A pneumatic cylinder with damping in the end position, also comprising a housing in which at least one slide rod element is mounted with at least one sealing element, in such a way that said slide rod element is linearly displaceable. At least one damper sleeve or its bearing arrangement is associated with the slide rod element, said bearing arrangement engaging with front-end bearing elements in the end positions. According to the invention, the damper sleeve or its bearing arrangement has at least one indentation for damping the end position and for ventilation.
PNEUMATIC CYLINDER WITH DAMPING IN THE END POSITION

[0001] The present invention relates to a pneumatic cylinder with end position damping, having a housing in which at least one push-rod element with at least one sealing element is mounted to be movable in a linear manner, at least one damper sleeve being assigned to the push-rod element and engaging, in the end positions, into end face bearing elements, and to a damper sleeve or the bearing thereof.

[0002] Such pneumatic cylinders are known and conventional on the market in many different shapes and configurations. They are used primarily for the movement of any objects and are frequently employed today in handling technology.

[0003] A push-rod element is movable within a housing in the manner of a piston, the push-rod element being mounted for reciprocal movement via end face bearing elements.

[0004] At the present time, such pneumatic cylinders are being required to meet ever-increasing standards. They are constantly being operated at higher speed, meaning that greater forces and loads have to be absorbed.

[0005] Particularly problematical here is end position damping, since throttle valves or the like have hitherto been used in the end face bearing elements, these damping the corresponding end positions when the push-rod element, especially its damper sleeve, enters into a corresponding bearing of the bearing elements.

[0006] It is additionally disadvantageous that, in conventional throttles or throttle valves, especially with large differences in mass applied to the push-rod element of a pneumatic cylinder, vibrations occur in the region of the end positions. Furthermore, conventional cylinders are only of very limited utility, particularly as regards the absorbance of variable magnitudes of load and high speeds and/or accelerations.

[0007] For end position damping, conventional throttles have to be continuously and laboriously readjusted, at very high cost, during continuous operation of the pneumatic cylinders. Even when such a pneumatic cylinder is first installed in a machine or installation, laborious adjustment of the end positions is necessary. Only skilled personnel can undertake this necessary adjustment of the end positions.

[0008] In addition, the appropriate additional throttling ports, throttle inserts and throttle ducts cause increased production costs, which is undesirable.

[0009] GB 2,049,050 describes a hydraulically operated cylinder in which a piston is moved reciprocally by means of a liquid working medium. A corresponding damper sleeve comprises a slot for end position damping.

[0010] It is an object of the present invention to provide a pneumatic cylinder of the type identified initially whereby the above-mentioned disadvantages are eliminated and whereby, in particular, end position damping is to be greatly improved, additional production costs being eliminated and readjustment by cost-intensive skilled personnel also eliminated. In addition, the intention is to make higher cycle times possible with unchanged end position damping. First installation and immediate operation are intended to be possible without skilled personnel and without adjustment of an end position.

[0011] This object is achieved by the features of patent claims 1, 9, 10 and 16.

[0012] In the present invention, preferably, a notch is provided in an outer shell surface of a damper sleeve or in an inner shell surface of a bearing of the damper sleeve, the notch extending in the axial direction of, respectively, the bearing or the damper sleeve.

[0013] Via this notch, the built-up pressure in the interior of the housing can be relieved, as by a throttle, for end position damping. As a result, a movement of the push-rod element in the end position is damped.

[0014] It has proven particularly advantageous to provide the notch discontinuously in the shell surface of the damper sleeve or in the bearing thereof.

[0015] At one end face, close to a phase of the damper sleeve, the notch is of deeper configuration than at its other end face, where it runs over almost into the shell surface and emerges into the latter. The same applies to the bearing, should the notch be provided in the bearing.

[0016] Thus expansion of the air or gas is continuously reduced by the diminishing cross section of the notch, which also provides ever-increasing assistance to a breaking movement in the increasing end position range.

[0017] The notch here may be of triangular, rectangular, arched or other cross-sectional shape.

[0018] Furthermore, provision is also made for a plurality of notches either to be assigned to the damper sleeve in the shell surface thereof or to be provided in an inner shell surface of the bearing of damper sleeves. No limit is set upon the invention in this context. Preferably, the notches are provided axially and linearly, parallel to the push rod or parallel to the push-rod element. They may however also be provided, for example, diagonally or in a serpentine configuration in the shell surface in the longitudinal direction. However, the present invention is not intended to be restricted to this.

[0019] In a further example of embodiment of the present invention, in a pneumatic cylinder an overpressure valve is additionally provided, particularly among its bearing elements, and is in connection via an overpressure duct with a compression space formed between scaling element, damper sleeve, inner shell surface of the housing and an end surface of the bearing elements. As a result of the rapid acceleration or movement of the push-rod element toward the end surface of the bearing element, a pressure is increased, which pressure can admittedly expand, in the manner described above, via the at least one notch into a cavity of the bearing element, but in order to prevent vibrations, especially in end position damping, pressure peaks arising can be reduced via at least one overpressure valve, which is preferably in connection by means of a bypass with an environment or a cavity of the bearing elements. Only those pressure peaks in which the overpressure valve is preferably opened for a short period are damped.

[0020] However, it is also intended to be within the scope of the present invention to use a conventional damper sleeve in order to damp the end position by means of a corresponding overpressure valve. Therefore, protection is also claimed by the independent claim 15. As a result, very great differences in mass can be moved with one and the same pneu-
matic cylinder, an end position damping being optimized without vibrations occurring during the end position damping. Furthermore, very high speeds or accelerations of the push-rod element can be achieved with subsequent loading. In addition, it is advantageous that no adjustment, even with different masses applied to one and the same pneumatic cylinder, is necessary. In particular, a large mass difference of, for example, 5 to 60 kg can be moved via the corresponding overpressure valve with one and the same cylinder, even with very high and changing speeds and/or accelerations. The overpressure valve damps the vibrations completely in the end positions.

[0021] Further advantages, features and details of the invention are apparent from the description of preferred examples of embodiment that follows and with reference to the drawing, in which:

[0022] FIG. 1 is a diagrammatically illustrated plan view of a pneumatic cylinder with inserted push-rod element;

[0023] FIG. 2 is a diagrammatically illustrated plan view of a push-rod element with two damper sleeves and sealing elements mounted theretween and a partial longitudinal section through a bearing element with bearing to receive the damping sleeve;

[0024] FIG. 3 is a longitudinal section through a damper sleeve according to the invention;

[0025] FIG. 4 is a lateral view of the damper sleeve according to FIG. 3;

[0026] FIG. 5 is a longitudinal section through a further example of embodiment of the damper sleeve according to FIG. 3;

[0027] FIG. 6 is a lateral view of the damper sleeve according to FIG. 5;

[0028] FIGS. 7a and 7b are diagrammatically illustrated lateral views of a damper sleeve with notch according to the invention;

[0029] FIGS. 8a and 8b are lateral views of the damper sleeve according to FIGS. 3, 5 and 7a as further examples of embodiment with a notch according to the invention;

[0030] FIG. 9 is a diagrammatically illustrated longitudinal section through the damper sleeve according to FIG. 7a along the line IX-IX;

[0031] FIG. 10 is a diagrammatically illustrated plan view of a possible further arrangement of the notch in a shell surface of a damper sleeve;

[0032] FIG. 11 is a diagrammatically illustrated longitudinal section through a further example of embodiment of the damper sleeve;

[0033] FIG. 12 is a lateral view of the damper sleeve according to FIG. 11;

[0034] FIG. 13 is a diagrammatically illustrated plan view of the further example of embodiment of the damper sleeve according to FIGS. 11 and 12; and

[0035] FIG. 14 is a diagrammatically illustrated partial longitudinal section through a further example of embodiment of a pneumatic cylinder according to FIG. 1.

[0036] According to FIG. 1, a pneumatic cylinder R comprises a housing 1 which is of cylindrical configuration in its interior. Bearing elements 2.1, 2.2, which in one case subject an internal push-rod element 3 to pressure for the reciprocal movement of any desired loads and control it accordingly, adjoin the housing 1 at each end.

[0037] In this case, corresponding apertures 4.1, 4.2 are provided in the bearing elements 2.1, 2.2 and form the corresponding connections for the pneumatic lines (not shown here) for feeding air or gas into the housing interior of the housing 1.

[0038] When air is passed through the aperture 4.1 via the bearing element 2.1 into the housing 1, the push-rod element 3 can be moved in the direction of the bearing element 2.2. However, when air or gas is passed via the aperture 4.2 into the housing 1, the push-rod element 3 can be moved back.

[0039] For end position damping, sealing elements or the like are provided in the bearing elements 2.1, 2.2, into which sealing elements corresponding damper sleeves 5 assigned to the push-rod element 3, as are shown for example in FIG. 2, engage. Provided between the two damper sleeves 5 is at least one sealing element 6, which extends in the manner of a piston within the cylindrical housing 1, mounting the push-rod element 3 on the one hand and sealing it on the other.

[0040] The diameters of the damper sleeve 5 are somewhat greater than those of the push rod 7 of the push-rod element 3.

[0041] The damper sleeves 5 engage into the corresponding bearing elements 2.1, 2.2, especially into the bearing 13 thereof, with sealing, the aperture 4 being closed. In a conventional manner, via a throttle, a throttle valve or the like, the compressed air for damping a pushing movement of the push-rod element 3 in an end position is continuously and slowly-removed.

[0042] With the present invention, however, corresponding throttle elements can be dispensed with in that, according to the invention, at least one notch 8 is provided in the damper sleeve 5 or the bearing 13 thereof in the shell surfaces 9 thereof.

[0043] As shown in particular in FIG. 2, the notch 8 is provided linearly and parallel to the push rod 7 in a longitudinal direction of the damper sleeve 5.

[0044] When the push-rod element 3, in particular the damper sleeve 5, enters into the corresponding seal of the bearing elements 2.1 or 2.2, or into the bearing 13 in the respective end positions, for the end position damping of the movement of the push-rod element 3 the compressed air in the bearing element 2.1 or 2.2, or in the bearing 13, can continuously, permanently and slowly escape via the notch 8.

[0045] At one end in each case, the damper sleeve 5 is provided with a phase 10 which is used for introduction into the bearing 13 of the bearing elements 2.1, 2.2.

[0046] FIGS. 3 and 5 each show longitudinal sections of the damper sleeve, in which the notch 8 is visible. In the example of embodiment according to FIGS. 3 and 4, and according to FIGS. 5 and 6, the notch 8 is of triangular cross-sectional configuration.
In this case, the notch 8 is let in much more deeply in the region of one end face 11, starting from the shell surface 9, and, viewed toward the shell surface 9, is figured to run outward to the opposite end face 12. In the region of the end face 12, especially in the shell surface 9, the notch 8 is very slight or virtually makes a transition into the shell surface 9.

As a result, a cross-sectional surface of the notch 8 changes permanently, this cross-sectional surface tapering toward the end face 12, starting from the end face 11.

Furthermore, it is also intended to be within the scope of the present invention, as is indicated for example in FIG. 2, that the notch 8 described above may be provided in a bearing 13 of the bearing elements 2.1 or 2.2 in the region of an inner shell surface 9. In this case, accordingly, a gasket, for example, would be provided on the damper sleeve 5 so that, for end pressure damping, the overpressure or the air or gas can escape via the notch 8 in the inner shell surface 9 of the bearing 13 of the bearing elements 2.1 or 2.2. This is likewise intended to be within the scope of the present invention.

If the notch 8 is assigned to the damper sleeve 5, corresponding scaling elements are provided within the bearing 13 of the bearing elements 2.1, 2.2. If the at least one notch 8 is provided within the shell surface 9 of the bearing 13 of the bearing elements 2.1, 2.2, corresponding scaling elements are assigned to the damper sleeve 5.

FIGS. 7a and 7b show lateral views of a corresponding damper sleeve 5, from which it is apparent that the notch 8 extends in an approximately triangular manner and encloses an angle β of approximately 30 to 90°, preferably 60°.

It is also within the scope of the present invention in this case to let a plurality of notches 8 into the shell surface 9, distributed over the circumference, in which case the latter, as is shown in particular in FIG. 8a, may also be rectangular and, as shown in FIG. 8b, also of arched configuration.

In the example of embodiment of the present invention according to FIG. 9, it is shown in partial cross section and on a larger scale that the notch 8 comprises a maximum depth T in the region of the end face 11 and extends in a tapering manner to the other, opposite end face 12, into the plane of the shell surface 9. In this case, the notch 8, viewed in an axial direction, encloses an angle α of from 1° to 3°, and preferably 1.7° to 2.0°, with the shell surface 9. The invention is not, however, intended to be restricted to this angle α.

This change in the cross section or this continuous running-out of the notch 8 is also to be provided in the bearing 13, as is shown, in particular, in FIG. 2. In this case, a maximum depth T is always to extend in a tapering manner from the end face 11 to the opposite end face 12.

In the example of embodiment in accordance with FIG. 10, a plan view of the damper sleeve 5 is shown, in which the notch 8 is provided, for example, extending diagonally in the shell surface 9. Again, the present invention is not restricted to this.

In a further example of embodiment of the present invention, in accordance with FIGS. 11 and 12, a further damper sleeve 5.1 is shown, in the shell surface 9 of which at least one recess 14, especially an aperture, bore or blind hole, is provided, preferably axially. Substantially, the recess 14 extends into the end face 11 and leads to the end face 12. The recess 14 is, however, a blind hole. Moreover, radial bores 15 meet the recess 14 from outside, as is also shown in the plan view according to FIG. 13.

The functioning of the present example of embodiment corresponds approximately to that described above with reference to FIGS. 2 to 6.

It is important that, on entry of the damper sleeve 5.1 by its end face 11 into the bearing element 2.1, 2.2 via the bores 15, the air compressed between scaling element 6 and bearing element 2.1, 2.2 for end position damping expands through the bores 15 into the recess 14 and can escape from there via the apertures 4.1 or 4.2 of the bearing elements 2.1, 2.2.

As a result of permanent pushing of the damper sleeve 5.1 into the bearing element 2.1, 2.2, in which a sealing element (not shown in detail here) is seated at the end face, the number of bores 15 subjected to the action of pressure becomes smaller, so that a lesser volume flow of the expanding gas can escape through the bores 15 or recess 14 for end position damping.

In this case, the individual bores 15 may be arranged at variable distances away from one another axially, in order thereby to exert an influence on a damping behavior.

Moreover, a diameter D of the individual bores 15 may vary, so that influence can thereby be exerted on the outflow behavior and, hence, also on the damping behavior of the compressed gas.

Especially when the end face 11 of the damper sleeve 5, 5.1 engages into the sealing element (not shown) of the bearing element 2.1, 2.2, what is referred to as an annular space forms between the sealing element 6 and the end face 11 of the bearing element 2.1, 2.2.

In order to damp the end position, it has proven particularly advantageous to bring out the air or the gas at a definable rate of outflow of the space formed between scaling element 6 and bearing element 2.1, 2.2.

Especially if the scaling element 6 is located close to the bearing element 2.1 or 2.2, the speed of the push-rod element 3 is to be damped virtually to zero, without the scaling element 6 impacting at high speed against the bearing element 2.1, 2.2. In this case, the air, as is shown in particular in FIGS. 2 to 10, can escape in a definable manner by what is referred to as the notch 8, it being advantageous here that such a notch, first, does not impair the sealing element in the bearing element 2.1, 2.2 and that the air, especially the gas, can flow along the notch 8, so that self-cleaning takes place here.

In a further example of embodiment of the present invention, in accordance with FIG. 14, a partial longitudinal section is shown through a further example of embodiment of a pneumatic cylinder R1, which corresponds approximately to the type described above. The bearing elements 2.1, 2.2, one of which is provided at one end and the other at the other end of the pneumatic cylinder R1, are merely shown in a one-sided view for the sake of simplicity.
The housing 1 adjoins the at least one bearing element 2.1, 2.2 at the end face, a gasket 16 of a flange (not specifically numbered here) producing a seal between the housing 1 and the bearing element 2.1, 2.2.

Within the bearing elements 2.1, 2.2, this example of embodiment comprises a cavity 17, preferably of cylindrical configuration, the bearing 13, for example in the form of a radial packing ring or similar sealing element, being inserted in the region of an end surface 18 of the bearing elements 2.1, 2.2.

Furthermore, an overpressure duct 19 opens at the end surface 18 within the housing 1 and is adjoined by an overpressure valve 20. Substantially, the overpressure valve 20 consists of a spherical element 21, closing the duct 19, of a spring element 22 and of a closure element 23. The latter are inserted into a blind hole 24 of the bearing element 2.1, 2.2.

The blind hole 24 is further adjoined by a bypass 25, which forms a connection between the overpressure duct 19 and the cavity 17 of the bearing elements 2.1, 2.2 if an overpressure builds up within a compression space 26 which is not sufficient for the escape of air, described above, via the notch 8 into the cavity 17.

The overpressure valve 20 is then actuated, and the ball 21 releases a connection between overpressure duct 19 and bypass 25, so that the compressed air can pass into the cavity 17 and, from there, either be removed to the environment or escape through the apertures 4.1, 4.2 for the introduction and/or removal of air.

In the case of the present invention, it has proven particularly advantageous that, in conventional operation, as a result of the movement of the push-rod element 3 with damper sleeve 5 and at least one sealing element 1 within the housing 1, the air compressed in the region of the end position in the compression space 26 can flow out via the notch 8 into the cavity 17, which in this position is connected to the environment, in order to damp an end position of the push-rod element 3.

In this case, consideration is also to be given to exerting an influence by means of the closure element 23 and/or the spring element 22 on the overpressure, especially the overpressure valve 20, in order to ensure opening only in the event of a definable and selectable overpressure in the compression space 26 and to release a bypass 25 to the cavity 17.

Preferably, the bypass 25 opens into the cavity 17 behind the bearing 13 and close to the aperture 4.1, 4.2.

A further important point of the present invention is that, in the event of very high masses, especially mass differences, which are moved reciprocally by the pneumatics cylinder R, at different speeds, vibrations in the region of the end positions can be reduced. As a result of the additional provision of the overpressure valve 20, which arises only in the event of a particular overpressure, that is to say is reached, in particular, shortly before a corresponding vibration, arising as a result of an overpressure in the end position by movement of the push-rod element 3 against the bearing element 2.1 or 2.2, is compensated, the overpressure valve merely opening for a short period in order to reduce the pressure peak by means of relief via the bypass 25 into the cavity 17. Only these pressure peaks are responsible for an end position vibration of the push-rod element 3, and they are hereby prevented. On further movement of the push-rod element 3, the air is continuously expanded in the manner described above via the notch 8 from the ever-diminishing compression space 26 via the notch 8 in the damper sleeve 5 into the cavity 17.

This ensures that an adjustment, especially in the event of large differences in mass that may be conveyed with one and the same pneumatics cylinder R, becomes unnecessary and optimum end position damping is ensured.

Similarly, vibrations in the end positions are completely eliminated by the relieving of the pressure peaks via the overpressure valve 20.

In addition, very high speeds and, especially, accelerations can be set, even for large masses. In particular, a light weight and a very heavy weight can be moved without readjustment, using one and the same pneumatics cylinder R, the mass differences being able to lie between 5 and 60 kg, preferably between 5 and 40 kg, without any readjustment being necessary.

It is also advantageous in the present invention that, by means of the latter, a self-setting end position damping takes place in pneumatics cylinders. The pneumatics cylinders according to the invention here operate in absolute synchrony, more rapid machine cycle times being capable of being achieved thereby.

It is also of advantage that no initial setting of the damping of the pneumatics cylinder is necessary. End position throttling, together with throttle ports and end position throttles, become unnecessary. The latter often become soiled and thereby require frequent end position adjustment or readjustment of the machines. The overall result is an increased service life of the pneumatics cylinders R, R,.

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Patent claims

1. Pneumatic cylinder with end position damping, having a housing (1) in which at least one push-rod element (3) with at least one sealing element (6) is mounted to be movable in a linear manner, at least one damper sleeve (5) being assigned to the push-rod element (3) and engaging, in the end positions, into end face bearing elements (2.1, 2.2), characterized in that, for end position damping and ventilation, the damper sleeve (5) or the bearing (13) thereof comprises at least one notch (8).

2. Pneumatic cylinder according to claim 1, characterized in that the at least one notch (8) is provided in a shell surface (9) of the damper sleeve (5) or in the bearing (13) thereof.

3. Pneumatic cylinder according to claim 2, characterized in that the at least one notch (8) is provided approximately axially to the damper sleeve (5) or approximately axially to the bearing (13) thereof in the shell surface (9).

4. Pneumatic cylinder according to at least one of claims 1 to 3, characterized in that the at least one notch (8) is provided approximately parallel to the push-rod element (3) in the damper sleeve (5) or the bearing (13) thereof.

5. Pneumatic cylinder according to at least one of claims 1 to 4, characterized in that the damper sleeve (5) is provided at one end, with a phase (10) for engagement into at least one sealing element (6) of the bearing (13).

6. Pneumatic cylinder according to at least one of claims 1 to 5, characterized in that the at least one notch (8) is provided at different depths (1) in the damper sleeve (5) or in the bearing (13) thereof.

7. Pneumatic cylinder according to at least one of claims 2 to 6, characterized in that the notch (8), starting from the shell surface (9) of the damper sleeve (5) or the shell surface (9) of the bearing (13) thereof, is let into the latter at an angle (α) of approximately 1 to 3°, especially 1.7 to 2.0°.

8. Pneumatic cylinder according to claim 6 or 7, characterized in that the depth (1) in the region of the phase (10) of the damper sleeve (5) or the bearing (13) thereof is maximal and the notch (8) extends at the other end from the end face of the damper sleeve (5) or the bearing (13) thereof precisely into the shell surface (9).

9. Pneumatic cylinder according to at least one of claims 2 to 8, characterized in that the at least one notch (8) is provided to be linear and parallel to a longitudinal direction of the damper sleeve (5) or the bearing (13) thereof within the latter and/or extends diagonally over the shell surface (9) from a first end to a second end via the shell surface (9).

10. Pneumatic cylinder according to at least one of claims 1 to 9, characterized in that the at least one notch (8) of the damper sleeve (5) or the bearing (13) thereof is configured to be triangular, rectangular or arched in cross section.

11. Pneumatic cylinder according to at least one of claims 1 to 10, characterized in that the at least one notch (8) is configured to be triangular in cross section at an angle β of approximately 30 to 90°, especially 60°.

12. Pneumatic cylinder with end position damping, having a housing (1) in which at least one push-rod element (3) with at least one sealing element (6) is mounted to be movable in a linear manner, at least one damper sleeve (5), (5.1) being assigned to the push-rod element (3) and engaging, in the end positions, into end face bearing elements (2.1, 2.2), characterized in that, for end position damping and ventilation, the damper sleeve (5.1) and/or the bearing (13) thereof comprises at least one recess (14) and/or bore (15).

13. Pneumatic cylinder according to claim 12, characterized in that the recess (14) is provided axially in a shell surface (9) of the damper sleeve (5.1), into which at least one bore (15) engages radially.

14. Pneumatic cylinder according to claim 13, characterized in that a diameter (D) of each bore (15) and/or recess (14) is variably selectable and a distance (A) between bores (15) which are respectively disposed axially adjacent to one another can be selected as desired.

15. Pneumatic cylinder with end position damping, having a housing (1) in which at least one push-rod element (3)
with at least one sealing element (6) is mounted to be movable in a linear manner, at least one damper sleeve (5) being assigned to the push-rod element (3) and engaging, in the end positions, into end face bearing elements (2.1, 2.2), characterized in that at least one overpressure valve (20) is assigned to the bearing element (2.1, 2.2).

16. Pneumatic cylinder according to claim 15, characterized in that the overpressure valve (20) is connected via at least one overpressure duct (19) to a compression space (26).

17. Pneumatic cylinder according to claim 16, characterized in that, if a pressure is exceeded in the compression space (26), air, gas or a medium passes via the overpressure duct (19) into the overpressure valve (20) and can be relieved via a bypass (25) into a cavity (17) or an environment.

18. Pneumatic cylinder according to claim 17, characterized in that the bypass (25) from the overpressure valve (20) opens within a bearing (13) in a shell surface (9) of the bearing element (2.1, 2.2) or is guided into an environment.

19. Pneumatic cylinder according to at least one of claims 16 to 18, characterized in that the overpressure duct (19) opens at the end face from one end surface (18) within the housing (1) into the compression space (26).

20. Pneumatic cylinder according to at least one of claims 16 to 19, characterized in that the overpressure valve (20) comprises a valve element (21), especially a ball, which seals the overpressure duct (19) and/or the bypass (25) in the closed position, the ball (21) being subjected to pressure by means of at least one spring element (22), which is retained via a closure element (23) in a blind hole (24) of the bearing element (2.1, 2.2).

21. Damper sleeve or bearing thereof, especially for push-rod elements (3) for pneumatic cylinders, characterized in that for end position damping and ventilation the damper sleeve comprises at least one notch (8) and/or recess (14) and/or bore (15).

22. Damper sleeve or bearing thereof according to claim 21, characterized in that the at least one notch (8) is provided in a shell surface (9).

23. Damper sleeve or bearing thereof according to claim 22, characterized in that the at least one notch (8) is provided extending in a longitudinal direction in the shell surface (9) parallel to the axis or diagonally.

24. Damper sleeve or bearing thereof according to claim 22 or 23, characterized in that the at least one notch (8) is let in deeper into the shell surface (9) at one end than at the other end.

25. Damper sleeve or bearing thereof according to at least one of claims 22 to 24, characterized in that the at least one notch (8) is configured deeper at one end in the region of an end face (11) and emerges at the other end in the region of an opposite end face (12) to make a transition into the shell surface (9).

26. Damper sleeve or bearing thereof according to at least one of claims 22 to 25, characterized in that the at least one notch (8) is provided in the shell surface (9) to be triangular, rectangular or arched in cross section.

27. Damper sleeve or bearing thereof according to at least one of claims 22 to 26, characterized in that the recess (14) is provided axially in the shell surface (9) and at least one radial bore (15) engages into the recess (14).

28. Damper sleeve or bearing thereof according to claim 27, characterized in that the radial bores (15) are spaced from one another axially by a selectable distance (A), it being possible, if desired, to select a diameter (D) of each individual bore (15).