

5 A. Mannesmann Maschinenfabrik GmbH
 Bliedinghauser Straße 27, D-42859 Remscheid

Four-stage telescopic actuator with a screw drive

10 The present invention relates to a telescopic actuator
for executing out a linear movement according to the
features in the preamble of claim 1.

 It is known from the prior art to use actuators for
15 linear movements of various machine parts. For example,
hydraulic or pneumatic actuators in which a piston rod
is extended out of or retracted into a cylinder are
known from the prior art.

20 Moreover, electromechanical actuators in the form of
spindle drives are known in which a rotation movement
of a drive is converted into an axial movement by
rotation of a spindle or of a nut.

25 Specifically when there are strict precision
requirements in relation to an exact axial adjustment
in connection with the rapid assumption of an axial
displacement position, actuators with ball screw drives
are known. The ball screw drive for this purpose has a
30 ball screw spindle with a circumferential thread and a
ball screw nut, wherein ball screw nut and ball screw
spindle come into form-fit engagement with
interposition of balls. If an axially fixed ball screw
spindle is rotated when the nut is mounted in a
35 rotationally fixed manner, the nut executes an axial
displacement movement in relation to the ball screw
spindle. The conversion of rotation movement to axial
movement is dependent on the pitch of the thread. The
advantage is a particularly low level of friction

between ball screw nut and ball screw spindle on account of the interposition of the balls, with at the same time exact axial positionability. Moreover, ball screw drives are more or less free of wear.

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Linear actuators that can be extended like a telescope with ball screw drives are also known from the prior art, for example as described in WO 98/43001 A1 or DE 92 09 280 U1.

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The object of the present invention is to make available a telescopic actuator which provides a large extension path while having compact dimensions in the retracted state, and which at the same time affords the possibility of targeted and exact adjustment of each operating position during the retraction and extension process.

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According to the invention, the aforementioned object is achieved by a telescopic actuator having the features of claim 1.

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Advantageous embodiment variants of the present invention are the subject matter of the dependent claims.

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The telescopic actuator according to the invention for executing a linear movement, wherein a motor is provided which applies a drive torque to a ball screw drive, such that a ball screw spindle can be linearly extended or retracted with respect to a ball screw nut, is characterized in that the telescopic actuator has four screw drives and extends or retracts simultaneously on both sides in the axial direction, wherein the total extension path is composed of four partial extension paths.

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A conventional screw drive having a threaded spindle and a screw nut can be used as the screw drive. However, it is particularly preferable to use ball screw drives and/or roller screw drives. In the case of
5 a ball screw drive, at least one of the four screw drives is designed as a ball screw drive with ball screw spindle and ball screw nut with interposition of balls. Alternatively or in addition, at least one screw drive can be designed as a roller screw drive. In the
10 context of the invention, combined forms of the various screw drives can also be used, such that for example a ball screw drive is used with a roller screw drive or else a ball screw drive or roller screw drive is used with a conventional screw drive.

15 In the following description and in the illustrative embodiment, the concept of the invention is explained with a ball screw drive. Alternatively or in addition, roller screw drives or else also conventional screw
20 drives can be used in order to form the four-stage telescopic actuator.

In the context of the invention, it is thus possible for a telescopic actuator, which can also be designated
25 as a linear actuator, to be designed in such a way that, in the fully extended state, it has an axial length greater than or equal to 2.5 times, particularly greater than or equal to 2.8 times, preferably greater than or equal to 2.9 times, and particularly preferably
30 greater than or equal to 3 times the axial length in the fully retracted state. This means that, in a telescopic actuator of particularly compact configuration in the fully retracted state, there is the possibility to realize a large extension path. For
35 example, if the telescopic actuator in the fully retracted state has an axial length of 100 cm, then it is possible in particular according to the invention to extend the telescopic actuator to a length of greater

than or equal to 300 cm. The length in the extended state is limited to at most 4 times the length in the retracted state.

5 The total extension path is composed of the four partial extension paths of the four ball screw drives. This means that each ball screw drive has an extension path, and addition of the four extension paths gives the total extension path of the telescopic actuator. It
10 is furthermore possible, according to the invention, to influence each partial extension path by the allocation of the pitch of the thread of ball screw spindle and ball screw nut. In particular, the coordination of all four ball screw drives relative to each other then
15 makes it possible, in the various operating positions during the extension or retraction that a telescopic actuator has four simultaneously extensible ball screw drives. This in particular affords the advantage that the sequence of pulling out is not dependent on the
20 friction conditions or the driving of individual stages.

To ensure that the telescopic actuator is extensible on both sides in the axial direction, the four ball screw
25 drives are divided into pairs, such that a first pair and a second pair are obtained. The first pair then extends on one side from the telescopic actuator in the axial direction, and the second pair extends on the opposite side of the telescopic actuator, likewise in
30 the axial direction. Upon reversal of the drive torque, a retraction movement takes place. The two screw drives of each pair preferably have opposite pitch directions. This means one screw drive is left-handed and the other screw drive of the same pair is by contrast right-
35 handed.

Each pair of ball screw drives has in turn an inner and an outer ball screw spindle, wherein in the retracted

state the respectively inner ball screw spindle is received, in particular concentrically, in the outer ball screw spindle. A first inner pair of ball screw drives is in turn arranged absolutely inside in a
5 second outer pair of ball screw drives in the retracted state. With respect to the radial direction to the radial direction protruding from the axial direction, the respective ball screw drives are arranged stacked concentrically inside each other, wherein in the
10 retracted state there is an at least partial stacking in the axial direction. To ensure that each pair of ball screw drives executes an extension movement or retraction movement at the same time, the thread profiles of each pair are oriented in opposite
15 directions. A screwing-out movement of a first ball screw spindle then at the same time enforces a screwing-out movement of a second threaded spindle connected thereto in a pair, and vice versa.

20 The individual ball screw drives thus have a stroke division such that, in each operating stage in the extension or retraction movement, the relative position to each other and the absolute position with respect to a housing of the telescopic actuator are defined.

25 The motor for applying the drive torque in particular in a rotation direction is offset and parallel to the axial axis of the linear movement and transmits the torque via an auxiliary means which, for example, can
30 be a gearwheel or also a wedge belt or a chain drive. The motor itself is in particular configured as an electric motor and can be, for example, a frequency-regulated rotation current motor, a rotation current servo motor or else a stepping motor.

35 Moreover, a drive wheel is arranged rotatably in the housing of the telescopic actuator. In particular, the drive wheel is mounted for conjoint axial displacement

with a floating bearing having a degree of freedom of rotation. By way of the auxiliary means, the drive torque is transmitted to the drive wheel, wherein the drive wheel is coupled for conjoint rotation to sleeves
5 that are described below. By applying energy to the motor, a torque is transmitted to the drive wheel and the telescopic actuator executes an extension movement or retraction movement.

10 For this purpose, a first ball screw nut of the first ball screw drive at one end of the housing is coupled to the housing for conjoint rotation therewith and for conjoint displacement in the axial direction. If the first ball screw spindle now executes a rotation
15 movement, the ball screw spindle screws in relation out of the ball screw nut or into the latter, i.e. executes the linear movement.

At its extending end, the first ball screw spindle is
20 in turn coupled to a second ball screw spindle nut for conjoint rotation therewith and for conjoint displacement in the axial direction. This means that the second ball screw spindle nut is movable relative to the housing but is coupled to the end of the first
25 ball screw spindle for conjoint rotation and displacement therewith. The second ball screw spindle guided in the second ball screw spindle nut is coupled to a bearing point, to be moved by the telescopic actuator, specifically for conjoint rotation therewith
30 and for conjoint displacement in the axial direction. The rotation movement of the second ball screw spindle nut thus ensures that the latter rotates about the second ball screw spindle, and, on account of the thread pitch, the rotation movement is converted into a
35 linear movement of the second ball screw spindle. The coordination of the thread pitch of the first ball screw drive and of the second ball screw drive then dictates the ratio with which the first ball screw

drive and the second ball screw drive are extended from/retracted into the housing and move relative to each other.

5 To ensure that the drive torque is transmitted to the first ball screw spindle and the latter executes a rotation movement, a first sleeve is provided which is coupled to the drive wheel for conjoint rotation therewith and for conjoint displacement in the axial
10 direction. The first sleeve has a floating bearing with an axial degree of freedom, by which it is coupled to the first ball screw spindle. In particular, this first sleeve is designed as a spline shaft in such a way that its outer circumference has grooves in which there
15 engage with form fit a spline hub and inwardly directed continuations that are coupled to the first ball screw spindle. In this way, the rotation movement of the sleeve is transmitted to the spline hub and in turn to the first ball screw spindle. The inwardly directed
20 continuations can then be mounted with axial displaceability in the groove, with simultaneous transmission of the rotation movement.

The third ball screw drive and the fourth ball screw
25 drive extend on the opposite side of the telescopic actuator. For this purpose, a third ball screw nut is coupled to the housing for conjoint rotation therewith and for conjoint displacement in the axial direction. A rotation movement of the third ball screw spindle thus
30 leads to an extension movement or retraction movement thereof with respect to the third ball screw nut. At the extension-side end of the third ball screw spindle, a fourth ball screw nut is in turn coupled for conjoint rotation and conjoint displacement, which ball screw
35 nut engages around the fourth ball screw spindle. The fourth ball screw nut is thus movable relative to the housing, but coupled absolutely to the end of the third ball screw spindle.

The fourth ball screw spindle is in turn coupled to a second bearing point for conjoint rotation therewith and for conjoint displacement in the axial direction, 5 the second bearing point being arranged on the side opposite the first bearing point in the axial direction. The rotation movement of the fourth ball screw nut is thus converted into a linear movement of the fourth ball screw spindle. By means of the 10 retraction and extension, the first bearing point and second bearing point are thus moved toward each other or away from each other in the linear direction.

To ensure now that the drive torque is transmitted to 15 the third ball screw spindle, the latter is coupled to a second sleeve for conjoint rotation therewith. The second sleeve is in turn coupled to the drive wheel for conjoint rotation therewith and has a rotationally fixed floating bearing with an axial degree of freedom, 20 such that a rotation movement of the third ball screw spindle is converted, but the third ball screw spindle is mounted axially displaceably relative to the second sleeve and thus extends out of the housing or is retracted into the latter. The second sleeve is mounted 25 concentrically in the first sleeve with respect to the radial direction. In the axial direction, the length of the first sleeve and of the second sleeve is dependent on the respective extension path of the ball screw spindle driven with the sleeve.

30 In particular, the housing is itself mounted in a rotationally fixed manner. With respect to the axial direction, it is conceivable that the housing is mounted so as to be movable itself in the axial 35 direction and also mounted so as to be fixed in position in the axial direction, such that the first bearing point is moved by the extension-side end of the second ball screw spindle and the second bearing point

is moved by the extension-side end of the fourth ball screw spindle with respect to the axially fixed mounting of the housing during execution of the retraction or extension movement.

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On account of the favorable friction conditions of the ball screw drives, the latter are also not self-locking at very small pitch angles. In the context of the invention, provision is therefore also made that a
10 brake mechanism affords inhibition against unwanted axial displacement after the desired extension length has been reached.

In the context of the invention, it is moreover
15 possible, for position determination, to carry out an indirect path measurement, for example via a rotation sensor of the drive motor, or alternatively it is also possible to determine the respective extension position by an axial path measurement, for example a cable-pull
20 sensor. For example, a measuring system can be provided in order to determine the total extension path. It is also possible for two partial measuring systems to determine the respective extension of the first pair and of the second pair relative to each other.

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In the context of the invention, it is also conceivable for the ball screw drive with the smallest load-bearing capacity to be replaced by a roller screw drive. This relates in particular to the fourth inner ball screw
30 drive.

Further advantages, features, properties and aspects of the present invention are the subject matter of the following description. The preferred embodiment is
35 shown in the schematic figures. It serves to provide a clear understanding of the invention.

Figure 1 shows the telescopic actuator in the fully extended state, and

5 Figure 2 shows the telescopic actuator in the fully retracted state.

In the figures, the same or like components are designated by the same reference signs, even if a repeated description of said components is dispensed with for reasons of simplicity.

Figures 1 and 2 show the telescopic actuator 1 according to the invention in the fully extended state (Figure 1) and in the fully retracted state (Figure 2).
15 The telescopic actuator 1 for this purpose has an outer housing 2, wherein a drive in the form of a motor 3 is arranged on the housing 2 in a rotationally fixed manner. For this purpose, the motor 3 itself has a rotation axis 4, which is offset in parallel to a central longitudinal axis 5 of the ball screw drives described below. To ensure that the drive torque of the motor 3 is transmitted to the ball screw drives, it is coupled to a drive wheel 7 via a belt 6. The rotation movement of the rotor 3 is thus transmitted to the drive wheel 7 via the belt 6 and ensures that the drive wheel 7 executes a rotation movement.

It is also possible, although not shown in detail here, that the rotation movement is effected not via a belt but instead via a gearwheel stage or even a direct drive. In the case of the direct drive, the latter would be arranged directly about the housing 2.

The drive wheel 7 itself has a multi-part design, which is dictated in particular by fitting or assembly of the various ball screw drives. The drive wheel 7 is coupled to a first sleeve 8 for conjoint rotation therewith, wherein the first sleeve 8 is in turn mounted rotatably

in the housing 2 by a roller bearing 9. In the axial direction A, the roller bearing 9 is for this purpose let into a depression 10 of the housing 2 and secured with a retaining ring 11. Thus, the sleeve 8, but also
5 the drive wheel 7 and the roller bearing 9, is fixed in position in the axial direction A with a degree of freedom of rotation about the central longitudinal axis 5.

10 Moreover, a second sleeve 12 is arranged concentrically in the first sleeve 8, which second sleeve 12 is likewise coupled to the drive wheel 7 for conjoint rotation therewith. A rotation movement of the drive wheel 7 thus likewise ensures a rotation movement of
15 the second sleeve 12.

To ensure that the rotation movement of the drive wheel 7 is converted into an axial movement in the axial direction A, a first ball screw nut 13 is provided
20 which is coupled to an end 14 of the housing 2 for conjoint rotation therewith and for conjoint displacement in the axial direction A. At its inner end, the first ball screw spindle 15 is coupled with form-fit engagement to a spline hub 16 for conjoint
25 rotation and displacement therewith. If the first sleeve 8 now executes a rotation movement about the central longitudinal axis 5, a continuation 18 oriented inwardly in radial direction R is formed on the spline hub 16 and engages with a form fit in the groove 17 of
30 the first sleeve 8. The rotation movement is transmitted by this form-fit engagement, wherein this is at the same time designed in the axial direction A as a floating bearing, such that a displacement in the axial direction A can be brought about. By means of the
35 rotation movement of the first ball screw nut 13, the first ball screw spindle 15 is thus screwed outward in the axial direction A to a first bearing point 19 in the extension movement from the ball screw nut 13 and,

in the reverse rotation movement, is screwed into the housing 2.

At the bearing-side end 20 of the first ball screw spindle 15, a second ball screw nut 21 is mounted for conjoint rotation and displacement. During the rotation movement of the first ball screw spindle 15, the second ball screw nut 21 thus also rotates, wherein the axial displacement of the bearing-side end 20 of the first ball screw spindle 15 also ensures an axial displacement of the second ball screw nut 21.

The second ball screw spindle 22 is connected for conjoint rotation and conjoint displacement at the first bearing point 19. By means of the rotation movement of the second ball screw nut 21, the latter thus screws the second ball screw spindle 22 out of the housing 2 and also out of the first ball screw spindle 15 in the direction of the first bearing point 19 or, in the reverse rotation movement, into the housing 2. This is effected on account of opposite thread turns of the first ball screw drive K1 and second ball screw drive K2. The first bearing point 19 is thus displaced in the axial direction A in relation to the housing 2. It is possible in the context of the invention, although not shown in Figure 1, to use a measuring system with cable pull which measures, at the first bearing point 19 and fourth ball screw spindle 31, the extension path between bearing point 19 and fourth ball screw spindle 31, in order thereby to measure and indicate the total displacement.

As shown in Figure 2, the first ball screw drive and the second ball screw drive form the outer second pair, wherein the first ball screw spindle 15 engages around the outside of the first sleeve 8, and the second ball screw spindle 22 is arranged, with respect to the

radial direction R, between first sleeve 8 and second sleeve 12.

On the opposite side in the axial direction A, a third
5 ball screw nut 23 is coupled to the housing 2 for
conjoint rotation and conjoint displacement therewith,
here in particular to a cover 24 of the housing 2. The
third ball screw spindle 25 is coupled to a second
10 spline hub 26 for conjoint rotation therewith, which
spline hub 26 has outwardly oriented continuations 27,
which in turn engage with a form fit in an inner groove
28 of the second sleeve 12 in such a way that a
rotation movement about the central longitudinal axis 5
is transmitted and, at the same time, an axial
15 displaceability in the form of a floating bearing is
formed. The rotation movement applied by the drive
wheel 7 to the second sleeve 12 is thus transmitted to
the third ball screw spindle 25, for which reason the
latter extends out of the housing 2 in axial direction
20 A in relation to the third ball screw nut 23.

A fourth ball screw nut 30 is arranged at the outer end
29 of the third ball screw spindle 25. The fourth ball
screw nut 30 is coupled to the end 29 of the third ball
25 screw spindle 25 for conjoint rotation and displacement
therewith. Extension of the end 29 of the third ball
screw spindle 25 thus also ensures an axial
displacement of the fourth ball screw nut 30.

30 The fourth ball screw spindle 31 is in turn coupled at
a second bearing point 32 for conjoint rotation and
displacement therewith, wherein the second bearing
point 32 lies opposite the first bearing point 19 with
respect to the axial direction A. The rotation movement
35 of the fourth ball screw nut 30 thus ensures a
retraction or extension movement of the fourth ball
screw spindle 31 in relation to the fourth ball screw
nut 30. In this way, the fourth ball screw spindle 31

extends out of the third ball screw spindle 25 and also out of the housing 2. The thread turns of the third ball screw drive K3 and fourth ball screw drive K4 are in opposite directions.

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According to the view in the retracted state, the fourth ball screw spindle 31 is mounted in the first ball screw spindle 15 concentrically with respect to the radial direction, and the third ball screw spindle 10 25 is retracted into the second sleeve 12.

Moreover, a bearing 33 is provided with which the housing 2 can be secured on a base, machine bed or the like, which is not shown in any detail. This bearing 33 15 is designed in such a way that it secures against rotation relative to the central longitudinal axis 5 of the linear actuator and is either fixed in position in axial direction A or itself mounted so as also to be displaceable in axial direction A. In the former case, 20 it is possible to displace the first bearing point 19 and the second bearing point 32 in the axial direction from an absolute position of the housing 2. If the bearing 33 is itself designed to be axially displaceable, it is possible, with the telescopic 25 actuator 1, for the first bearing point 19 and the second bearing point 32 to be moved relatively toward or away from each other, which would be possible, for example, in a scissor drive of a work platform.

30 Figure 1 and Figure 2 also show the total length LG in the extended state and the total length LE in the retracted state. Figure 1 also shows the total extension path, which is composed of GA1 + GA2, since the telescopic actuator 1 extends on both sides. The 35 extension paths GA1 and GA2 are in turn composed of partial extension paths G1 to G4 of the respective ball screw drives K1, K2, K3, K4.

Reference signs:

- 1 telescopic actuator
- 2 housing
- 3 motor
- 4 rotation axis
- 5 central longitudinal axis
- 6 belt
- 7 drive wheel
- 8 first sleeve
- 9 roller bearing
- 10 depression
- 11 retaining ring
- 12 second sleeve
- 13 screw nut as first ball screw nut
- 14 end of 2
- 15 threaded spindle as first ball screw spindle
- 16 spline hub
- 17 groove of 8
- 18 continuation of 16
- 19 first bearing point
- 20 bearing-side end of 15
- 21 screw nut as second ball screw nut
- 22 threaded spindle as second ball screw spindle
- 23 screw nut as third ball screw nut
- 24 cover of 2
- 25 threaded spindle as third ball screw spindle
- 26 second spline hub
- 27 continuation of 26
- 28 groove of 12
- 29 outer end of 25
- 30 screw nut as fourth ball screw nut
- 31 threaded spindle as fourth ball screw spindle
- 32 second bearing point
- 33 bearing

- A axial direction

G1	partial extension path of K1
G2	partial extension path of K2
G3	partial extension path of K3
G4	partial extension path of K4
GA1	extension path
GA2	extension path
LG	total length in the extended state
LE	total length in the retracted state
K1	screw drive as first ball screw drive
K2	screw drive as second ball screw drive
K3	screw drive as third ball screw drive
K4	screw drive as fourth ball screw drive
R	radial direction

Claims

1. A telescopic actuator (1) for executing a linear movement, wherein a motor (3) is provided which
5 applies a drive torque to a screw drive, such that a threaded spindle can be linearly extended or retracted with respect to a screw nut, characterized in that the telescopic actuator (1) has four screw drives (K1, K2, K3, K4) with a
10 threaded screw spindle (15, 22, 25, 31), the four screw drives divided into a first pair and second pair and extends or retracts on both sides in the axial direction (A), wherein the total extension path (GA) is composed of four partial extension
15 paths (G1, G2, G3, G4) and further comprising a first sleeve (8) which is coupled to a drive wheel (7) for conjoint rotation therewith and is mounted rotatably in an outer housing (2), wherein the first pair can be retracted into the first sleeve (8), and the first sleeve (8) is coupled to the
20 second pair for conjoint rotation therewith, in particular to the first threaded spindle (15), via a floating bearing with an axial degree of freedom.
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2. The telescopic actuator according to claim 1, characterized in that at least one screw drive is designed as a ball screw drive (K1, K2, K3, K4) with a ball screw spindle (15, 22, 25, 31) and a
30 ball screw nut (13, 21, 23, 30), and/or in that at least one screw drive is designed as a roller screw drive with a roller screw spindle and a roller screw nut.
- 35 3. The telescopic actuator according to claim 1 or 2, characterized in that the axial length (LG) of the fully extended telescopic actuator (1) is greater than or equal to 2.5 times, particularly greater than or equal to 2.8 times, preferably greater

than or equal to 2.9 times, and particularly preferably greater than or equal to 3 times the axial length (LE) of the fully retracted telescopic actuator (1).

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4. The telescopic actuator according to one of claims 1 through 3, characterized in that the division of the total extension path during the extension movement is determined by the pitch of each screw drive (K1, K2, K3, K4) and/or the pitch direction of each screw drive (K1, K2, K3, K4).

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5. The telescopic actuator according to one of claims 1 through 4, characterized in that the first pair is extensible at one side from the telescopic actuator (1) and the second pair is extensible at the opposite side from the telescopic actuator (1), wherein the pitch direction of the two screw drives of each pair is preferably oriented in opposite directions.

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6. The telescopic actuator according to claim 5, characterized in that each pair has an inner and an outer threaded spindle, wherein the first pair is preferably arranged lying inside the second pair.

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7. The telescopic actuator according to claim 5 or 6, characterized in that the drive torque is applied to the inner first pair and at the same time to the outer second pair.

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8. The telescopic actuator according to one of claims 6 through 7, characterized in that the outer housing (2) is provided on which a first screw nut (13) for the outer first screw drive (K1) of the outer first pair is coupled to the housing (2) for conjoint rotation therewith and for conjoint displacement in the axial direction (A).

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9. The telescopic actuator according to claim 8, characterized in that a second screw nut (21) is coupled to the first threaded spindle (15) for conjoint rotation therewith and for conjoint displacement in the axial direction (A), wherein the second inner threaded spindle (22) of the outer second pair is coupled to a first bearing point (19) for conjoint rotation therewith and for conjoint displacement in the axial direction (A).
10. The telescopic actuator according to one of claims 6 through 9, characterized in that a third screw nut (23) of a third outer threaded spindle (25) of the inner pair is coupled to the housing (2) for conjoint rotation therewith and for conjoint displacement in the axial direction (A).
11. The telescopic actuator according to claim 10, characterized in that a fourth screw nut (30) is coupled to an axial end (29) of the third threaded spindle (25) for conjoint rotation therewith and for conjoint displacement in the axial direction (A).
12. The telescopic actuator according to claim 11, characterized in that a fourth threaded spindle (31) is coupled to a second bearing point (32) for conjoint rotation therewith and for conjoint displacement in the axial direction (A), wherein the second bearing point (32) is arranged on the side opposite the first bearing point (19) in the axial direction (A).
13. The telescopic actuator according to one of the preceding claims, characterized in that a rotation movement of the first sleeve (8) causes a rotation movement of the first threaded spindle (15), such

that the first threaded spindle (15) can be extended or retracted axially with respect to the first screw nut (13) and, on account of the coupling of the first threaded spindle (15) to the second screw nut (21), the second threaded spindle (25) can be extended or retracted axially with respect to the first threaded spindle (15).

14. The telescopic actuator according to one of the preceding claims, characterized in that a second sleeve (12) is provided which is coupled to a drive wheel (7) for conjoint rotation therewith and is mounted rotatably in the housing (2), wherein the first pair can be retracted into the second sleeve (12), and the second sleeve (12) has a floating bearing with an axial degree of freedom and is coupled to the third threaded spindle (25) for conjoint rotation therewith.

15. The telescopic actuator according to claim 14, characterized in that a rotation movement of the second sleeve (12) causes a rotation movement of the third threaded spindle (25), such that the third threaded spindle (25) can be extended or retracted in the axial direction (A) and the fourth threaded spindle (31) can be extended or retracted relative to the third ball screw spindle (25).

16. The telescopic actuator according to claim 14 or 15, characterized in that the second threaded spindle (22) is arranged between first sleeve (8) and second sleeve (12), with respect to the radial direction (R), when the telescopic actuator (1) is retracted.

17. The telescopic actuator according to one of the preceding claims, characterized in that a measuring system is provided with which a position

determination of the extension path is carried out, in particular a cable-pull measuring system.