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(54) A roller shutter winding lifting friction device.

(57) A roller shutter winding lifting device comprising: a roller shutter support plate assembly (A) including a roller shutter winding bar connection (5) and on the inside three planetary gears 1, cooperating peripherically with a fixed toothed rim (D) and axially inside with a toothed pinion (14) of a driving clutch assembly (B) provided with a driving pulley (11) and a clutch device (20, 21, 14') cooperating with a free ratched wheel (18, 9), being said assembly (B) tightened and supported by a mounting plate (C) in such a way that: rotating the driving pulley (11) in one direction the friction (20, 21, 14') locks tightening the free ratchet wheel (19) allowing the free wheel movement transmission by means of the pinion (14), through planetary gears (11) and toothed rim (D) in reduced rotation of the roller shutter connection (5) in the same direction; whereas rotating the driving pulley (11) in the opposite direction the clutch device (20, 21, 14') is unclutched allowing the controlled rotation of the connection (5) for unwinding the roller shutter in the same direction, and this by means of a multi-start screw thread (15) which causes the clutching or unclutching of said free wheel clutch device (20, 19, 21, 14').

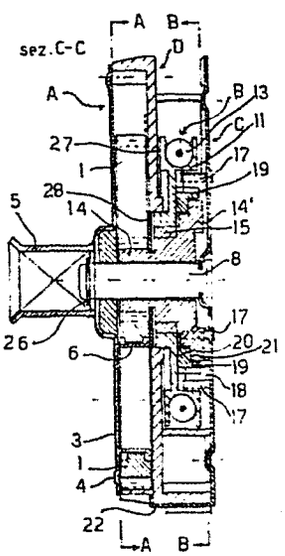

Fig. 4

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The invention relates to a roller shutter lifting-winding friction device.

Roller shutter winding-lifting devices manually operated by belt or by rotating bar are well known in prior art. Said devices are generally used for lifting and winding roller shutters or blinds. Belt operated devices are very bulky as they utilize a winding belt device generally separated from the winding drum coaxially placed with respect to the roller shutter winding bar; furthermore, the utilization of an independent winding belt device requires a separate installation with an expensive hole on the wall; not to mention that the belt breaks frequently, involving a considerable amount of work for its replacement.

On the other hand, rotating bar operated devices are extremely expensive for their complexity and the rotating bar is also very bulky; furthermore, the lifting and lowering speed is inevitably very slow, due to the transmission means.

The invention as claimed is intended to provide a remedy. It solves the problem of how to carry out a new roller shutter winding-lifting device for winding a roller shutter by means of a

winding bar, which obviates said disvantages, utilizing a manual endless chain as driving means to operate a rotatable toothed driving pulley coaxially placed at one end of said winding bar, said pulley comprising an automatic free multi-plate clutch ratchet wheel that in the winding direction is driven by said chain fixedly connectable to said winding bar and freely rotatable in the opposite direction and wherein the transmission to the winding bar is preferably realized by an axial reduction gear transmission means with planetary gears, wherein said chain operated pulley is connected to said transmission by means of a screw clutch in such a way that the friction clutch is tightened in one direction determining a single block for winding the roller shutter and in the opposite direction the screw connection is unscrewed releasing the clutch and loosening the roller shutter winding bar allowing the relative unwinding, according to the characteristics defined in the appended claims.

The advantages offered by the invention are mainly that belts are not utilized, avoiding the frequent breakages and replacements, and also avoiding separate bulky winding belt devices and expensive holes for their installation on the wall.

Further advantages can be noticed if the invention is compared with rotating bar winding-lifting devices, because the relative bulky rotating bar is not utilized and a very compact winding device coaxial with respect to said roller shutter winding bar is used, with reduced overall dimensions equal to a standard belt pulley.

The device according to the invention is very cheap and extremely reliable and can be utilized for lifting also very big and heavy roller shutters due to its gear reduction means which operate only

in the lifting action, being this one automatically disengaged when the toothed driving pulley is rotated in the opposite direction, allowing the desired and controlled lowering of said roller shutter.

One way of carrying out the invention is described in detail below with reference to the annexed drawings which illustrate only one specific embodiment, in which:-

Figure 1 is a perspective view of the device according to the invention, in the specific case for lifting-winding a roller shutter, placed on a wall; Figure 2 is a view of a gear transmission and reduction means of the device according to the sectional view on the plane A-A of Figure 4; Figure 3 is a view on the transversal plane normal to the rotation axis of the support plate of the roller shutter winding bar, supporting three free rotatable planetary gears of the axial gear reduction means "A"; Figure 4 is an axial sectional view of the whole device when the pulley assembly "B" is rotated in the roller shutter winding direction, tightening the plates and ratchet wheels of said multi-plate friction clutch by said screw connection; Figure 5 is a transversal plane view from the left inner side of the mounting plate "C", which fixes on the wall and supports the whole device and, by means of this one, supports the roller shutter winding-lifting bar, as shown in Figure 1; Figure 6 is a vertical plane sectional view of the mounting plate "C" shown in Figures 4 and 5, and in the specific case according to section C-C of Figure 5, with the free gear open springs (in continuous line and short dash line in the connecting position); Figure 7 is a right side view of the device shown in Figure 4 without the mounting plate "C" and showing, in partial section on the intermediate plane of the driving toothed pulley and internally coaxially to this one, the

free ratchet wheel multi-plate friction clutch assembly; Figure 8 is an axially sectional view of the complete device as shown in Figure 4, wherein said multi-plate friction clutch is disengaged from said free ratchet wheel by means of reversed rotation of said toothed driving pulley for the controlled lowering of said roller shutter.

The figures show the roller shutter lifting-winding device comprising in its basic design: a driven rotating plate with freely rotatable planetary gears assembly "A"; a driving toothed pulley with free ratchet wheel multi-plate friction clutch assembly 'B"; a mounting plate "C" for mounting the complete device on the wall; a fixed rim gear wheel "D" for gearing said planetary gears 1 of the driven rotating plate assembly "A" for supporting a winding bar for said roller shutter 2.

In detail, the driven rotating plate "A" consists of a metallic plate disc 3 with reinforcing ribs 4 further comprising an axial welded connecting pipe with squared interior section 5 for fixed connection with the end of a winding bar (not shown) for winding the roller shutter 2; furthermore, on the opposite side, said metallic plate disc 3 supports simmetrically welded, radially placed at 120° one from the other, at the same distance from the centre, three sleeves 6 which support coaxially three free rotatable planetary gears 1, and further, coaxially inside the pipe connection 5, said disc 3 has an axial central hole 7 for fixing the whole device by means of a central tightening pin 8, as shown in Figure 4. Said driven rotating plate assembly "A" is coaxially insertable within said rim gear "D" as shown in Figure 4, to realize a planetary transmission as shown in Figure 2. The rim gear wheel "D" is preferably made in plastic material and presents an internal toothed rim 9 for gearing with said planetary

gears 1, being said rim gear "D" provided with a suitable axial hole 10 to allow the crossing of an axial driving central pinion 14 of said driving toothed pulley assembly "B".

The driving toothed pulley with free ratchet wheel multiplate friction clutch assembly "B" comprises a plastic driving pulley 11 with periferical teeth 12 for engaging an endless multisphere chain 13, which allows the clockwise or counter-clockwise rotation of said pulley. The pulley 11 is thus free to rotate clockwise or counter-clockwise, manually driven by the chain 13, being said pulley 11 provided with an axial thread to receive an axially sliding central pinion 14 for centrally gearing with said three planetary gears 1, as shown in Figures 2,4 and 8.

The pinion 14, generally made in plastic material, makes one body with a first abutment comprising a two, three or four-start thread 15 cooperating with a similar thread of the axial hole of the driving pulley 11, in such a way that pulling the chain 13 on the side 13' of Figure 1 the driving pulley 11 rotates clockwise, and rotating counter-clockwise it screws on the thread 15 of the support pinion 14 tightening against a suitably provided flange shaped abutment 14' by means of the ratchet ring 19. On the outside the driving pulley 11 has a cylindrical seat 16 forming an annular groove and supports, annularly connected with rotation pins 17, three ratchet gear toothed springs 18 cooperating with the ring 19, free to rotate on the support pinion 14 and supplied with a free wheel peripheric toothing controlled by the ratchet gear springs 18 for allowing the free rotation of the free rotatable ring 19 clockwise but not counter-clockwise.

Two free rotatable clutch ledges 20,21 are provided on the

right and left side of the free rotatable ring 19, so that, with the counter-clockwise rotation of the driving pulley 11, pulling the multisphere chain 13 against the roller shutter 2 said chain winds on the thread 15 of the support pinion 14 tightening against the inside abutment 21 of the flange 14' and locking the free rotatable ring 19, thus allowing the connection 5 to rotate in reduction ratio by means of the reduction gear transmission system: support pinion 14, free rotatable planetary gears 1 and toothed rim 9; the roller shutter 2 will thus be easily lifted due to the gearing down of the turn numbers between the driving pulley 11 and the roller shutter connection 5 by means of said reduction gear transmission system 14,1,9 thus making the metallic plate disc 3 and its connection 5 rotate, as the mounting plate "C" is seamed fixed on the toothed rim "D" by means of three suitably arranged fastening connections 22,23,24, and the mounting plate "C" is fixed on the wall by means of tightening screws utilizing the holes 25, and the complete device is assembled by the central axial pin 8, axially fixed to the mounting plate "C" and tightened with the elastic ring 26 at the other end.

For this purpose the driving pulley 11 is free to move axially against the surface of said toothed rim "D", a slack 27 being provided with respect to the support pinion 14,14'; therefore, rotating clockwise the driving pulley 11, that is pulling the chain portion 13" of the driving chain 13, this one will unscrew from the thread 15 with the support pinion 14 moving axially to the left and unclutching the friction annular plates 20,21 and the free rotatable ring 19, thus allowing the rotation of said free rotatable ring 19 that will no longer lock the support pinion 14, which will thus be free to rotate and will slide in rotation by means of the weight of the roller

shutter 2, allowing the controlled clockwise rotation of the roller shutter support rotating disc "A", allowing the speedy lowering of the roller shutter 2 in the desired quantity, because, if the driving pulley 11 rotation is stopped by stopping the pulling of the chain portion 13" of the chain 13, the same unwinding force impressed by the weight of the roller shutter 2 to a driven plate "A" makes the pinion 14 rotate clockwise , while the driving pulley 11 stops causing the screwing of the pulley 11 on the thread 15 with the pinion 14 thus moving the driving pulley 11 to the right, clutching the friction annular plates 20,21 against the free rotatable ring 19 and consequently the roller shutter cannot lower anymore because the free rotatable ring 19 cannot rotate clockwise as its toothing meshes with the ratchet gear toothed springs 18 that allow only its counter-clockwise rotation. Therefore, also the pinion 14 is locked. When the chain 14" is pulled again, the driving pulley 11 is moved to the left, making a friction on the surface 27 against the toothed rim "D" which will cause a rotation friction also of the driving pulley 11, but said friction can be easily overcome by the manual pulling force of the chain portion 14", and consequently, as the driving pulley 11 rotates clockwise releasing the pinion 14, the roller shutter 2 will lower once more, and so on, because the thread 15 has a very lower friction force if compared with the rotation force of the device, in such a way that:

1. the friction is clutched:

a) either by the counter-clockwise rotation of the driving pulley 11 (lifting of the rollershutter);

b) or by stopping the rotation of said driving pulley 11 (tension of the rollershutter weight which makes the pinion 14 rotate clockwise).

2. The friction is unclutched only rotating clockwise the

driving pulley 11 thus allowing a controlled counter clockwise rotation of the pinion 14, utilizing the weight of the roller shutter 2 with automatic locking when the clockwise rotation of the driving pulley 11 is stopped.

Naturally the rotations will be reverse if the device is installed at the other side of the rollershutter.

The driving pulley 11 is restricted in its axial movement as regards the pinion 14 due to the inside ledge which prevents its slipping off by means of an elastic ring 28.

Anyhow, the execution details can vary without departing from the spirit or scope of the invention as described,illustrated and defined in the appended claims.

Udine, June 28, 1983.

p. Piemonte Elvana

The Representative

Dr. Giovanni D'Agostini

Claims:

1. A roller shutter (2) winding device which operates by means of a bar connection (5) and a clockwise or counter-clockwise rotatable driving pulley (11) placed coaxially with respect to said bar connection (5) for winding or unwinding a rollershutter or curtain (2), wherein said driving pulley (11) is connected to said bar connection (5) by means of a free rotating ratchet gear device (18,19) cooperating with a plate disc friction clutch (20,21,14') operated by an axial movement utilizing a screw thread coupling (15) in such a way that rotating said driving pulley (11) in one direction, the friction (20,21) is clutched locking the free ratchet wheel (19) of said free rotating ratchet gear device, thus causing a fixed joint connection between said driving pulley (11) and the movement transmission (14) to said roller shutter connection (5), whereas rotating said driving pulley (11) in the opposite direction, said plate disc friction clutch (20,21,14') will be unclutched allowing a controlled rotation in the same direction of said roller shutter connection (1).

2. A roller shutter winding device as claimed in claim 1, wherein the transmission of the rotation, by means of said friction clutch means for allowing the rotation of said roller shutter connection (5), is carried out by a coaxial gear reduction means comprising a coaxial driving gear pinion (14) connected to said friction clutch means, being said pinion geared with free rotatable planetary gears (1) on a support plate disc (3) connected axially fixedly to said roller shutter connection (5) and wherein said planetary gears (1) are externally and circularly geared by a fixed toothed rim (D) connected to a fixed mounting plate (C) which supports the entire device (2,2') at one end of the roller shutter (2,2') by means of said winding bar connection (5).

3. A roller shutter winding device as claimed in claims 1 and 2, characterised in that it comprises: a rotatable roller shutter support plate assembly (A) comprising a rotating plate disc (3) supplied with a roller shutter or curtain (2,2') winding and unwinding bar connection, supporting three radially spaced face rotatable planetary gears (1); a toothed rim (D) provided with inside circular rim gearing tooth (9) for gearing externally with said planetary gears (1) of said roller shutter support plate assembly (A); a driving friction clutch pulley assembly (B) coaxial to the preceding assemblies and placed externally to said toothed rim (D) and comprising a driving pulley (11) connected to an automatic free multiphase clutch ratched wheel (18,19,20,21,-14') for driving, through an axial displacement screw coupling (15), an axial pinion (14) for driving the planetary gears (1) respectively clutching said friction clutching means only in one direction, and unclutching said friction clutching means in the opposite direction, making the driving pulley (11) free rotatable as regards the pinion (14); a mounting plate (C) supplied with holes for its connection on the wall (25) and fixed supporting means (22,23,24) for fixedly supporting said fixed toothed rim (D).

4. A roller shutter winding device as claimed in the preceding claims, wherein said screw coupling (15) for driving said automatic free multiplate friction clutch ratchet wheel means (20,21,14',18,19) has two or more starts.

5. A roller shutter winding device as claimed in the preceding claims, wherein said plate unit (roller shutter support assembly) (A), said fixed toothed rim (D), said driving friction clutch pulley assembly (B) and said mounting plate (C), are axially

assembled in a single device by means of an axial central pin (8), coaxial to said roller shutter bar connection (5) and in which the screw coupling between the driving pulley (11) and the pinion (14) allows a free axial movement between said driving pulley (11) and the flange shaped abutment (14') of the pinion (14) of the gear transmission and this in order to cause, with rotation in one or in the opposite direction, respectively the clutching between them of a free ratched wheel (19) locking it in one rotating body, or vice versa its unclutching making them free rotating and realeasing the driving pulley (11) with respect to the pinion (14).

6. A roller shutter winding device as claimed in the preceding claims, wherein said driving pulley (11) is driven by an endless chain (13), being one chain portion (13") deviated by a fixed lower guide (28) which approaches the two chain portions (13',-13"), wherein the first one is for winding lifting the roller shutter (2,2') and the second one is for unwinding lowering the same roller shutter (2,2') respectively.

Udine, June 28, 1983.

p. Piemonte Elvana
The Representative
D'Agostini Giovanni

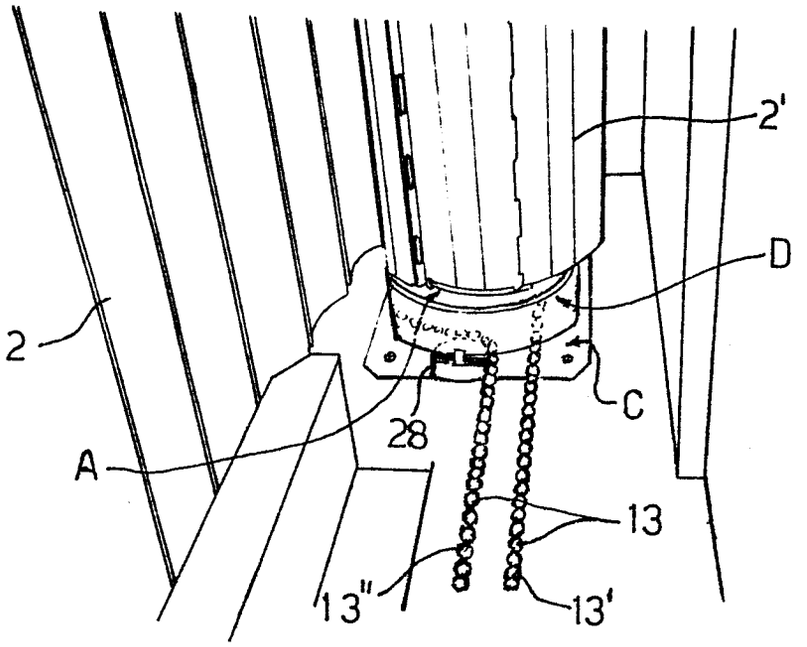

Fig.1

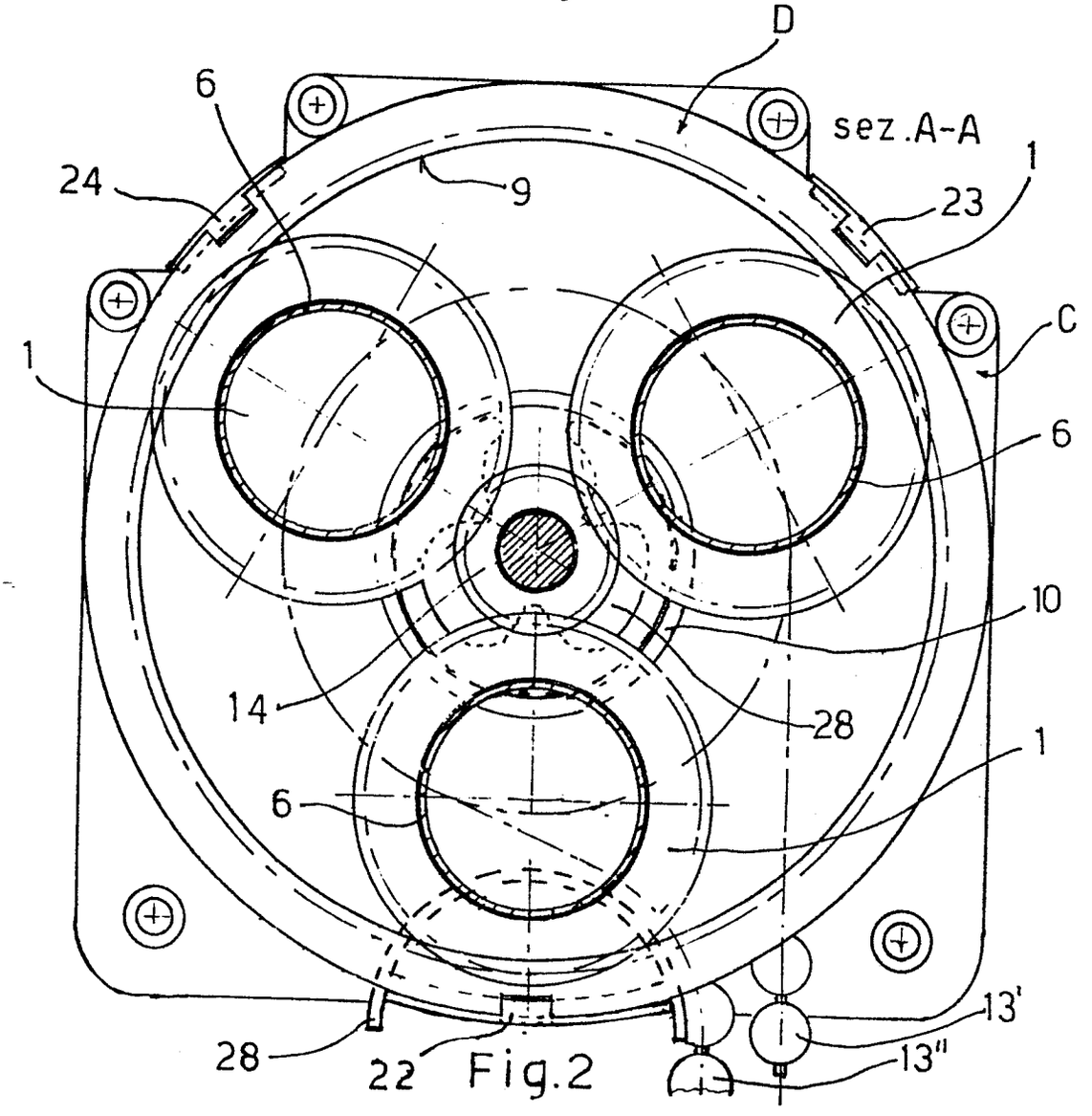

Fig.2

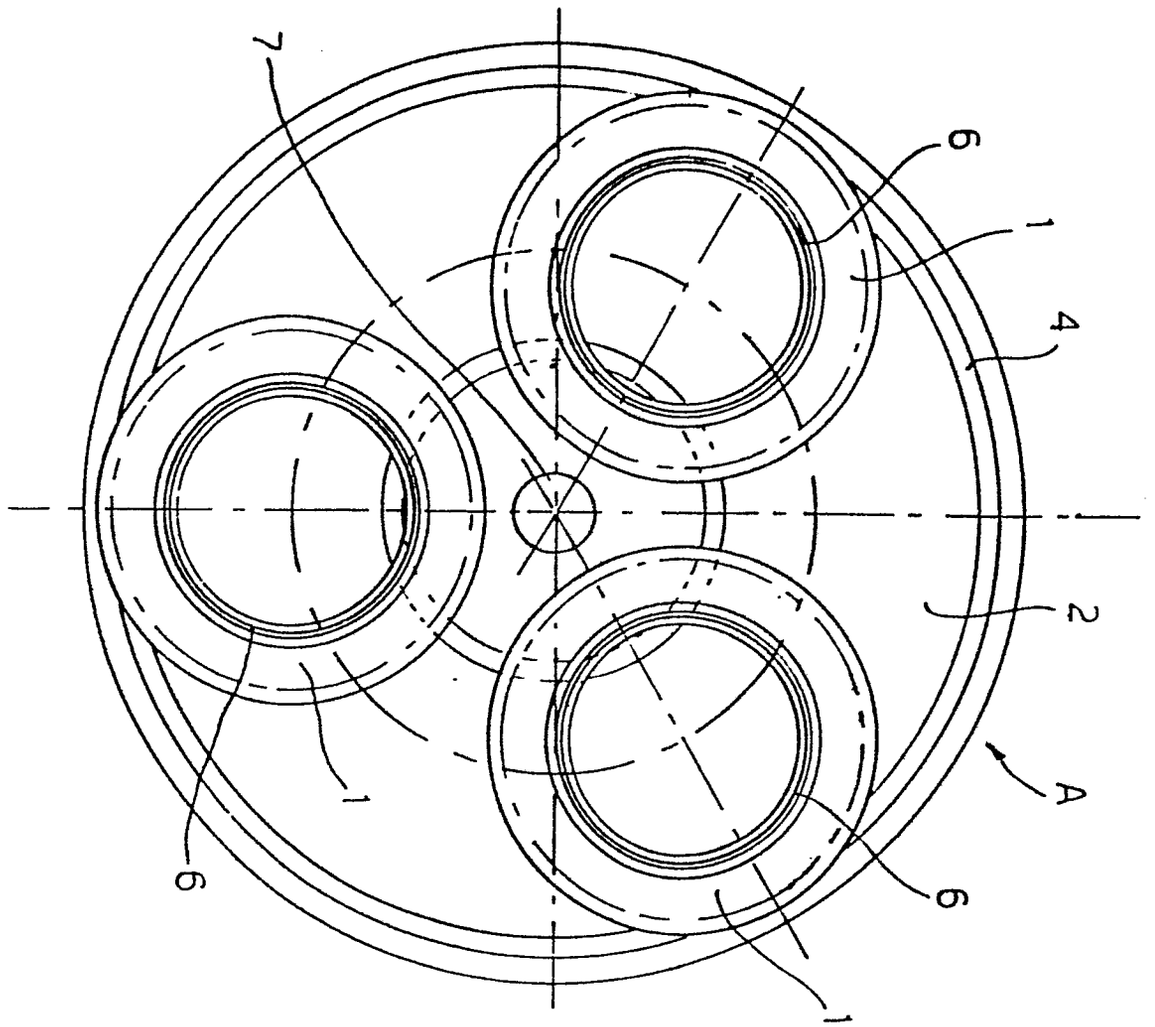
7
6
1
4
2
A
6
1
6
1

Fig.3

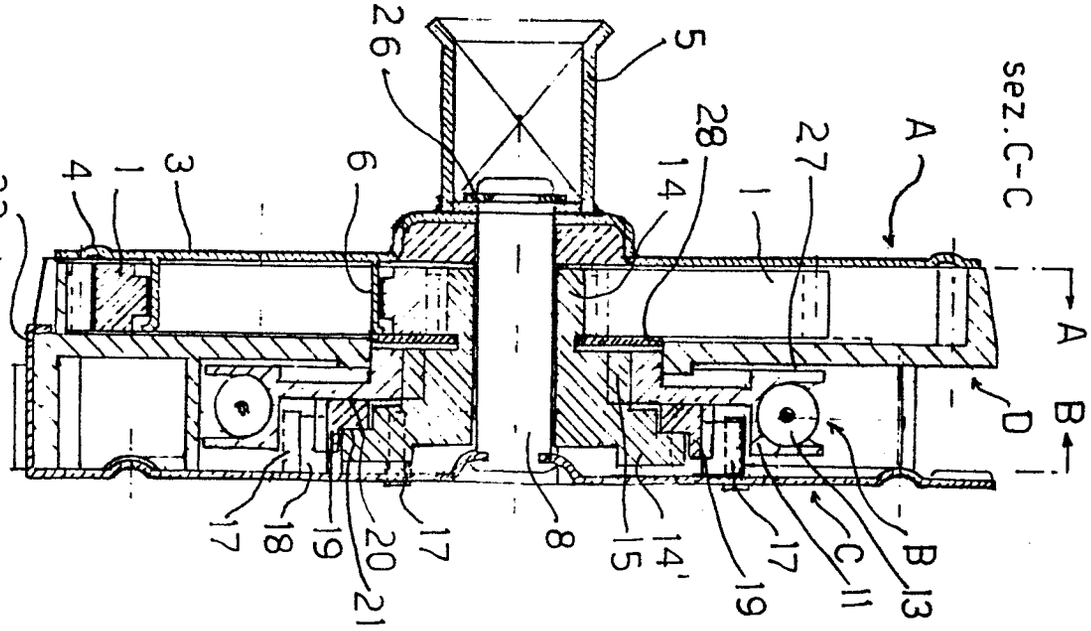
26
5
sez.C-C
28
27
A
14
1
3
6
4
1
22
A
B
D
B
17
18
19
20
21
17
8
15
14'
19
11
C
13

Fig.4

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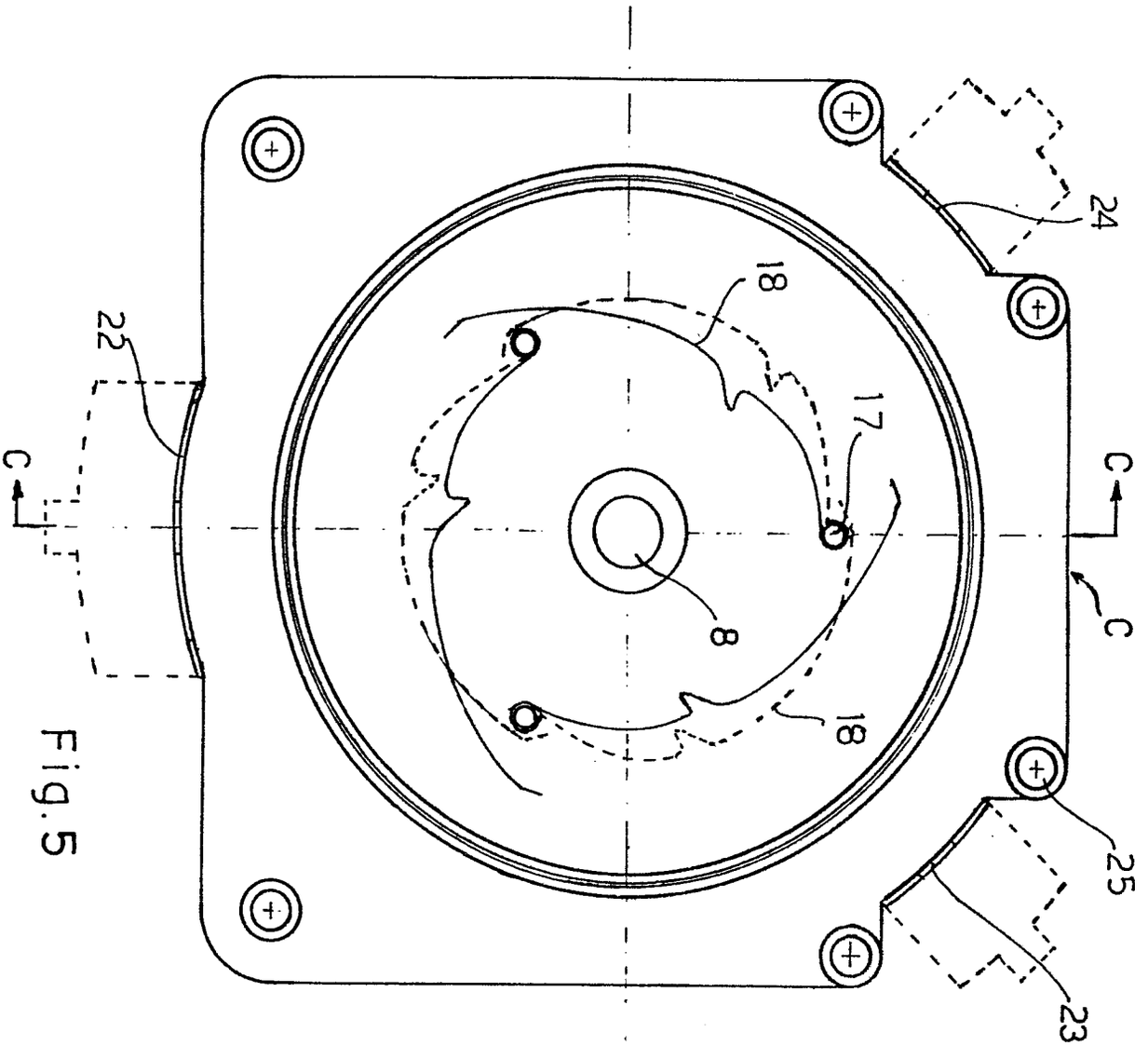

Fig.5

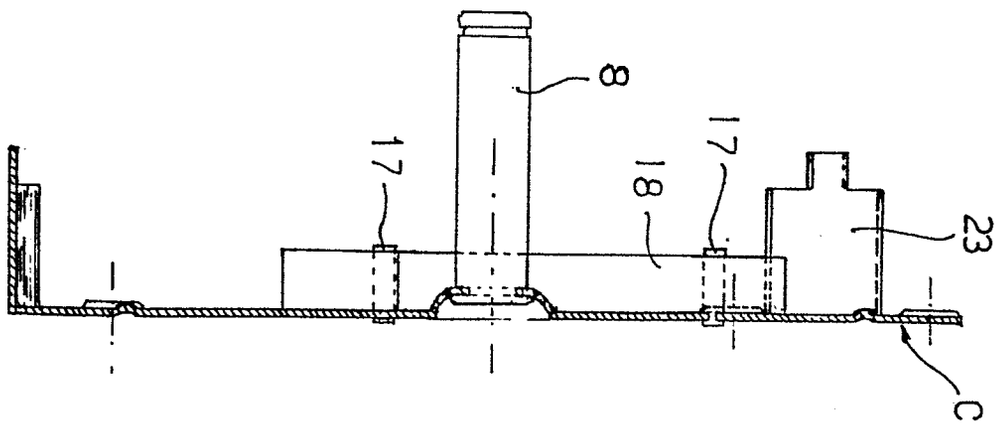

Fig.6

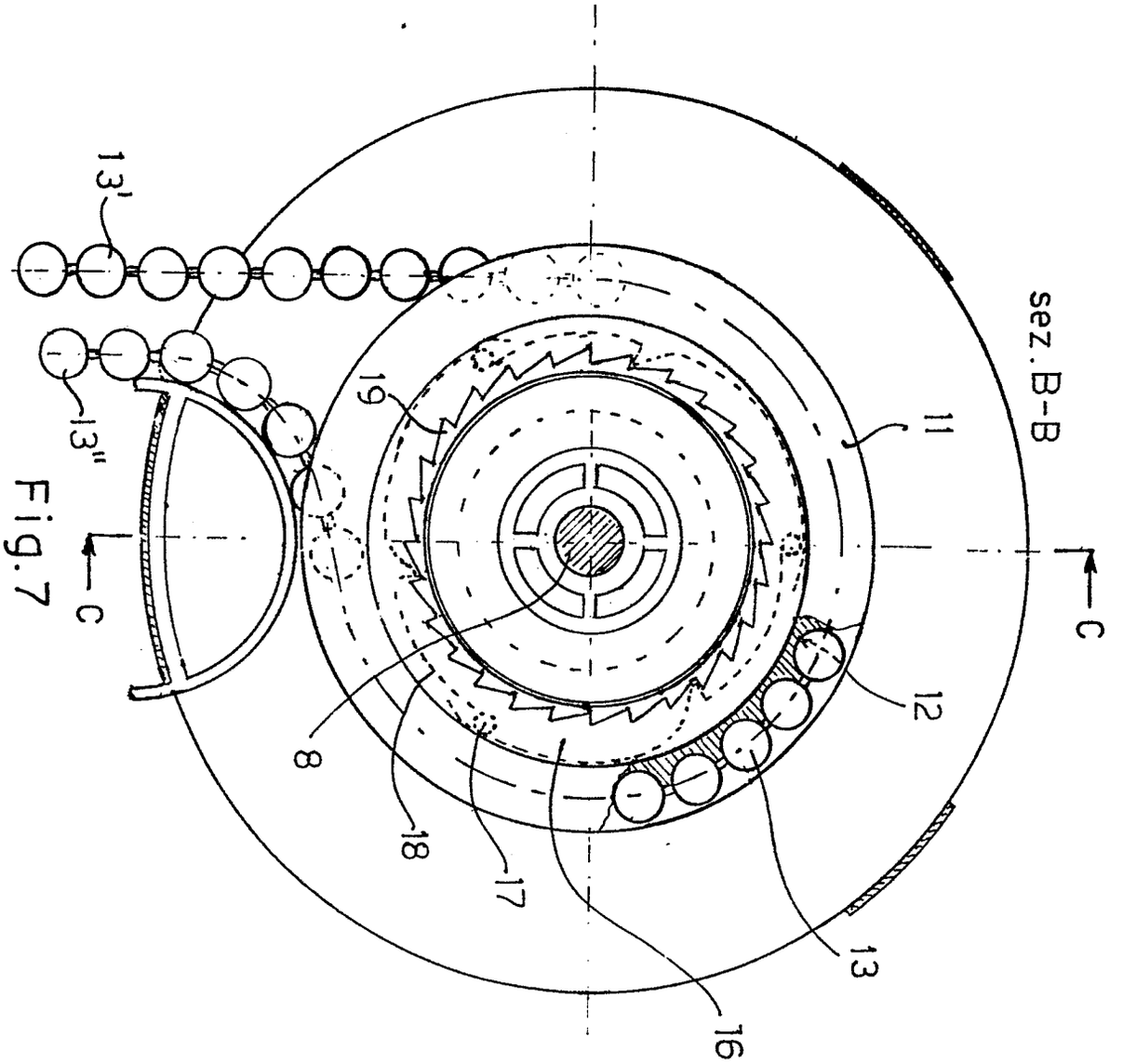
13'
13"
C
19
11
sez. B-B
C
12
8
18
17
13
16

Fig.7

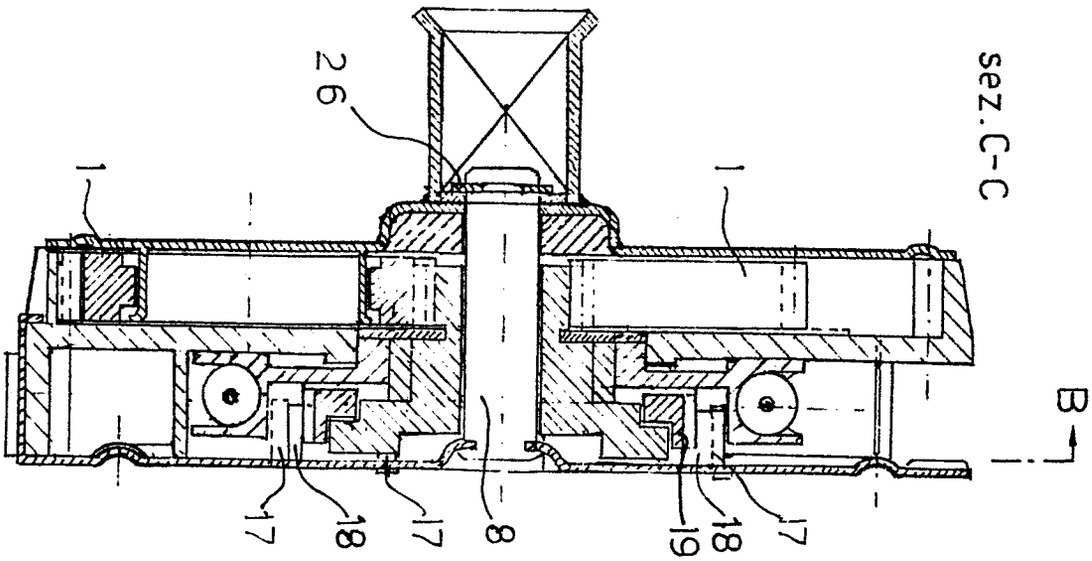
26
1
1
sez. C-C
B
B
17
18
17
8
19
18
17

Fig.8