June 22, 1965 J. WERNER 3,190,140

DRIVING DEVICE

Filed Nov. 8, 1962 2 Sheets-Sheet 1

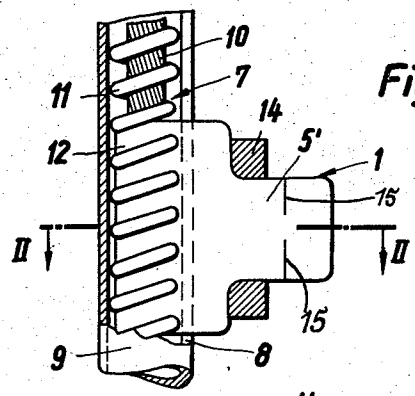


Fig. 1

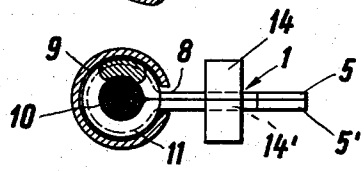


Fig. 2

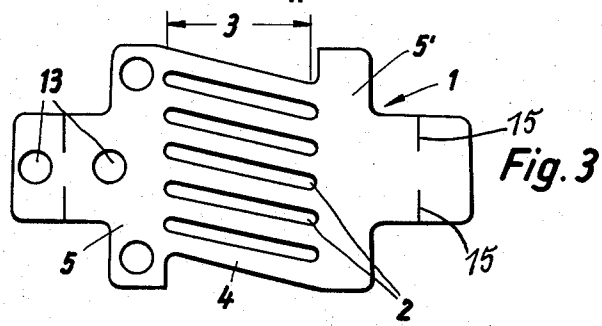


Fig. 3

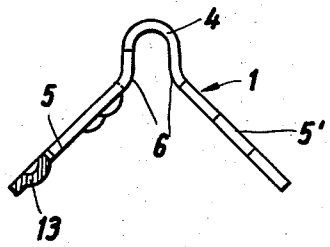


Fig. 4

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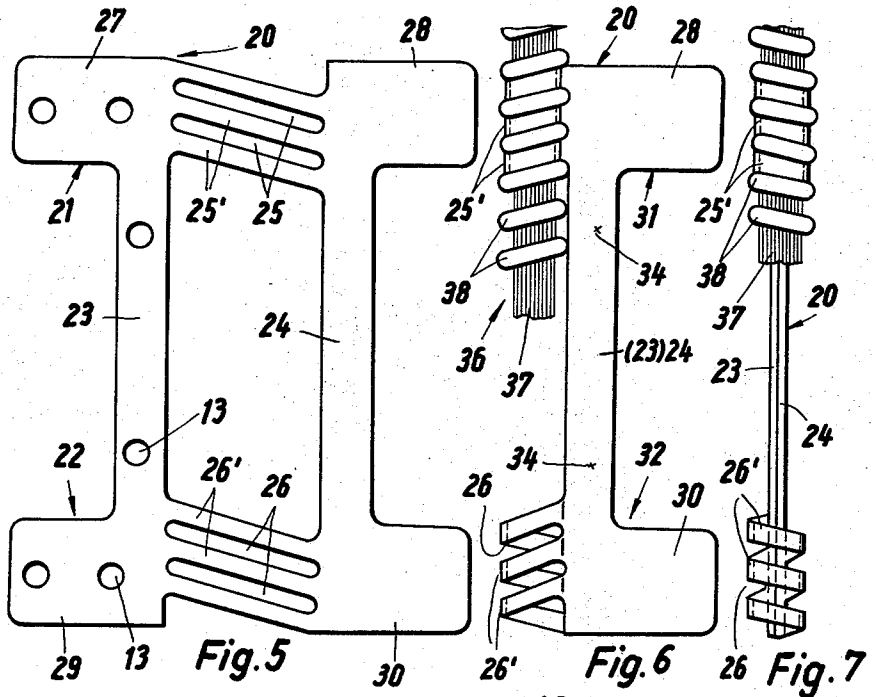


Fig. 5 Fig. 6 Fig. 7

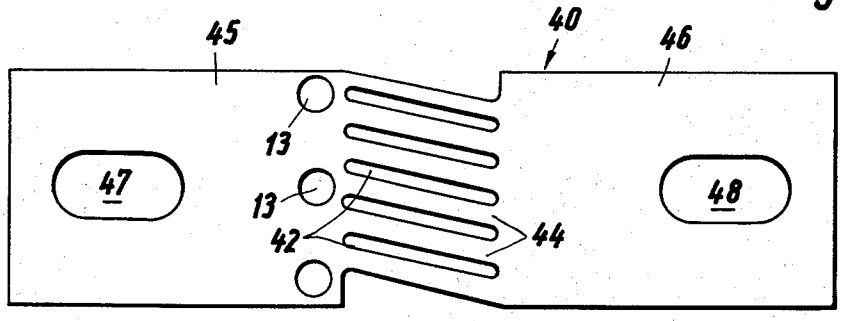


Fig. 8

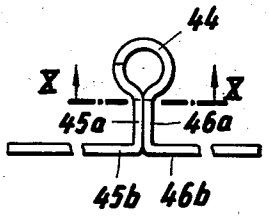


Fig. 9

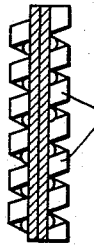


Fig. 10

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DRIVING DEVICE

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5 Claims. (Cl. 74—501)

This invention relates to a driving device.

According to one aspect of the present invention there is provided a driving device, comprising a long member, projecting portions of said member spaced apart therealong, a one-piece driver formed from sheet material, a portion of said driver which is bent about an axis extending in the same direction as does the axis of said member and which embraces said member, and portions of said driver defining holes therein which receive said projecting portions, whereby said driver is put in driving connection with said member.

According to another aspect of the present invention there is provided a method of making a driving device comprising providing a long member having projecting portions spaced therealong, punching from sheet material a one-piece plate, forming holes in said plate at a spacing corresponding to the spacing of said projecting portions, and bending said plate to form a driver embracing said member and to engage said projecting portions in said holes, to put said driver in driving connection with said member.

The driver can be manufactured in a simple and inexpensive manner and can be arranged to transmit to another piece the axial movement of the long member which can take the form of a rack, or an axially-displaceable cable having annular ribs or a helical rib at its periphery. A cable has the advantage that it does not have to extend in a straight line, but can be made to follow any desired path of travel. The cable is preferably so guided that it is rigid to tensile and compressive forces in an axial direction.

In particular, the driving device can be used in the operation of sliding roofs or sliding windows of motor vehicles.

The driving device can be made by punching a plate in one piece from sheet material, and then embracing the core of the cable at least over a greater part of the circumference thereof by suitable bending of the plate, the plate having been punched with a plurality of apertures for the engagement of the projecting portions of the cable. The apertures are made parallel to one another and correspond in their length to the circumferential extent of hte embraced peripheral portion and in their mutual spacing to the spacing of the annular ribs, or the pitch of the helical rib of the cable.

Preferably, the width of the punched plate is greater than the circumference of the surrounded core, so that at least one end is available as a fixing flange for the piece to be displaced.

If the driver is used with a cable guided in a tubular guide duct, two flanges of the driver project through a longitudinal slot in the guide duct and are preferably connected fast one to the other, so that the core of the cable is tightly embraced, and the driver, which is held against rotation in the slot even if the cable happens to rotate, is only free for longitudinal displacement.

Alternatively, the driver could form with its punched-out apertures a running nut on the cable or a spindle, so that the cable or the spindle displaces the driver axially by rotation about its axis relatively to the driver.

In order that the invention may be clearly understood and readily carried into effect, reference will now be made,

by way of example, to the accompanying drawings, in which:

FIGURE 1 is a sectional side view of part of a driving device including a driver,

FIGURE 2 shows a section taken on the line II—II of FIGURE 1,

FIGURE 3 is a plan view of a punched plate before bending to form the driver,

FIGURE 4 is a sectional end view of an open-section piece formed by partly bending the plate,

FIGURE 5 is a plan view of a modified version of the punched plate before bending to form a modified version of the driver,

FIGURE 6 is a side view of part of the driving device of FIGURE 1, but including the modified version of the driver,

FIGURE 7 is a front elevation of the part shown in FIGURE 6,

FIGURE 8 is a plan view of another modified version of the punched plate before bending to form another modified version of the driver,

FIGURE 9 is an end view of that other modified version of the driver, and

FIGURE 10 shows a section taken on the line X—X of FIGURE 9.

Referring to FIGURES 1 to 4, a driver is formed from a plate **1** (see FIGURE 3) punched from sheet metal or sheet plastic and having therein punched-out apertures **2** which are parallel to one another. The plate portions between the apertures **2** are identified by numeral **12**. The driver **1** has a portion **4** which is bent about an axis extending in the same direction as does the axis of the cable **7** and which embraces the latter.

The cable consists of a flexible core **10** and a helical rib **11** fixed to and surrounding the core. The dimension of the apertures **2** measured in the axial direction of the cable corresponds to the thickness of the helical rib **11**, and the dimension **3** of the apertures corresponds approximately to the circumference of the cable core **10** or slightly less than the length of one turn of the helical rib.

In assembling the device, initially, as FIGURE 4 shows, the plate **1** is so bent at the portion **4** that it forms an open-section piece which can be brought to surround partly the cable core **10**, whereby the screw thread **11** engages in the slot-shaped apertures **2** which form, so to speak, a co-operating thread. The flanges **5** and **5'** projecting from respective sides of the portion **4** are so bent over at **6** from the position shown in FIGURE 4 and then brought together face-to-face that they project from the cable in respective planes parallel one to the other and to the axis of the cable, as FIGURE 2 shows.

The driver is guided rectilinearly in a slot **8** formed longitudinally in a tubular cable guide **9** surrounding the cable **7**. The guide **9** is provided with the slot **8** at least over the path of movement of the driver. The cable **7** is so guided by the guide duct **9** as to be rigid to axial force, and the rib **11** consists of a helical wire. The guide **9** can consist of a flexible tube provided with a longitudinal slot over the working region of the driver **1**, so that the cable is guided in the manner of a Bowden cable.

The flanges **5** and **5'** are used for longitudinal guiding in the slot **8** and at the same time for fixing to a displaceable piece **14**, which is here shown only schematically, but can be, for example, a fitting on a sliding window which is to be moved parallel to the slot **8**. The two flanges **5** and **5'** are provided with depressions **13** for effecting a welded connection between the two flanges. Alternatively, they may be connected in some other way, for example by rivetting or screwing as they lie in face-to-face contact.

The flanges extend through a slot **14** in the piece **14** and are connected rigidly, preferably in a releasable

manner, to the piece **14**. This rigid connection can be effected by screws or split pins. However, these ends portions of the flanges 5 and 5', situated beyond the slot **14'** in the part **14**, can be simply bent over or twisted, with the aid of weakening cuts **15**, out of the planes of the respective flanges.

The flanges 5 and 5' of the driver can operate limit switches for interrupting the cable drive, or can form with the ends of the slot 8 mechanical stop means for limiting the cable movement.

In regard to FIGURE 5, a punched plate **20** for forming a driver has two identical, spaced, main parts **21** and **22** connected integrally one to the other by two narrow webs **23** and **24**. Each of the two parts **21** and **22** has formed in its central portion a group of parallel punched-apertures **25** or **26**, the inclination of which corresponds to the pitch angle of a helical wire **38** of a cable **36** for which the driver is intended.

As compared with the inclined slots **25** and **26**, different apertures would be provided if the driver is intended not to embrace a helically ribbed long member but to embrace some other long member. For example, for a spindle having annular ribs there will be formed, not the inclined slots **25** and **26**, but non-inclined, parallel apertures, whilst short apertures spaced in accordance with the tooth pitch will be provided for a rack having teeth on one side only.

Each part **21** or **22** has at respective opposite sides of central portion flanges **27** and **28**, or **29** and **30**, which project laterally outwardly beyond webs **23** and **24**.

During the assembly of the device, the plate shown in FIGURE 5 is bent to form an open-section piece between the limbs of which there remains an opening adequate for the insertion of the cable **36**. After the insertion of the cable, the helical wire **38** projects through the slots **25** and **26**, whilst webs **25'** and **26'** remaining between the slots bear closely against a cable core **37**.

When the flanges **27** to **30** have been brought to lie in face-to-face contact (see FIGURE 6) the external diameter of the central portions of the main parts **21** and **22** is not greater than the external diameter of the cable. The cable **36** which is situated in a tubular guide (not shown in FIGURE 6 or 7, but see FIGURE 1) when in its working state, is therefore not hindered by the driver in its axial movement in the guide duct. The flanges **27** to **30** and also the webs **23** and **24**, which extend longitudinally of the cable **36**, project through a longitudinal slot in the tubular guide dust and thus can be connected to members which are to be moved with the cable **36**.

FIGURE 6 shows the driver closed about the cable. The flanges of each pair are connected releasably or permanently to one another, for example by rivetting, or welding with the aid of depressions **13**, or suitable screw connections. Numerals **31** and **32** denote respective main parts of driver plate **20**, similar to the afore-mentioned parts **21** and **22** (for which see FIGURE 5). The points registering with the depressions **13** are identified by numeral **34**.

Whereas, instead of the illustrated two webs **23** and **24**, it would also be possible to provide a single longitudinal web, for example the web **23**, the two webs **23** and **24** reliably maintain the chosen spacing between the two parts **21** and **22**. In many cases, it may also be convenient to have a single, continuous flange at each side of the driver instead of the two flanges **27** and **29** or **28** and **30**. Moreover, instead of having a gap between the two groups of webs **25'** and **26'**, that gap can be filled with further lands or webs, if this proves desirable in view of the amount of force to be transmitted.

With reference to FIGURES 8 to 10 the driver shown is intended for use with a helically ribbed cable, although a suitably modified version of it can also be used with other long members. A punched plate **40** is provided with punched-out apertures **42** so that webs **44** are formed which are intended to engage between the turns of the helical rib of the cable. Side portions **45** and **46** are provided with respective elongated holes **47** and **48**.

As shown in FIGURES 9 and 10 the flanges **45*a*** and **46*a*** of the driver formed from the plate **40** bear face-to-face one against the other, whilst flange extensions **45*b*** and **46*b*** are bent at right angles to the flanges and thus form a flat surface to which a movable piece can be fixed. The fixing is expediently effected by means of screws (not shown) which extend through the elongated holes into tapped holes which are provided in the piece to be displaced, for example in a fitting of a sliding window (not shown).

The elongated form of the holes allows for manufacturing tolerances in a simple manner. However, it would also be possible to provide circular holes. Instead of a screw connection, it would also be possible to select another appropriate method of fastening the flange extensions **45*b*** and **46*b*** to a window fitting.

In the case of a rigid rack, there is no need to have a tubular guide duct.

I claim:

1. A driving device comprising a cable having radial projections, a driver member surrounding said cable, and a tubular guide enveloping said cable and said driver member while permitting relative axial movement of said cable and said driver member within said guide, the latter including a longitudinal slot, said driver member comprising a single sheet of material including elongated apertures, said sheet being bent around substantially the entire cable with said projections extending into said apertures, the opposing ends of said sheet extending through said slot to form a connector portion for making connection with a driven member.

2. A driving device comprising a cable having external threads and being subject to tension and pressure, a driver member rounded about said cable, a tubular guide enveloping said cable and said driver member while permitting relative axial movement of said cable within said guide, the latter including a longitudinal slot, said driver member having a connector portion extending through said slot for connection to a driven member, said driver member comprising a single sheet of material including elongated apertures, tightly bent around substantially the entire cable with said threads extending into said apertures, said connector portion comprising flanges on opposing ends of said sheet.

3. A driving device according to claim **2**, wherein said driver member comprises three longitudinal sections, the two outer sections including said apertures and said flanges, the central section including at least one web for connecting said flanges of the outer sections.

4. A driving device according to claim **2**, wherein said flanges include weakened areas to facilitate connection of said flanges to said driven member.

5. A driving device according to claim **2**, wherein said flanges extending through said slot are welded together.

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