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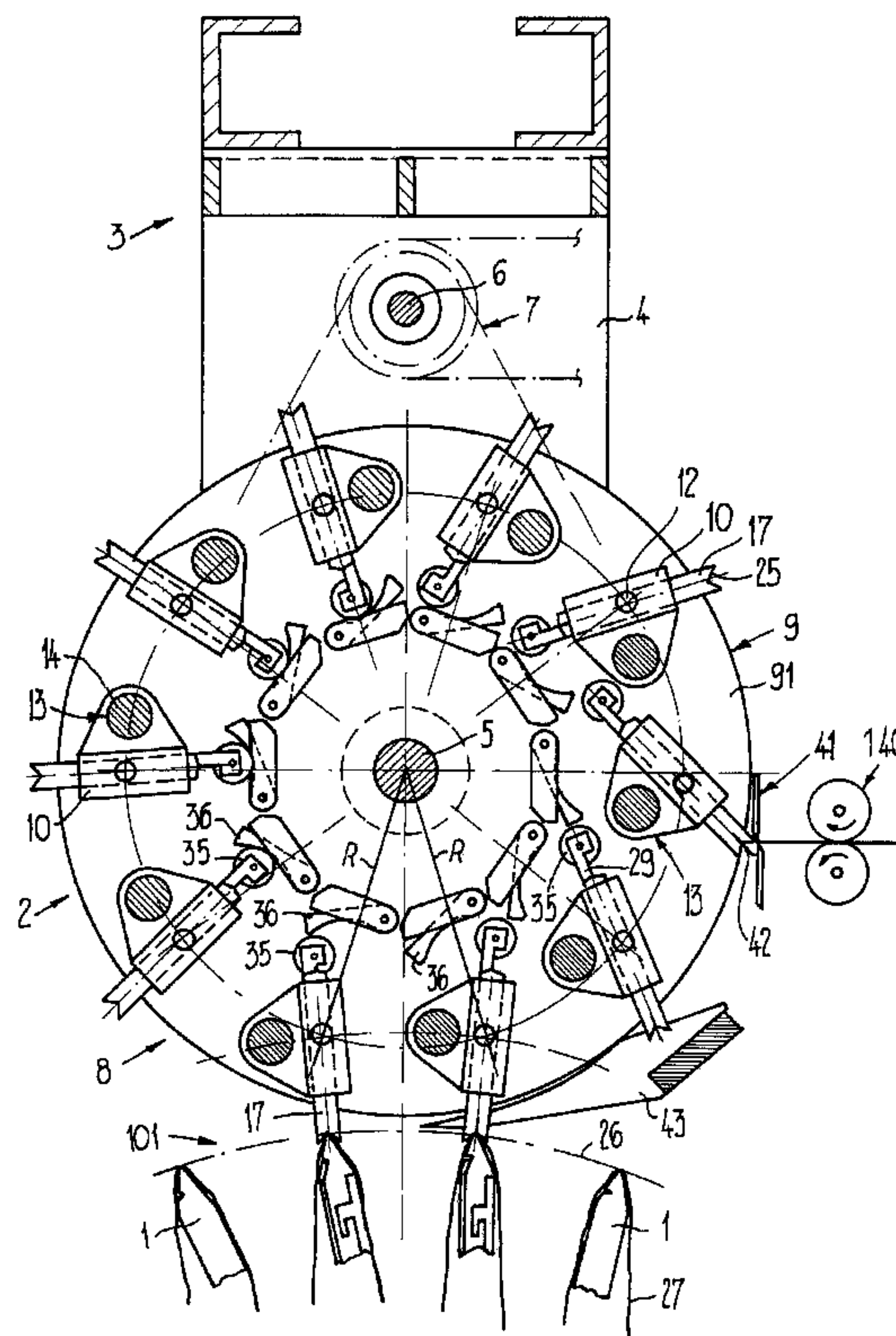
(72) Inventeur/Inventor:
STAUBER, HANS-ULRICH, CH

(73) Propriétaire/Owner:
FERAG AG, CH

(74) Agent: FETHERSTONHAUGH & CO.

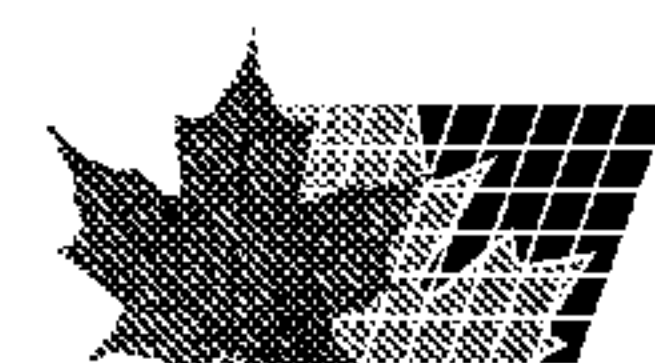
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(54) Title: GATHERING STAPLER FOR PRINTED PRODUCTS COMPRISING FOLDED PRINTED SHEETS



(57) Abrégé/Abstract:

A gathering stapler for printed products of folded printed sheets, has gathering sections extending parallel to one another and circulating transversely to their longitudinal extent, with saddle-shaped rests on which the printed sheets are gathered and stapled. A rotary stapling apparatus has essentially stellately arranged stapling heads driven with the gathering sections in the stapling region in such a way that they meet up. The stapling heads have in each case a staple guide for seating on the printed products, and a push rod, engaging telescopically in the staple guide. The trajectory of the staple guides and the path of circulation of the rests intersect. The staple guides on the rotating carrier of the stapling apparatus can swivel out of a leading position into a trailing position, in relation to their radius, and are secured displaceably inward against a restoring force.



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ABSTRACT

A gathering stapler for printed products of folded printed sheets, has gathering sections extending parallel to one another and circulating transversely to their longitudinal extent, with saddle-shaped rests on which the printed sheets are gathered and stapled. A rotary stapling apparatus has essentially stellately arranged stapling heads driven with the gathering sections in the stapling region in such a way that they meet up. The stapling heads have in each case a staple guide for seating on the printed products, and a push rod, engaging telescopically in the staple guide. The trajectory of the staple guides and the path of circulation of the rests intersect. The staple guides on the rotating carrier of the stapling apparatus can swivel out of a leading position into a trailing position, in relation to their radius, and are secured displaceably inward against a restoring force.

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Gathering stapler for printed products comprising folded printed sheets

The present invention relates to a gathering stapler for printed products comprising folded printed sheets.

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A gathering stapler of this type is known from Swiss Patent 645,074 and the corresponding US Patent 4,408,755. In both cases it is shown that with such a gathering stapler even printed sheets which are initially still joined together in the form of folded webs can be gathered without the usual opening devices. The printed sheets gathered thus or in some other way are stapled in the stapling region of the circulating rests by means of a rotary stapling apparatus.

15 The stapling apparatus itself is represented merely in an indicative way, in accordance with the fact that the nature and operating principle of rotary stapling apparatuses had long been known to a person skilled in the art at the time at which the abovementioned prior art came into being. It was namely known that the rotating stapling heads have for driving in the staples a push rod which is displaceably guided approximately in the radial direction.

25 It readily follows from this that, during the driving in of the staples, the push rod is constantly changing its angular position, the push rod and the rest with the product to be stapled at that moment being aligned ideally with each other only in a single rotational position. In spite of this fact, rotary stapling apparatuses can be used not only in the aforementioned context, but rather were and are used in a wide variety of fields of application.

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Against this background, the present invention is based on the object of providing a gathering stapler of the

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type mentioned at the beginning in which the stapling heads and the rests are aligned ideally with each other not only in one rotational position, but over a rotational region, in which case not only can the operational reliability be increased - even at an elevated rotational speed - but what is more the possibility is also created of working with different qualities of wire and/or lengths of wire and correspondingly different staple dimensions, with minimal setting work.

10 In accordance with an aspect of the present invention, there is provided a gathering stapler for stapling printed products comprising folded printed sheets along a product fold, the stapler comprising: a plurality of elongated saddle-shaped rests extending parallel to each other and circulating transversely to their longitudinal extent while the printed sheets are gathered and stapled on the rests; a rotary stapling apparatus having a plurality of stapling heads and being driven for rotation about an axis of rotation in such a way that each of said stapling heads successively meets up with one of the rests in a stapling region as the rests circulate and the stapling apparatus rotates; each of said stapling heads including a staple guide for holding a staple and adapted to seat on a printed product arranged on one of said rests when the one of the rests meets with said stapling head in the stapling region and further including a push rod movably guided within said staple guide; said plurality of stapling heads being mounted on a carrier rotating about said axis of rotation so as to have an orientation in a substantially radial direction and for a swiveling movement about an axis extending substantially parallel to said axis of rotation through an arc in such a way that the stapling heads swivel out of a leading position into a trailing position, in relation to their substantially

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radial direction, when one of the staple guides meets one of the rests in the area of the stapling region, said staple guides being further mounted on said carrier for a displacement inwardly against a restoring force; and wherein the trajectory of ends of said staple guides and the path of circulation of said rests intersect such that each staple guide is being displaced inwardly by the associated rest when said staple guide meets up with said associated rest in the stapling region.

10 These and other problem solutions aimed at and accomplished according to the invention arise during the course of the following description, in which the design and functioning principle of an illustrated embodiment of the subject of the invention diagrammatically represented in the
15 drawing are set forth. In the drawing:

Fig. 1 shows the rotary stapling apparatus in a section perpendicular to its axis of rotation, according to the line I-I in Figure 2, with some of the circulating rests,

20 Fig. 2 shows the rotary stapling apparatus and one of the rests in side view, partially in section,

Fig. 3 shows the rotary stapling apparatus in the stapling region in a cutout enlarged in comparison with Figure 1,

25 Fig. 4 shows on a further enlarged scale sections according to the lines IVa, IVb (b''-b') and IVc in Figure 3,

Fig. 5 shows a single stapling head in a representation corresponding to Figure 3, but in section and enlarged,

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Fig. 6 shows a section according to the line VI-VI
in

Figure 5, and

Fig. 7 shows a section according to the line VII-VII in Figure 5, but folded into the plane of Figure 6.

In the case of the illustrated embodiment represented,
5 the rests 1 form a drum-shaped gathering system, that is to say a gathering drum 101, as is also the case according to Swiss Patent 645,074, mentioned at the beginning; as there, here the printed sheets are conveyed axially on the rests during the rotation of the gathering
10 drum 101 and of course are held to stop them falling out. This technology invented in 1973 by Walter Reist has been part of the published prior art since German Patent Application 2,447,336 (corresponding to US Patent 3,951,399) was laid open in 1975, but has also been
15 adopted in practice - in various fields of application; there is therefore no need here to go any further into details of the gathering in order to understand the illustrated embodiment represented. All that need be mentioned is that, from the point of view of the present
20 invention, it does not matter whether the rests are arranged in the form of a drum or in some other way and it does not matter how the printed sheets are gathered on the rests, arranged parallel to one another and circulating transversely with respect to their longitudinal
25 extent, or how the charging of the rests or the removal of the finished products takes place.

Above the gathering drum 101 there is a rotary stapling apparatus 2, which is suspended by means of two side walls 4 on the machine frame 3 shared with the gathering
30 drum 101. Mounted in these side walls 4 is the driveshaft 5 of the stapling apparatus 2 and a countershaft 6, which are connected to each other each by a toothed-belt drive 7 arranged outside the side walls 4.

The stapling head carrier 8 of the stapling apparatus 2,
35 located on the driveshaft 5 of the stapling apparatus 2,

has in the case of the illustrated embodiment represented three double-walled carrier disks 9, which are connected in a rotationally fixed manner to the driveshaft and in the interior of which the stellately distributed stapling heads 10 are located. As Figure 1 reveals, in particular in combination with Figure 6 or 7, the housing 11 of the stapling heads 10 is swivel-mounted in the walls 91 of the carrier disks 9 by means of pins 12.

The swivelling position of the stapling heads 10 is determined by means of a joint 13 acting eccentrically on the stapling head housing 11, the joints of the stapling heads 10 mounted albeit in other carrier disks 9 but on the same "star arms", i.e. radii R, being connected to one another by a common joint spindle 14. Figure 1 shows, in particular in combination with Figure 7, that the ends of the joint spindles 14 are guided in endless, enclosed control grooves 15 (which cannot be seen in Figure 1) by control disks 16, which for their part are each anchored fixedly in place bearing against the inner side of the side walls 4, but preferably adjustable in the rotational sense.

The arrangement is set up - as best revealed by Figure 1, in such a way that the stapling heads 10, to be more precise their stapling guides 17, meet up with the rests 1 in the leading position, in relation to the radius of their swivel pins 12, and leave said rests in the trailing position. In other words this means that, in the stapling region, the angular position of the stapling heads does not change like that of the relevant radii, but essentially like that of the rests, so that the latter and the stapling heads are aligned ideally with one another not in a single rotational position but in a rotational region, indeed in the stapling region.

As revealed well by Figures 5 to 7, at each stapling head 10 the staple guide 17 is guided inwardly displaceably in the stapling head housing 11, to be precise against the

action of restoring springs 18, which are arranged in blind bores 19 of the stapling head housing 11 and are supported on shoulders 22 of the staple guide 17 by means of a bolt-shaped counterholder 21, provided with a head 20. As Figure 6 reveals, the counterholders 21 are guided in the housing 11 and are captured in the blind bores 19 by their head 20 for the eventuality that the staple guide 17 withdrawn from the housing 11. In the operationally ready position of the staple guide 17, the head 20 of the counterholders 21 is of course not on its seating, in order that the restoring force of the spring 18 takes full effect. The staple guide 17 is held against the restoring force by a stop 23 (Figure 5), which is fixed to the housing, designed as a disconnectable locking bolt and is formed by the angled-off end of a leaf spring 24 anchored on the housing 11, more accurately on a housing cover 111. As Figure 7 reveals, the cover 111 closes off the open side of the cross-sectionally U-shaped housing 11 and the stop 23 engages on a shoulder of the inwardly displaceable staple guide 17 in the stapling head housing.

The arrangement is set up in such a way that, in this stop position of the staple guides 17, the trajectory of the staple guides, more accurately of the V-shaped centering attachments 25 attached to the ends of the same, intersect the path of circulation 26 of the rests 1 (cf., for example, Figure 1), so that when the staple guides 17 meet up with the rests 1 the former are lifted off the stops 23 and pushed back into the stapling head housing 11. At the same time, the stapling heads 10 are centered accurately on the rests 1, any deviations from the relative desired positions being compensated for by the compliance of the rests 1. Conversely, when leaving the stapling region, the staple guides 17 follow the rests 1 under the action of the restoring force of the springs 18 and gradually detach themselves from the rests 17. This is of significance insofar as in the stapling region there are located on the rests the gathered

printed sheets, or the printed products 27 formed by the latter, which must not be damaged by the action of the centering attachments.

5 In this context it should also be pointed out that to the right and left of the outer carrier disks 9 there are arranged double-walled centering disks 28, which carry between their walls centering heads 10' which correspond in their design to the stapling heads 10; however, these centering heads only have the function of centering the
10 stapling head carrier 8 in relation to the gathering system by their pseudo staple guides 17', which act with their V-shaped centering attachments directly on the rests 1. Thanks to these precautions, the stapling head carrier can, as is readily revealed, be secured in such
15 a way that they can be swung away from the drum, in order to exchange stapling heads and consequently convert the system to different production, which requires, for example, a different number of staplings and/or different staple dimensions.

20 Figures 5 to 7 reveal that the staple guides 17, displaceable in the guide channel 112 of the housing 11 closed off by the cover 111, are likewise U-shaped in cross section, so that they form with the bottom of the guide channel 112 an inner guide for the push rods 29
25 engaging in the staple guides. These push rods have a longitudinal slot 30, in which a pin 31 of the staple guide 17 engages. A spring 32 arranged in the slot 30 is supported on the pin 31 or on the push rod 29, with the tendency to push the latter and the staple guide away
30 from each other, the pin 31 setting an absolute limit to this tendency. It is easy in this case to make the staple guide 17 and the push rod 29 engaging in it form an assembly unit which can be withdrawn from the housing, in the manner of a drag connection, in this case the pin 31
35 striking against the end of the slot, whereas in the reverse direction the push rod 29 or the staple guide 17 can be displaced in relation to each other - even in the

installed state.

In the installed state of the staple guide 17, it is not however the pin 31 that determines the position of rest of the push rod 29, but rather a stop 292 of the same, which interacts, as best revealed by Figure 5 - with a counterstop 33 formed on the stapling head housing 11. Thus, if the staple guide 17 is pushed back in the stapling region by a rest 1, the drag connection comes into action, in that the relevant push rod 29 remains stationary, the spring 32 being tensioned to a correspondingly greater extent.

Each staple guide 17 has at its free end a forking, formed by legs 171, which form with their V-shaped end faces the centering attachments 25. Located on the inner side walls of the legs 171 are longitudinally directed guide grooves 172, which are intended to receive the legs of a U-shaped staple 34, as can be best seen from Figure 4a). Push rod ribs 291 engage in these guide grooves, in order to push the staples 34 out of the guide grooves 172 when there is a relative movement between staple guide 17 and push rod 29. (In this context it is irrelevant how the staple 34 arrives in its guide; such an operation is still to be explained.)

Each push rod 29 bears at its free end a follow-up roller 35, which interacts with a control link 36 belonging to the relevant stapling head 10 (Figures 1 and 3). However - as indicated in particular in Figure 1 by a distorted representation - an effective connection does not come about until the stapling head 10 is moved by the positive control 13-14-15-16 out of its leading position into the trailing position. As can be seen in Figure 3, the control link 36 has such a profile that the push rod 29 is initially advanced out of its stop position and then is held in the new position. Although the control link 36 is swivel-mounted at a pin 37 on the stapling head carrier 8, the force of a supporting spring 38 acting on

the link is nevertheless sufficient to prevent any giving way of the control link.

The following follows from that said above - with particular reference to Figures 1 and 3 and with allusion to
5 Figure 4:

Owing to the intersection of the trajectory of the staple guides 17 and the path of circulation 26 of the rests 1, when a rest 1 meets up with a staple guide 17 the latter is lifted off the stop 23 and pushed back into the
10 stapling head housing 11 by the rest, the follow-up control 35-36 of the push rod 29 also coming into action owing to the swivelling of the stapling head about the pin 12. Starting from an initial position represented in Figure 3 at a), as a result - as indicated in Figure 3 at
15 b) - the staple 34 is soon driven (b') into the product located on the rest 1; it then only has to be closed (b").

For this purpose - as can be seen in Figures 4 b') and b") - there are provided in the rests 1 for each stapling
20 head 10 controlled bending-over means 39, which interact in pairs and are in each case actuated by a common push rod 40. The arrangement is set up in such a way that after the product has been penetrated - Figure 4 b') - the staple legs strike the bending-over means, still in
25 the position of rest, and are deflected inward, in order to prepare for the following bringing to bear against the inside of the product - Figure 4 b").

During this closing operation, which takes place according to Figures 4 b' - b" in a small rotational
30 region, the push rod 29 interacts as a counterholder with the bending-over means 39. After reaching the stop 23, the stapling head is swivelled back into the leading position and, as a result, the control cam 36 makes the push rod 29 travel back as far as its stop. At the same
35 time, the staple guide 17 follows the rest 1 moving away

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from the stapling head, trying to reach its stop 23. With this, the stapling head 10 is ready to receive a further staple 34.

5 A way of feeding the staple 34 to the stapling heads 10 can easily be imagined with reference to Figures 1 and 6. In Figure 1, the wire advancement is indicated at 140 and the wire cutter of a wire cut-off dispenser (not shown in any more detail) is indicated at 41. As explained, for example, in EP-A1 476 718, the stapling heads run past 10 the wire cut-off dispenser, from which their staple guides in each case take over a wire section 42 (Fig. 6), which is held, for example magnetically, in the V-shaped ends of the legs 171, until the relevant stapling head - at the bottom right according to Figure 1 - runs into the 15 region of a fixed-in-place wire-bending link 43. The latter acts on the wire section 42 in its central region, which is pressed in between the legs 171, the ends of the wire section being bent around and drawn into the guide grooves (cf. Figure 4a). With this the staple 34 is 20 formed, or the stapling head 10 is loaded for renewed stapling. The link 43 ends, as Figure 3 shows, directly before the stapling region.

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CLAIMS:

1. A gathering stapler for stapling printed products comprising folded printed sheets along a product fold, the stapler comprising:

5 a plurality of elongated saddle-shaped rests extending parallel to each other and circulating transversely to their longitudinal extent while the printed sheets are gathered and stapled on the rests;

10 a rotary stapling apparatus having a plurality of stapling heads and being driven for rotation about an axis of rotation in such a way that each of said stapling heads successively meets up with one of the rests in a stapling region as the rests circulate and the stapling apparatus rotates;

15 each of said stapling heads including a staple guide for holding a staple and adapted to seat on a printed product arranged on one of said rests when the one of said rests meets with said stapling head in the stapling region and further including a push rod movably guided within said
20 staple guide;

said plurality of stapling heads being mounted on a carrier rotating about said axis of rotation so as to have an orientation in a substantially radial direction and for a swiveling movement about an axis extending substantially
25 parallel to said axis of rotation through an arc in such a way that the stapling heads swivel out of a leading position into a trailing position, in relation to their substantially radial direction, when one of the staple guides meets one of the rests in the area of the stapling region, said staple
30 guides being further mounted on said carrier for a displacement inwardly against a restoring force; and

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wherein the trajectory of ends of said staple guides and the path of circulation of said rests intersect such that each staple guide is being displaced inwardly by the associated rest when said staple guide meets up with
5 said associated rest in the stapling region.

2. The gathering stapler as claimed in claim 1, wherein the staple guides are provided with a centering attachment engaging around the rests.

3. The gathering stapler as claimed in claim 2,
10 wherein the staple guides are positively actuated for said swivelling movement by a follow-up control, so that the staple guides run into the stapling region in the leading position and leave it in the trailing position.

4. The gathering stapler as claimed in claim 3,
15 wherein the staple guides are mounted on the rotating carrier for a swivelling movement about a swivel pin and are connected to the follow-up control by a joint arranged eccentrically in relation to the axis.

5. The gathering stapler as claimed in claim 4,
20 wherein a plurality of carriers are arranged on a common shaft at intervals, the joints of the staple guides being both relatively aligned with one another in the direction of the common shaft, and respectively seated on a common radius and sharing a continuous common pin, the pin being guided at
25 both of its ends in a fixed control slot of the follow-up control.

6. The gathering stapler as claimed in claim 1, wherein each staple guide is guided displaceably in a stapling head housing and rests on a stop of the housing
30 directed against the restoring force, while the push rod

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guided in the staple guide is supported inward by a counterstop of the housing.

7. The gathering stapler as claimed in claim 6, wherein the staple guides and the push rods engaging in them
5 are in each case configured as an assembly unit which can be withdrawn from the housing, the unit comprising:

a spring interposed between each staple guide and the associated push rod, the spring pushing the staple guide and push rod away from each other; and

10 a further stop and further counterstop to limit the movement of the push rod relative to the staple guide.

8. The gathering stapler as claimed in claim 6 wherein:

the stop assigned to each staple guide is
15 configured as a disconnectable locking bar; and

spring-loaded counterholders are provided in the stapling head housing, which in the locking position of each staple guide acts on the staple guide, and in the non-locking position when the staple guide is removed can be
20 displaced to a predetermined limit.

9. The gathering stapler as claimed in claim 6, wherein each push rod is actuated by means of a follow-up control, responding when the staple guides are transferred out of the leading position into the trailing position.

25 10. The gathering stapler as claimed in claim 9, wherein each push rod bears at its free end a follow-up roller, which in each case interacts with a sprung control link, anchored on the carrier.

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11. The gathering stapler as claimed in claim 1, further comprising a staple-wire dispenser and a stationary wire-bending link arranged one following the other in the rotating direction of the carrier, the wire-bending link
5 having a path which gradually enters into the trajectory of the staple guides between two legs of the staple guides and extends into the region of the intersection of the trajectory of the staple guides and the path of circulation of the rests.

10 12. The gathering stapler as claimed in claim 10 comprising bending-over means, arranged inside the rests, the bending-over means being actuated by the follow-up control synchronously with the push rod within an associated staple guide.

15 13. The gathering stapler as claimed in claim 1 comprising centering disks disposed adjacent to the rotating carrier, the centering disks having securing means, arranged and controlled in a way corresponding to stapling head housings, for centering attachments which are displaced
20 against a restoring force and engage in a meshing manner around the rests.

14. The gathering stapler of claim 1 further characterized by and including:

a) resilient means constantly tending to urge said
25 staple guides generally toward the axis of said rotary stapling apparatus.

FETHERSTONHAUGH & CO.
OTTAWA, CANADA

PATENT AGENTS

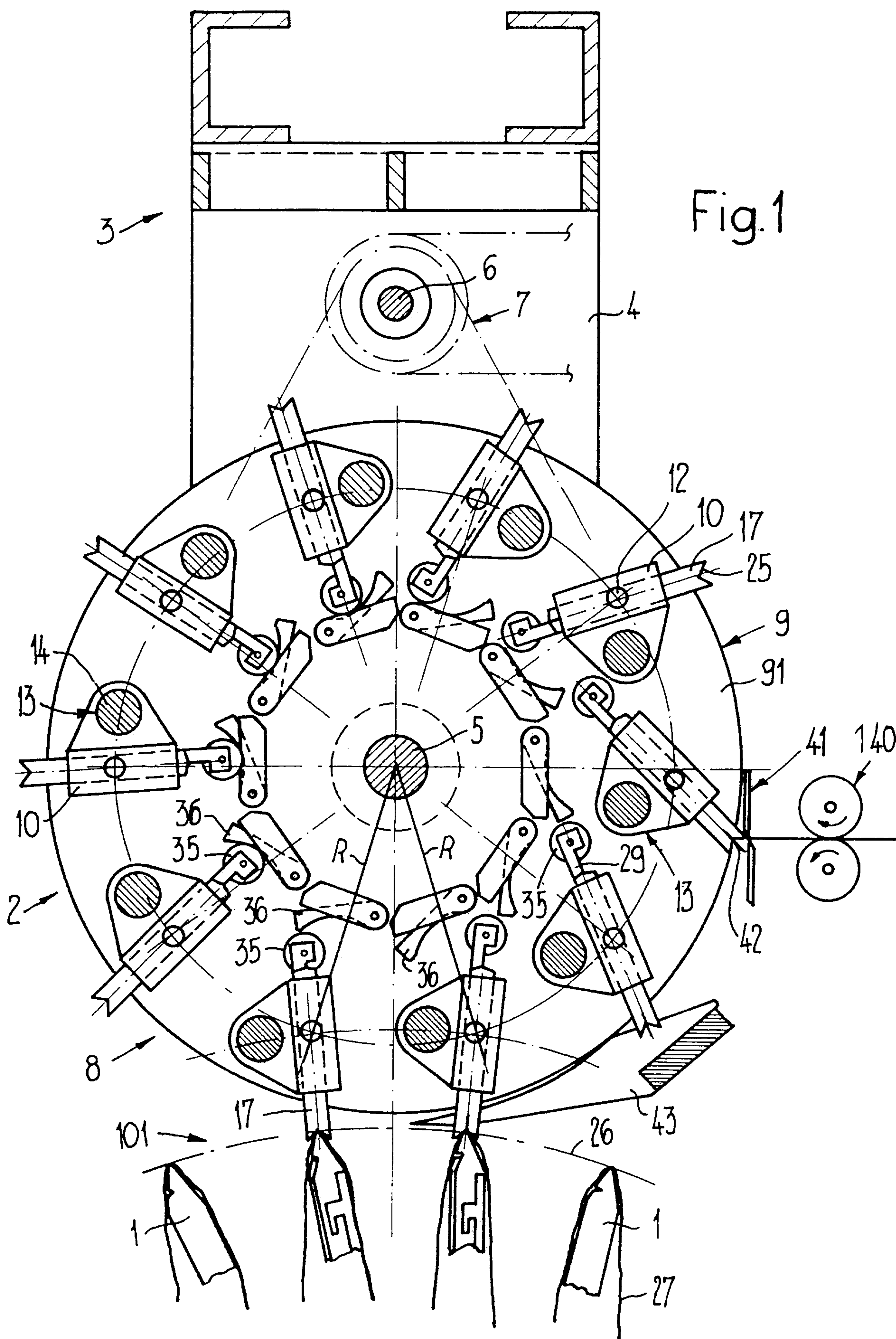
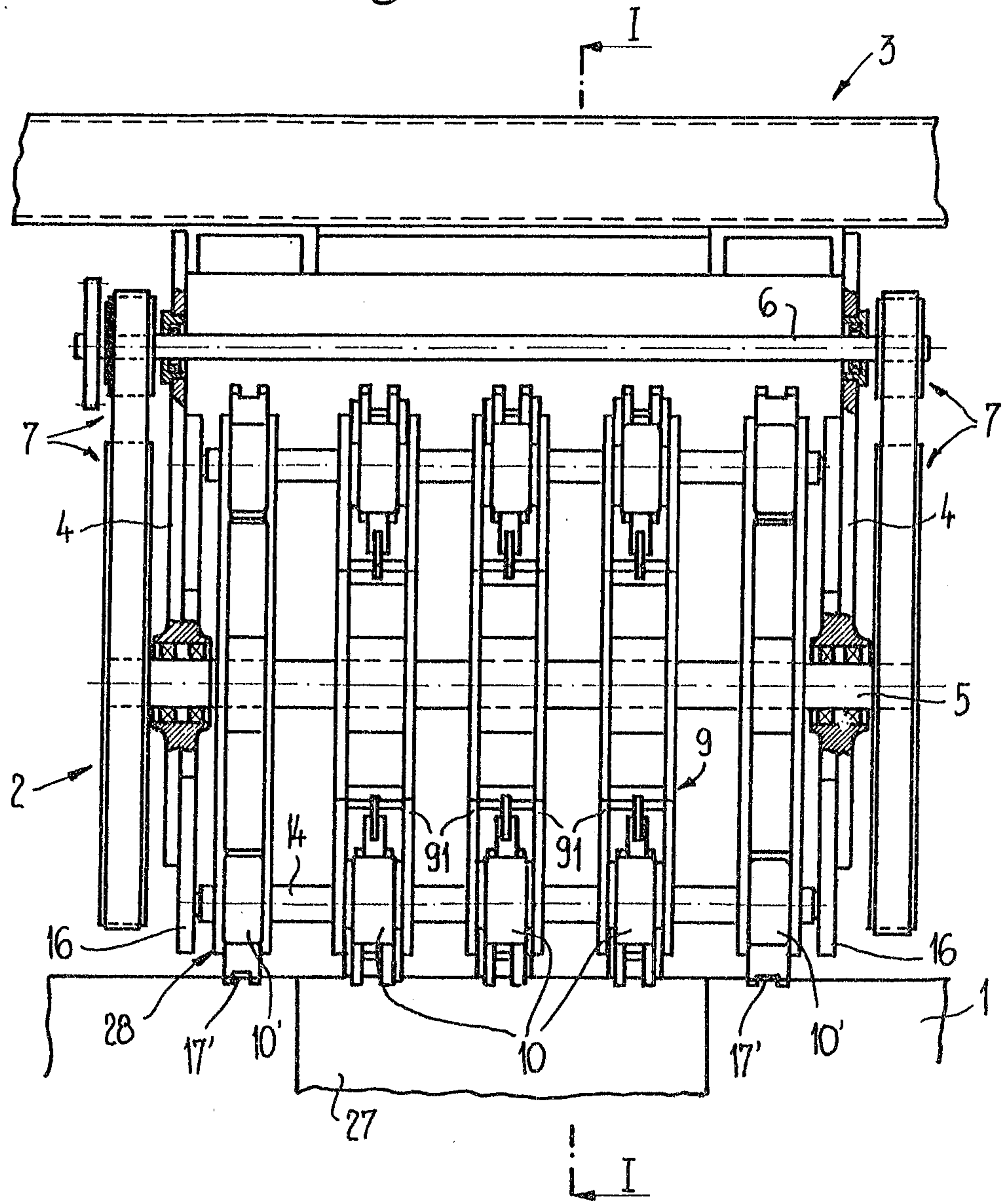
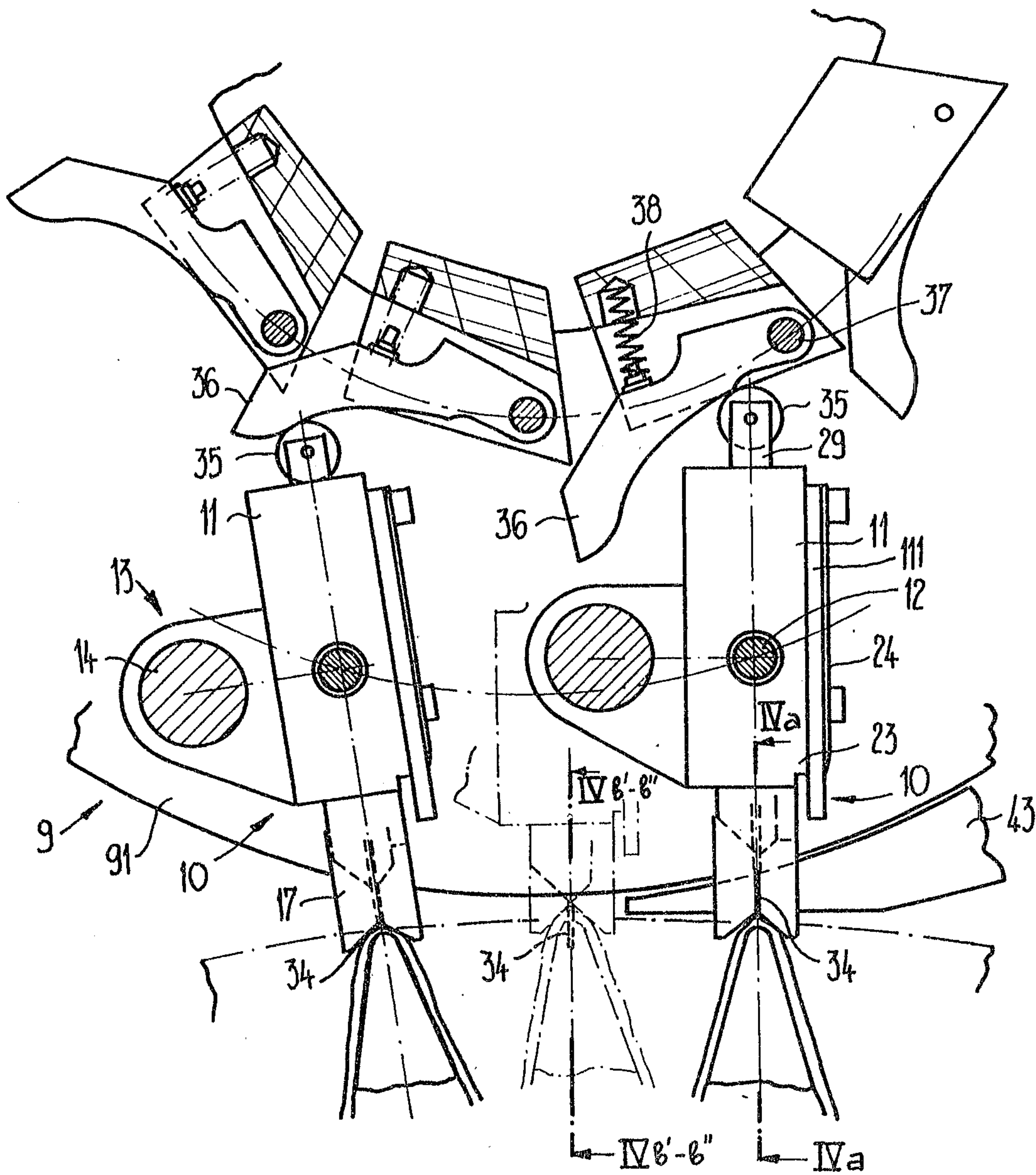


Fig. 2



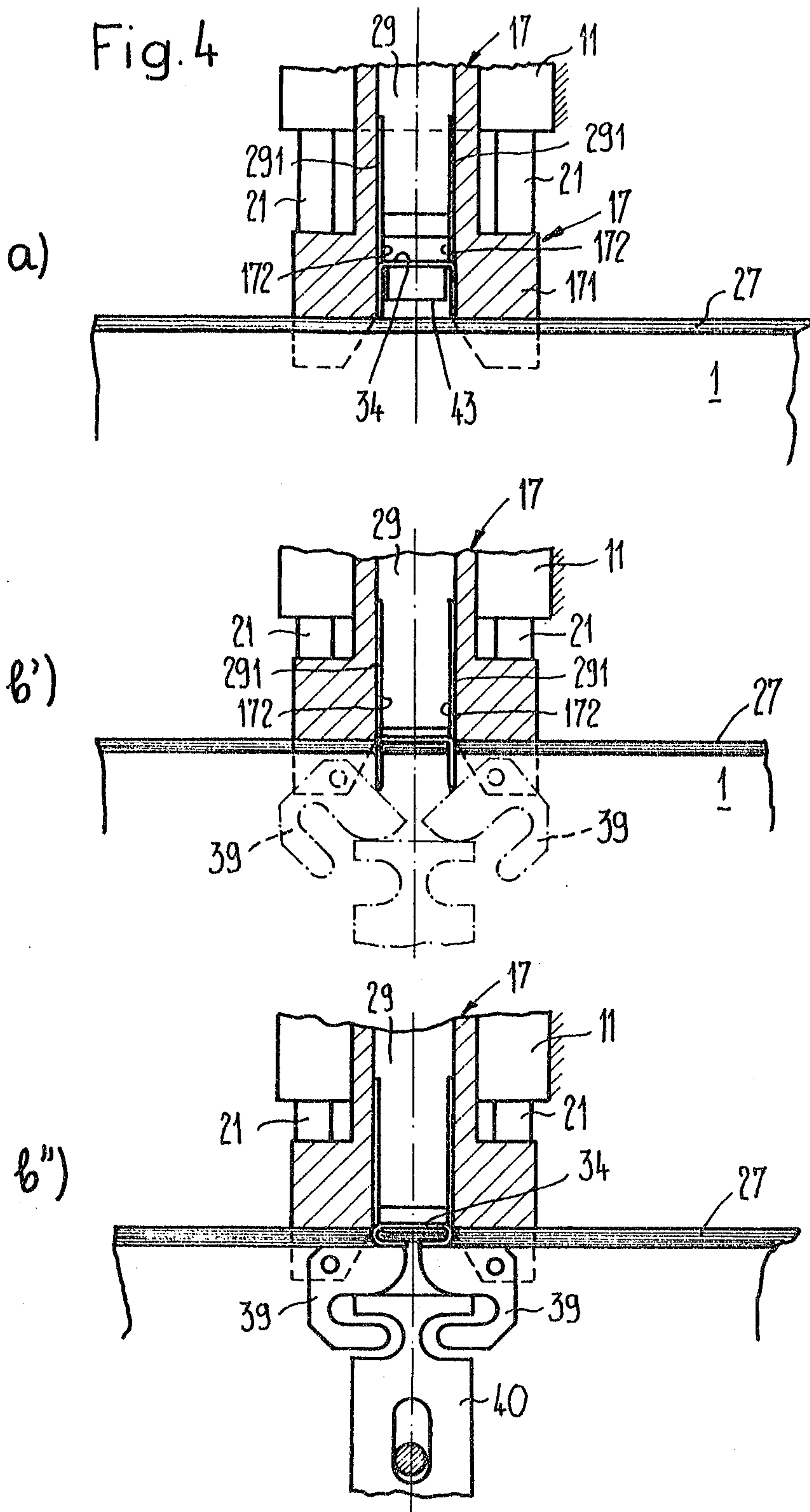
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Fig.3

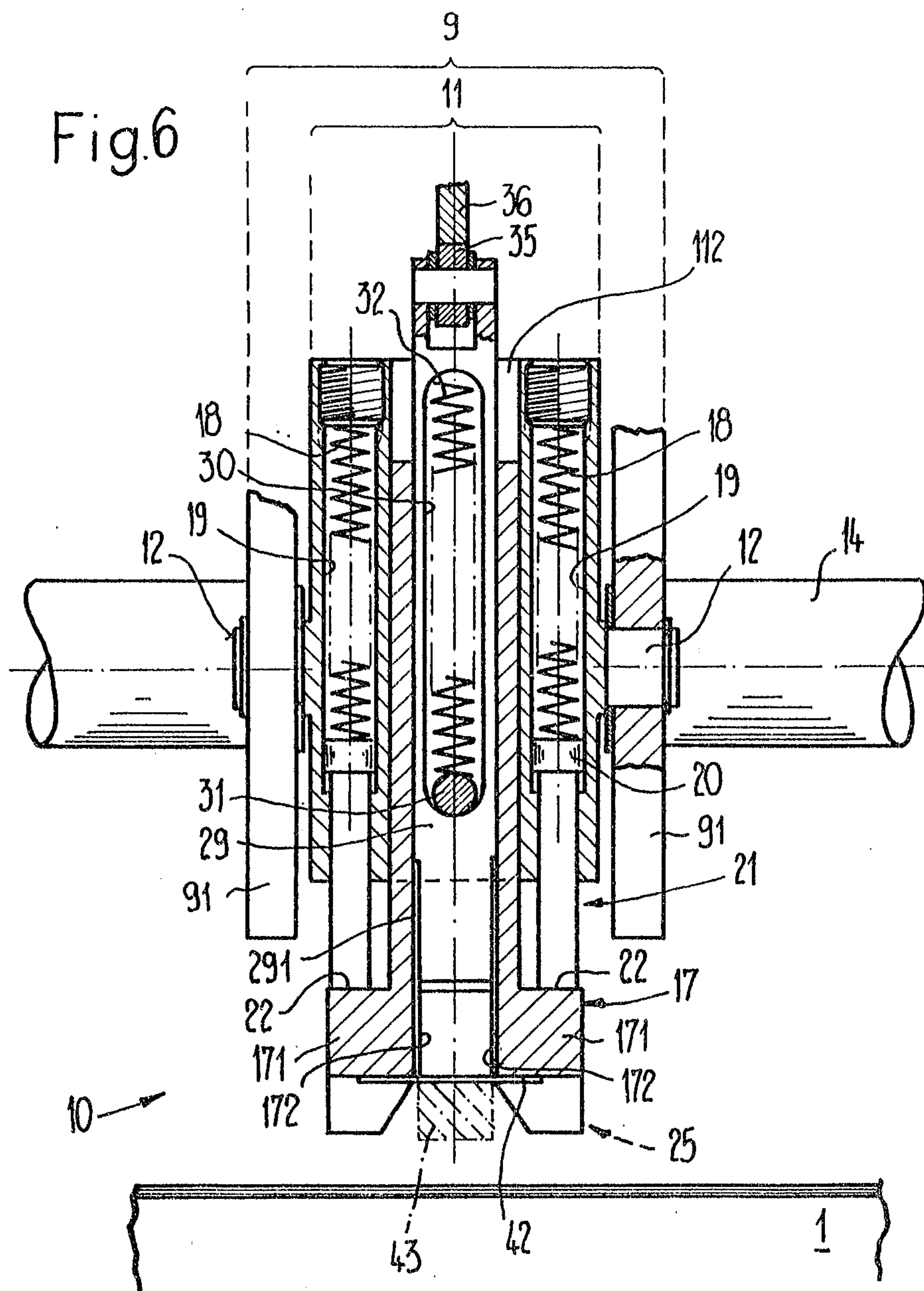


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Fig. 4

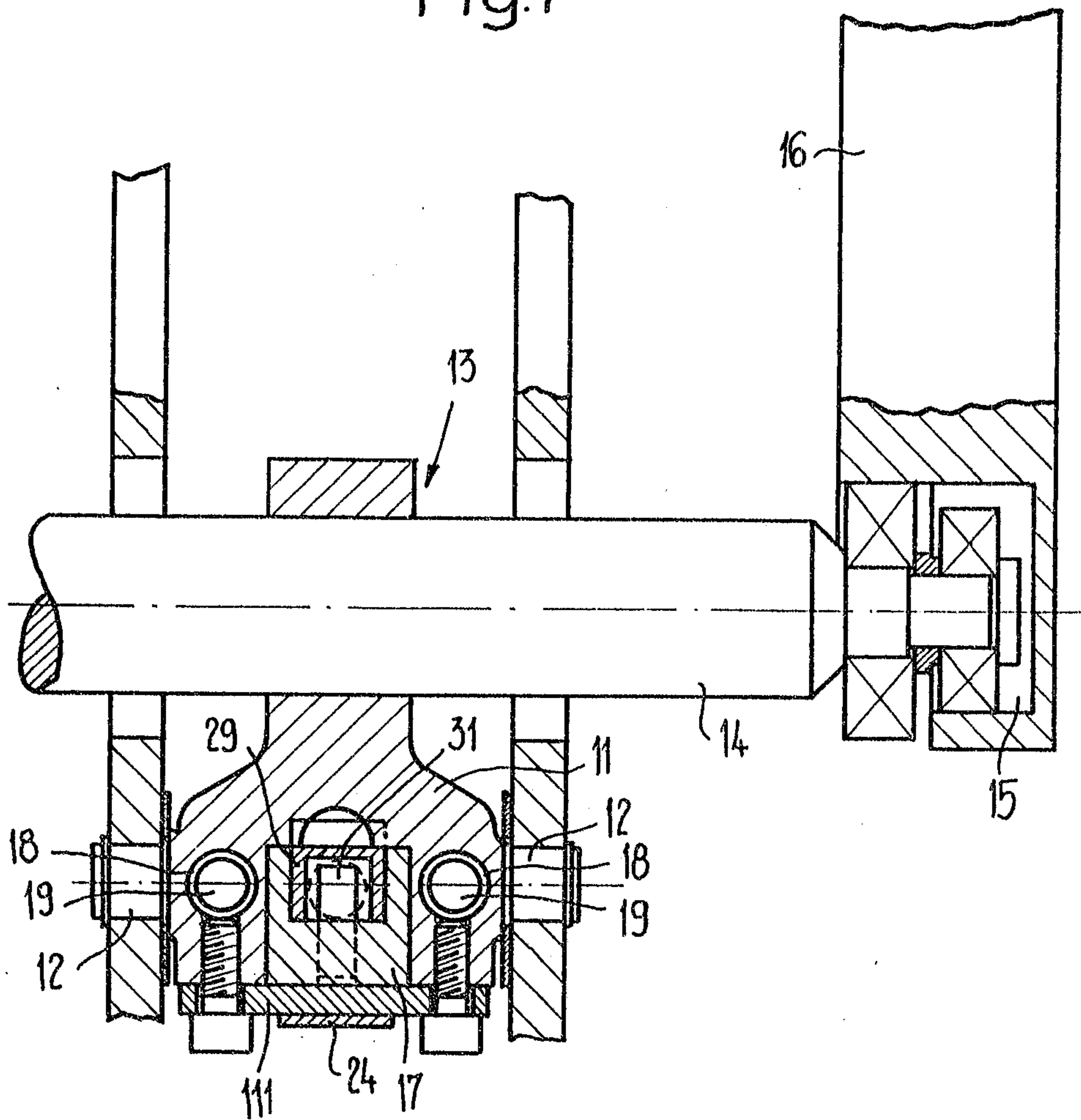


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Fig. 7



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