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Printer for printing marking strips

The invention relates to a printer for printing marker strips according to the preamble of claim 1.

Such a subject matter is known from DE 10 2015 109020 A1. According to US 2008/089732 A1, the feed shaft has a coating with particles and thus such a roughness that the transport of the media to be printed, such as paper, is improved. JP 2004-338900 A discloses an analogous prior art. According to this document, on a feed shaft for paper, first protrusions of a few micrometers in height are provided to facilitate the transport of the paper, and second protrusions a little higher are provided to protect the first protrusions against dulling when no paper is being transported.

If a plurality or multitude of electric devices, such as terminal blocks, are arranged next to one another on a submount, each having a latch contour, in particular a latch recess, the marking process is simplified by employing, instead of a plurality of completely discrete marking elements, marking elements which are connected to one another in a strip-shaped pattern. For example, for marking a terminal block assembly on a mounting rail, it is then only necessary to place the marking strip above the area of the latch contours of the terminal blocks which are arranged next to one another and then to press on the individual marking elements from above such that secure latching of the marking elements to the devices, in particular the terminal blocks, is accomplished.

As an example, in order to manufacture such marking strips, injection molding methods are used, in which strips of a defined length of, for example, eight marking elements are made, which are then joined to be able to equip a reel with a long marking strip off of which marking strips with a desired amount of marking elements can then be cut.

From DE 10 2015 109 020 A1 it is known to produce the marking strip from at least two different plastic materials of different hardness, the latching contour of each marking element consisting of the harder material and the marking plate consisting of the softer plastic material at least in the area of the writing field. Preferably, the marking strip is first manufactured in an extrusion process and then processed further. Extrusion allows to simply produce a continuous strip for winding it, e.g., onto a reel. By using extrusion, in particular

co-extrusion, the marking strips or their marking elements can then be used in particular for printing by means of thermal transfer technology. If the latch contour of each marking element is made of a harder plastic material, it can be readily and securely latched onto the given electric device. Furthermore, it is advantageous for the marking plate to consist of the softer plastic material at least in the area of the writing field. As such it can be printed on more precisely. The softer material facilitates automatic adjustment to the printing head and is also gentler on the printing head than a harder material.

Further, it is advantageous if each connecting area between the marking elements consists of at least one or more connecting web(s) and if at least one hole, in particular an elongated hole, is formed in the connecting area between adjacent marking elements, the hole penetrating the marking elements in a latching direction perpendicular to the arrangement direction. The hole allows to selectively increase or adjust the resilience of the connecting area. In addition, the given hole is readily usable as a sensing means for a sensor of a printer to trigger or stop printing. However, it is also contemplated that the marking plate of the marking strip does not contain any holes and/or edge recesses. This makes easy and advantageous implementation of writings across devices possible. It is also contemplated to provide the marking strip with markings in the form of printings at the bottom, for example, with markings applied in a grid spacing and having different colors compared to the material of the marking strip, which are easy to sense and usable as a reference for the printing process. These different types of marking strips and sensing and printing methods continue to also be usable with the printer according to the invention.

Irrespective of the type of manufacture and nature of the marking strip used, it is desirable to print the marking strip in a dedicated printer in its main direction of extension as precisely as possible such that the respectively desired print image is printed exactly within the area of the intended marking plate. This requires a printer which is equipped correspondingly.

The invention has the object of further developing the known printer in such a way that the described problem is solved of printing the marker strip in its main extension direction as precisely as possible in a printer provided for this purpose, so that the respectively desired print image is printed exactly in the area of the marking plate provided for this purpose.

The invention achieves this object with the subject matter of claim 1.

Therefore, it is intended, according to the invention, that the rotatably mounted feed shaft has at least one section (referred to as a protrusion section) which is provided with protrusions and which rests directly against the marking strip while the feed shaft is rotated such that the advancing speed of the marking strip is synchronized with the circumferential speed of the feed shaft.

In this manner, a defined, tolerance-free feed of the marking strip -- from a practical view -- can be ensured, resulting in a clean print image without offset, in particular in its main direction of extension.

Further, it is preferably provided that the section provided with protrusions advantageously rests directly against the marking strip while the feed shaft is rotated such that the protrusions each introduce a deformation into the marking strip, causing or creating a positive fit between the feed shaft and marking strip such that the advancing speed of the marking strip is synchronized with the circumferential speed of the feed shaft.

According to a further feature of claim 1, which is especially easy to implement and also results in a very smooth feed motion of the marking strip, the at least one protrusion section is formed as an interlocking section. Preferably, the interlocking section creates a positive fit, on the one hand, and preferably optionally or alternatively also a frictional connection, thus ensuring smooth further transport of the marking strip at all times. It does not have to create any deformation during feed, which is, however, a particularly advantageous further development.

According to claim 1, it is further provided that the feed shaft comprises tooth-less sections, wherein the tooth-less sections are configured such that latch lugs of a latch contour of the marker strips can move in the tooth-less sections without contact.

Preferably, it is provided that the protrusion section is formed as an axial section of the feed shaft, preferably enclosing the shaft completely or almost completely and having a surface roughness which is configured such that, when transporting a marking strip made of at least one plastic material through one or more radially extending protrusions, a positive fit is created between the section having the surface roughness and the marking strip while transporting the marking strip.

As such, the defined and – from a practical view – zero-tolerance feed of the marking strip may be ensured in a simple and cost-effective manner, resulting in a clean print image without offset, in particular in its main direction of extension.

5 According to another variant, it may be further advantageously intended that the at least one interlocking section is a first interlocking section with a first diameter, having a first interlock, in particular a saw-toothed interlock. The tooth shape, in particular the pointed tooth shape, of the interlock advantageously produces a precise feed when printing the marking strip.

10 It may be further advantageously intended that the feed shaft has one or more additional protrusion sections, in particular interlocking sections, which is/are axially offset from the first protrusion section, in particular interlocking section, or which each rest directly against the marking strip in at least one or more additional areas with a defined pressure force while the feed shaft is rotated such that the advancing speed of the marking strip is synchronized with the circumferential speed of the feed shaft also in these areas.

15 This allows an even more precise motion of the marking strip during printing to be implemented easily and cost-effectively. In addition, sensing of markings such as holes or stripes or the like may be accomplished for referencing during printing.

20 In a further preferred embodiment variant of the invention, the pressure force applied onto the marking strip by the printing head is effective to press the protrusions, in particular formed by the interlock, into the marking strip. Advantageously, each tooth of the interlock creates a permanent indentation in the marking strip. This advantageously creates a positive fit between the interlock and the marking strip, enabling precise feed.

25 In a further preferred embodiment of the invention, each of the additional interlocking section(s) also has a saw-toothed interlock on its periphery. In turn, the pointed tooth shape of this interlock advantageously creates a precise feed when printing the marking strip.

Further advantageous designs of the invention are set forth in the remaining dependent claims.

In the following, the invention is described in greater detail with reference to the drawings by way of exemplary embodiments. In the drawings:

Figure 1: shows a perspective view of a simplified illustration of a printer for printing multiple marking strips;

Figure 2: shows, in a), a sectional view of an embodiment variant of a marking strip and, in b), a sectional view of a further embodiment variant of a continuous marking strip;

5 Figure 3: shows, in a), a 3-dimensional view of terminal blocks arranged next to one another with an inserted marking strip, in b), a front view of the terminal blocks of Fig. 3a arranged next to one another with an inserted marking strip;

Figure 4: shows a front view of a roller and a printing head with a continuous marking strip of the printer of Fig. 1;

10 Figure 5: shows an enlarged detail of the roller and the printing head with the continuous marking strip of Fig. 4;

Figure 6: shows a sectional side view of the roller and the printing head with the continuous marking strip of Fig. 5;

15 Figure 7: shows a bottom view of the roller and the printing head with the continuous marking strip of Fig. 4.

Fig. 1 shows a simplified illustration of printer 1 for printing continuous marking strips 2. Marking strips 2 are used for marking, in particular of electric devices which can be arranged next to one another, such as terminal blocks (on this, see also Fig. 3a and Fig. 3b). The printer may have further components, such as a cover or the like, which are not shown herein.

20 Printer 1 is preferably designed as a direct thermal printer or a thermal transfer printer. Alternatively, printer 1 may also be intended for other printing methods, such as ink jet or laser printing.

Printer 1 has a printing head 3, herein preferably arranged above a feed shaft 4. Marking strip 2 is advanced between these two elements. Printing head 3 is preferably spring-loaded – in
25 Fig. 1 from top to bottom – and presses marking strip 2 onto feed shaft 4. A spring means required to this end is not shown herein. As such, herein, feed shaft 4 also rests against marking

strip 2 with a predetermined or defined force.

Feed shaft 4 may be inserted into two bearing seats 5a, 5b. Feed shaft 4 may further have respective bearings 6a, 6b – preferably one at each of its ends. With these bearings 6a, 6b, feed shaft 4 is rotatably mounted on printer 1. Further, feed shaft 4 has a gear 7, at least at one of its free ends, which can mesh with a corresponding mating gear (not shown herein). The mating gear is driven by a motor (also not shown herein) located within printer 1.

Thanks to this drive, feed shaft 4 can be set into a rotating motion. The rotating motion of feed shaft 4 is suitably controlled by a printer controller (not shown herein).

The rotatably mounted feed shaft 4 has at least one interlocking section 8, here exemplified as being arranged in the middle between bearings 6a, 6b, which rests directly against marking strip 2 by a defined pressure force produced by printing head 3 herein when feed shaft 4 is rotated such that the advancing speed of marking strip 2 is synchronized with the circumferential speed of feed shaft 4. An advancing motion is produced in direction X, corresponding to the main direction of extension X of marking strip 2.

This allows a precisely defined advancing movement of the marking strip during printing in this direction to be provided easily and cost-effectively. The print image is precisely applied in the dedicated areas in the main direction of extension (which is the same as the advancing direction) in an easy manner.

The preferably inserted at least one interlocking section 8 will be described in greater detail further below.

Fig. 2a and Fig. 2b show two exemplary embodiments of the “continuous” marking strip (see also Fig. 1). Marking strip 2, also called “continuous” in the technical language, has multiple marking elements 9 (not shown herein, see Fig. 6). Each of marking elements 9 has a marking plate 10 with at least one writing field which can be provided with information, such as writing. Preferably, the writing field is configured to be printed with printer 1.

On the side facing away from the writing field, each of marking elements 9 may further have a latch contour 11 formed integrally with the respective marking plate 10 for latching attachment of a corresponding latch contour (not shown herein) of a corresponding electrical

device. For this purpose, latch contour 11 has latch lugs.

Marking strip 2 is made of a plastic profile produced in an extrusion process, preferably a co-extrusion process, wherein preferred cross-sections can be derived from Fig. 2a and Fig. 2b. Preferably, this extrusion process is carried out such that the areas forming marking plate 10
5 with the writing surface upon completion are made of a first material that is softer than that of latch contour 11, which is made of a harder second material.

For marking an assembly of terminal blocks 12 on a mounting rail, it is then only necessary to place marking strip 2 – see Fig. 3a and Fig. 3b – above the area of the latch contours of the terminal blocks which are arranged next to one another and then to press on the individual
10 marking elements 9 from above such that secure latching of marking elements 9 to the terminal blocks is accomplished. Then or before that, the marking strip is cut from a kind of “continuous strip”, such as on a reel, such that the number of marking elements 9a, b, c, ... corresponds to the number of devices arranged next to one another which are to be marked. Thus, marking strip 2 of Fig. 2a or Fig. 2b is suitable for marking three devices arranged next to one another.
15 However, many more devices arranged next to one another can be marked within a single operation.

For the detailed design of continuous marking strip 2, refer to DE 10 2015 109 020 A1. It should be noted here that the marking strips could also be different in design.

In Fig. 3a or Fig. 3b, the writing “Main drive” is implemented across devices as an example.
20 Thus, the writing “Main drive” – here exemplified for a drive motor, here powered with 3-phase alternating voltage (L1 to L3) and having a neutral connection (N) and a protective earth terminal (PE) – spans five devices, here terminal blocks 12.

In Fig. 4, feed shaft 4 is shown with interlocking section 8 and printing head 3 of printer 1. Between feed shaft 4 and printing head 3, a marking strip 2 to be printed is inserted in the area
25 of interlocking section 8.

Here, as an example, interlocking section 8 is positioned approximately centered or precisely centered on feed shaft 4 with respect to the longitudinal extension of feed shaft 4. Interlocking section 8 has interlock 13 around its entire periphery. It may be designed as a saw-toothed

interlock herein. Further, interlocking section 8 advantageously engages with a gap between the latch lugs of latch contour 11 formed by marking strip 2. In this area, a precise feed is advantageous.

During the rotating motion of feed shaft 4, the at least one interlock 13 produces indentations in at least one area due to the pressure force, here applied – in a preferred, but not necessary – design by printing head 3 to marking strip 2. The respective indentation 14 may be a permanent indentation 14 (not shown herein, see Fig. 6).

Here, each tooth of interlock 13 creates these indentations during the rotating motion of feed shaft 4 in a base of latch contour 11.

Preferably, this allows to easily and advantageously create a positive fit between marking strip 2 and interlock 13 or interlocking section 8, resulting in a precise feed.

Here, next to interlocking section 8, feed shaft 4 has two respective tooth-less sections 15a, 15b of a “small” diameter arranged symmetrically with respect to the interlocking section.

Small-diameter tooth-less sections 15a, 15b are designed such that the latch lugs of latch contour 11 may freely move therein without contact with respect to a radial direction and may be guided on both sides of a shoulder 16a, 16b of a respective additional interlocking section 17a, 17b – present here – with respect to an axial direction. This is advantageous and structurally simple.

The additional interlocking sections 17a, 17b also rest directly against marking strip 2 due to the defined pressure force created here by printing head 3 while feed shaft 4 is rotated such that the advancing speed of marking strip 2 is synchronized with the circumferential speed of feed shaft 4 in additional areas of marking strip 2. Here, the interlocking sections rest against marking plates 10 from beneath, and provide for precise feed of these elements directly in the proximity of the actual areas to be printed.

For this purpose, in its periphery, the respective interlocking section 17a, 17b may in turn preferably have an interlock 19 extending across its periphery. The latter may in turn have a saw-toothed design.

The one or, here, the two additional interlocking sections 17a, 17b axially offset from the first interlocking section may each have a step 18a, 18b with another radius, here a smaller radius, than that of interlocking section 17a, 17b. On its periphery, the respective step 18a, 18b in turn preferably has an interlock 20. The respective step 18a, 18b also rests directly against marking strip 2 in an additional area under the defined pressure force here created by printing head 3 while feed shaft 4 is rotated such that the advancing speed of marking strip 2 is synchronized with the circumferential speed of feed shaft 4 in still another area, here at a part of the latch contour. What is essential is that one or more interlocks on different diameters may be used to carry out an adjustment to the respective marking geometry to implement a feed motion of the marking strip as precisely as possible.

While feed shaft 4 is rotated, due to the pressure force applied by printing head 3 to marking strip 2, each tooth of interlocks 19, 20 also creates a respective resilient or plastic deformation or indentation 21, 22 (not shown herein, see Fig. 6) in a step of latch contour 11 or on the side of marking plate 10 facing away from the printable side of marking plate 10, with which the respective interlock 19 or 20 engages such that a positive fit is created between marking strip 2 and the respective interlock 19, 20 or the respective interlocking section 17a, 17b, advantageously ensuring a tolerance-free feed – from a practical view – of marking strip 2 during printing.

Not all of the protrusions, in particular interlocks, have to leave a permanent indentation. For instance, it may not be desirable to create permanent indentations which might affect the visual appearance in places, such as at the sides of the marking, which will be visible after attaching the marking to a device.

At the axial external surfaces of each of the further axial interlocking sections 17a, 17b, feed shaft 4 may have a respective section 23a, 23b, having a larger outer diameter than the interlocking sections with respect to interlocking sections 8, 17a, 17b. Thus, printing head 3 of printer 1 may be protected while no marking strip 2 is being printed.

In Fig. 5, printing head 3 and feed shaft 4 are shown with the respective interlocking sections 8, 17a, 17b, shoulders 16a, 16b and steps 18a, 18b and interlocks 13, 19, 20.

In Fig. 6, interlocks 13, 19, 20 and indentations 14 in marking strip 2, which are formed by

interlock 13, can be seen particularly well.

In Fig. 7, indentations 14, 22 formed by interlocks 13, 20 in marking strip 2 are shown.

Marking elements 9 of marking strip 2 can also be seen.

List of reference numerals

	1	Printer
	2	Marking strip
	3	Printing head
5	4	Shaft
	5a, 5b	Bearing seat
	6a, 6b	Bearing
	7	Gear
	8	Interlocking section
10	9	Marking elements
	10	Marking plate
	11	Latch contour
	12	Terminal block
	13	Interlock
15	14	Indentation
	15a, 15b	Sections
	16a, 16b	Shoulder
	17a, 17b	Interlocking section
	18a, 18b	Step
20	19	Interlock
	20	Interlock
	21	Indentation
	22	Indentation
	23a, 23b	Section
25	X	Main direction of extension

Patentkrav

1. Printer (1) til print på markeringsstriber (2) af mindst et plastmateriale, hvor markeringsstriben (2) har en flerhed af markeringselementer (9a, b, c) til marke-
5 ring af elektriske apparater, særligt elektriske apparater, der kan placeres ved siden af hinanden, hvortil hvert af markeringselementerne (9) har en markeringsplade (10) med mindst et inskriptionsfelt, som kan printes med information såsom en inskription, og hvor hvert af markeringselementerne (9) desuden på den side, der vender væk fra inskriptionsfeltet, har en indgrebskontur (11) med indgrebsnæser,
10 som er integreret forbundet med den respektive markeringsplade (10), hvor printeren (1) har en drejeligt lejret fremføringsaksel (4), der kan drives af en motor, og et printhoved (3), **kendetegnet ved, at** den drejeligt lejrede fremføringsaksel (4) har mindst et afsnit forsynet med fremspring, et fremspringsafsnit (8), som, når fremføringsakslen (4) drejes, ligger direkte op ad markeringsstriben (2), sådan
15 at markeringsstribens (2) fremdriftshastighed er synkroniseret med fremføringsakslens (4) omkredshastighed, hvor fremspringsafsnittet (8), når fremføringsakslen (4) drejes, ligger direkte op ad markeringsstriben (2), sådan at der ved hjælp af fremspringene ved fremføring dannes en formlutning mellem fremføringsakslen (4) og markeringsstriben (2), hvorved markeringsstribens (2) fremdriftshastighed
20 er synkroniseret med fremføringsakslens (4) omkredshastighed, hvor det afsnit af fremføringsakslen (4), som er forsynet med fremspring, er udformet som fortandingsafsnit (8), og hvor fremføringsakslen (4) har fortandingsfrie afsnit (15a, 15b), hvor de fortandingsfrie afsnit (15a, 15b) er udformet sådan, at markeringsstribens indgrebskonturs (11) indgrebsnæser kan bevæge sig berøringsfrit i de fortandings-
25 frie afsnit (15a, 15b).

2. Printer (1) ifølge et af det foregående krav 1, **kendetegnet ved, at** det mindst ene fortandingsafsnit (8) er et første fortandingsafsnit med en første diameter, som har en første fortanding, særligt en savtandslignende fortanding (13).

30

3. Printer (1) ifølge et af de foregående krav, **kendetegnet ved, at** fremføringsakslen (4) har et eller flere yderligere fremsprings-, særligt fortandingsafsnit (17a, 17b, 18a, 18b), som er forskudt aksialt i forhold til det første fremsprings-, særligt fortandingsafsnit (8), og som, når fremføringsakslen (4) drejes, i mindst et eller
35 flere yderligere områder ligger direkte op ad markeringsstriben (2) med en defineret trykkraft.

4. Printer (1) ifølge krav 3, **kendetegnet ved, at** det eller de yderligere fremspringsafsnit, særligt fortandingsafsnit (17a, 17b), har en anden diameter end det første fortandingsafsnit.

5 5. Printer (1) ifølge et af de foregående krav 3 eller 4, **kendetegnet ved, at** det ene eller de yderligere fortandingsafsnit (17a, 17b) på den respektive omkreds har en yderligere fortanding, særligt en yderligere savtandslignende fortanding (19).

10 6. Printer (1) ifølge et af de foregående krav, **kendetegnet ved, at** det tryk, som printhovedet (3) virker med på markeringsstriben (2), er dimensioneret på en sådan måde, at det ene eller de flere fremspring, dvs. fortandinger, trykker ned i markeringsstriben (2), når markeringsstriben fremskubbes under drift.

15 7. Printer (1) ifølge krav 6, **kendetegnet ved, at** den eller de flere fortandinger pr. tand danner en blivende fordybning (14) i markeringsstriben (2).

20 8. Printer (1) ifølge et af de foregående krav, **kendetegnet ved, at** indgrebsnæserne hver føres af en skulder (16a, 16b) af det respektive yderligere fortandingsafsnit (17a, 17b).

Fig. 1

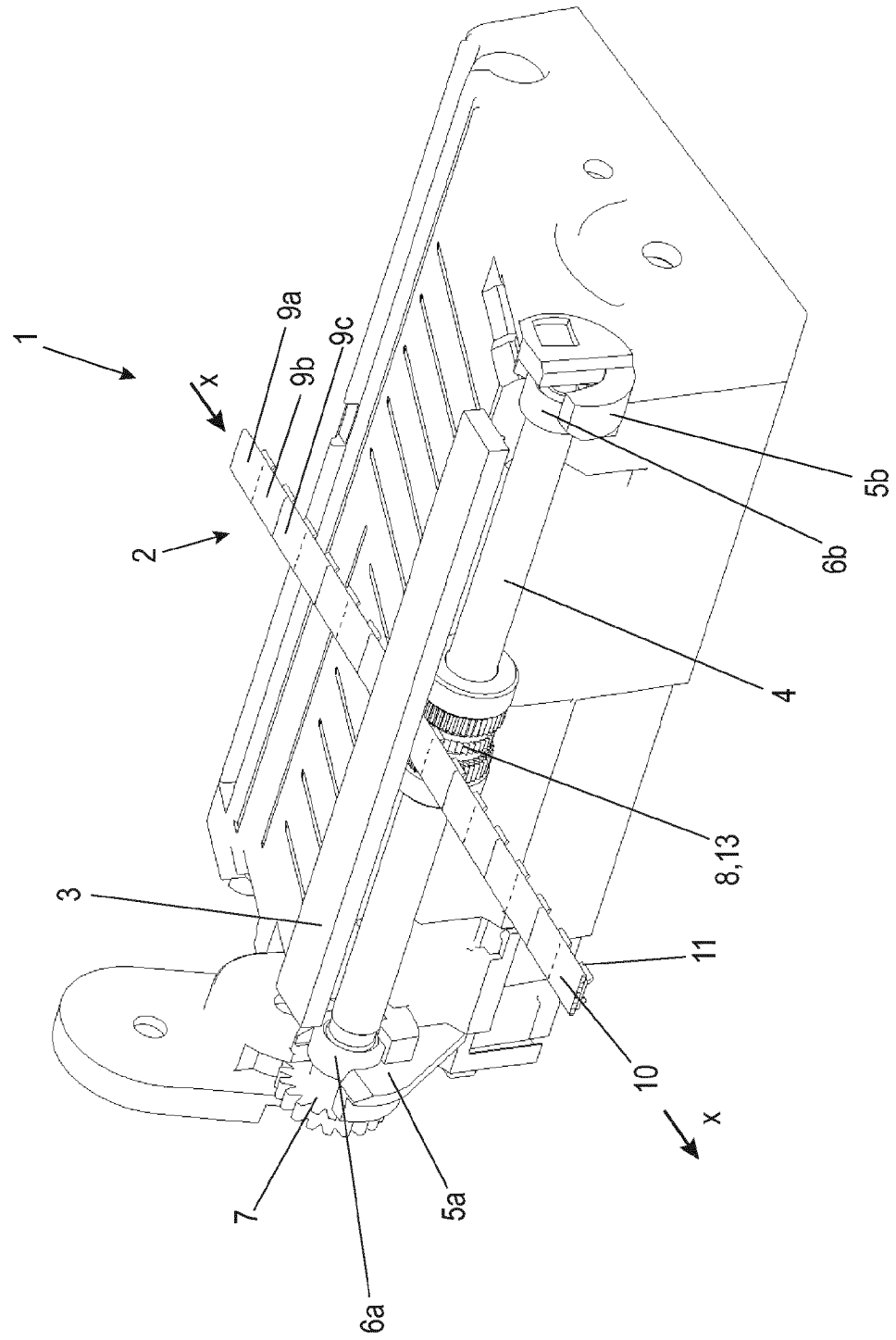


Fig. 2a

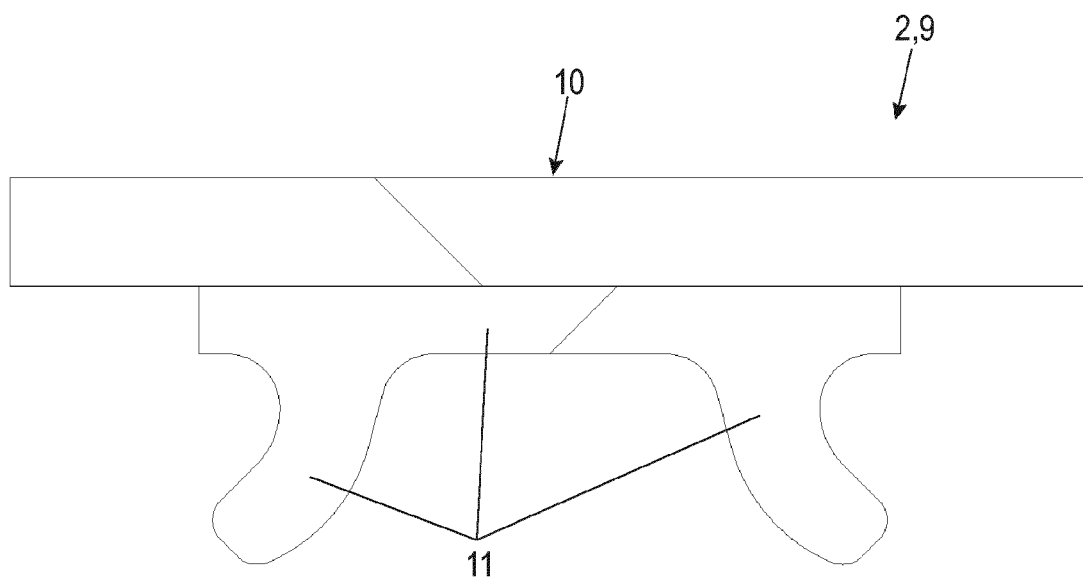


Fig. 2b

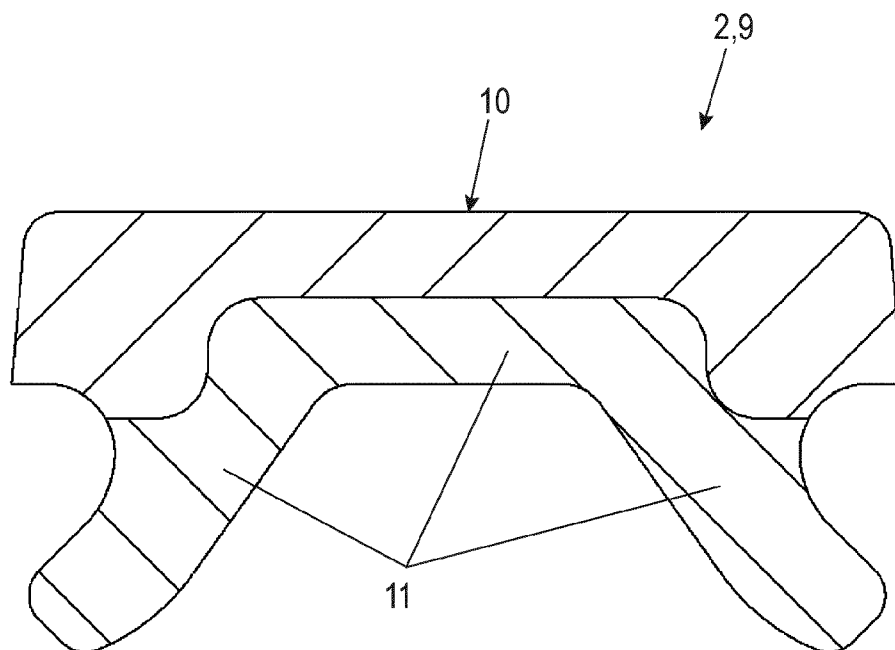


Fig. 3a

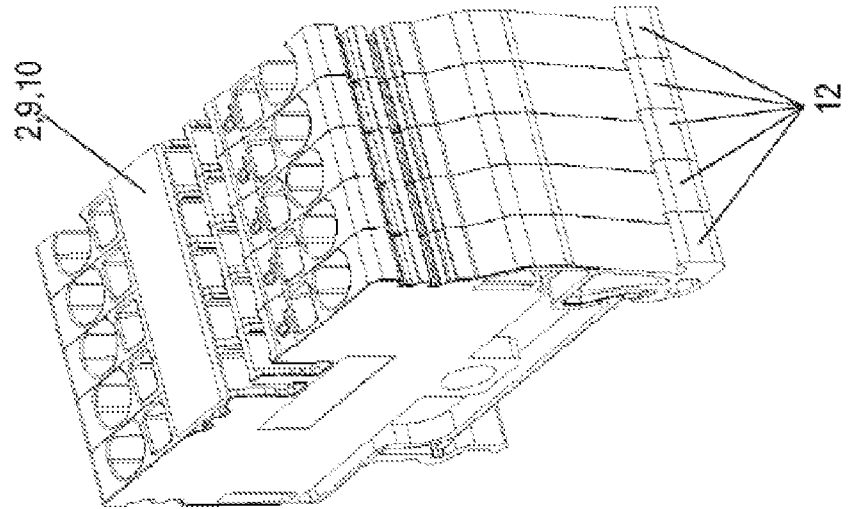


Fig. 3b

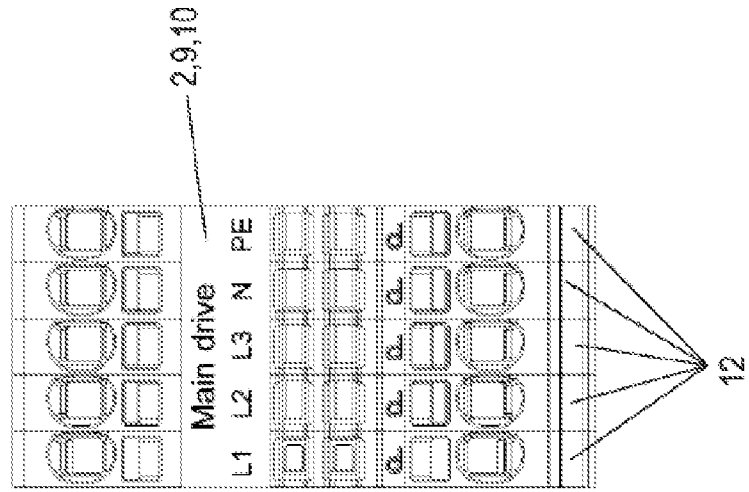


Fig. 4

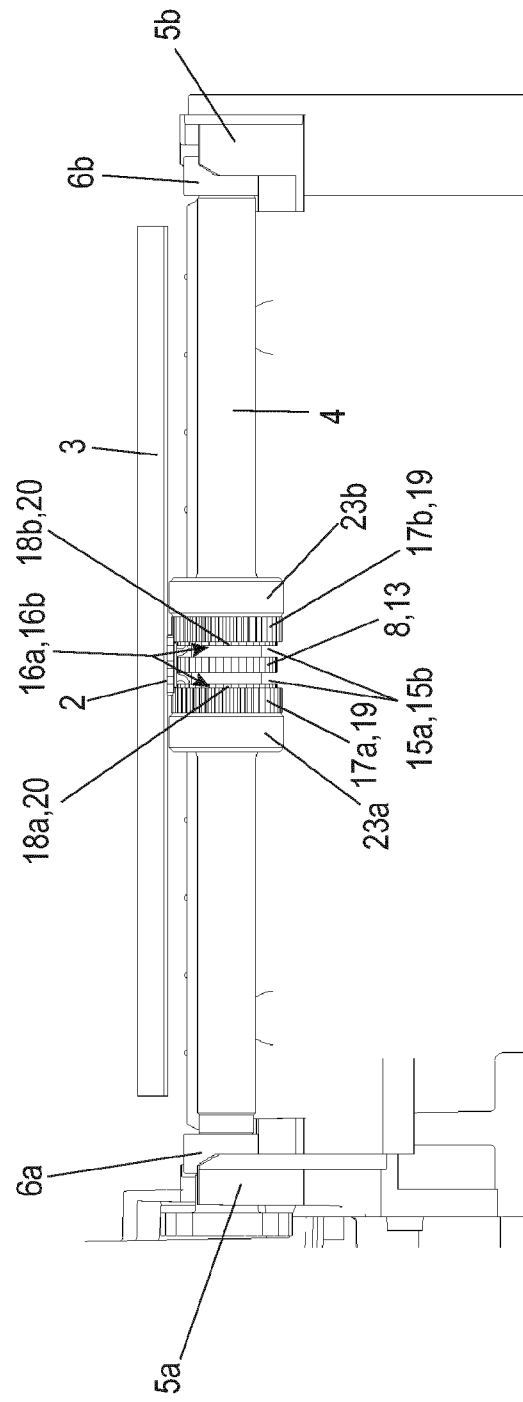


Fig. 5

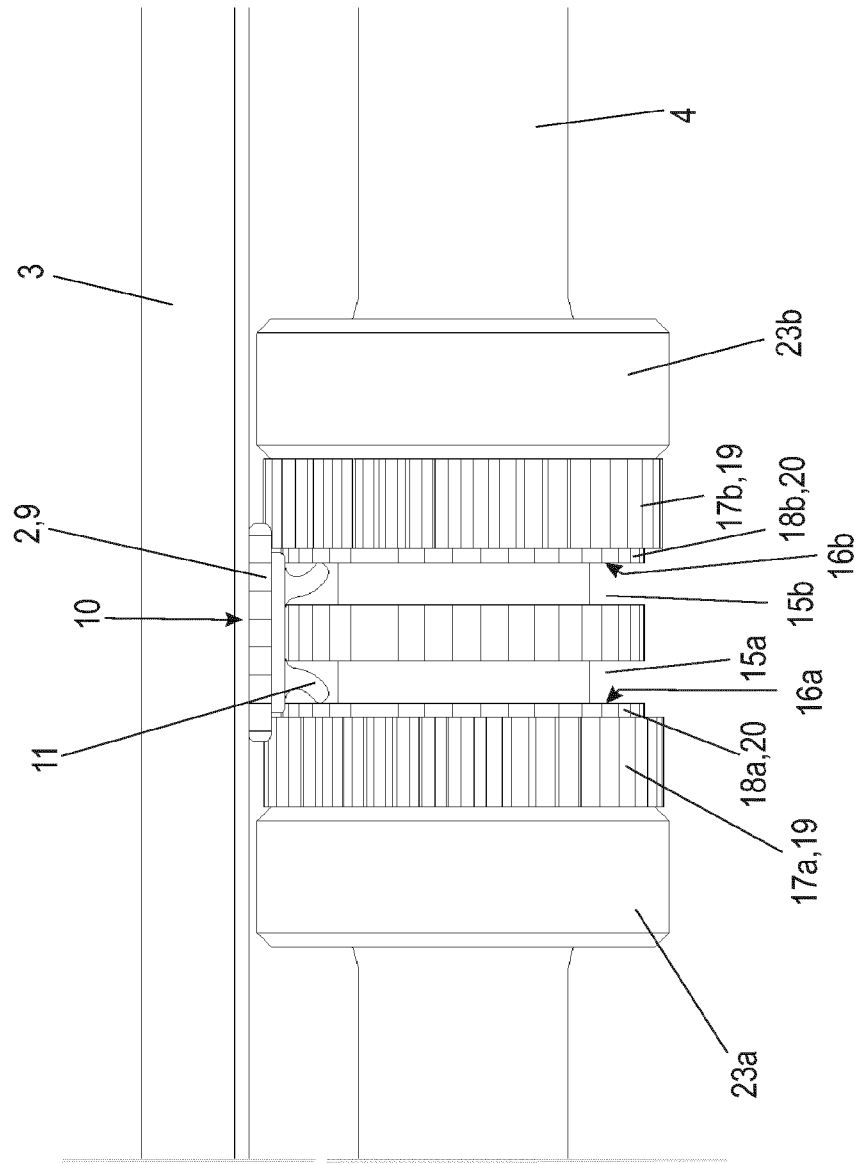


Fig. 6

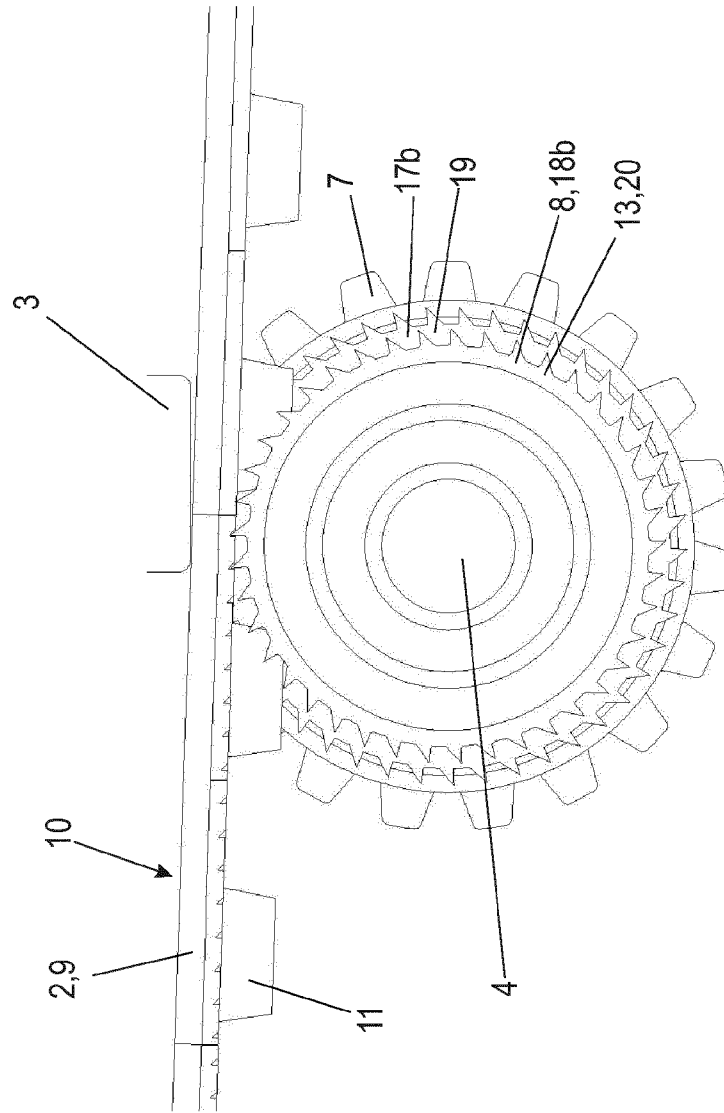


Fig. 7

