

Actuating device for points

The present invention comprises an actuating device for points, of the type including:

- 5 - a drive motor;
- a reduction gear including a set of pinion gears arranged between an input rotatably connected to the drive motor and an output suitable for being connected to a control device for the points, the
10 reduction gear further including a rigid casing having a base and lateral walls rising from the base and defining support bearings for the set of pinion gears;
- a protective housing containing the drive motor and the reduction gear, which housing has a bottom and a
15 peripheral wall bordering the bottom, the base of the casing being rigidly secured along the bottom of the housing.

Such a device is used in particular for displacing the switch rail of a set of points. To this end, a
20 mechanism, formed of an assembly of sliding rods connected to one another, is arranged along the points, and the switch rail is secured at several points along its length to this mechanism. At one end, the mechanism is connected to an actuating device permitting the
25 displacement of the assembly formed by the rods.

Such an actuating device, as is known per se, comprises a housing in which is arranged an electric drive motor, at the output of which a reduction gear is provided. The reduction gear is formed of a set of
30 pinion gears contained in a metal casing. The rotatory pinion gears are each held on parallel shafts carried by two opposed, parallel lateral walls of the casing.

Some sets of points are very long, and the switch rail is thus very difficult to manoeuvre. It is then advisable to have available an actuating device which can supply a very high power at the output.

5 It is found that the set of pinion gears is subjected to great stress, so that when the power to be supplied is very high, the pinion gears wear and the gear train deteriorates very rapidly.

10 The aim of the invention is to propose a reliable actuating device having a long service life.

To this end, the subject of the invention is an actuating device of the aforesaid type, characterized in that it includes a retaining arm connecting one of the lateral walls of the casing, from a stress take-up point
15 arranged on the casing away from the base, to the peripheral wall of the housing at a point located away from the bottom.

According to particular embodiments, the actuating device includes one or more of the following features:

- 20 - the casing is oblong in shape, the set of pinion gears being arranged generally transversely to the length of the casing, and the retaining arm is secured to the casing at a longitudinal end of the casing;
- the casing has a reinforcing rib arranged along
25 one wall between the base and the stress take-up point;
- the casing has on the inside, along the base, between two opposed regions of the peripheral wall, a reinforcing rib;
- the retaining arm comprises an independent arm
30 screwably held at one end on the lateral wall of the housing and at the other end on the casing;

- a magnetic torque limiter is arranged between the output of the motor and the input of the reduction gear;

- each pinion gear of the set of pinion gears has 5 teeth such that for each pair of meshed pinion gears, at least two teeth per pinion gear co-operate permanently with one another;

- the casing forms a closed enclosure in which an oil bath is maintained in which the set of pinion gears 10 is immersed; and

- the housing and the casing are formed by casting.

The invention also has as its subject a set of points including a movable switch rail and an actuating 15 device such as defined above, the device being mechanically connected to the switch rail for its displacement.

The invention will be more easily understood on reading the following description, provided solely by way 20 of example and with reference to the drawings, in which:

- Figure 1 is a diagrammatic view of an actuating device for points according to the invention;

- Figure 2 is a perspective view of the actuating device according to the invention with the cover, the 25 motor and the torque limiter removed;

- Figure 3 is a perspective view of the reduction gear of the device of Figure 1;

- Figure 4 is a view in longitudinal section of the reduction gear along a plane parallel to the mounting 30 plate;

- Figure 5 is a sectional view of the reduction gear along the section line V-V of Figure 6;

- Figure 6 is a side view of the reduction gear of the preceding figures;

- Figure 7 is a perspective view of a retaining arm of the casing;

5 - Figure 8 is a perspective view of the casing of the reduction gear of the preceding figures; and

- Figure 9 is a perspective view from below of the casing of the reduction gear.

As illustrated in Figures 1 and 2, an actuating
10 device for points 10 includes a housing 12 in which are arranged a motor 14, a torque limiter 16 and a reduction gear 18, the output of which is coupled to a rotatory output shaft 20 carried by the housing 12 and passing through the latter.

15 The housing 12 is produced for example from cast iron by casting. It has a bottom 22 bordered by a peripheral wall 24 defining, opposite the bottom, an opening 26 normally closed by a removable cover which is not shown. The cover extends substantially parallel to
20 the bottom 22.

Fixing lugs 28 are provided at the periphery of the bottom 22 to effect the rigid connection of the actuating device on its support to the track.

The motor 14 is arranged in the housing on the
25 opposite side from that at which the shaft 20 emerges. The output of the motor 14 is connected by a drive "star" 30 to the torque limiter 16. Advantageously, the torque limiter 16 is a magnetic limiter.

The output of the torque limiter 16 is rotatably
30 coupled to a hollow input shaft 32 of the reduction gear. The output shaft marked 34 of the reduction gear has at one end an eccentric stud 36 forming a crank which is

engaged in a groove of an arm 38 fixedly joined transversely to the control shaft 20 of the actuating device.

In addition, the other end of the output shaft 34 is
5 rotatably coupled by an angle gear 40 to a shaft 42 for manual actuation of the device. The shaft 42 is carried by the peripheral wall 24 of the housing and projects on the outside, where it has a profile suitable for receiving a removable transverse control bar.

10 The reduction gear 18 is shown in detail in Figures 3 to 6. It includes a casing 50 and a set of pinion gears arranged substantially in the casing and supported thereby.

The casing 50 has a mounting plate 52 of generally
15 rectangular shape. It is formed of aluminium with excellent mechanical properties, obtained by casting.

The mounting plate 52 is formed of a solid plate having at its periphery bores allowing it to be screwed onto the bottom 22 of the housing. Some of the bores are
20 provided on lateral protuberances 54 of the mounting plate.

The casing 50 defines a sealed enclosure in the general shape of a parallelepiped, formed above the mounting plate 52 in a mid position. Thus, the casing is
25 bounded lengthwise by two longitudinal walls 56 extending generally parallel to each other. These two walls are connected at the ends of the casing by end walls 58 and, opposite the mounting plate 52, by a top web 60.

The top web has an opening 62 allowing the lubricant
30 to be fed into the reduction gear enclosure.

The pinion gears of the reduction gear are supported by shafts extending parallel to one another and arranged

transversely to the length of the casing. The shafts are supported by the two longitudinal walls 56 into which they partially extend. Bearings are interposed between each longitudinal wall 56 and each of the support shafts of the pinion gears.

The input shaft 32 is hollow along its axis. A screw 63 for connection to the output of the torque limiter 16 extends through it from end to end. The screw 63 is retained at its end by a nut 63A. The screw effects the rotary connection of the shaft 32 and the output of the torque limiter. The shaft 32 has a pinion gear 64 of small diameter engaged with a pinion gear 66 of larger diameter carried by a first reduction shaft 68.

The pinion gear 66 is rotationally secured to a pinion gear 70 of smaller diameter, which engages a pinion gear 72 of larger diameter rotationally secured to an output pinion gear 74 of reduced diameter. The pinion gears 72 and 74 are carried by a second reduction shaft 76.

The output pinion 74 engages an input pinion gear of larger diameter 78 carried by a third reduction shaft 80. The reduction shaft 80 projects through the longitudinal wall 56 and carries an output pinion gear of reduced diameter 82, arranged outside the casing. The pinion gear 78 and the shaft 80 are rotationally secured to each other.

The output pinion gear 82 engages a pinion gear 84 of large diameter arranged outside the casing and on which the drive stud 36 of the output shaft is provided. The stud 36 is equipped with a roller 86 facilitating the travel of the stud in the groove of the control arm.

The teeth of the pinion gears co-operating with one another are such that, as illustrated in Figure 6, at least two teeth of two meshed pinion gears are constantly in contact with one another, whatever the position of the
5 pinion gears.

The input shaft, the first, second and third reduction shafts, and also the output shaft, are arranged consecutively in this order from one end 58 to the other of the reduction gear, such that the reduction gear has
10 an input end on the side where the input shaft 32 is located and an output end at the side on which the output shaft 34 is arranged.

At its output end, and as illustrated in Figure 2, the casing 50 is secured at a point spaced from the
15 mounting plate 52 to the peripheral wall of the housing by a rigid connecting arm 100.

The arm 100 provides a stress take-up and is formed of a bracket shown on its own in Figure 7.

The bracket comprises a plate 102 suitable for
20 bearing against the inner surface of the lateral wall 24 with an interposed flat pad. The plate has two bores 104 for the passage of pins for fixing against the wall 24. In the region where it receives the plate 102, the wall 24, as illustrated in Figure 2, has reinforcing pads 106
25 integral with the remainder of the housing.

On the opposite side from the bearing face of the plate 102, the bracket 100 has a projecting limb 110 connected by a solid base to the plate 102 and tapering gradually towards its free end. At its free end, the
30 bracket has a bush 112 having extending therethrough from one side to the other a bore 114 with its axis generally

parallel to the plate 102 and perpendicular to the axis linking the two bores 104.

The bush 112 is suitable for receiving a pin 116 screwed into a threaded hole 120 of the casing visible in
5 Figures 3 and 8. The threaded hole 120 is provided in a cylindrical bush 122 with its axis perpendicular to the mounting plate 52. The bush is integral with the remainder of the casing 102. It is formed substantially at the intersection between the end wall 58 on the output
10 side of the casing and the top web 60 of the casing.

In addition, a reinforcing rib 126 is formed opposite the bush 122 along the end wall 58. The rib 122 extends from the mounting plate 52 to the top web 60. The rib 122 is reinforced along its free edge, that is to
15 say, its edge away from the end wall 58 of the casing, by a web 128 extending generally parallel to the end wall 58. The web 128 has a width decreasing gradually from the mounting plate 52 to the bush 122. In addition, a transverse rib 130 extends substantially at mid-height of
20 the casing between the end wall of the casing and the web 128. The transverse rib 130 extends parallel to the mounting plate 52.

Moreover, other reinforcing ribs are provided along the length of the longitudinal walls 56. These ribs,
25 marked generally 132, extend from the mounting plate 52. They are generally perpendicular to the longitudinal wall which they reinforce, and have a width decreasing gradually from the mounting plate 52 towards the top web 60 of the casing.

30 Advantageously, a reinforcing rib 134 is arranged transversely inside the volume defined by the casing. For example, and as illustrated in Figure 9, the rib 134

extends opposite the output shaft 34 between the two longitudinal walls 54, supporting itself on the mounting plate 52.

Finally, a brake 150 is mounted on the casing 18 of the reduction gear. The brake 150 has a lever 152 articulated about a shaft 154 extending parallel to the axes of the set of pinion gears and fixed to an upper rib 155 of the casing. The lever 152, at a braking end equipped with a sleeve 158 and as illustrated in Figure 5, has a brake pad 160 carried by the braking end via a rod 162 slidably engaged in the sleeve 158. The pad 160 in the shape of a fork is applied to an extension 164 of the input shaft 32. It is biased against this shaft by a spring 166 interposed between the sleeve 158 and the pad 160.

At its other end, the lever 152 has a cam follower 170 formed by a rotatory roller 172 bearing on a cam surface 174, generally a surface of revolution, defined on a surface of an output pinion gear 84. The cam surface 174 is of variable diameter, such that the angular displacement of the pinion gear 84 brings about the tilting of the lever 152, thus applying or eliminating the pressure force and therefore the friction force of the pad 160 applied to the input shaft 32.

Thus, depending on the position of the output shaft and of the pinion gear 84, the input shaft is either free to rotate, or is braked, thus ensuring the rotational stabilisation of the shaft and consequently the stabilisation of the mechanism when it is subjected to the vibrations generated by the passage of traffic. The actuating device functions in the following manner. For the displacement of the switch rail, the motor 14 is set

in operation in one direction or the other. The rotational movement is transmitted via the torque limiter 16 to the reduction gear 18. The output shaft is driven at low speed by the input shaft 32 turning at a higher speed via the set of pinion gears. The rotational movement is finally imparted to the control shaft 20 via the stud 36 travelling in the groove of the control arm of the shaft 20.

The stud 36 is capable of transmitting a very high torque to the shaft 20. The presence of the stress take-up arm 100 makes it possible to connect the output end of the casing rigidly to the lateral wall of the housing 12. Thus, the casing undergoes only slight torsional deformation such that the axes of rotation of the pinion gears remain strictly parallel to one another. Under these conditions, the risks of deterioration of the pinion gears are reduced and the service life of the actuating device is prolonged. Under these conditions, the housing, and especially its peripheral wall, contributes to the rigidifying of the casing by a stress take-up in the upper end part of the casing.

C L A I M S

1. An actuating device (10) for points, comprising:

- 5 - a drive motor (14);
- a reduction gear (18) including a set of pinion gears arranged between an input (32) rotatably connected to the drive motor (14) and an output (34) suitable for being connected to a control device for the points, the
- 10 reduction gear (18) further including a rigid casing (50) having a base (52) and lateral walls (56, 58) rising from the base (52) and defining support bearings for the set of pinion gears;

- a protective housing (12) containing the drive
- 15 motor (14) and the reduction gear (18), which housing (12) has a bottom (22) and a peripheral wall (24) bordering the bottom (22), the base (52) of the casing being rigidly secured along the bottom (22) of the housing,

20 characterized in that it includes:

- a retaining arm (100) connecting one of the lateral walls (58) of the casing (50), from a stress take-up point (122) arranged on the casing away from the base (52), to the peripheral wall (24) of the housing (12) at
- 25 a point (106) located away from the bottom (22).

2. An actuating device according to claim 1, characterized in that the casing (50) is oblong in shape, the set of pinion gears being arranged generally transversely to the length of the casing (50) and the

30 retaining arm (100) is secured to the casing (50) at a longitudinal end (58) of the casing.

3. An actuating device according to claim 1 or claim 2, characterized in that the casing (50) has a reinforcing rib (126) arranged along one wall between the base (52) and the stress take-up point (122).

5 4. An actuating device according to any one of the preceding claims, characterized in that the casing (50) has on the inside, along the base (52), between two opposed regions of the peripheral wall (56), a reinforcing rib (134).

10 5. An actuating device according to any one of the preceding claims, characterized in that the retaining arm (100) comprises an independent arm screwably held at one end on the lateral wall (24) of the housing and at the other end on the casing (50).

15 6. An actuating device according to any one of the preceding claims, characterized in that a magnetic torque limiter (16) is arranged between the output of the motor (14) and the input (32) of the reduction gear (18).

20 7. An actuating device according to any one of the preceding claims, characterized in that each pinion gear of the set of pinion gears has teeth such that for each pair of meshed pinion gears at least two teeth per pinion gear co-operate permanently with one another.

25 8. A device according to any one of the preceding claims, characterized in that the casing (50) forms a closed enclosure in which an oil bath is maintained in which the set of pinion gears is immersed.

30 9. A device according to any one of the preceding claims, characterized in that the housing (12) and the casing (50) are formed by casting.

10. A set of points including a movable switch rail and an actuating device according to any one of the

preceding claims, the device being mechanically connected to the switch rail for its displacement.