34. The operating linkage 24 is fashioned to be a flexible, force transmitting member, being desirably fabricated as a solid cylindrical element or wire; and in one specific embodiment of the invention, linkage 24 has been usefully fabricated from music wire.

Since the ribbon 32 is to be both flexible and shape-retentive, it has proved advantageous to fashion the ribbon 32 from a heat treated alloy steel in order to achieve dead straightness in the ribbon and to provide both high linear strength and maximum ductility. In addition, the ribbon 32 is intended to form a guide or conduit for the linkage 24. Accordingly, tunnel-like protrusions 36 are raised from opposite sides of the ribbon 32 in alternate fashion, protrusions 36 being arranged to possess a common axis. This construction is well shown in FIG. 6.

In order to form this conduit or passageway for linkage 24 the ribbon 32 is first provided with a series of circular apertures 38 spaced at regular intervals along the longitudinal dimension of the ribbon. Thereafter, the tunnel-like protrusions 36 are formed so as to terminate in one such aperture at each end, as is shown in FIG. 5. The tunnel-like protrusions 36 and the apertures 38 are selected to admit free passage of linkage 24 in order that the linkage may be easily slidable and rotatable relative to the ribbon 32.

In accordance with an important feature of the invention, the sheath or jacket 34 is formed over the ribbon 32 and over the wire linkage 24 to fit in a snug manner so that the material of the sheath depends between the protrusions 36 forming catenaries 40 that contact the linkage 24. Advantageously, sheath 34 is extruded over the ribbon and the linkage.

The sheath 34 is selected to be abrasion, chemical and water resistant as well as tough, flexible and possessed of a low coefficient of friction. A number of resinous plastic materials have been successfully employed for the sheath 34; and useful, specific embodiments of sheath 34 have been made from the polyamide resin generally known as "nylon." Other useful embodiments of sheath 34 have employed polyolefinic resins, particularly the polyolefinic

resin generally known as "linear polyethylene." Polyester and polytetrafluoroethylene resins may also be used.

When sheath 34 is selected and arranged as has been described immediiately hereinabove, it forms an efficient protective covering for ribbon 32 and linkage 24. More importantly, sheath 34 defines a principal bearing surface for the wire linkage 24 at the catenaries 40 where there is intimate contact between the linkage and the sheath.

The control apparatus 10 has been successfully used in a number of automotive applications, as for example in controlling air vents, heater components and accelerator mechanisms. In such uses, control apparatus 10 has been called upon to negotiate 180° bends on five inch radii and has been subjected to 90° twist without adverse effect on the degree or ease of control. These exemplary uses are herein set forth for purposes of illustration and are in no way intended to limit or delineate the operational scope of control apparatus constructed in accordance with the invention. Many other uses are contemplated and other capabilities can be realized.

It is important to point out that, because of the low frictional coefficient existing between sheath 34 and wire linkage 24, it is generally unnecessary to lubricate the control apparatus of the invention. However and due to the substantial chemical resistance of the sheath 34, a wide variety of lubricating substances can be employed, if desired.

The specific example herein shown and described is illustrative only. Various changes will, no doubt, occur to those skilled in the art; and these changes are to be understood as forming a part of this invention insofar as they fall within the spirit and scope of the appended claims.

The invention is claimed as follows:

1. Remote control apparatus comprising: guide strip means having axially aligned tunnels upstanding from at least one side thereof; means defining an operating linkage received in said tunnels; and a sheath fitting over said guide means and depending between said tunnels for contacting said linkage with a low coefficient of friction therebetween.

2. Remote control apparatus comprising: a shape-retentive ribbon having axially aligned tunnels upstanding from at least one side thereof; a flexible, force transmitting member received in said tunnels; and an anti-friction sheath snugly fitting over said ribbon, said sheath protecting said ribbon and said member and providing a bearing surface for said member.

3. Remote control apparatus comprising: a shape-retentive ribbon having axially aligned tunnels upstanding from at least one side thereof; a flexible, force transmitting member slidably received in said tunnels, the shape of said member being preserved by said ribbon; and an anti-friction sheath snugly fitting over said ribbon, said sheath protecting said ribbon and said member and providing a bearing surface for said member.

4. Remote control apparatus comprising: a shape-retentive ribbon having axially aligned tunnels upstanding from opposite sides thereof; a flexible, force transmitting member rotatably received in said tunnels; and an anti-friction sheath snugly fitting over said ribbon and depending between said tunnels for contacting said member with a low coefficient of friction therebetween.

5. Remote control apparatus comprising: an elongated, flexible, shape-retentive ribbon; a flexible, force transmitting wire guidably received by said ribbon; and an anti-friction sheath snugly fitting over said ribbon, said sheath protecting said ribbon and said wire and providing a bearing surface for said wire.

6. Remote control apparatus according to claim 5 wherein said wire is provided with a predetermined curvature.

7. Remote control apparatus comprising: an elongated, flexible, shape-retentive ribbon having axially aligned tunnels upstanding from opposite sides thereof, said tunnels being spaced at intervals along the longitudinal dimension of said ribbon; a flexible, force transmitting member slidably and rotatably received in said tunnels; and a sheath snugly fitting over said ribbon and depending between said tunnels for contacting said member with a low coefficient of friction therebetween.

8. Remote control apparatus comprising: an elongated, flexible, shape-retentive ribbon having axially aligned tunnels upstanding from opposite sides thereof, said tunnels being spaced at regular intervals along the longitudinal dimension of said ribbon; a flexible, force transmitting member freely received in said tunnels, the shape of said member being preserved by said ribbon; and a resinous plastic sheath snugly fitting over said ribbon and depending between said tunnels for contacting said member with a low coefficient of friction therebetween, said sheath providing a bearing surface for said member.

9. A remote control apparatus comprising an elongated flexible guide means, a flexible operating member movably disposed within said guide means, said elongated guide means including a plurality of longitudinally spaced openings, and a flexible sheath snugly fitting over said guide means and depending into contact with said operating member to provide a low friction bearing support surface for said member.

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