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(54) TRACTION-BUFFER DEVICE

(57) The invention pertains to the field of transport engineering and relates to traction-buffer devices and absorbing apparatuses installed between railcars in a train set.

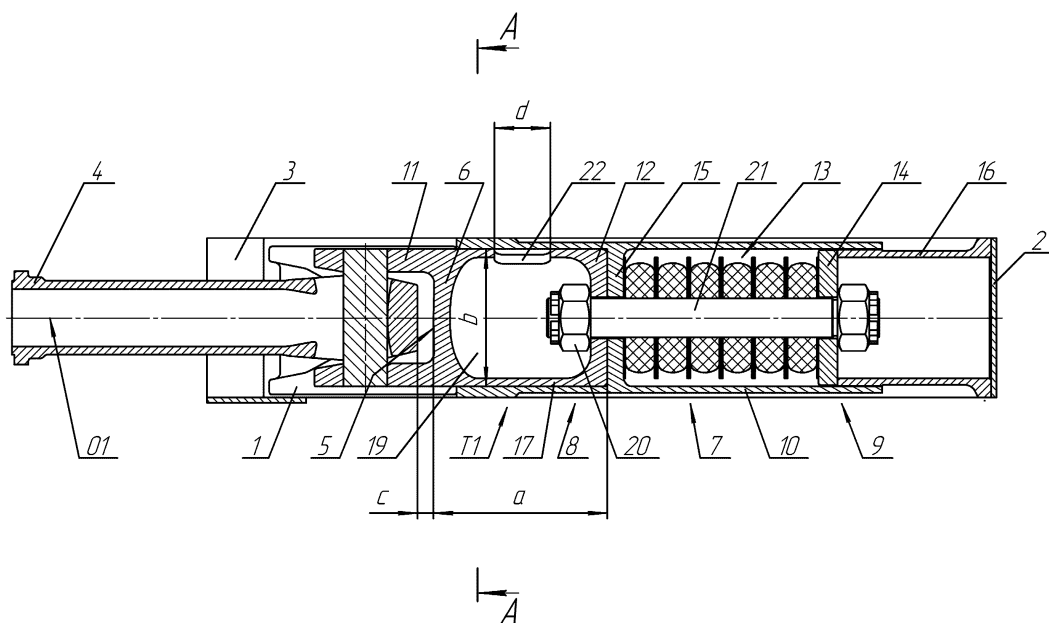
The objective is to limit the angular movement of the support part of the support element within the guide assembly relative to the longitudinal axis.

This objective is achieved by a traction-buffer device comprising a traction-bearing rod positioned along the longitudinal axis of the unit, capable of contacting the support part of the support element. The device also includes a housing with a front part, a rear part, and walls,

with traction elements housed inside. The rear part of these traction elements contains a traction-support element. Additionally, a spring device is placed within the housing, situated between a rear stop element and a traction-buffer stop, which restricts movement towards the front part of the housing.

Distinctive features include a stop in the rear part of the housing, which maintains movable contact with the housing walls, while the traction-buffer stop restricts movement towards the rear part of the housing.

Further details of the invention's components are also described.

**Fig. 1**

Description

[0001] The invention pertains to the field of transport engineering, specifically to absorbing devices and traction-buffer devices installed between railcars in a train set. Various designs of traction-buffer devices are known, for example, the energy-absorbing device [1, Patent EP4342763A1, IPC B61G9/06, priority date 20.09.2022, published 27.03.2024], which is taken as the prototype.

[0002] This device includes a housing consisting of two chambers, the first and second, bounded by a front and a rear plate. Elastic-deformable elements are placed in both chambers, with the chambers positioned respectively in the front and rear parts of the housing. The front plate of one chamber is connected to the rear plate of the other. The traction force compresses the first chamber, while the buffer force compresses both chambers.

[0003] The prototype [1] has drawbacks, such as insufficiently reliable retention of the fork against skewing relative to the longitudinal axis and inadequate centering of the front and rear plates of the housing that contact the elastic-deformable elements of the chambers.

[0004] The identified drawback of the aforementioned design option for the traction-buffer device sets the invention's objective-to restrict angular movement of the support part of the support element within the guide assembly relative to the longitudinal axis. The invention's structure is illustrated in Figures 1-15.

[0005] The objectives are achieved by configuring the traction-buffer device (Figures 1, 2, 6-15) for installation in the coupling unit of a railcar equipped with a front stop (1) and a rear stop (2) within a pocket (3) and comprising a traction-bearing rod (4) arranged along the longitudinal axis (O1) and capable of contacting the support part (5) of the support element (6), as well as a housing (7) with a front part (8), a rear part (9), and walls (10). Inside this housing (7), traction elements (11) are placed, with the rear part containing a traction-support element (12). The housing (7) includes a spring device (13) positioned between a rear stop element (14) and a traction-buffer stop (15), which restricts movement towards the front part (8) of the housing (7).

[0006] The traction-buffer device distinguishes itself from the prototype [1] by having a stop (16) in the rear part (9) of the housing (7), which is in movable contact with its walls (10) and also with the rear stop (2). The traction-buffer stop (15) is restricted from moving towards the rear part (9) of the housing (7), enabling joint movement of the traction-buffer stop (15) and the housing (7) towards the rear stop (2) while limiting their combined movement towards the front stop (1).

[0007] The support element (6), traction elements (11), and traction-support element (12) are combined into a guide assembly (T1), which has walls (17) and is installed inside the housing (7). The walls (17) of the guide assembly (T1) can contact the walls (10) of the housing (7) to allow movement of the guide assembly (T1) along the longitudinal axis (O1) and to limit angular movement of the support part (5) of the support element (6) relative to the longitudinal axis (O1).

[0008] The above distinguishing features ensure restriction of angular movement of the guide assembly (T1) relative to the longitudinal axis (O1), preventing skewing of the traction-bearing rod (4) and enhancing the reliability of centering the front and rear parts (8, 9) of the housing.

[0009] Additional distinguishing features of the invention aimed at enhancing the aforementioned advantages include:

- the guide assembly (T1) is configured for contact with the inner surfaces of the walls (10) of the housing (7), with one set of guide catches (18-1) on the walls (17) of the guide assembly (T1) and another set of guide catches (18-2) on the walls (10) of the housing (7) to limit rotation of the guide assembly (T1) within the housing (7);
- the guide assembly (T1) has a cavity (19), with a retainer (20) inside it that allows movement along the longitudinal axis (O1) within the cavity (19) and can contact the traction-support element (12);
- the support element (6), traction elements (11), and traction-support element (12) of the guide assembly (T1) are integrated;
- the length (a) of the guide assembly (T1) is greater than the distance (b) between its opposite walls (17);
- along the longitudinal axis (O1), a traction unit (21) is installed, and within the guide assembly (T1), a cavity (19) is created, housing one end of the traction unit (21), fixed by a retainer (20) in the shape of a nut, with a hole (22) of length (d) over 45 mm on the side of the walls (10) of the housing (7);
- an additional element (23) in the housing (7) divides the spring device (13) into front and rear parts (13-1 and 13-2);
- limiters (24) are installed on the walls (10) of the housing (7) to contact the additional element (23), restricting compression of the front part (13-1) of the spring device (13) in traction mode;
- a traction unit (21) with a rear part (21-2) having a fixed stop element (25) positioned to move towards the front part (8) of the housing (7) relative to the rear stop element (14), with the stop element (25) in contact with the additional element (23), enabling compression of the front part (13-1) of the spring device (13) in traction mode;
- an additional spring device (26) installed between the traction-support element (12) and the traction-buffer stop (15);
- along the longitudinal axis (O1), a traction unit (21) is arranged with its front part (21-1) equipped with a retainer (20) inside the guide assembly (T1) and its rear part (21-2) passed through the rear stop element (14) and secured by a rear retainer (20-2), with the traction unit (21) encased by spring devices (13, 26);
- an internal spring device (27) located in the front part of the guide assembly (T1);

- the guide assembly (T1) is equipped with a limiting lock (28) to set a clearance (c) between the traction-bearing rod (4) and the support element (6);
- the internal spring device (27) can create an additional clearance (n) between the support and traction-support elements (6, 12).

[0010] *The Essence of the Invention is Explained with Illustrations, Where:*

- Fig. 1 shows a front cross-section of the traction-buffer device positioned in the pocket (3).
- Fig. 2 presents a horizontal cross-section of the traction-buffer device.
- Figs. 3-5 depict cross-sections A-A from Fig. 1 for various versions of guide catches.
- Fig. 6 illustrates a horizontal cross-section of the traction-buffer device for the design variant with an additional element (23).
- Fig. 7 shows a front cross-section of the traction-buffer device for the design variant with the additional element (23) and limiters (24).
- Fig. 8 displays a front cross-section of the traction-buffer device for the design variant with the additional element (23) and stop element (25).
- Fig. 9 shows a front cross-section of the traction-buffer device for the design variant with the additional element (23), stop element (25), and rear retainer (20-2).
- Fig. 10 illustrates a front cross-section of the traction-buffer device for the design variant with an additional spring device (26).
- Fig. 11 shows a front cross-section of the traction-buffer device for the design variant with an internal spring device (27) and limiting locks (28).
- Fig. 12 represents the same as Fig. 11, with the installation of an additional spring device (26).
- Fig. 13 provides a horizontal cross-section of the traction-buffer device for the traction operation mode.
- Fig. 14 depicts a horizontal cross-section of the traction-buffer device for the buffer operation mode.
- Fig. 15 shows a three-dimensional view of the guide assembly (T1) with a spring device (13).

[0011] The traction-buffer device is designed for installation in the coupling unit of a railcar, which is equipped with a front stop (1) and a rear stop (2) within a pocket (3) (Figs. 1, 2, 6-15). It includes a traction-bearing rod (4) positioned along the longitudinal axis (O1) of this unit and configured to contact the support part (5) of the support element (6), as well as a housing (7) with a front part (8), a rear part (9), and walls (10). Inside the housing (7), traction elements (11) are placed, with the rear part containing a traction-support element (12). The housing (7) also holds a spring device (13) positioned between a rear stop element (14) and a traction-buffer stop (15) that limits movement towards the front part (8) of the housing (7).

[0012] A stop (16), which is in movable contact with the walls (10) of the housing (7), is located in the rear part (9) of the housing (7) and also contacts the rear stop (2) (Figs. 1, 2). The traction-buffer stop (15) restricts movement towards the rear part (9) of the housing (7), allowing joint movement of the traction-buffer stop (15) and the housing (7) towards the rear stop (2) while limiting their combined movement towards the front stop (1).

[0013] The traction-support element (12) can move along with the traction-buffer stop (15) and housing (7) along the longitudinal axis (O1) towards the rear stop (2), allowing compression of the spring device (13) in buffer mode. The support element (6), traction elements (11), and traction-support element (12) are combined into a guide assembly (T1) with walls (17) and are installed inside the housing (7). The walls (17) of the guide assembly (T1) can contact the walls (10) of the housing (7), enabling movement of the guide assembly (T1) along the longitudinal axis (O1) and restricting angular movement of the support part (5) of the support element (6) relative to the longitudinal axis (O1).

[0014] The term front part (8) of the housing (7) refers to the part closer to the front stop (1), while the rear part (9) refers to the part closer to the rear stop (2). Walls (17) of the guide assembly (T1) encompass all surfaces that contact the housing (7).

[0015] The support element (6), traction elements (11), and traction-support element (12) may be integrated into the guide assembly (T1) with a detachable connection (e.g., fasteners, threaded connections), a permanent connection (e.g., welding), or as a single piece (e.g., by forging or casting).

[0016] Movement along the longitudinal axis (O1) of the housing (7) and the traction-buffer stop (15) is jointly possible but not limited to simultaneous movement.

[0017] This design limits the angular movement of the support part (5) of the support element (6) within the guide assembly (T1) relative to the longitudinal axis (O1).

[0018] The guide assembly (T1) can be configured to contact the internal surfaces of the walls (10) of the housing (7). Additionally, one set of guide catches (18-1) may be on the walls (17) of the guide assembly (T1), and another set (18-2) on the walls (10) of the housing (7), to restrict the rotation of the guide assembly (T1) within the housing (7) (Figs. 3-5, 15). One set of guide catches can be implemented as separate parts (e.g., keys or spline projections) (Fig. 3), while the other set may

be made as facets (Figs. 4, 5, 15). In this configuration, both the guide assembly (T1) and housing (7) are faceted, each having four or more facets. This structure prevents rotation of both the guide assembly (T1) and the housing (7) relative to the longitudinal axis (O1).

[0019] The guide assembly (T1) can be designed with a cavity (19) (Figs. 1, 2, 6-10). A retainer (20) located inside the guide assembly (T1) is configured to allow movement along the longitudinal axis (O1) within the cavity (19) and to contact the traction-support element (12). This design facilitates the assembly of the spring devices (13, 26).

[0020] The support element (6), traction elements (11), and traction-support element (12) of the guide assembly (T1) can be integrated as a single unit, for example, through casting or forging. In another design variant, the support element (6), traction elements (11), and traction-support element (12) of the guide assembly (T1) can be joined by a permanent connection, such as welding.

[0021] The length (a) of the guide assembly (T1) is ideally greater than the distance (b) between its opposite walls (17), ensuring reliable centering of the guide assembly (T1) within the housing (7) relative to the longitudinal axis (O1).

[0022] A traction unit (21) may be installed along the longitudinal axis (O1). Inside the guide assembly (T1), a cavity (19) may house one end of the traction unit (21), which is secured by a nut-shaped retainer (20) (Figs. 1, 2). An opening (22) of length (d) greater than 45 mm is recommended on the side of the walls (10) of the housing (7) within the cavity (19) of the guide assembly (T1) to simplify the assembly of the guide assembly (T1) with the traction unit (21).

[0023] An additional element (23), dividing the spring device (13) into front and rear parts (13-1 and 13-2), is ideally installed in the housing (7) (Figs. 6-9). This element (23) reduces the travel of the traction-buffer device in traction mode, stabilizes the characteristics of the spring device (13), and improves operating conditions for its components.

[0024] The front part (13-1) of the spring device (13) refers to the section closer to the front stop (1), while the rear part (13-2) is closer to the rear stop (2).

[0025] Limiters (24) may be installed on the walls (10) of the housing (7) (Fig. 7) to contact the additional element (23) and restrict compression of the front part (13-1) of the spring device (13) in traction mode, preventing excessive deformation of the components in the front part (13-1) of the spring device (13).

[0026] A traction unit (21) may be installed in the housing (7), with its rear part (21-2) containing a fixed stop element (25) and positioned to move relative to the rear stop element (14) towards the front part (8) of the housing (7) (Fig. 8). The stop element (25) contacts the additional element (23), enabling compression of the front part (13-1) of the spring device (13) in traction mode.

[0027] The front part (21-1) of the traction unit (21) is the section closer to the front stop (1), while the rear part (21-2) is closer to the rear stop (2).

[0028] The rear part (21-2) of the traction unit (21) may also be equipped with a stop element (25) and fixed by a rear retainer (20-2), allowing joint movement with the rear stop element (14) towards the front part (8) of the housing (7) (Fig. 9). Here, the stop element (25) contacts the additional element (23), enabling compression of the front part (13-1) of the spring device (13) in traction mode.

[0029] An additional spring device (26) can be placed between the traction-support element (12) and the traction-buffer stop (15) within the housing (7) (Figs. 10, 12). The additional spring device (26) increases the energy absorption capacity and efficiency of the traction-buffer device.

[0030] The front part (21-1) of the traction unit with its installed retainer (20) may be positioned inside the guide assembly (T1), while the rear part (21-2) passes through the rear stop element (14) and is secured by a rear retainer (20-2). In this configuration, the traction unit (21) is surrounded by spring devices (13, 26) (Fig. 10).

[0031] An internal spring device (27) may be located in the front part of the guide assembly (T1) (Figs. 11, 12). The internal spring device (27) further enhances the energy capacity of the traction-buffer device.

[0032] A limiting lock (28) is ideally installed on the guide assembly (T1) to set a clearance (c) between the traction-bearing rod (4) and the support element (6) (Fig. 12).

[0033] The internal spring device (27) may also allow for an additional clearance (n) between the support and traction-support elements (6, 12) (Figs. 11, 12), with the clearance (n) adjusted to restrict the maximum deformation of the internal spring device (27).

Operating Principle of the Traction-Buffer Device

[0034] In traction mode (Fig. 13), when the railcar accelerates, the traction force is transmitted from the traction-bearing rod (4) to the support element (6), the walls (17) of the guide assembly (T1), the traction-support element (12), the retainer (20), the traction unit (21), the rear stop element (14), the spring device (13), the traction-buffer stop (15), the housing (7), and the front stop (1). Here, the spring device (13) compresses, converting oscillating traction force energy into elastic deformation energy within the spring device (13). When the train moves along a curved track section, the traction-bearing rod (4) deviates from the longitudinal axis (O1) at a certain angle, with the resulting additional lateral forces compensated by centering the guide assembly (T1) along the longitudinal axis (O1) through the aforementioned design elements.

[0035] In buffer mode (Fig. 14), when braking, the braking force is transmitted from the traction-bearing rod (4) to the

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support part (5) of the support element (6), the walls (17) of the guide assembly (T1), the traction-support element (12), the traction-buffer stop (15), the spring device (13), the rear stop element (14), the stop (16), and the rear stop (2). Here, the spring device (13) compresses, converting the oscillating braking force energy into elastic deformation energy within the spring devices. Additional lateral forces occurring when the train moves on a curved section are compensated similarly to traction mode.

[0036] This design of the traction-buffer device thus limits angular movement of the support part (5) of the support element (6) within the guide assembly (T1) relative to the longitudinal axis (O1).

LIST reference designations and the names of the elements to which these designations relate

[0037]

1	front stops
2	rear stops
3	pocket
4	traction-bearing rod
5	support part of the support element (6)
6	support element
7	housing
8	front part of the housing (7)
9	rear part of the housing (7)
10	walls of the housing (7)
11	traction elements
12	traction-support element
13	spring device
13-1	front part of the spring device (13)
13-2	rear part of the spring device (13)
14	rear stop element
15	traction-buffer stop
16	stop
17	walls of the guide assembly (T1)
18-1	one guide catch
18-2	another guide catch
19	cavity in the guide assembly (T1)
20	retainer
20-2	rear retainer
21	traction unit
21-1	front part of the traction unit (21)
21-2	rear part of the traction unit (21)
22	hole in the housing (7)
23	additional element
24	limiters
25	support element
26	additional spring device

(continued)

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27	internal spring device
28	limiting lock
O1	longitudinal axis
T1	guide assembly
a	length of the guide assembly (T1)
b	distance between opposite walls (17) of the guide assembly (T1)
c	clearance between the traction-bearing rod (4) and the support element (6)
d	length of the hole (22) on the side of the walls (10) of the housing (7)
n	additional clearance between the support and traction-support elements (6, 12)
A-A	designation of the cross section in Fig 1

Claims

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- 1. A traction-buffer device** made with the possibility of its installation in a pocket (3) of a railroad coupling unit provided with a front stop (1) and a rear stop (2), and containing along the longitudinal axis (O1) of this unit a traction-bearing rod (4) made with the possibility of contact with a support part (5) of a support element (6), and also a housing (7) having a front part (8), rear part (9) and walls (10), wherein inside said housing (7) are placed traction elements (11), the rear part of which contains a support and traction-support element (12), furthermore, the housing (7) contains a spring device (13) arranged between the rear stop element (14) and a traction and buffer stop (15) made with the possibility of limiting movement towards the front part (8) of the housing (7), **differing in that** in the rear part (9) of the housing (7) there is located a stop (16) in movable contact with its walls (10), which is also located in contact with the rear stop (2), wherein the traction-buffer stop (15) is made with restriction of movement towards the rear part (9) of the housing (7), wherein the traction-buffer stop (15) and the housing (7) can be moved together towards the rear stop (2) and their joint movement towards the front stop (1) can be restricted, and the support-pulling element (12) can be moved together with the traction-buffer stop (15) and the housing (7) along the longitudinal axis (O1) towards the rear stop (2) to ensure compression of the spring device (13) in the buffer mode, wherein the support element (6), the traction elements (11) and their support and traction-support element (12) are combined in a guide assembly (T1) made with walls (17) and installed inside the housing (7), and the walls (17) of the guide assembly (T1) may be in contact with the walls (10) of the housing (7) with the function of moving the said guide assembly (T1) relative to the longitudinal axis (O1), and also relative thereto with the function of limiting the angular displacement of the support part (5) of the support element (6) relative to the longitudinal axis (O1).
- 2. The device according to claim 1, characterized in that** the guide assembly (T1) is made with contact with the inner surfaces of the walls (10) of the housing (7), with one guide catch (18-1) on the walls (17) of the guide assembly (T1) and other guide catches (18-2) on the walls (10) of the housing (7) with the function of limiting the rotation of the guide assembly (T1) in the housing (7).
- 3. The device according to claim 1, characterized in that** the guide assembly (T1) is made with a cavity (19) and with a retainer (20) located therein, made to allow its movement along the longitudinal axis (O1) with its location within said cavity (19) and with the possibility of contacting the support and pulling element (12).
- 4. The device according to claim 1, characterized in that** the support element (6), the traction elements (11) and the support and traction-support element (12) of the guide assembly (T1) are combined into a single unit.
- 5. The device according to claim 1, characterized in that** the length (a) of the guide assembly (T1) is greater than the distance (b) between its opposite walls (17).
- 6. The device according to claim 1, characterized in that** a traction unit (21) is mounted along the longitudinal axis (O1), and inside the guide unit (T1) there is a cavity (19) in which the said traction unit (21) is located at one end and fixed by a nut-shaped retainer (20), wherein the cavity (19) of the guide unit (T1) has a hole (22) with a length (d) of more than 45 mm on the side of the walls (10) of the housing (7).

7. **The device according to claim 1, characterized in that** the housing (7) has an additional element (23) made with the function of differentiating the spring device (13) into front and rear parts (13-1 and 13-2).
8. **The device according to claim 7, characterized in that** the walls (10) of the housing (7) are provided with limiters (24) arranged with the function of contacting the additional element (23) with the function of limiting the compression of the front part (13-1) of the spring device (13) in the traction mode.
9. **The device according to claim 7, characterized in that** the body (7) has a traction unit (21), the rear part (21-2) of which is made with a support element (25) fixed thereon and arranged with the possibility of moving relative to the rear stop element (14) towards the front part (8) of the body (7), the support element (25) being arranged in contact with the additional element (23) with the possibility of compressing the front part (13-1) of the spring device (13) in the traction mode.
10. **The device according to claim 7, characterized in that** a traction unit (21) is mounted in the housing (7), wherein the rear part (21-2) of the traction unit (21) is made with a support element (25) and is fixed by a rear retainer (20-2) with the possibility of moving together with the rear stop element (14) towards the front part (8) of the housing (7), whereby the stop element (25) is arranged in contact with the additional element (23) so as to enable compression of the front part (13-1) of the spring device (13) in traction mode.
11. **The device according to any one of claims 6-10, characterized in that** the housing (7) includes an additional spring device (26) arranged between the support and traction-support element (12) and the traction-buffer stop (15).
12. **The device according to claim 11, characterized in that** a traction unit (21) is mounted along the longitudinal axis (O1), wherein its front part (21-1) with a retainer (20) mounted thereon is arranged inside the guide assembly (T1), and its rear part (21-2) is passed through the rear stop element (14) and secured by the rear retainer (20-2), the traction unit (21) being embraced by the spring devices (13, 26).
13. **The apparatus according to any one of claims 1-3, or claim 6, or claim 12, characterized in that** an internal spring device (27) is arranged at the front of the guide assembly (T1).
14. **The device according to claim 13, characterized in that** the guide assembly (T1) is provided with a limiting lock (28), made with the function of setting a gap (c) between the stop-pull rod (4) and the support member (6).
15. **The device according to claim 13, characterized in that** the internal spring device (27) is made with the function of setting an additional gap (n) between the support element and the support-pulling element (6, 12).

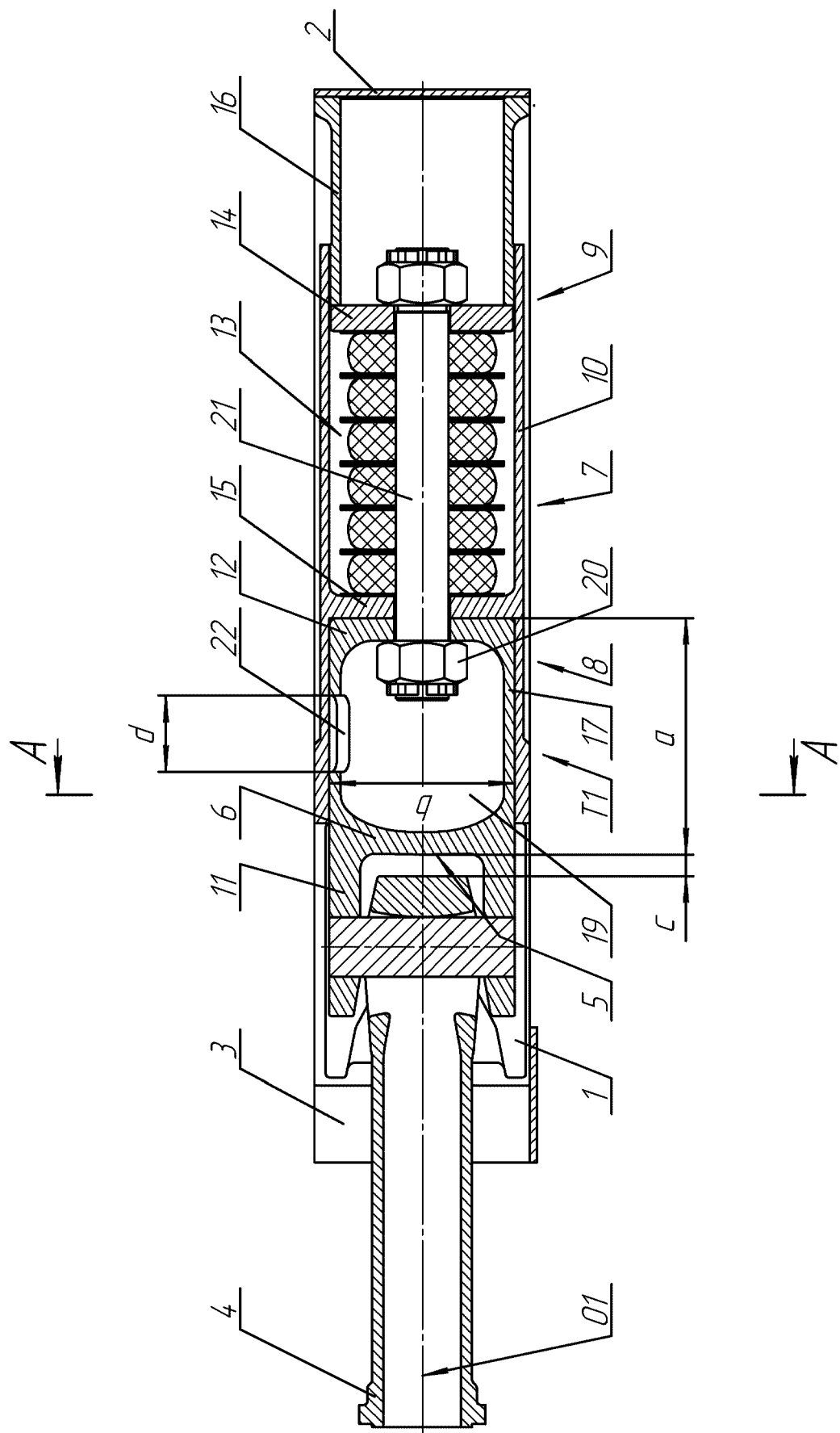


Fig. 1

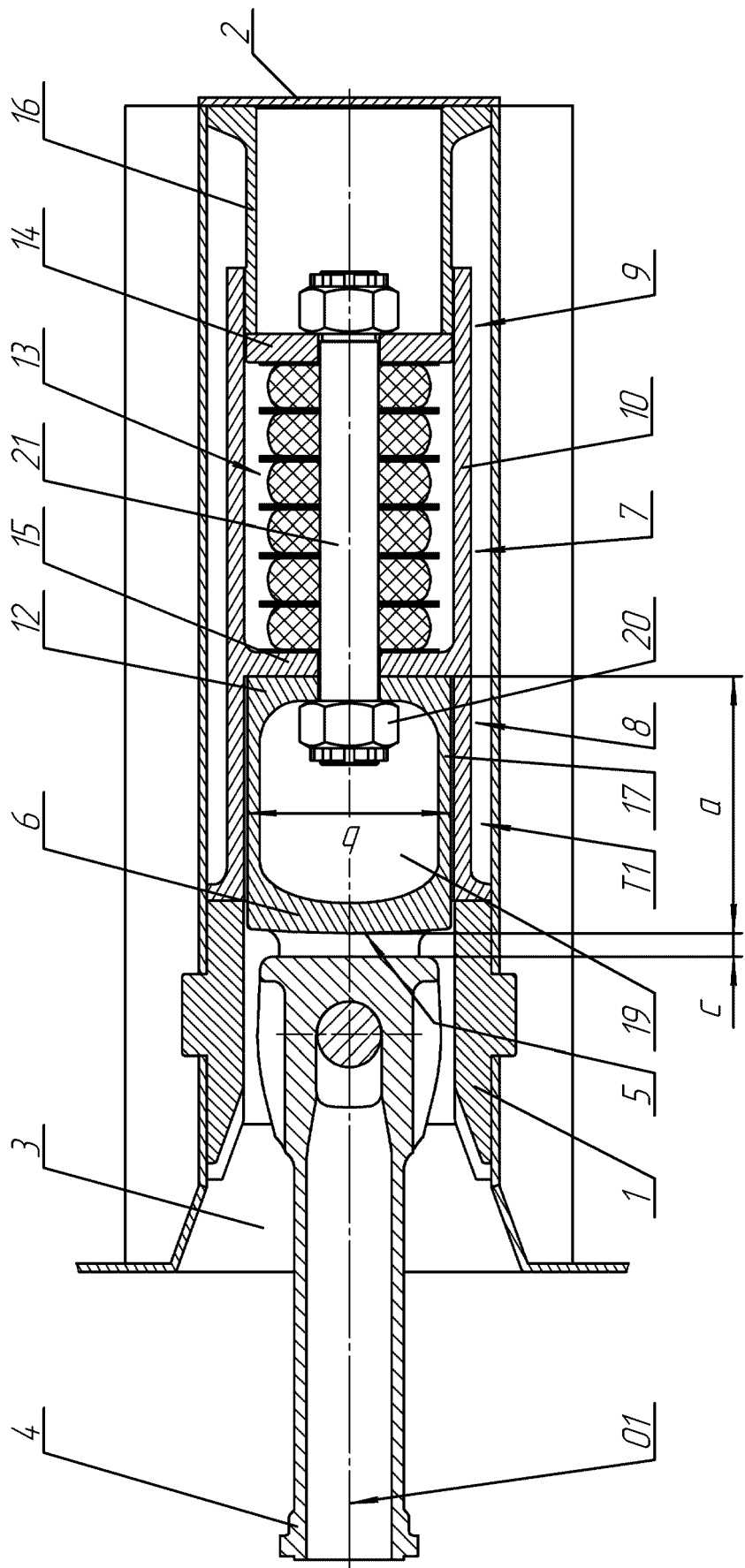


Fig. 2

A-A according to Fig. 1
variant 1

A-A according to Fig. 1
variant 2

A-A according to Fig. 1
variant 3

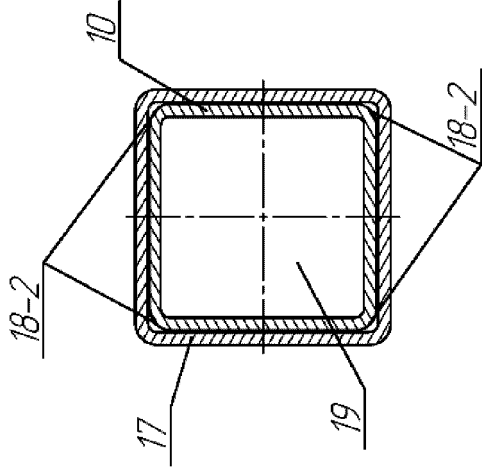
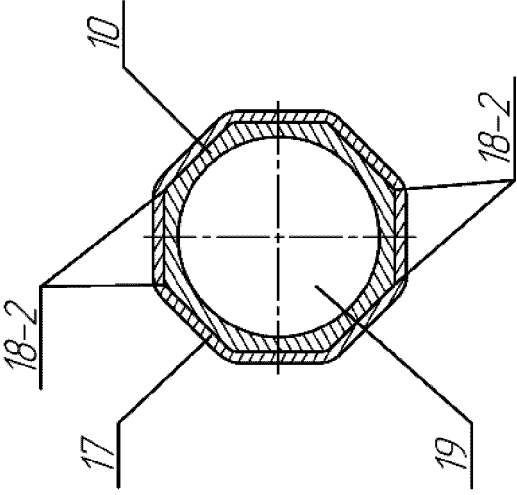
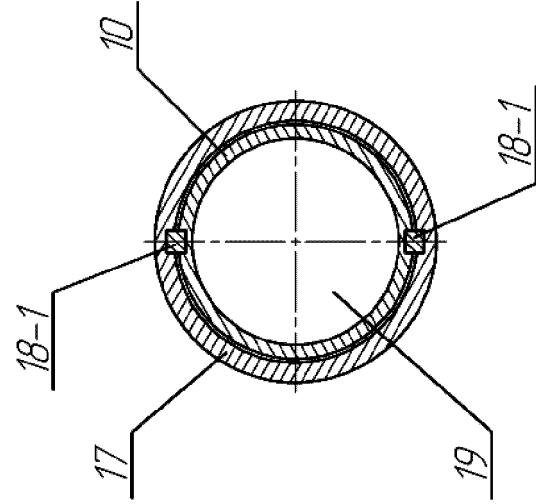


Fig. 3

Fig. 4

Fig. 5

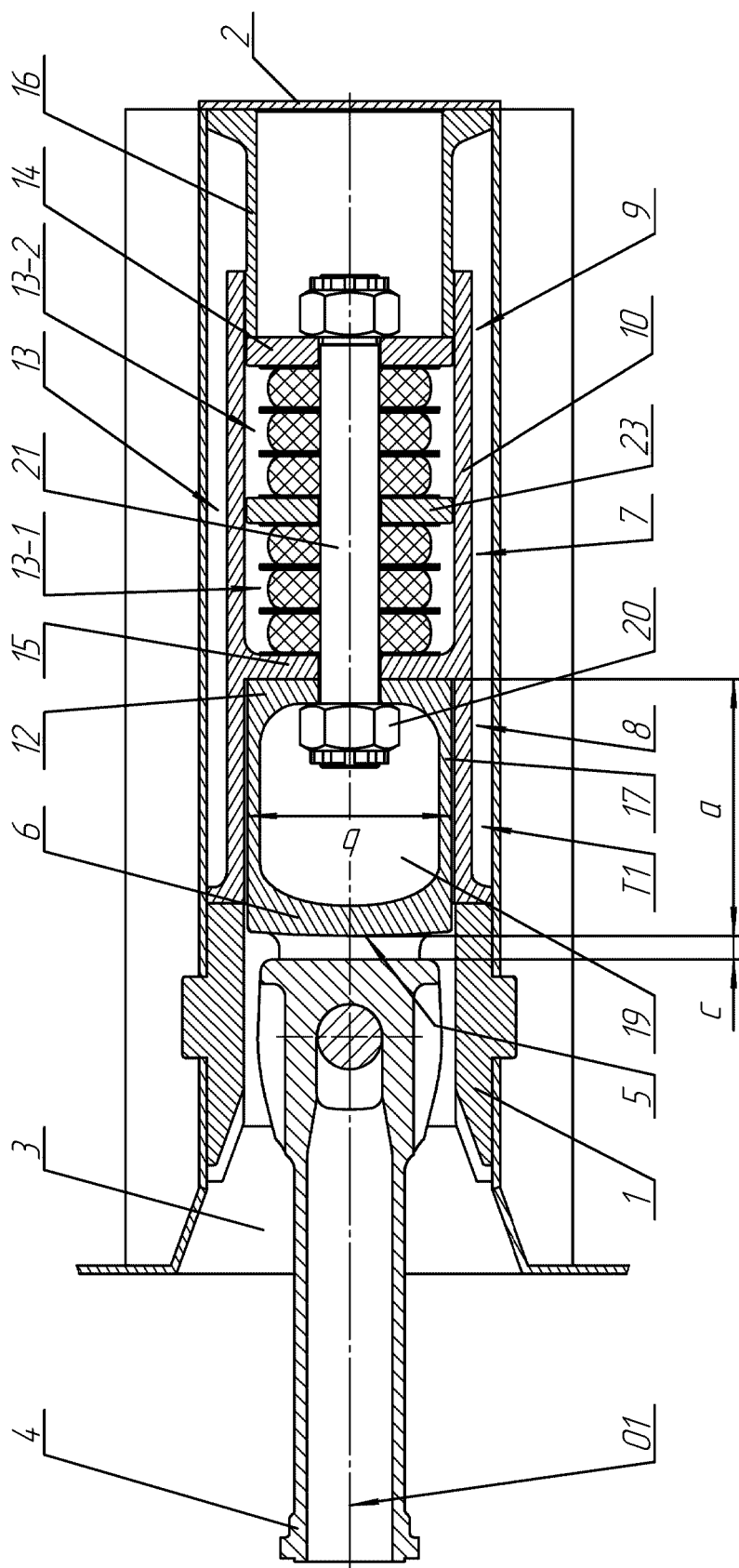


Fig. 6

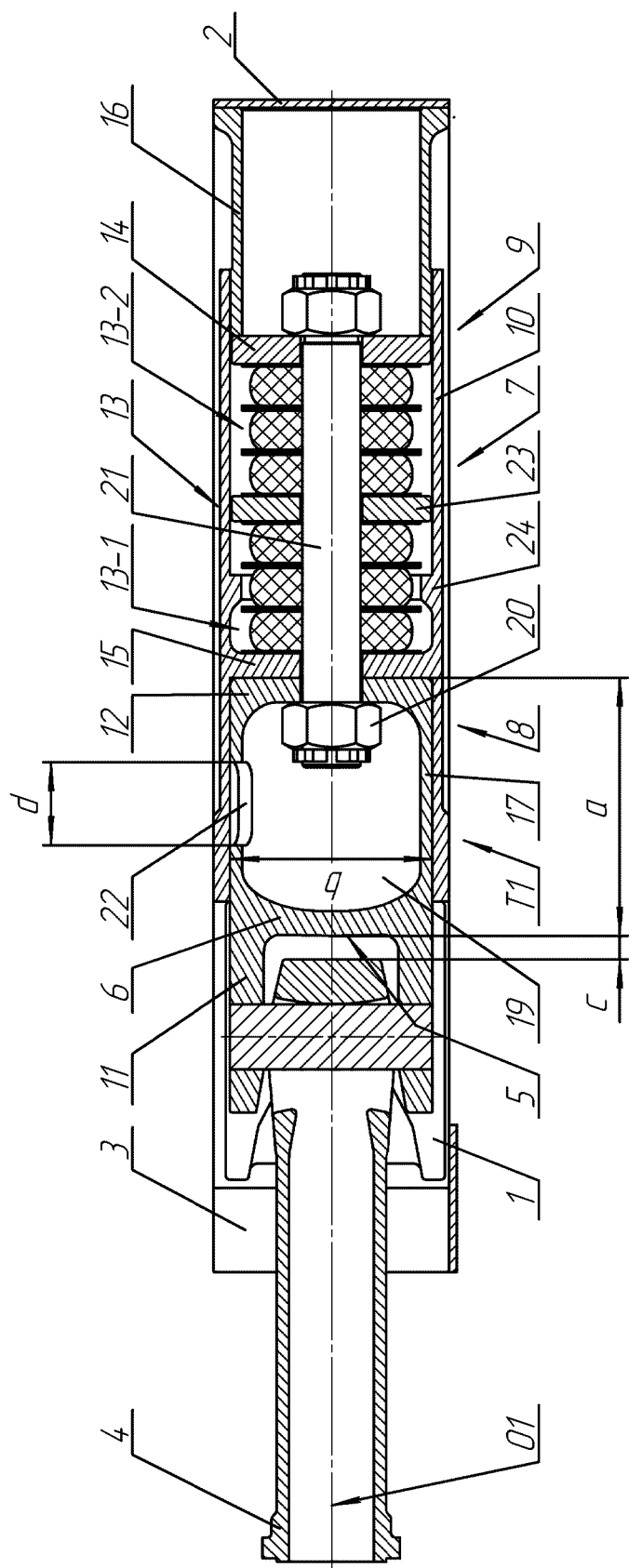


Fig. 7

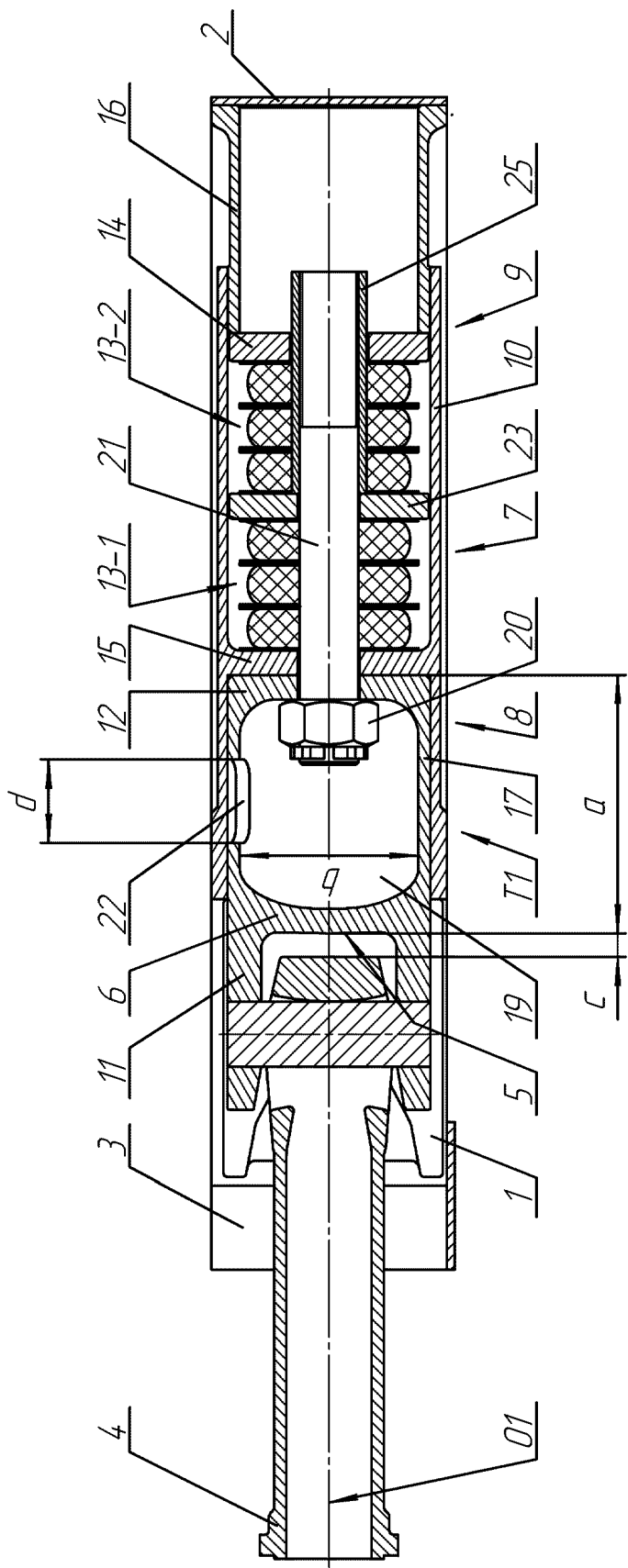


Fig. 8

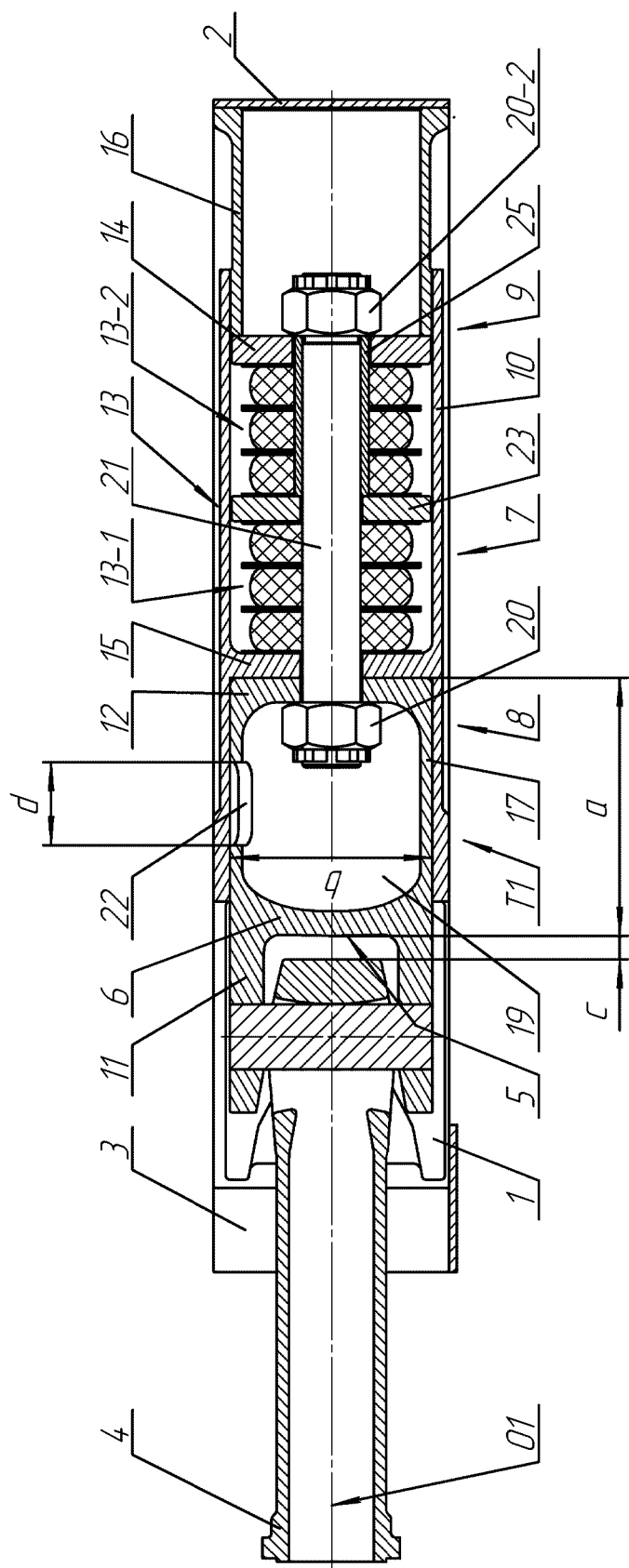


Fig. 9

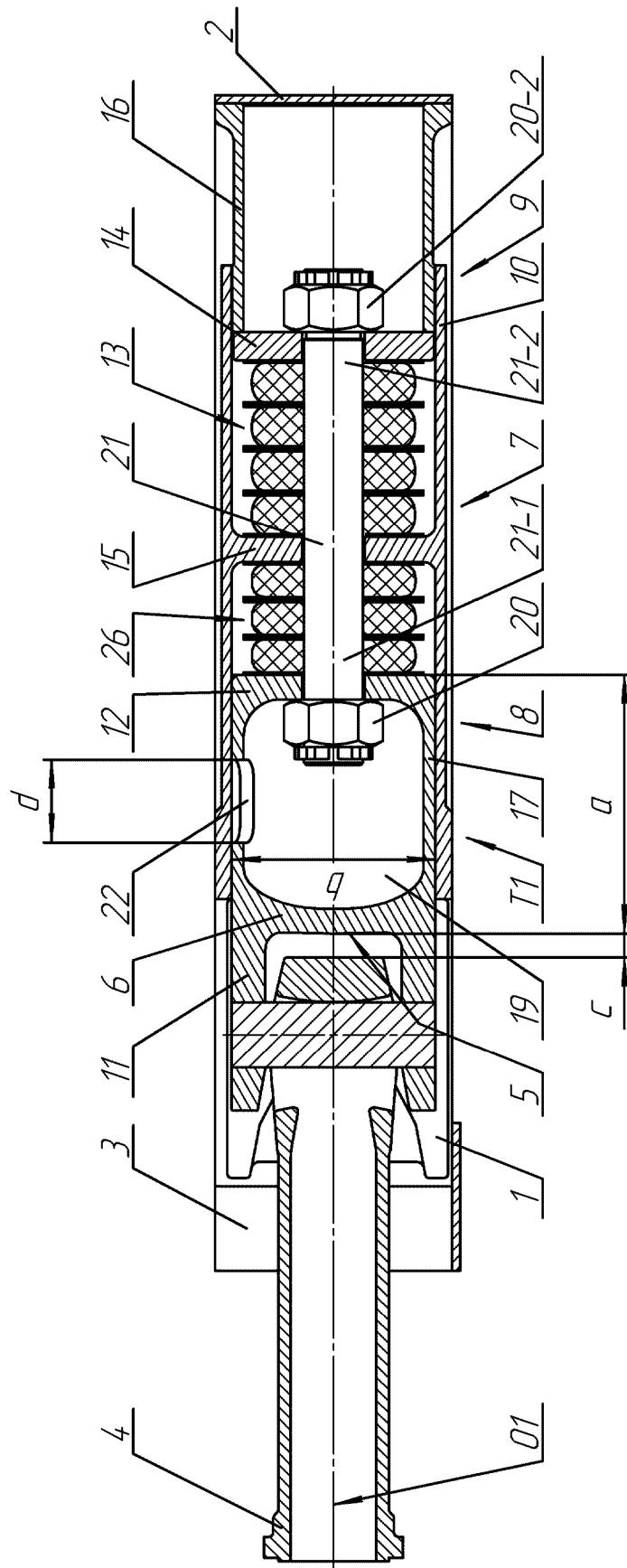


Fig. 10

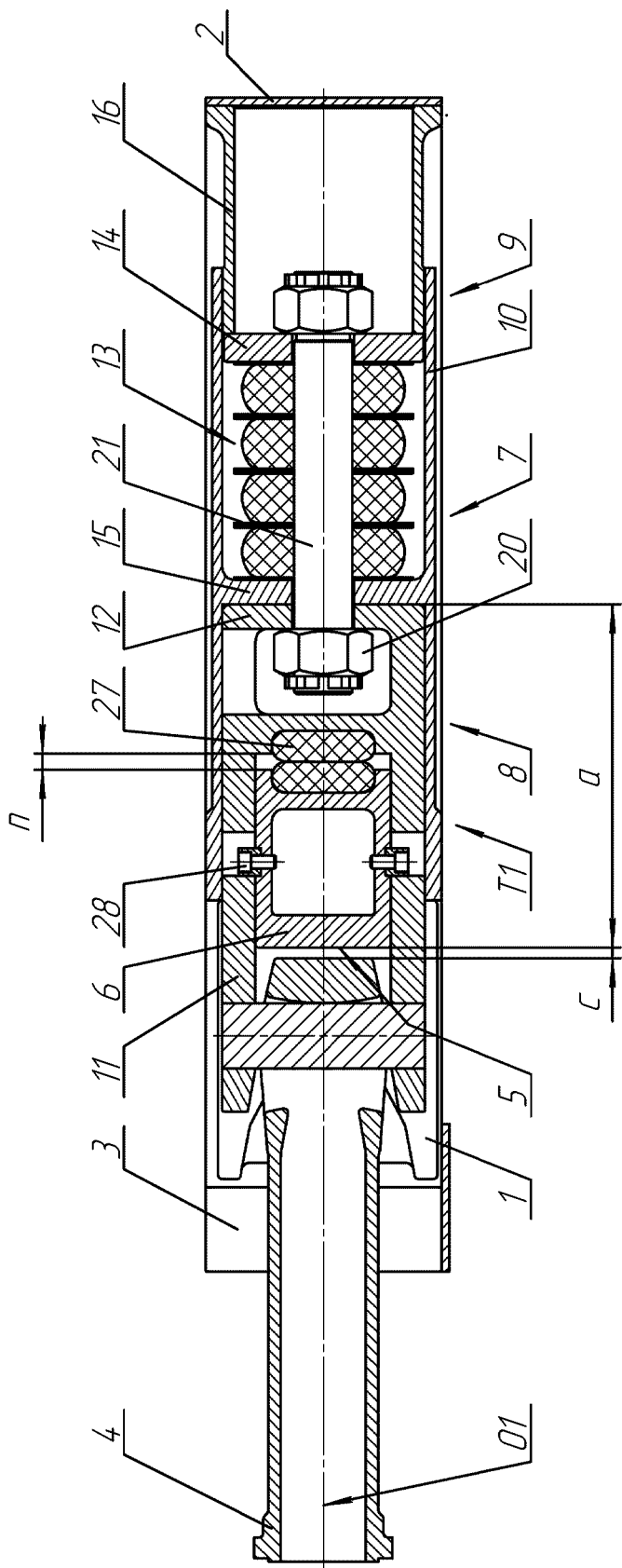


Fig. 11

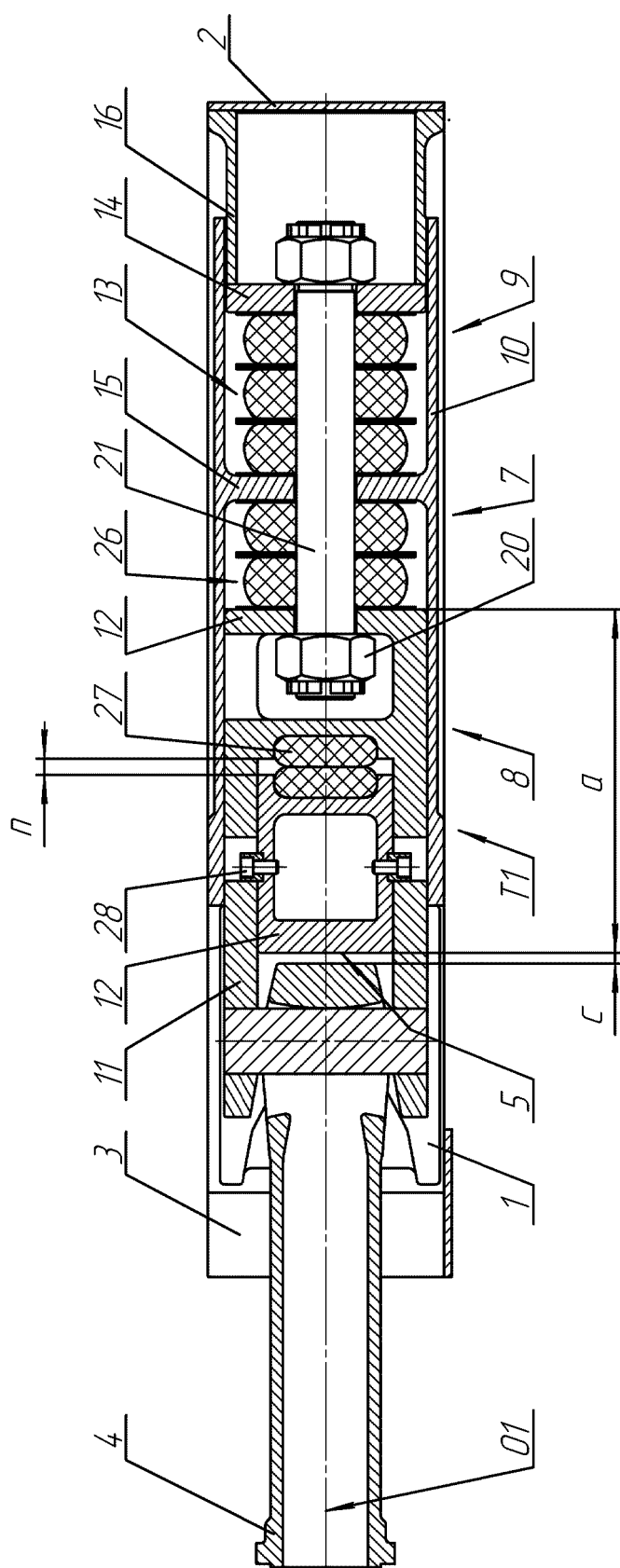


Fig. 12

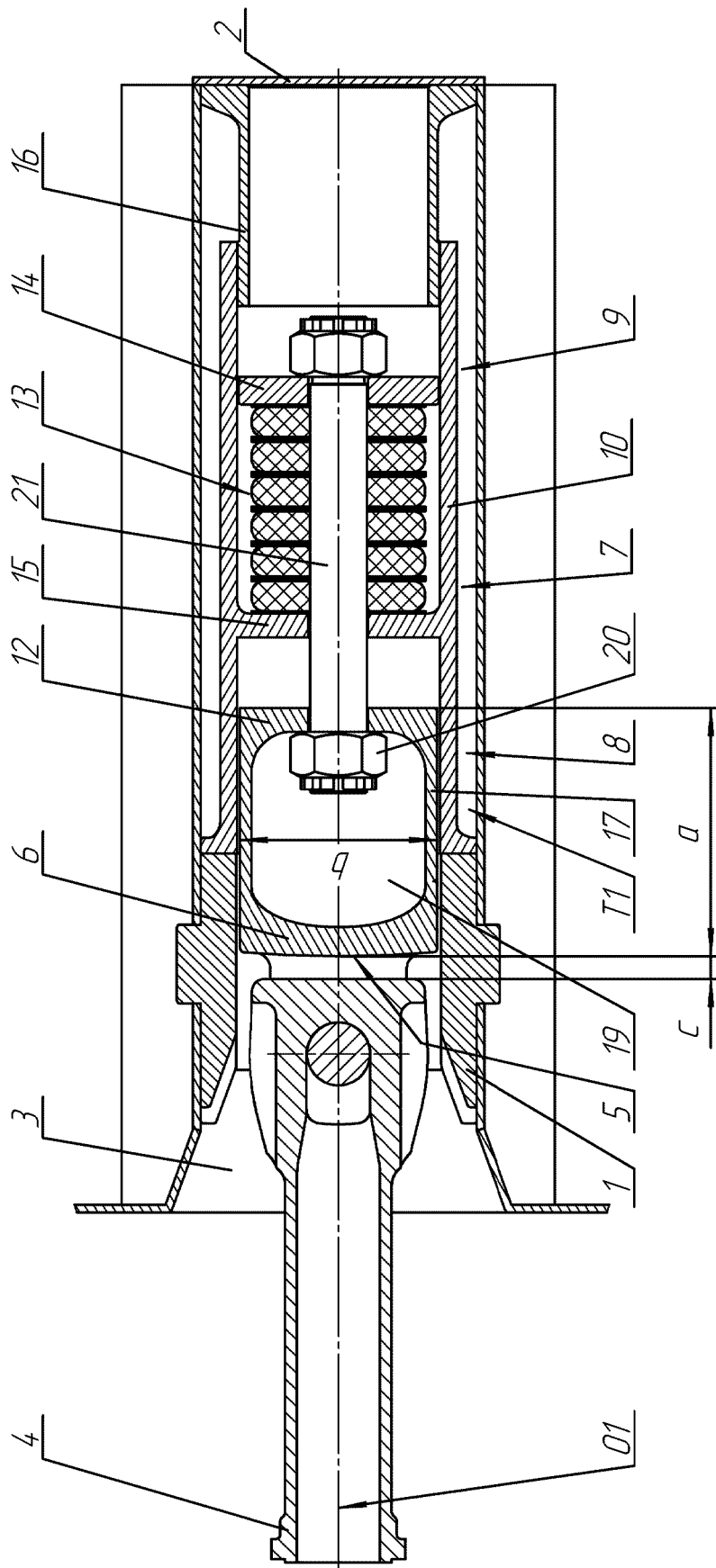


Fig. 13

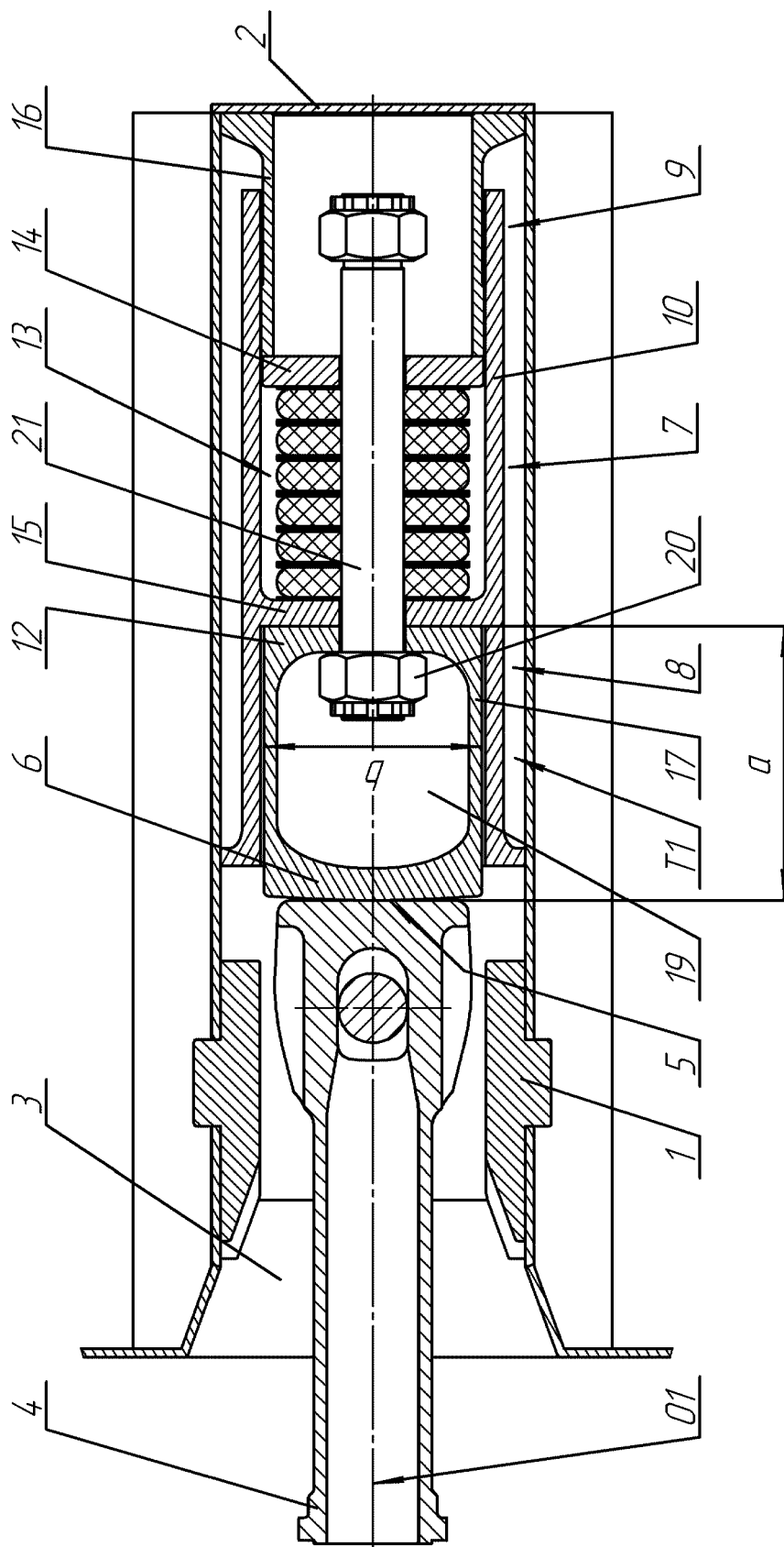


Fig. 14

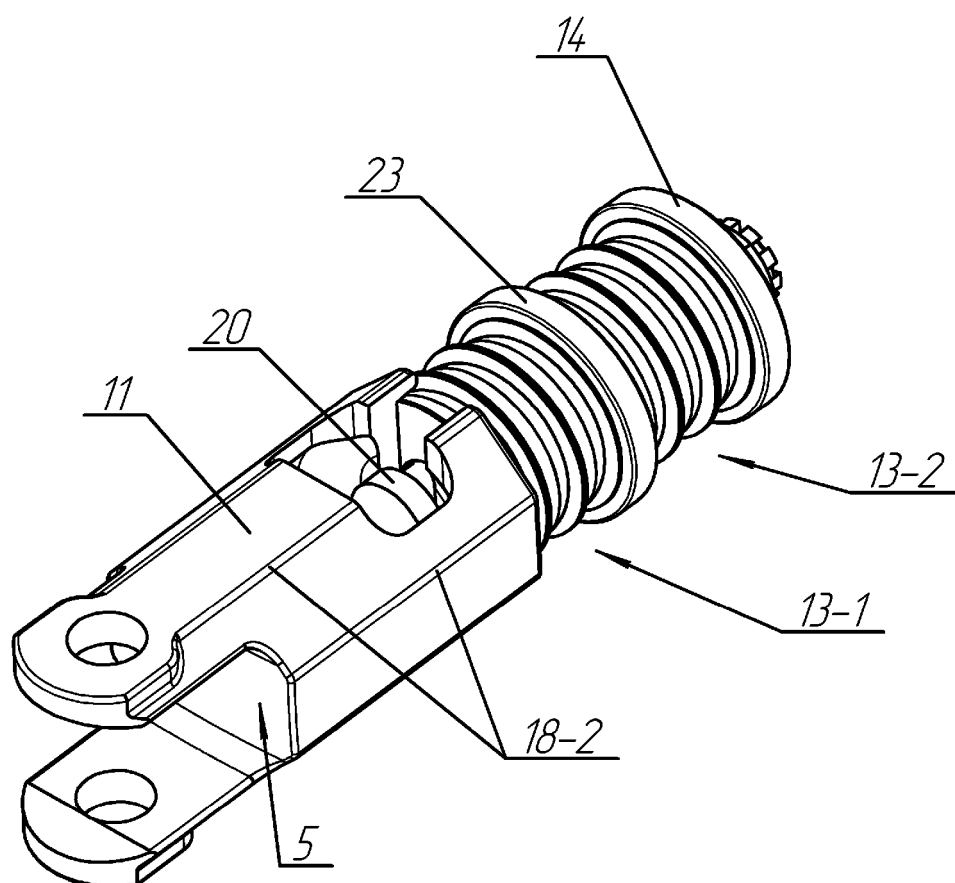


Fig. 15



EUROPEAN SEARCH REPORT

Application Number

EP 24 21 1166

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X A	US 3 827 575 A (MOSIER J ET AL) 6 August 1974 (1974-08-06) * figures 1-6 *	1-5,7, 11,13 6,8-10, 12,14,15	INV. B61G9/06
-----			TECHNICAL FIELDS SEARCHED (IPC)
			B61G
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
Munich		2 April 2025	Crama, Yves
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document			
T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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REFERENCES CITED IN THE DESCRIPTION

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- EP 4342763 A1 [0001]