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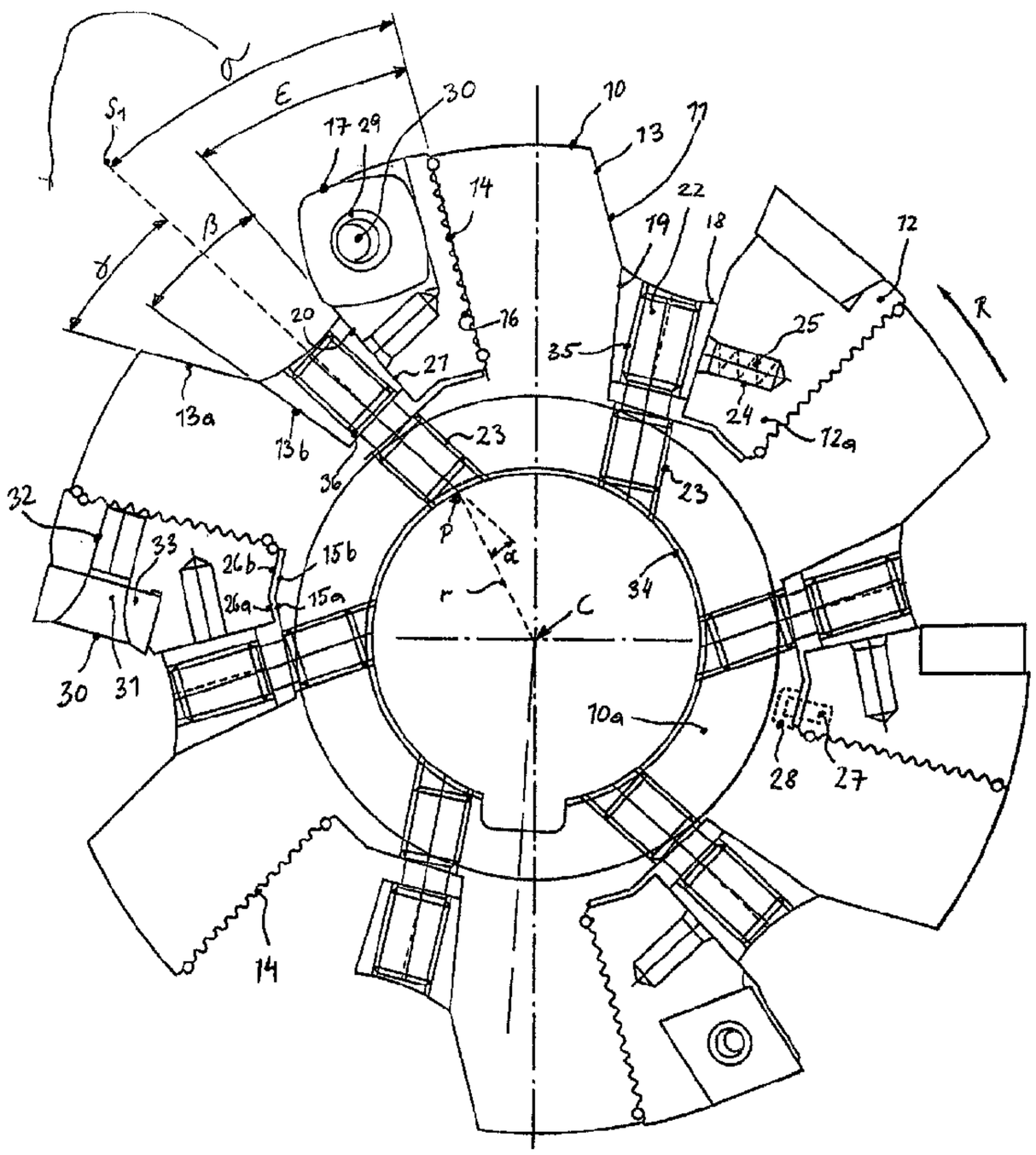

(57) Abrégé/Abstract:
The invention provides a milling cutter, preferably in the form of a rotary slotting cutter with a disc-shaped cutter body (10), said body (10) having a plurality of insert-equipped cartridges (12) mechanically clamped into recesses (11) around its periphery, said cartridges being clamped by means of clamp wedges (18). Each cartridge (12) is provided with a wedge-shaped portion (12a) and serrations (16) at its rear surface which are intended to engage with correspondingly provided serrations in the rear wall (14) of the recess (11).

Abstract

The invention provides a milling cutter, preferably in the form of a rotary slotting cutter with a disc-shaped cutter body (10), said body (10) having a plurality of insert-equipped cartridges (12) mechanically clamped into recesses (11) around its periphery, said cartridges being clamped by means of clamp wedges (18). Each cartridge (12) is provided with a wedge-shaped portion (12a) and serrations (16) at its rear surface which are intended to engage with correspondingly provided serrations in the rear wall (14) of the recess (11).

Milling Cutter

The present invention relates to a milling cutter, preferably in the form of a rotary slotting cutter, with mechanically clamped cutting elements whereby each cutting insert is carried by a cartridge received in a recess of the milling cutter body.

Milling cutters equipped with a number of cutting inserts received in corresponding recesses in the milling cutter are previously known, for instance from German patent 1102526. The cutting inserts are mechanically clamped by means of screws or wedges with serrations. With such tool it is possible to achieve good stability and regrinding but it is not possible to achieve desired precision when exchanging inserts and, furthermore, the manufacture of such tool becomes expensive.

It is an object of the present invention to provide a milling cutter with cartridges wherein the clamping means for the cartridge is not exposed to unfavorable and varying bending moments.

It is another object of the invention to firmly fix both the axial and the radial position of the cutting insert.

A further object of the invention is to provide a milling cutter with a maximum of stability and adjustability by using a new type of cartridges which enable different assembling variants in an advantageous way for rotary slotting cutters.

A still further object of the invention is to provide a milling cutter with clamping means of such design and with such location that the discharge of chips is not negatively influenced.

The above and other objects of the invention are attained by giving the invention the characterizing features stated in the claims following hereinafter.

The invention is described in detail in the following description with reference to the accompanying drawings. It is to be understood that the illustrated embodiments are only shown by way of example and that various modifications may be made within the scope of the claims.

Fig 1 is a side view of a slotting milling cutter according to one embodiment of the invention in which an insert equipped cartridge is mounted in the milling cutter body while one of said cartridges is taken away,

Fig 2 is a partial side view of a slotting cutter according to another embodiment of the invention, and

Fig 3 is a partial side view of a slotting cutter according to another embodiment of the invention.

In the drawings, the cutter body of the rotary slotting milling cutter is denoted by 10. The cutter has a central core portion 10a and a plurality of peripheral recesses 11 located in positions radially inside but in close proximity of said core portion 10 for the receipt of insert-equipped and partially wedge-shaped cartridges 12. The width of said cartridge 12 could be

identical with the entire width or a portion of the width of the milling cutter.

The radially inner wedge-shaped portion of said cartridge is denoted by 12a. The milling cutter body is arranged for rotation around the central axis in direction R. The recesses 11 are evenly distributed along the periphery of the cutter body 10, in this case six of them are provided. It is to be understood, however, that said recesses 11 in certain cases might be unevenly distributed around the periphery of the milling cutter body.

The forwardly located wall of each recess 11, as seen in the rotary direction R, consists of two surfaces 13a and 13b arranged at an angle from each other whereas the rear wall 14 has a straight contour. The bottom of said recess is confined by a bottom wall ocnsisting of two surfaces 15a and 15b arranged at an angle from each other which extend between the walls 13 and 14. The rear wall 14 of said recess 11 is provided with straight serrations intended to engage with corresponding serrations 16 provided in the rear wall of said cartridge 12. These serrations 16 extends along the entire width or put of the cutter body 10 and enable pushing said cartridge 12 in the axial direction from either the front side or the back side of said cutter body. It is a characterizing feature that the forward bottom portion 15a of said recess 11 is arranged at an angle of 90-100° with regard to the wall 13b whereas the rear 15b of said bottom is oriented at an angle of 90° from the rear wall 14 in same recess.

The clamping means for the cartridge 12 is in the form

of a clamping wedge 18 arranged radially inside the insert 17 on the cartridge 12. The forward wedge surface 19, as seen in rotary direction, is arranged in abutment with wall portion 13b of recess 11, whereas the rear wedge surface 20 is arranged in abutment with the opposite surface 21 of the cartridge 12. The wedge 18 is displaced along said surfaces 13b and 21 upon tightening a clamp screw 22 that is threadably engaged in a corresponding threaded bore 23 in said recess in the cutter body 10, whereby said bore 23 extends all the way through the core portion 10a of said cutter. The clamp screw is provided with right hand and left hand threads so that the clamp wedge 18 is urged displaceable in both the clamping and the opening directions. There is provided and axial bore 24 in the cartridge 12 which extends into the surface 21 in which a helical spring 25 is to be received. This helical spring 25 is intended to push the cartridge 12 rearwards so that the serrations 16 of the cartridge come into engagement with corresponding serrations of the surface 14. Loosening of said cartridge 12 is accomplished by un-tightening the clamp screw 22.

In order to provide stable and good radial support for the cartridge 12 the underneath side thereof is provided as an angular broken surface composed by surfaces 26a and 26b which correspond with angular broken surfaces 15a and 15b in the recess 11. In order to achieve proper mounting of the cartridge 12 in its recess said cartridge is provided with a radially oriented cylindrical steering pin 27 which is received in a bore 28 in the cutter body whereby said bore having a larger diameter than said steering pin. This steering pin 27 should be oriented parallel with the

extension of the surface 14.

The radially outer portion of said cartridge 12 should, in a manner known per se, be provided with a seat for the location of the cutting insert 17. The insert 17 is in this case provided with a central aperture 29 for the receipt of the conical head 31 of a centrally provided clamp screw 30 which is threadably engaged in a correspondingly threaded bore 32 in said cartridge 12. The central aperture 29 of the insert has a decreasing cross section towards the bottom surface 33.

The cartridges 12 could, at different positions around the milling cutter body, be provided with inserts 17 located in different ways such as shown in Fig 1. The common features for all these cartridges is that the inserts have central apertures for the receipt of a clamping screw 30 engaging therein. The wedge-formed portion 12a of the cartridge shall be provided with a wedge angle ϵ that amounts to 10-35°, preferably 20-30°.

A characterizing feature is that the centre line S_1 of the clamp screw 22 is not radially oriented in relation to the centre C of the milling cutter. More specifically, the wedge surface 20 forms an acute angle with line S_1 and said line S_1 forms an acute angle α with a radius r whereby said radius r intersects with line S_1 at a point where said line S_1 extends to a point P at the inner periphery of the central hole 34 of the milling cutter. This angle α should amount to 10-25°.

The centre line S_1 should be oriented substantially

perpendicularly from the surface 15a and also such that it coincides with the bisector of the angle ß between surface 21 and 13b. In order to achieve as efficient locking effect as possible when tightening the wedge 18 the centre line of the threaded bore 35 in the wedge 18 should deviate at a certain angle Θ from the centre line S_1 of the clamp screw 22 as illustrated in Fig 3. This angular deviation could be positive or negative in relation to the centre line S_1 . The angular range of Θ should be 1-5°. Another characterizing feature is that said centre line S_1 forms a larger angle γ with the surface 13 than compared with the angle between line S_1 and the radially innermost wall 13b. With the embodiment shown in Fig 3 the centre line S_2 of the bore 35 of the wedge 18 forms a positive angle Θ with centre line S_1 of the screw 22.

At the same time centre line S_1 for the screws 22 forms a rather large angle σ with the rear support wall 14 of recess 11 which is in surface abutment with the cartridge 12.

With the embodiment shown in Fig 2 a rotary slotting cutter is provided equipped with insert provided cartidges clamped into recesses 11 around the circumference of the milling cutter principally as shown in Fig 1. In this case the milling cutter body does not have a central core portion of same type as in Fig 1. The bores 23 for receiving the screws 22 do not extend all the way to the central hole 34 of the cutter body 10 since they are terminated at a certain distance therefrom. In order to provide for improved, more favorale discharge of chips the outer wall 13a of the recess 11 has been given a concave contour. At the same

time also the upper surface 37 of the wedge 18 could have a similar concave form. Normally the concave surface of said upper surface 37 is provided with a larger radius of curvature than compared with the radius of curvature for said outer wall 13a.

In order to achieve a stable and safe abutment of the cartridge 12 in its recess the underneath surface of said cartridge has an angularly broken form composed of surfaces 26a and 26b, said surfaces having an angularly broken contour corresponding with the contour of surfaces 15a and 15b. This arrangement will, combined with the arrangement of steering pin 27 and helical spring 25, provide for a stable mounting of the cartridge and a stable engagement between the serrations 16 of the cartridge and the serrations of the rear wall 14 of the recess 11.

Claims

1. Milling cutter, comprising a disc-shaped cutter body (10) with a number of spaced recesses (11) around its periphery, each said recess being confined by a forward wall (13a, 13b), a rear wall (14) and a bottom wall (15a, 15b) therebetween in which cartridges (12) with inserts (17) are releasably secured by clamping means (31), each said cartridge (12) being wedgingly clamped in said recess by means of a clamp wedge (18) which by means of a clamp screw (22) is engaged between the forward wall of the recess and an opposite support surface (21) on the cartridge at a position located radially inside the cutting insert (17), c h a r a c t e r i z e d in that the rear wall (14) of said recess is provided with serrations extending in the longitudinal direction of said body (10) so as to be engaged with corresponding serrations (16) on an adjacent support surface of said cartridge (12), and that the radially inner portion (12a) of the cartridge is wedgeshaped with a radially inwardly decreasing cross section, whereby said support surface (21) of the cartridge is provided on said wedgeshaped portion (12a).

2. Milling cutter as defined in claims 1, c h a r a c t e r i z e d in that the centre line (S_1) of clamp screw (22) is oriented at an angle (α) from a radius (r) drawn from the centre of the body (10) that intersects with said centre line at a point (P) at the inner circumference of the central bore (34), said angle beeing in the range of 10-25°.

3. Milling cutter as defined in claim 1 or 2, c h a r a c t e r i z e d in that each cartridge (12) is provided with a radially oriented cylindrical steering pin (27) which is arranged to be received in a recess (28) with larger diameter in the cutter body (10) so as to enable axial displacement of said cartridge.

4. Milling cutter as defined in claim 3, c h a r a c t e r i z e d in that the steering pinn (27) is oriented parallel with the rear wall (14) of the recess (11).

5. Milling cutter as defined in any of claims 1-4, c h a r a c t e r i z e d in that the underneath side of the cartridge (12) is provided with two surfaces (26a, 26b) oriented at obtuse angles to each other which are arranged so as to abut against two correspondingly provided surfaces (15a, 15b) in the bottom of said recess (11).

6. Milling cutter as defined in any of claims 1-5, c h a r a c t e r i z e d in that the centre line (S_1) of the clamp screw (22) is oriented in alignment with the bisector of angle (ß) between wall surface (13b) and cartridge surface (21).

7. Milling cutter as defined in any of claims 1-6, c h a r a c t e r i z e d in that the centre line (S_2) for the threaded bore (35) in the wedge (18) deviates at an angle 1-5° from the centre line (S_1) for the clamp screw and threaded bore (23) in the cutter body (10).

8. Milling cutter as defined in any of the claims 1-7, c h a r a c t e r i z e d in that the centre line (S_1) forms an angle (σ) with the rear wall (14) of the recess (11), said angle (σ) being in the range of 25-45°, preferably 30-40°.

9. Milling cutter as defined in any of the claims 1-8, c h a r a c t e r i z e d in that the wedge-shaped portion (12a) of the cartridge is provided with a wedge angle (ϵ) that amounts to 10-35°, preferably 20-30°.

Fig. 1

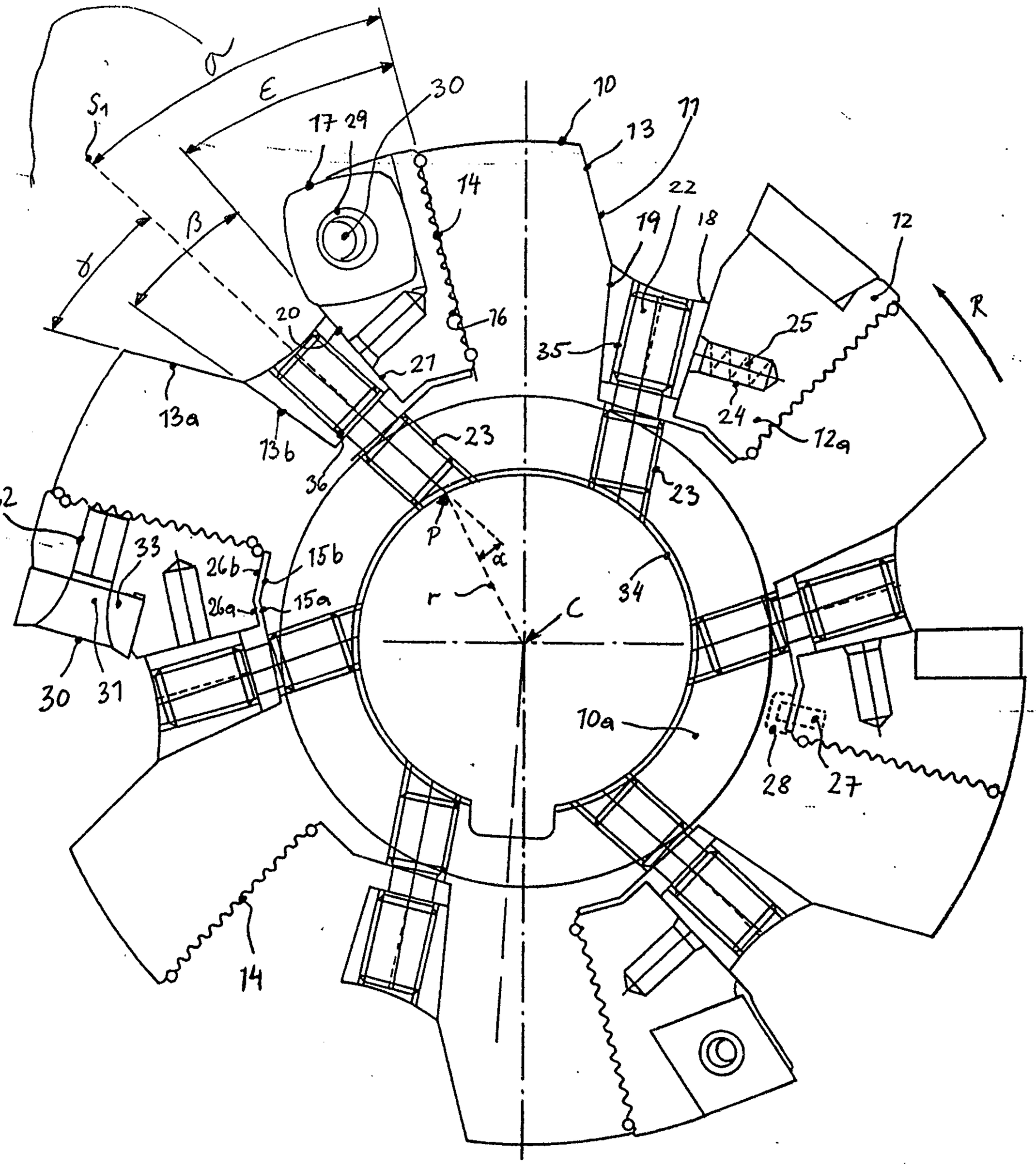

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Fig. 2

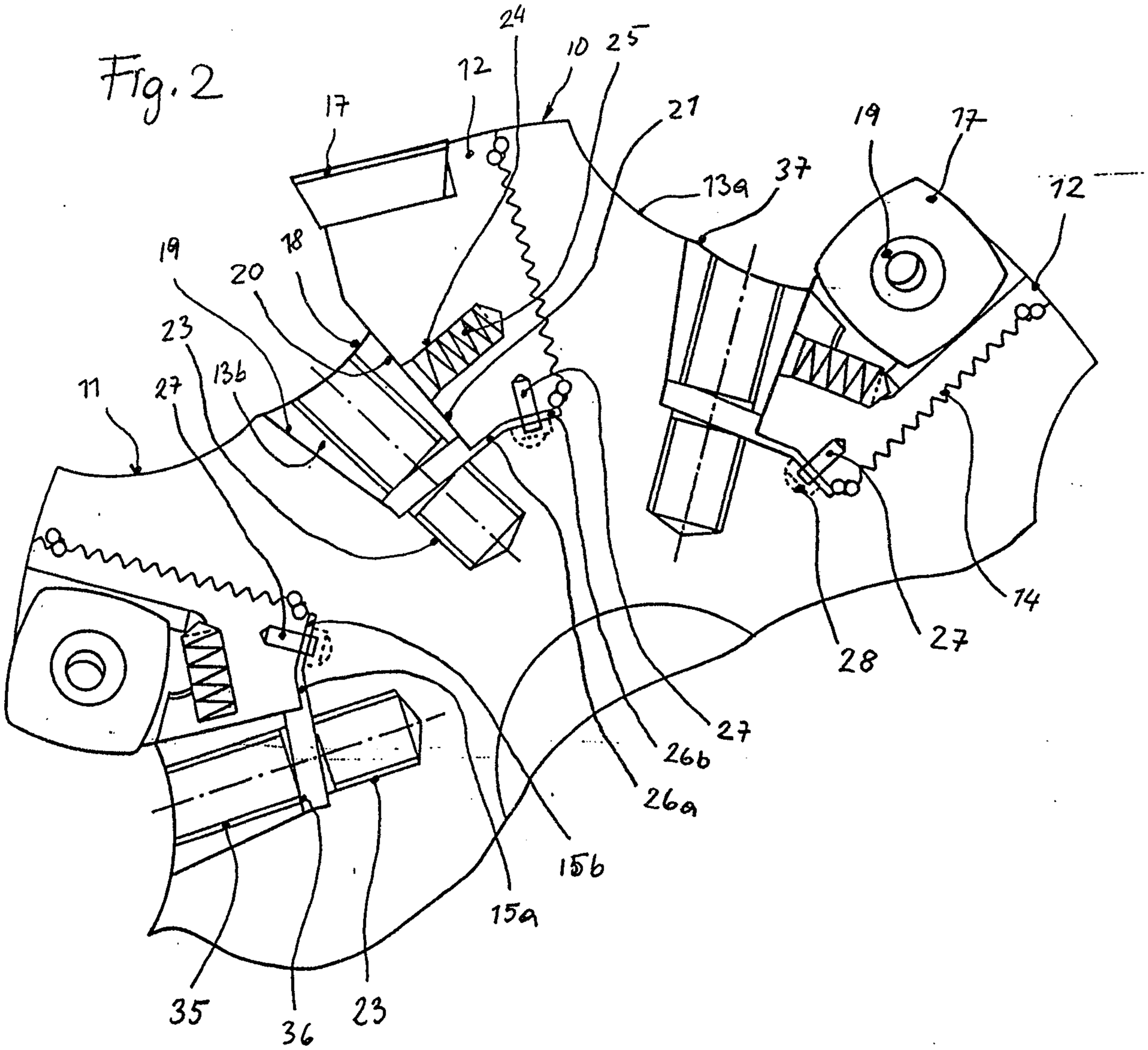

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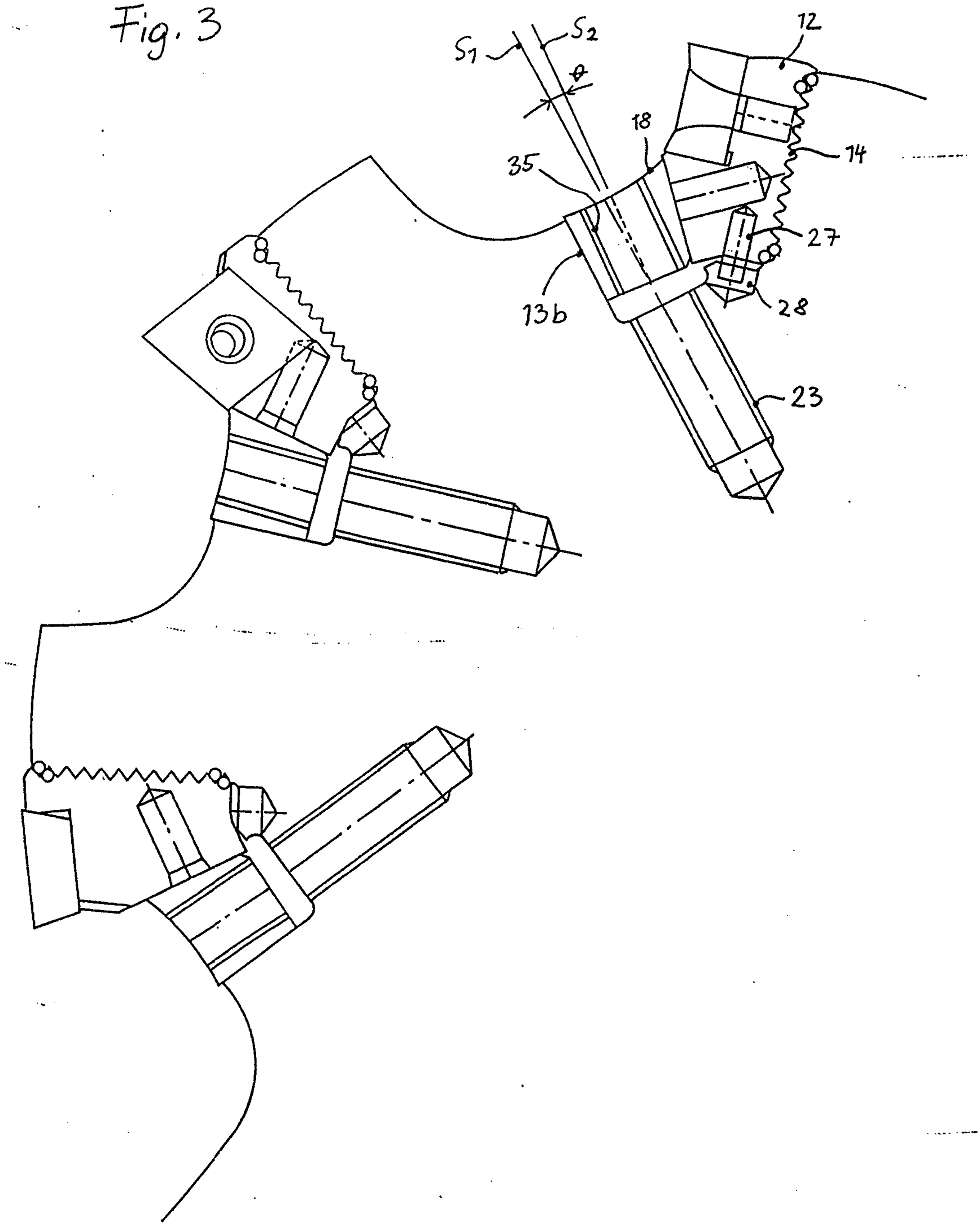
Fig. 3



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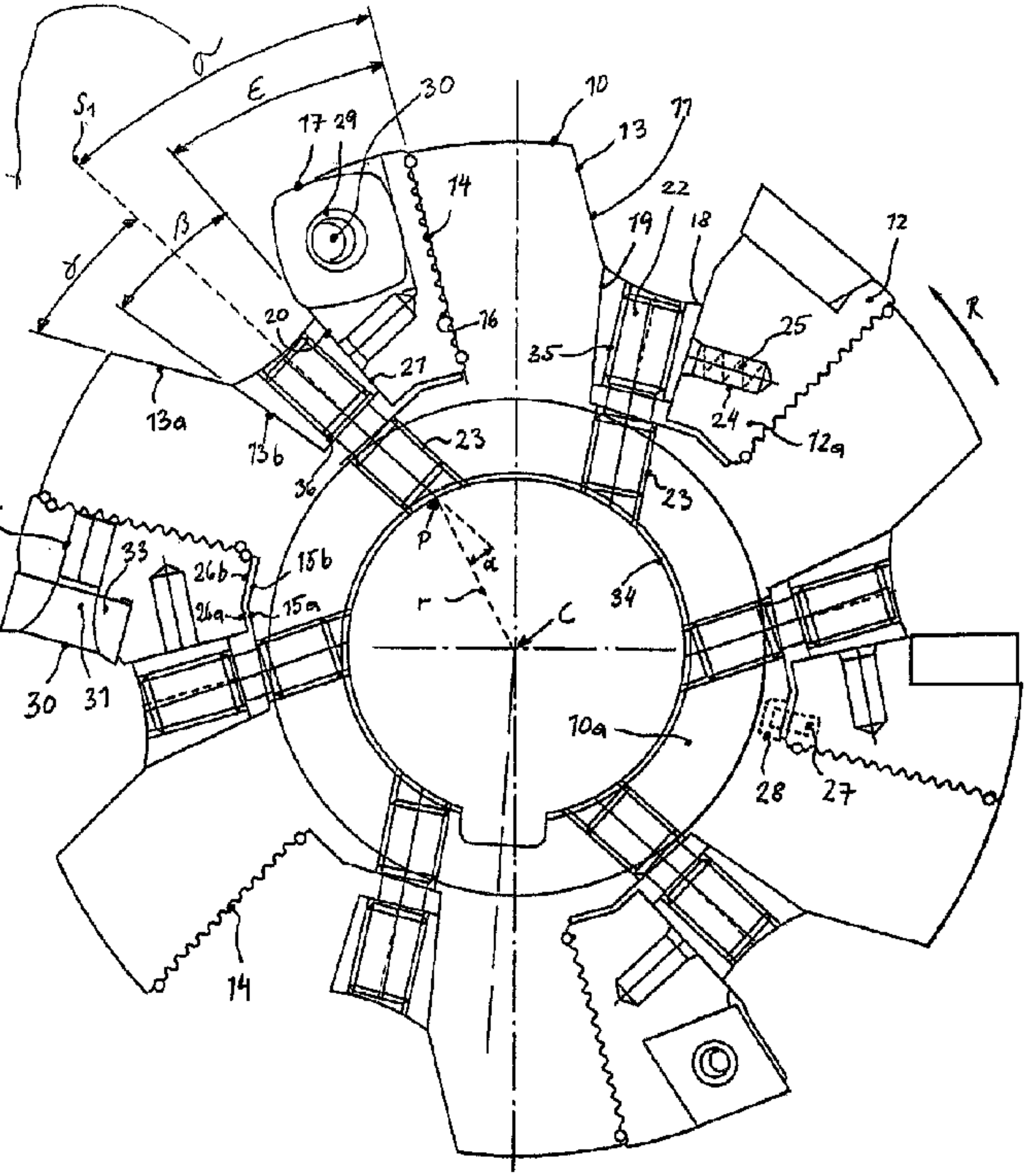
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