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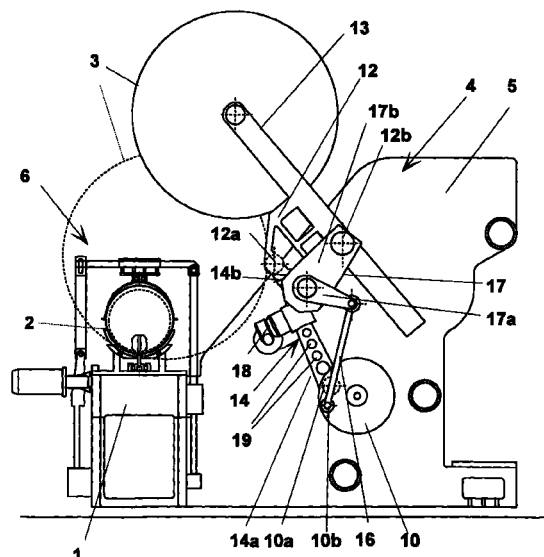
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(54) **Method and apparatus for moving the circular cutter of a machine for cutting logs of paper and the like**

(57) A transversal cutting machine of logs of paper and the like comprises a saw (3) arranged pivotally on a support (12), and a drive apparatus for driving the support (12) that lowers cyclically the saw (3) onto the logs (2) cutting them off into portions. The drive apparatus is pivoted at two distinct points (12a, 12b) of the support (12) whereby the saw (3) follows a composite orbit obtained combining two distinct driving movements given to these points (12a, 12b). The drive apparatus comprises a drive shaft (10), a first rocking arm (14) having ends pivoted respectively at a first point (12a) of the support (12) and at a first eccentric point (10a) of the drive shaft (10), and a crank mechanism (15) comprising a crank (17) pivoted at a second point (12b) of the support (12) and a second rocking arm (16) pivoted at a second eccentric point (10b) of the drive shaft (10). The first rocking arm (14) is made of at least two parts (14a, 14b) which can slide or be locked with respect to each other in a motorised way. The crank (17) is formed by two interchangeable levers (17a, 17b) bent with respect to each other. The machine is improved both effectiveness of the cut and under possibility of adjustment of the orbit of the saw after sharpening.

Fig. 1



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Description

Field of the invention

[0001] The present invention generally relates to paper converting machines, and more precisely it relates to a transversal cutting machine of the type having a rocking saw for logs of paper and the like for the production of rolls of toilet paper, all purpose and industrial rolls, stacks of napkins and the like.

[0002] In particular, the invention relates to a method for driving a saw and causing it to follow a complex orbit.

[0003] Moreover, the invention relates to a drive apparatus of a saw that carries out such method.

Brief description of the prior art

[0004] Transversal cutting machines are known for making rolls or stacks of paper, for example rolls of toilet paper, general purpose towels, napkins and the like, which are supplied with logs of paper wound upstream.

[0005] In said machines one or more logs are placed on a bench for their stepped conveying. Then, the downstream ends of the logs pass in turn through a cutting off section and are held by a clamp device so that a rocking saw is driven through the paper for cutting off in succession the rolls or stacks. More precisely, before of each lowering motion of the saw onto the logs, the latter are pushed forward axially for a distance equal to the length of each final roll or stack. The logs are held only at the moment of the cut by means of a clamping device which allows their sliding in the stepped conveying as well.

[0006] Means are provided for synchronising the stepped movement of the log and the moment in which the saw is raised between two consecutive cuts. In particular, most of machines are equipped with means for pushing the logs and means for rocking the saw support with independent motors, synchronised by programmable means.

[0007] Many types of systems for driving the saw are known, the latter normally being a quickly rotating circular saw, whose axis of rotation has an oscillating or a reciprocating motion.

[0008] Important parameters for the cut in case of a rocking saw are:

- the approaching speed of the saw onto the log;
- the exit speed of the saw from the log;
- the direction and the angle of the path that the saw follows when going through the log during the cutting step.

[0009] In case of circular orbit, for adjusting the approaching or exit speed, the change of the arm of the orbit with a longer or shorter one is possible, but this way also the angle changes. This has the consequence that machines designed for being used at certain working conditions cannot work in a correct way if are

adapted for working in substantially different conditions.

[0010] For carrying out the sharpening of the saw, moreover, on some types of machine sharpening means are provided directly on board. The wear of the saw, in fact, is quick even if it varies versus the working conditions, whereby the life of the saw is normally comprised between several days and several weeks. Therefore, since the orbit of the saw must be adjusted quite often versus its wear after sharpening, this has the consequence of frequent stops of the machine for carrying out the adjustment.

[0011] The existing machines, however, have means for driving the saw that can be improved both inertially, and on the effectiveness of the cut and of the cutting time. In particular, for the adjustment of the orbit of the saw after sharpening additional complex means are provided, further to the components of the drive apparatus of the orbit.

Summary of the invention

[0012] It is an object of the present invention to provide a transversal cutting machine, of the type above described, in which the rocking saw is driven by a drive apparatus that allows to overcome the limits and the drawbacks of the existing machines and in particular allows the adjustment of the trajectory of the saw after a sharpening step in an easy and effective way.

[0013] It is another object of the present invention to provide a transversal cutting machine in which it is possible to adjust the approaching speed and the exit speed of the saw with respect to the log, thus obtaining better cutting quality of the log core even at higher speed for each different type of product to cut off.

[0014] It is a further object of the invention to provide a method for driving the saw that allows the adjustment of the orbit thereof at the choice of the user.

[0015] These and other objects are achieved by the transversal cutting machine according to the present invention comprising:

- a circular saw;
- a support which pivotally holds the saw along with means of transmission to the saw of the rotational motion;
- a drive apparatus for driving the support that lowers cyclically the saw onto the logs and cuts them off into rolls;
- a drive shaft that carries the drive apparatus.

Its characteristic is that the drive apparatus is pivotally connected to two distinct points of the support whereby the saw follows a composite orbit carried out by combining two distinct driving movements given to said points.

[0016] Preferably, the rocking frame comprises:

- a first rocking arm having ends pivoted respectively at a first point of the support and at a first eccentric

point of the drive shaft;

- a crank mechanism comprising a second rocking arm, pivoted at a second point of the support, and a crank, pivoted at a second eccentric point of the drive shaft.

[0017] Preferably, the first rocking arm is made of two parts and means are provided for adjusting its length, whereby the orbit of the saw can be adjusted for recovering the wear of the saw.

[0018] The length of the first rocking arm is adjustable for example by means of an electromechanical jack that adjusts the relative position of its parts.

[0019] Also the crank, preferably, is made of two arms bent with respect to each other and integral to each other by means of a coupling that allows the adjustment of the angle thereof. In this way the adjustment of the angle changes the distance between the axes of the crank thus changing the cutting parameters. Advantageously, also both the lengths of at least one of the two arms and the point of pivot of the first rocking arm at the drive shaft can be changed.

Brief description of the drawings

[0020] Further characteristics and/or advantages of the present invention will be made clearer with the following, but not limitative, exemplifying description of several exemplifying embodiments thereof, with reference to the attached drawings wherein:

- figure 1 shows a cross sectional view of a transversal cutting machine according to the present invention with detail of the drive apparatus of the saw;
- figure 2 shows a longitudinal sectional view of the drive apparatus of figure 1.
- figures from 3 to 6 show four different positions of the drive apparatus of figure 1 and of the saw with respect to the log to cut.

Description of the preferred embodiments

[0021] With reference to figure 1, a transversal cutting machine according to the present invention comprises a base 1, capable of slidably supporting a log of paper 2, for example toilet paper to cut off into rolls by means of a rocking saw 3, supported and driven by a drive apparatus 4 fixed to a frame 5. For a clearer comprehension of figure 1 the view of the front wall of frame 5 has been omitted.

[0022] Saw 3 is shown in the position of top dead center of its orbit and, with dotted line, in the position of bottom dead center in which the saw has been completely driven into log 2. During the cut log 2 is held by a clamping device 6.

[0023] According to the invention, the drive apparatus 4 for driving saw 3 comprises means for adjusting the orbit versus the wear of the saw after a sharpening and

according to the different cutting conditions to which the machine must be adapted.

[0024] In particular, the drive apparatus 4 comprises:

- 5 - a drive shaft 10 operated by means of a motor and a transmission linkage 9 (fig. 2);
- a support 12 with beams 13 which pivotally support the saw 3 and a transmission linkage 11 of the rotational motion (fig. 2);
- 10 - a first rocking arm 14 having adjustable length with ends pivoted respectively in a first point 12a of the support and in a first eccentric point 10a of the drive shaft 10;
- 15 - a crank mechanism 15 comprising a second rocking arm 16 and a crank 17 formed by two levers 17a and 17b bent with respect to each other; crank 17 is pivoted at a second point 12b of the support 12, whilst the second rocking arm 16 is pivoted at a second point 10b of the drive shaft 10, the points 10b and 12b being respectively distinct from points 10a and 12a of rotation of the first rocking arm 14.

[0025] The first rocking arm 14 is made of two parts 14a and 14b, which can slide with respect to each other operated by a electromechanical jack 18. In this way, the change of length can be carried out automatically after each sharpening step of saw 3 for compensating its reduction of diameter by adjusting the trajectory of the sharpened edge for continuing the cutting off of the logs into rolls.

[0026] The first rocking arm 14, moreover, have portion 14a which comprises a plurality of linking housings 19 to the eccentric point 10a of drive shaft 10. In this way, the length of rocking arm 14, further to being automatically subject to small differences after each sharpening step, can be changed in a discrete way for adjusting the orbit of the saw to new cutting parameters.

[0027] Further adjustments of the orbit of the saw 3 can be obtained changing the angle between levers 17a and 17b, as well as replacing lever 17b or 17a with a lever of different length. In this way the parameters of crank mechanism 15 are variable, similarly to the change of length of first rocking arm 14, in order to adjust the orbit and then the cutting parameters.

[0028] It is also possible to displace eccentric point 10b of drive shaft 10 thus allowing further differences of orbit.

[0029] Circular saw 3 of the cutting off machine, therefore, follows an orbit which is the composition of two plane motions, the former being given by the first rocking arm 14 to the first point 12a of support 12 and the latter being given by crank mechanism 15 to second point 12b of support 12.

[0030] The former motion can be changed with continuity without stopping the machine for adjusting the trajectory of the sharpened edge of the saw after each sharpening thus allowing the continuation of the cut. Both motions, moreover, can be changed stopping the

machine for adjusting in a discrete way the orbit of saw 3 and the approaching speed between saw and log, as well as for adjusting the exit speed and the angle of the orbit of the saw throughout the log versus the different types and size of the material to cut.

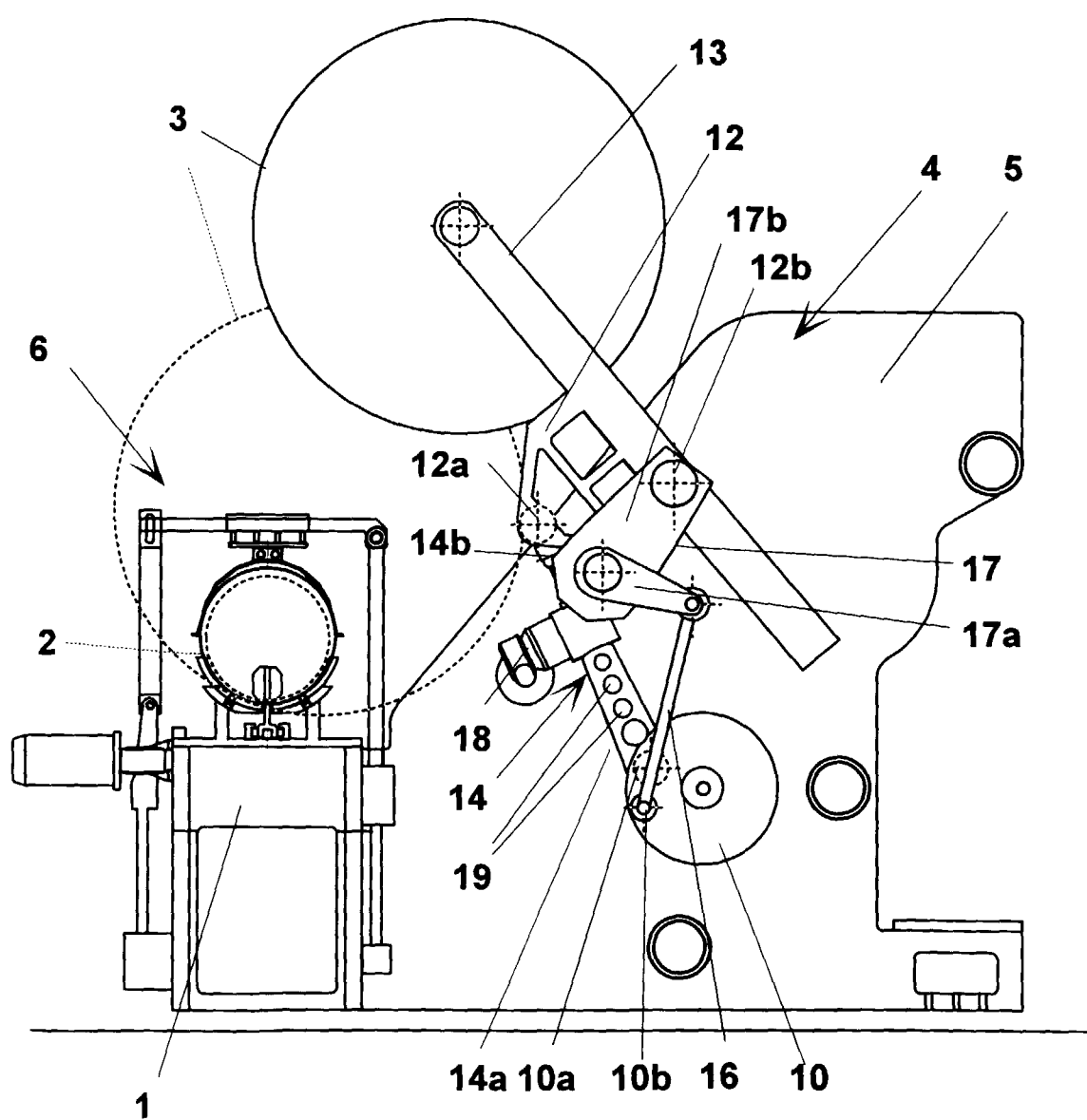
[0031] Therefore, different cutting conditions can be obtained with improved quality of the final product and higher top speed than the transversal existing cutting machines.

[0032] The foregoing description of a specific embodiment will so fully reveal the invention according to the conceptual point of view, so that others, by applying current knowledge, will be able to modify and/or adapt for various applications such an embodiment without further research and without parting from the invention, and it is therefore to be understood that such adaptations and modifications will have to be considered as equivalent to the specific embodiment. The means and the materials to realise the different functions described herein could have a different nature without, for this reason, departing from the field of the invention. It is to be understood that the phraseology or terminology employed herein is for the purpose of description and not of limitation.

Claims

1. Transversal cutting machine of logs of paper and the like, comprising
 - a saw (3),
 - a support (12) that pivotally carries said saw (3) along with transmission linkages of the rotational motion to said saw (3),
 - a drive apparatus for driving said support (12) that lowers cyclically said saw (3) onto said logs (2) cutting them off into portions,
characterised in that said drive apparatus is pivotally connected to two distinct points (12a, 12b) of said support (12), whereby said saw (3) follows a composite orbit obtained by combining two distinct driving movements given to said points (12a, 12b).
2. Transversal cutting machine according to claim 1, wherein said drive apparatus comprises:
 - a drive shaft (10);
 - a first rocking arm (14) having ends pivoted respectively at a first point (12a) of said support (12) and at a first eccentric point (10a) of said drive shaft (10);
 - a crank mechanism (15) comprising a crank (17), pivoted at a second point (12b) of the support (12), and a second rocking arm (16), pivoted at a second point (10b) of said drive shaft (10).
3. Transversal cutting machine according to claim 2, wherein said first rocking arm (14) is made of at least two parts (14a, 14b) integral to each other, means being provided for allowing said parts to slide or to be locked with respect to each other for the change of length of said first rocking arm (14).
4. Transversal cutting machine according to claim 3, wherein said means that allow said parts (14a, 14b) of said first rocking arm (14) to slide or to be locked with respect to each other comprise an electromechanical jack (18) which carries out said change of length after each sharpening of said saw (3) for compensating its reduction of diameter.
5. Transversal cutting machine according to claim 2 wherein said crank (17) of said crank mechanism (15) is formed by two levers (17a, 17b) bent with respect to each other, means being provided for adjusting the angle between said levers, whereby the length of said crank is adjustable.
6. Method for cutting off logs of paper and the like into portions, comprising the steps of:
 - disposition of a saw rotating on a support;
 - rocking of said support according to a orbit, said orbit passing through said log to cut off
characterised in that said orbit is obtained through at least two distinct points of said support and giving to said points distinct driving movements.
7. Method for cutting off according to claim 6, wherein the stroke given to said distinct points is adjustable and said orbit is changeable after each sharpening of said saw.
8. Method for cutting off according to claim 6, wherein the stroke of a first and a second point of said support is given respectively by means of a first rocking arm having adjustable length and a crank mechanism having variable shape.

Fig. 1



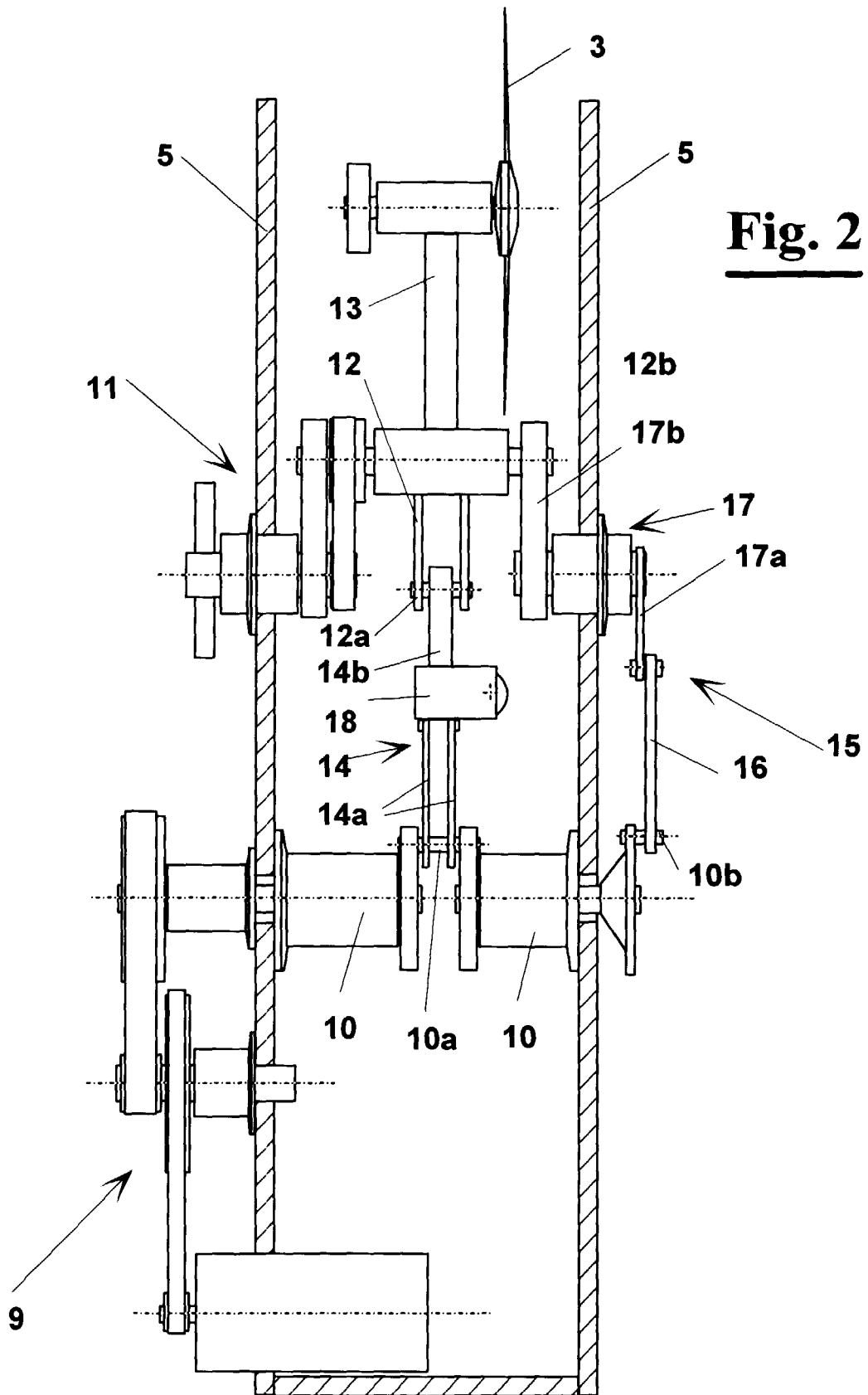


Fig. 3

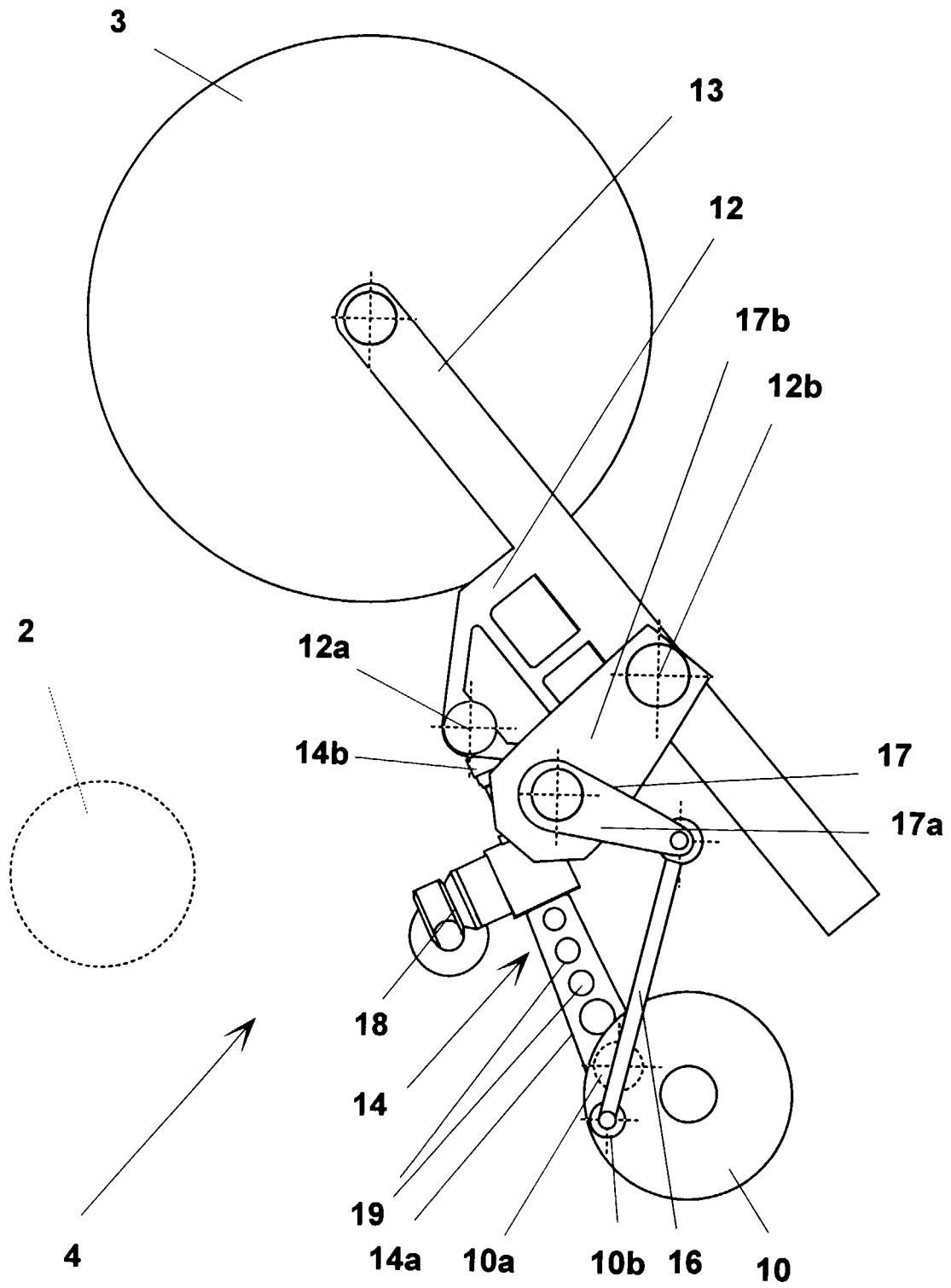


Fig. 4

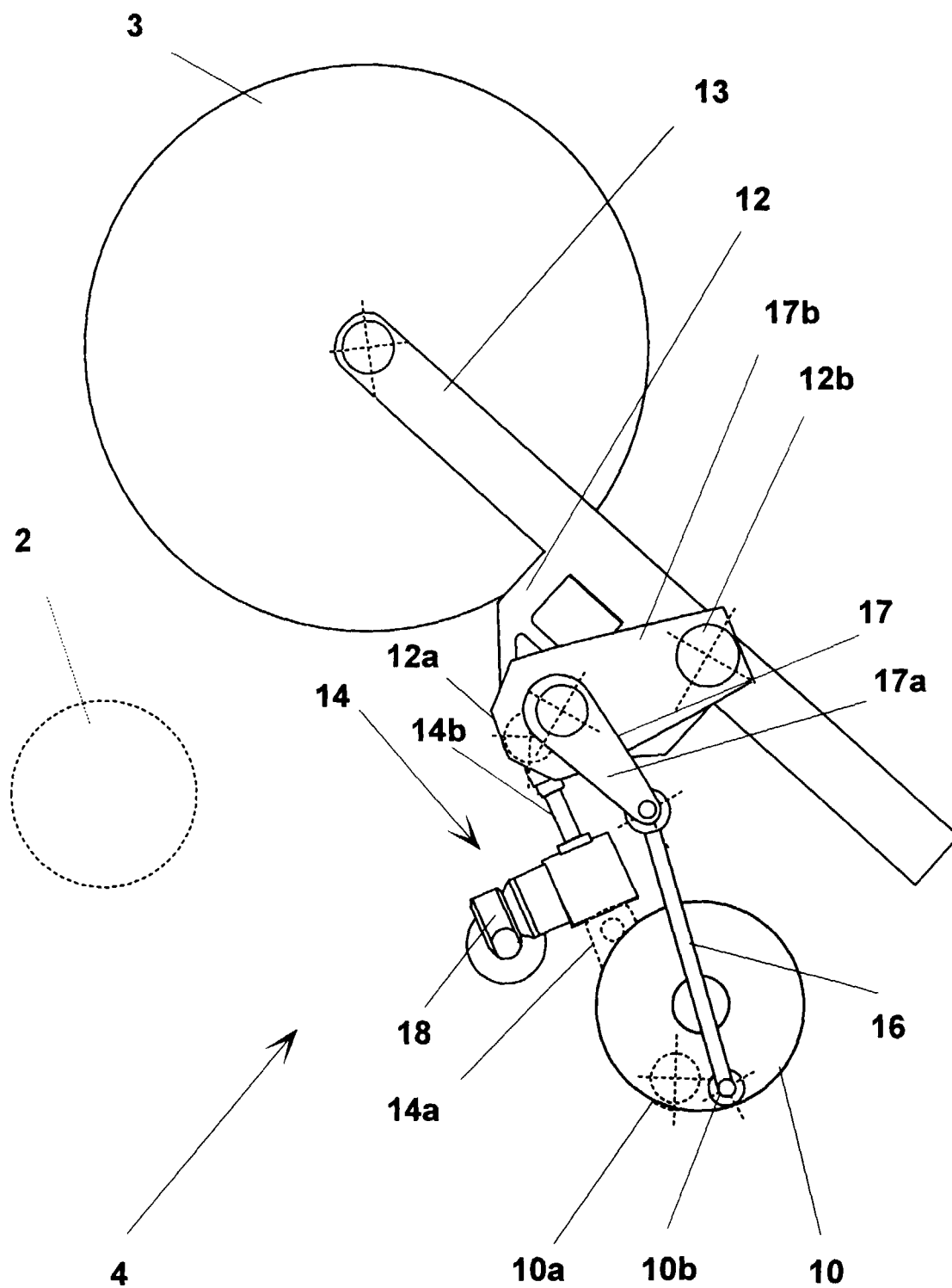


Fig. 5

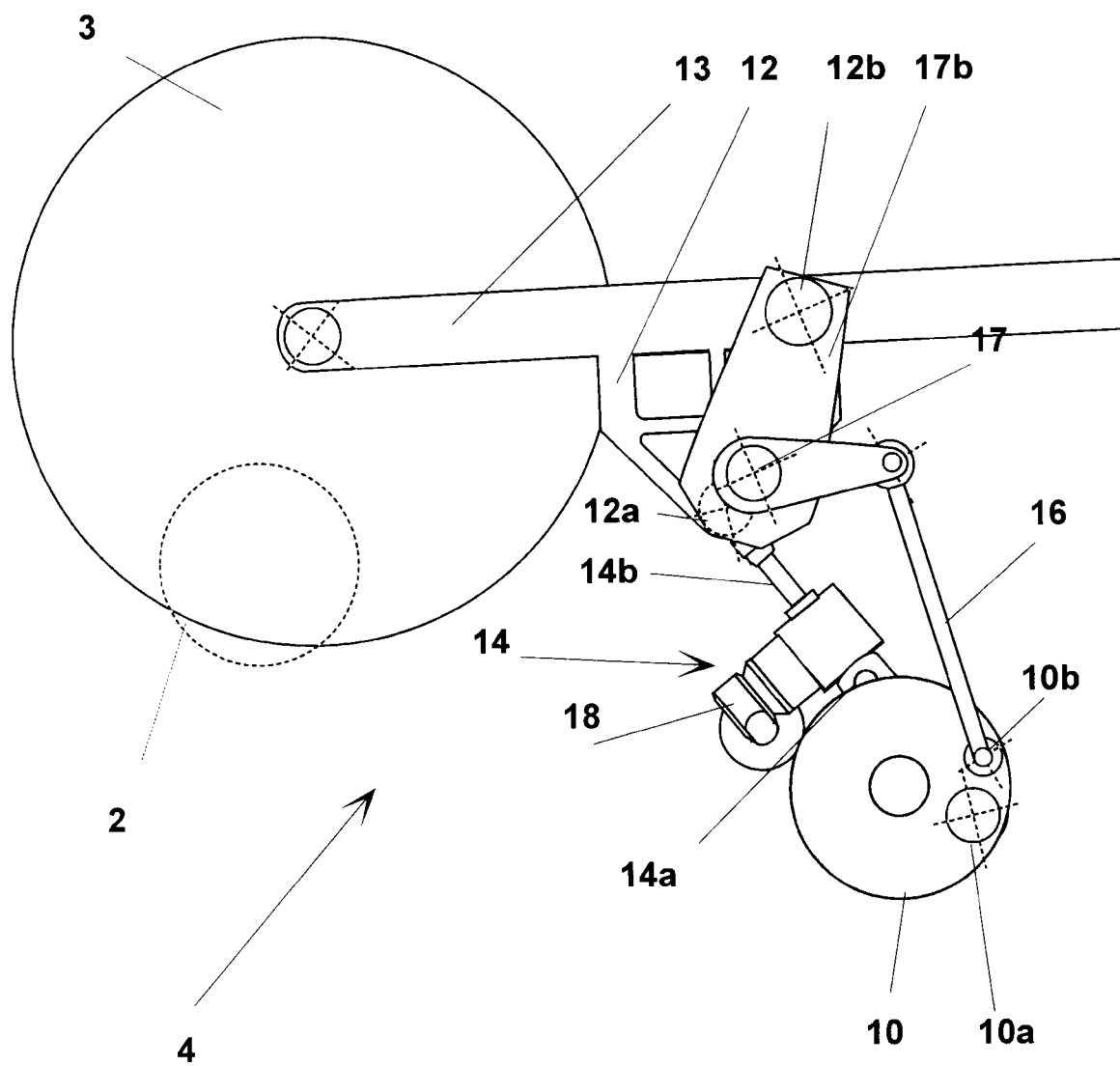


Fig. 6

