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(71) Applicant: **HARADA INDUSTRY CO., LTD.**
17-13, 4-chome Minami Ohi
Shinagawa Tokyo(JP)

(72) Inventor: **Tezuka, Kiyoshi**
12-3-304, Green-Heights 580 Nagasawa
Yokosuka-shi Kanagawa-ken(JP)

(74) Representative: **Crawford, Andrew Birkby et al**
A.A. THORNTON & CO. Northumberland
House 303-306 High Holborn
London WC1V 7LE(GB)

(54) A clutch for an electrically driven telescopic antenna.

(57) A first main body (10) is rotated by a motor. A second main body (60) is revolved by the rotational force of the first main body (10). A hexagonal wall portion (64) is formed on the inner peripheral surface of the second main body (60). In a disc (24) fitted on the outer periphery of the boss (11) of the first main body (10) are formed three elastic pressure members (21) so as to be arranged radially outwardly from the central axis of the disc (24). Each of the elastic pressure members (21) comprises a rubber elastic member (31), a contacting member (41) and a holding chamber (51). Each of the holding chambers (51) is enclosed by the disc (24) except for one portion opened at the outer peripheral wall of the first main body (1). The rubber elastic members (31) are held in the holding chambers (51). The contacting members (41) are housed in the holding chambers (51) and the distal portion of each of the contacting members is exposed at the open portion of each of the holding chambers (51). The exposed distal portions of the contacting members (41, 42, 43) are abutted against the hexagonal wall portion (64).

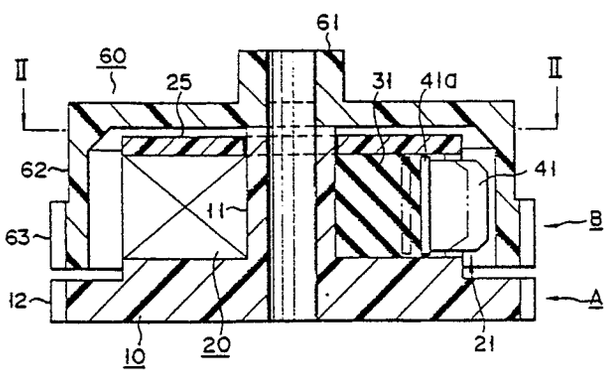

FIG. 1

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A clutch for an electrically driven telescopic antenna

This invention relates to a clutch for an electrically driven telescopic antenna for use in such as a car.

An electrically driven telescopic antenna is constructed so as to be telescopically extended or shortened as a motor is rotated forwardly or reversely, respectively. After the extension and shortening of the antenna have been completed, the motor is over-loaded. If this state continues, an excessive current continuously flows in the motor, resulting in the burning of windings. In order to avoid this trouble, a clutch is disposed between the motor and the antenna. The clutch disengages the motor from the antenna by causing the driving member to slip on the driven member after the extension and the shortening of the antenna have been completed.

With a conventional clutch, the contacting surfaces of the driving clutch disc and the driven clutch disc are provided with projections and depressions, and both the surfaces are pressed against each other by biasing the clutch discs by means of compressed springs.

This conventional clutch has the following drawback. When the clutch is in a disengaged state, or when the driving clutch disc slips on the driven clutch, the projections and depressions formed on the contacting surfaces of the clutch discs made of relatively hard material are strongly rubbed against each other and worn out heavily. Therefore, the clutch pressure is lowered in a relatively short time. Since the biasing forces of the compressed springs vary and are weakened in a relatively short time, it is difficult to give the clutch discs a stable contacting pressure. Thus, it was impossible to obtain a clutch pressure which was maintained stably for a long time. When the driving clutch disc, the driven clutch disc and the compressed springs are assembled into a body, many attachments are required and much assembling time is needed. Accordingly, the conventional clutch had the disadvantages that the structure was complicated and the manufacturing cost could not be reduced.

The object of this invention is to provide a clutch for an electrically driven telescopic antenna which produces a stable predetermined clutch pressure for a long time, and which has a simple construction and is manufactured at a low cost.

With a clutch according to this invention, a plurality of elastic pressure units are arranged on either one of a first main body and a second main body so as to be extended radially from the central axis thereof. The inner peripheral surface of the other one of the first and second main bodies forms an unevenly configurated portion for engaging with the elastic pressure members or disengaging therefrom when the first and second main bodies make a relative rotation. The elastic pressure unit comprises an enclosed holding chamber with one side thereof opened, an elastic member made of rubber and a contact element having a proximal portion abutted against the rubber elastic member and a rounded distal portion extended outwardly from said one side of the holding chamber.

In operation, when the clutch is in a disengaged state while the first and second main bodies slip on each other, the contacting elements of the elastic pressure units slide back and forth on the unevenly configurated portion under pressure due to the deformation of the rubber elastic members. Therefore, with the clutch mechanism of this invention, the contacting portions are not worn out so much and the durability of the clutch is improved as compared with the conventional clutch mechanism in which the surfaces having the projections and depressions of the clutch discs made of relatively hard material. Since the rubber elastic members are held in the enclosed holding chamber, they produce sufficiently strong biasing forces, even when they are made of relatively soft and light material. The biasing forces act as clutch pressure between the radially opposed portions of the first main body on the driving side and the second main body on the driven side. Thus, the stable predetermined clutch pressures are produced for a long time. Unlike the conventional clutch, it is unnecessary to build the compressed springs in the clutch so as to form a body with the other elements. Therefore, the number of constituent components and the assembling time are reduced with result that a clutch having a simple structure can be manufactured at a low cost.

This invention can be fully understood from the following detailed description with reference to the accompanying drawings in which:

Fig. 1 is a cross-sectional view of an embodiment of a clutch for an electrically driven telescopic antenna according to this invention;

Fig. 2 is a cross-sectional view taken along line II - II of Fig. 1; and

Fig. 3 is a perspective view of an elastic pressure unit which is the main part of this embodiment.

An embodiment of this invention will be explained with reference to Figs. 1 to 3.

A clutch for an electrically driven telescopic antenna of this embodiment comprises a driving clutch mechanism A rotated by the driving force of

a motor and a driven clutch mechanism B revolved by the rotational force of the driving clutch mechanism A for extending and shortening the antenna.

The driving clutch mechanism A comprises a first disc-like main body 10 molded from such as hard synthetic resin and an elastic pressure unit assembly 20 fixed to the first main body 10. The first main body 10 has a central boss 11 and provided on its outer peripheral wall of the disc portion with a gear portion 12 which engages the power transmission gear (not shown) of the motor. The elastic pressure unit assembly 20 comprises three elastic pressure units 21, 22 and 23 (only 21 is shown in the figure) extending radially from the boss 11 of the first main body 10 and separated by 180 degrees from each other in the circumferential direction such that the three elastic pressure units 21 to 23 are arranged radially from the central axis of the first main body 10. Slots for defining the holding chambers are formed in a relatively thick disc 24 at circumferential intervals of 120 degrees and open at the outer peripheral wall of the disc 24. The elastic pressure units 21 to 23 are housed in the corresponding slots. A blocking member 25 is connected with the disc 24 to cover the upper portions of the slots. The elastic pressure assembly 20 and the blocking plate 25 are tightened by bolts 27, 28 and 29 to form a unitary structure and are fitted on the boss 11. The slots covered at their upper portions with the blocking plates 25 form the enclosed holding chambers 51, 52 and 53 (only 51 is shown in the figure). They open only at the outer peripheral wall of the disc 24. The rubber elastic members 31, 32 and 33 (only 31 is shown in the figure) are inserted in the corresponding holding chambers 51 to 53. Contacting members 41, 42 and 43 are disposed in the corresponding holding chambers 51 to 53 such that the proximal portions of the contacting members are abutted against the distal portions of the rubber elastic members 31, 32 and 33, and the distal portions thereof are extended outwardly from the outer peripheral wall of the disc 24. On the proximal portions of the contacting members 41 to 43, flange portions 41a, 41b and 41c (only 41a is shown in the figure) are formed for preventing the contacting members 41 to 43 from slipping off the slots. The distal end of each of the contacting members 41 to 43 assumes a semispherical shape.

The driven clutch mechanism B composes the second bottomed short hollow cylindrical main body 60 molded from such as hard synthetic resin. The second main body 60 has a central boss 61. On the outer peripheral wall 62 of the second main body 60 is formed a gear portion 63 which engages the rack of a rope (not shown in the figure) for driving the antenna. The inner peripheral wall assumes a hexagonal shape when viewed from the top. The hexagonal inner peripheral wall 64 is an embodiment of the unevenly configurated portion as defined in the claims.

When the driving clutch mechanism A is combined with the driven clutch mechanism B as shown in the drawings, the distal portions of the contacting members 41 to 43 of the driving clutch mechanism A engage the corners of the hexagonal wall 64 of the driven clutch B. In this stage, the rubber elastic members 31 to 33 abutting against the proximal portions of the contacting members 41 to 43 are slightly compressed.

There will be explained the operation of the clutch of this embodiment installed in an antenna telescoping mechanism (not shown). As the driving clutch mechanism A is rotated by the driving force of the motor, the contacting members 41 to 43 slide on the corresponding edges of the hexagonal wall 64. When the contacting members 41 to 43 begin to ride on the edges of the hexagonal wall 64, a relatively large engagement force is produced as a rotational force which rotates the driven clutch mechanism B in the same direction. Accordingly, the driving clutch mechanism A rotates together with the driven clutch mechanism B. In this case, a rope (not shown) having a rack engaging the gear portion 63 is moved outwardly by the rotation of the driven clutch mechanism B to extend the antenna. After the antenna has been fully extended, the driven clutch mechanism B stops rotating. This state corresponds to the state in which the driving clutch mechanism A rotates in the direction shown by an arrow M or the driven clutch mechanism B turns in the direction shown by an arrow N. As the contacting members 41 to 43 slide on the edges, the contacting members 41 to 43 are retracted in the holding chambers 51 to 53 as shown by the dotted lines in Figs. 1 and 2, and the rubber elastic members 31 to 33 are sufficiently strongly compressed. As a result, only the driving clutch A is rotated. In other words, the clutch is in the disengaged state and the antenna is disengaged from the motor.

In this state, a well-known upper limit switch is operated to cut off the power source of the motor, and the rotation of the driving clutch mechanism is terminated. Thus, the antenna is remained extended by the clutch pressure of the clutch for the electrically driven telescopic antenna.

When the motor is rotated reversely, the driving clutch mechanism A turns in the opposite direction to that in which the antenna extends. The driven clutch mechanism B is also revolved in the same direction as the driving clutch mechanism A, whereby the antenna is shortened. After the shortening of the antenna has been completed, the clutch is also in the disengaged state. Thereafter, the power source of the motor is cut off, the

rotation of the driving clutch mechanism A is stopped, and then the antenna is maintained shortened in the similar manner as the antenna extends.

As explained above, in the state in which the clutch is in the disengaged condition with this embodiment, the contacting members 41 to 43 of the elastic pressure units 21 to 23 are moved back and forth by the deformation of the rubber elastic members 31 to 33 and slide on the hexagonal wall portion 64 as the unevenly configurated portion under pressure. Moreover, the hexagonal wall portion 64 has no specific projections but consists of only plane portions continuously connected with each other. Accordingly, the contacting portions are not worn out so much and the durability is improved as compared with the conventional electrically driven telescopic antenna in which the hard surfaces having the projections and depressions slide on each other under pressure. Further, since the rubber elastic members 31 to 33 are held in the enclosed holding chambers 51 to 53, the rubber elastic members have sufficiently strong biasing forces although they are made of relatively soft and light material. These biasing forces produce the clutch pressures between the radially opposed portions of the first main body 10 on the driving side and the second main body 60 on the driven side. Therefore, a stable predetermined clutch pressures are produced for a long time. Still further, since it is unnecessary to provide compressed springs for contacting the clutch discs under pressure, unlike the conventional clutch, many fastening parts such as washers and nuts are not required. This renders the structure of the clutch to be simple and the assembling cost to be low, enabling the clutch to be manufactured at a low cost.

This invention is not limited to the above embodiment. For example, three elastic pressure units are used in the embodiment, but any number of them can be employed. Although the unevenly configurated portion comprises a hexagonal wall portion, it may be polygonal other than hexagonal. Further, the flat planes of the hexagonal wall portion can be changed to radially inwardly inflated curves or can be formed with projections at their central portions to increase the clutching forces. Still further, various modifications are possible within the scope of this invention.

Claims

1. A clutch for an electrically driven telescopic antenna having a first main body (10) rotated by a motor and a second main body (60) for extending and shortening an antenna, characterized in that said clutch comprises:

a plurality of elastic pressure units (21) arranged radially in either one of said first main body (10) and said second main body (60) so as to be extended outwardly from the central axis thereof; and

an unevenly configurated portion (64) formed in the other one of said first main body (10) and said second main body (60) such that said elastic pressure units (21) are engaged with said unevenly configurated portion (64) and disengaged therefrom when said first main body (10) and said second main body make a relative movement;

said elastic pressure units (21) each comprising a holding chamber (51) enclosed by said one of said first main body (10) and said second main body (60) except for one portion, a rubber elastic member (31) held in said holding chamber (51), and a contacting member (41) having a proximal portion abutted against said rubber elastic member (31) and also each having a rounded distal portion extended outwards from said one portion of said elastic pressure unit (21).

2. The clutch according to claim 1, characterized in that said unevenly configurated portion (64) comprises a normally polygonal peripheral surface arranged coaxially with said first and second main bodies (10, 60).

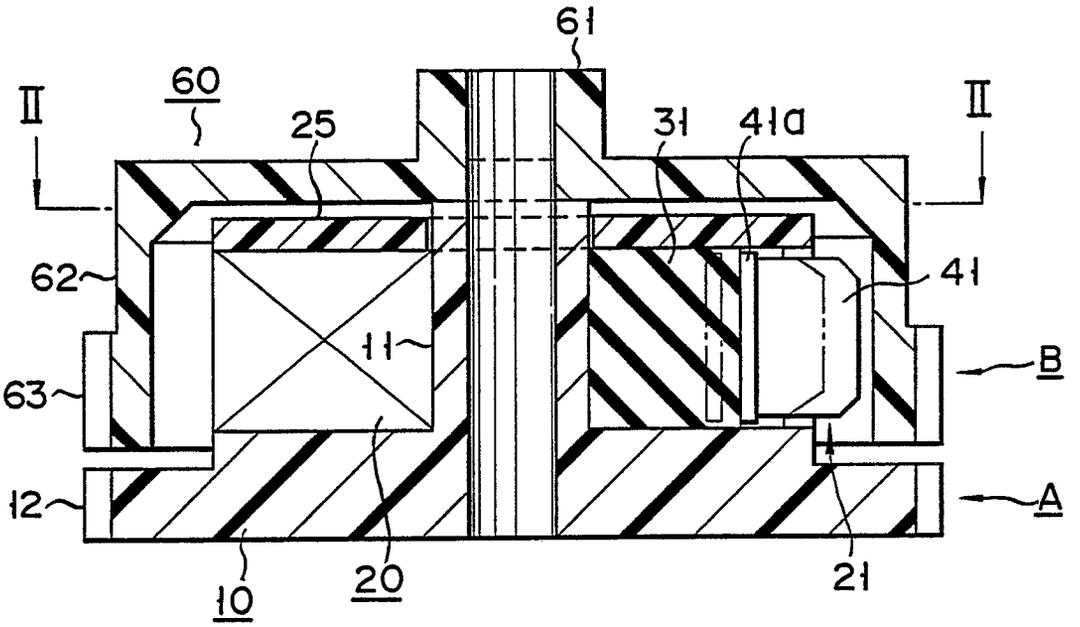
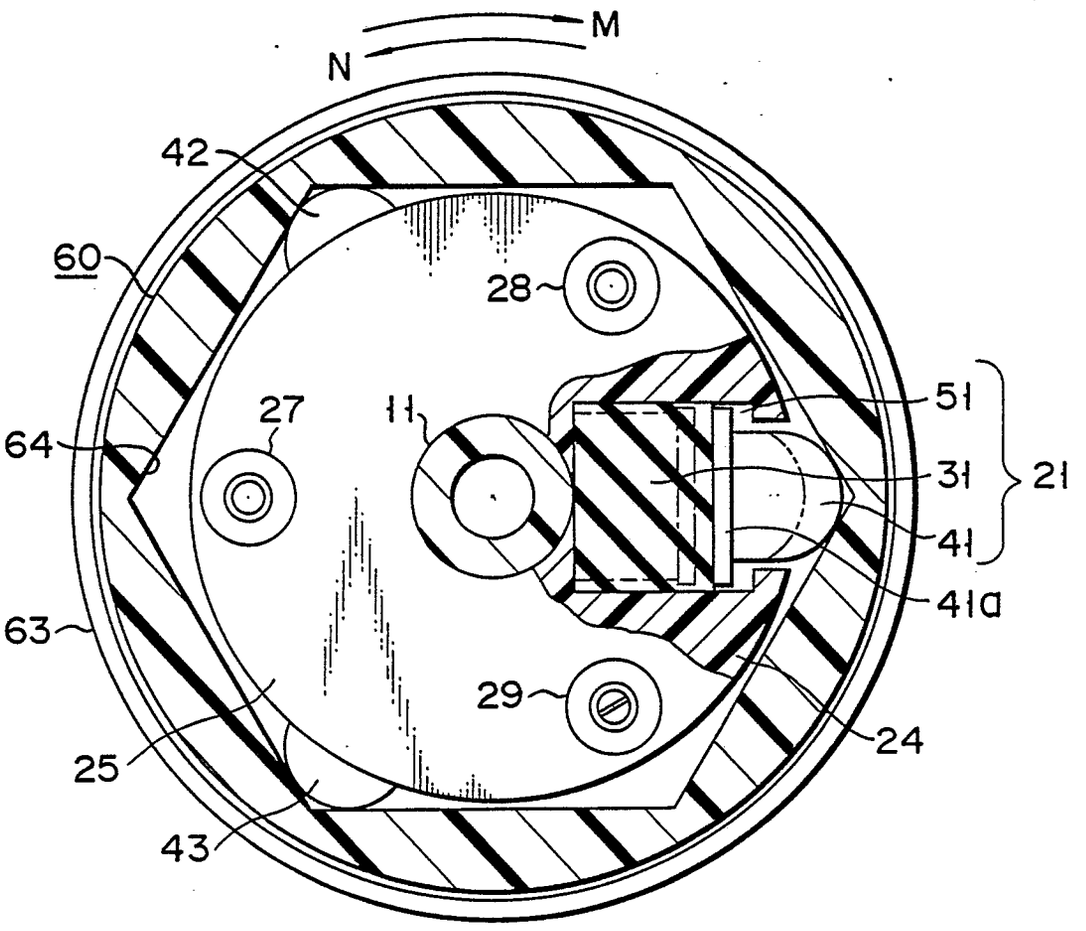

61
60
II
II
25
31
41a
62
41
11
B
63
12
A
10
20
21

FIG. 1


M
N
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60
28
27
11
51
64
31
21
41
41a
63
29
24
25
43

FIG. 2

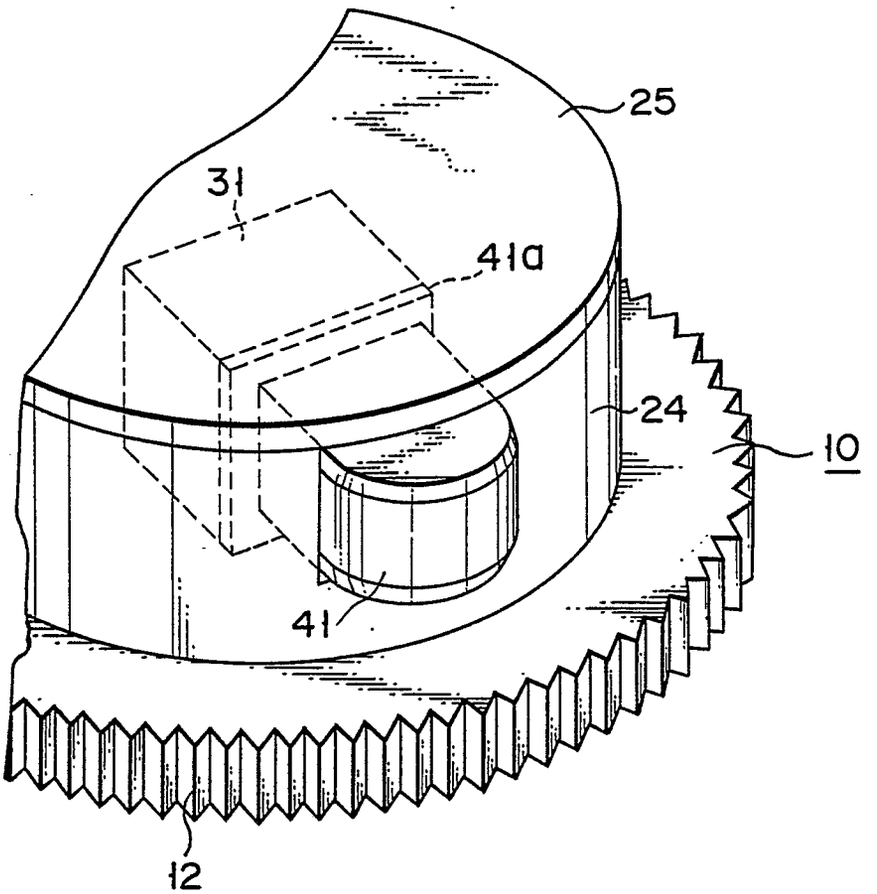

FIG. 3