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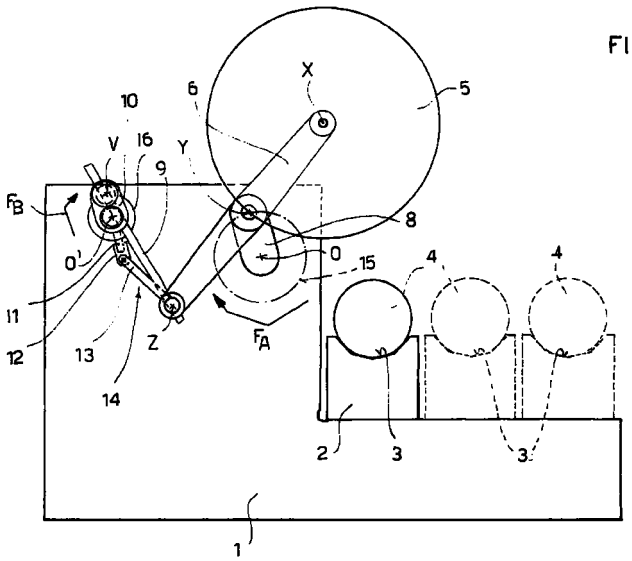
(54) Cutting device for rolls of web material

(57) A device for cutting rolls of web material from logs (4) advancing in one or more channels (3), comprising at least one cutting blade (5) driven in rotation around an axis of fulcrum (X), in which the means for moving the blade (5) give its axis (X) a substantially elliptical trajectory.

FIG.1



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Description

[0001] The present invention relates to a device for cutting rolls of web material, particularly suitable for cutting off machines intended for cutting logs of web material, such as paper, tissue paper, non-woven fabric, plastics, etc.

[0002] During production of rolls of web material, logs are initially produced which must subsequently be cut into rolls of the desired length. For this purpose use is made of special cutting-off machines having one or more rotating disc or endless blades that are cyclically lowered on the logs to be cut, which are made to advance in special channels. The cutting cycles are very frequent, therefore after a very short time the cutting blade becomes worn through the effect of friction, decreasing in diameter and requiring periodic adjustments to its position.

[0003] In cutting off machines of the prior art motorizations are provided to give the rotational movement blade, the oscillating raising and lowering movement of the blade and the feeding movement of the blade and the chains that pull the log by means of special pushers.

[0004] Usually the trajectory followed by the axis of the cutting blade during the working phase is substantially shaped like a parallelogram.

[0005] Articulated mechanisms are also *per se* known in which cam or connecting rod-crank systems cause the cutting blade axis to follow a substantially circular trajectory.

[0006] The cutting blade drive systems according to the prior art have various drawbacks. They give the cutting assembly a high inert mass that complicates its movement.

[0007] Because of the above mentioned trajectories, the cutting blade remains rather a long time inside the log that is to be cut; this results in excessive heating of the blade, which makes more frequent sharpening necessary and causes rapid, marked wear.

[0008] The known cutting blade drive systems are not very versatile. In fact, because of the trajectories followed by the blade, it is not possible to use a number of cutting channels in parallel, unless the blade assembly is radically replaced and in addition problems of adjustment arise every time there is a change in production to cutting of rolls with a different diameter.

[0009] The aim of the invention is to eliminate these drawbacks by providing a cutting device for rolls of web material that is practical, economical and easy to produce.

[0010] Another aim of the present invention is to provide such a cutting device for rolls of web material that is highly versatile.

[0011] These aims are achieved according to the invention, with the characteristics listed in the appended independent claim 1.

[0012] Preferred embodiments of the invention are apparent from the dependent claims.

[0013] The cutting device for rolls of web material according to the invention has a drive system such as to allow the cutting blade to follow a more or less elliptical orbit. Said drive system consists of a main arm supporting the cutting blade, said arm being hinged in an intermediate part to a first connecting rod and at the end opposite the blade to a second connecting rod connected to a mechanism for regulating wear on the blade.

[0014] The elliptical orbit followed by the blade makes it possible to obtain a cutting assembly with less inertia compared with the cutting assemblies of the prior art. Consequently the speed of movement of the cutting assembly is faster, enabling the production per time unit to be increased.

[0015] Furthermore, the elliptical trajectory of the blade is adjusted so that the blade enters the log to be cut following the smallest radiuses of curvature of its elliptical orbit, thus the blade stays inside the log for a shorter time than those of the prior art. Consequently less heating occurs, resulting in less need for frequent sharpening and thus less wear on the blade.

[0016] The geometrical arrangement of the elliptical orbit followed by the blade can be suitably modified to make it longer, thus obtaining the possibility of serving a plurality of log feeding channels arranged in parallel.

[0017] Further characteristics of the invention will be made clearer by the detailed description that follows, referring to a purely exemplary and therefore non-limiting embodiment thereof, illustrated in the appended drawings in which:

Figure 1 is a side elevation of the cutting device for rolls of web material according to the invention;

Figure 2 is a diagrammatic view of the trajectories followed by the cutting device in Figure 1;

Figure 3 is a side elevation of the cutting device in Figure 1 with the cutting blade having a smaller diameter due to wear;

Figure 4 is a diagrammatic view of further possible trajectories of the cutting device according to the invention.

[0018] The cutting device according to the invention is described with the aid of the figures. A cutting off machine comprises a supporting frame 1 on which a conveyor 2, usually of the chain type, is mounted. The configuration in the appended figures has a single channel 3, shown with unbroken lines, for housing and feeding of the logs 4, which can be of different diameters, as shown in the figures. Nevertheless, the device according to the invention can be adapted to a plurality of cutting channels, and in Figure 1 two other channels 3 parallel to the first are shown with a dashed line. The logs 4 advancing in the channel 3 are fed to a rotating-disc cutting blade 5, which cuts them to the desired

length.

[0019] The blade 5 is set in rotation, around its own axis X by a motor through a transmission, for example a belt transmission (not shown in the drawings) to be considered per se known.

[0020] The blade 5 is mounted at the end of an arm 6. A crank 8 turning around an axis O on the frame 1 of the machine acts at an intermediate point Y of the blade-bearing arm 6.

[0021] The other end of the blade-bearing arm 6 is hinged on an axis Z, to a secondary arm 9, so that the fulcrum Z can slide, when necessary, along said secondary arm 9. Near the free end of the secondary arm 9, a second crank 10 turning around an axis O' acts, on an axis V, on the frame 1 of the cutting off machine. Also hinged at the axis V is a rod 11 connected by means of an articulated joint 12 to a second rod 13 in turn hinged, at its free end, on the axis Z.

[0022] In this manner the system consisting of the secondary arm 9, the rod 11 and the rod 13 forms an articulated triangle 14, which remains rigid during operation of the machine and is moved by the crank 10. The articulated joint 12, together with the possibility of sliding of the fulcrum Z on the rod 9, allows the angle between the rods 11 and 13, and thus the inclination of the blade-bearing arm 6, to be varied according to the wear on the blade 5, as clearly shown by Figures 1 and 3.

[0023] Drive means, in phase with one another, respectively set the crank 8 in rotation around the axis O and the crank 10 around the axis O'. Said drive means can preferably be brushless motors set in phase with on another through an encoder.

[0024] When the crank 8 is made to turn in the direction of the arrow F_A the crank pin Y will travel along the circular trajectory 15. Likewise, when the crank 10 is turned in the same direction as the crank 8 (see arrow F_B), the crank pin V will travel along the circular trajectory 16 (Fig. 2), causing movement of the articulated triangle 14. As shown in Figure 2, movement of the articulated triangle 14 forces the fulcrum Z, integral with the end of the arm 6, to follow an elliptical trajectory 17; consequently the fulcrum X corresponding to the axis of the cutting blade follows an elliptical trajectory 18. The major axis of the elliptical trajectory 18 is substantially at right angle to the major axis of the elliptical trajectory 17. The disc cutting blade 5 therefore follows the envelope of trajectories 19 which proves to have a substantially elliptical outline.

[0025] Figure 3 shows a cutting device according to the invention in which the cutting blade, again indicated by reference numeral 5, has a smaller diameter than that in Figure 1, and likewise the log 4 is smaller in diameter than that in Figure 1. In this case the fulcrum Z can be seen to have been moved from the end of the secondary arm 9 toward the central part of said arm 9 in order to obtain an elliptical trajectory of the blade 5 that ensures cutting of the logs 4.

[0026] In order to obtain translation of the fulcrum Z along the secondary arm 9 drive means are provided that can be interfaced to a microprocessor that can receive the data from the user or from sensing means able to continually monitor the diameter values of the cutting blades 5.

[0027] Figure 4 shows an embodiment of the cutting device for rolls of web material according to the invention, in which the direction of rotation F_B' of the crank 10 around its own fulcrum O' is inverted with respect to the direction of rotation F_B of Figure 1. As can be seen in Figure 4, the axis X of the cutting disk 5 follows a trajectory again indicated by 18 shaped like an irregular ellipse. The envelope of the trajectories 19 that the blade 5 follows nevertheless continues to have a substantially elliptical outline and therefore in this case also the device according to the invention maintains all the above listed advantages.

[0028] Both in the case in Figures 1-3 and in the case in Figure 4, the angular velocities of rotation of the cranks 8 and 10 are the same.

[0029] By varying the length of the cranks 8 and 10 it is possible to modify the geometrical configuration of the orbit 18, moving it so that it becomes longer and can thus operate on a number of cutting channels, as shown by the dashed line in Figure 1.

Claims

1. A cutting device for rolls of web material from logs (4) advancing in one or more parallel channels (3) comprising at least one cutting blade (5) driven in rotation around a axis of fulcrum (X), characterized in that means of driving said blade (4) able to give said fulcrum (X) a substantially elliptical trajectory are provided.

2. A device according to claim 1, characterized in that said means of driving the blade (4) comprise a blade supporting arm (6), set in motion by a pair of cranks (8) and (10).

3. A device according to claim 2, characterized in that said cranks (8) and (10) are operated in phase with one another.

4. A device according to claim 2 or 3, characterized in that said cranks (8) and (10) turn in the same direction or in opposite directions.

5. A device according to claim 2, characterized in that said cranks (8) and (10) act respectively at an intermediate point (Y) of the blade supporting arm (6) and at an end fulcrum (Z) of said arm (6), through a system of rods (14).

6. A device according to claim 5, characterized in that said system of rods (14) is an articulated triangle,

comprising a secondary arm (9) on which said axis of fulcrum (Z) of the blade supporting arm (6) can slide and on which the pin (V) of the crank (10) acts, and two rods (11, 13) connected to one another by an articulated joint (12) and hinged respectively at the free ends to said axes (Z) and (V).

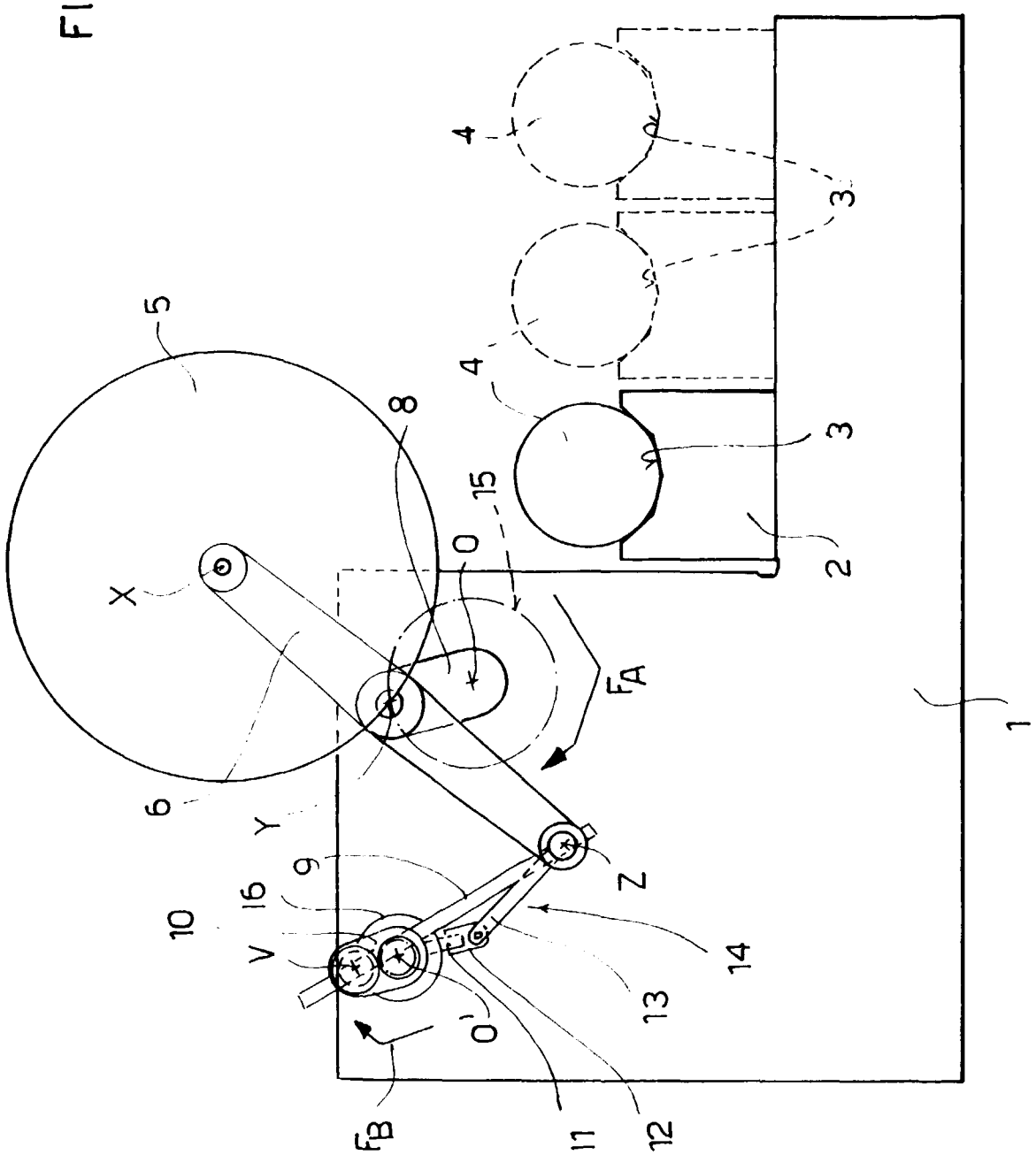
7. A device according to claim 6, characterized in that in one complete turn of said cranks (8) and (10), said axes of fulcrum (Z) and (X) complete substantially elliptical trajectories, the respective major axes of which are substantially at right angles to one another.

8. A device according to claim 6, characterized in that means controlled by a microprocessor interfaced to means for sensing the change in diameter of the blades (5, 5') are provided to cause said axis of fulcrum (Z) to slide along the secondary arm (9).

9. A device according to any one of claims 2 to 6, characterized in that said cranks (8) and (10) are operated by brushless motors set in phase with one another by means of an encoder.

10. A cutting-off machine for cutting rolls of web material from logs (4) characterized in that it comprises a cutting device according to any one of the preceding claims.

FIG.1



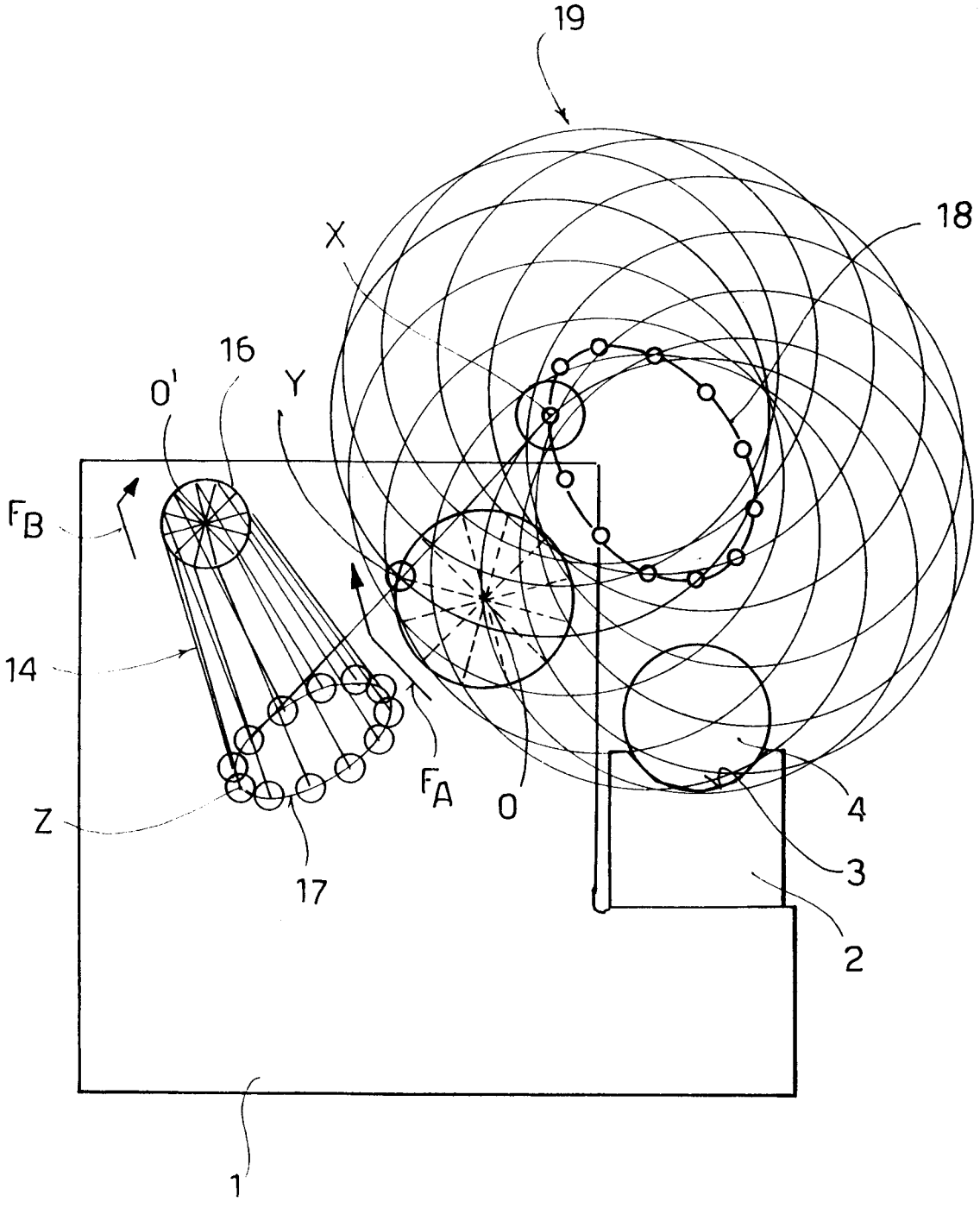


FIG. 2

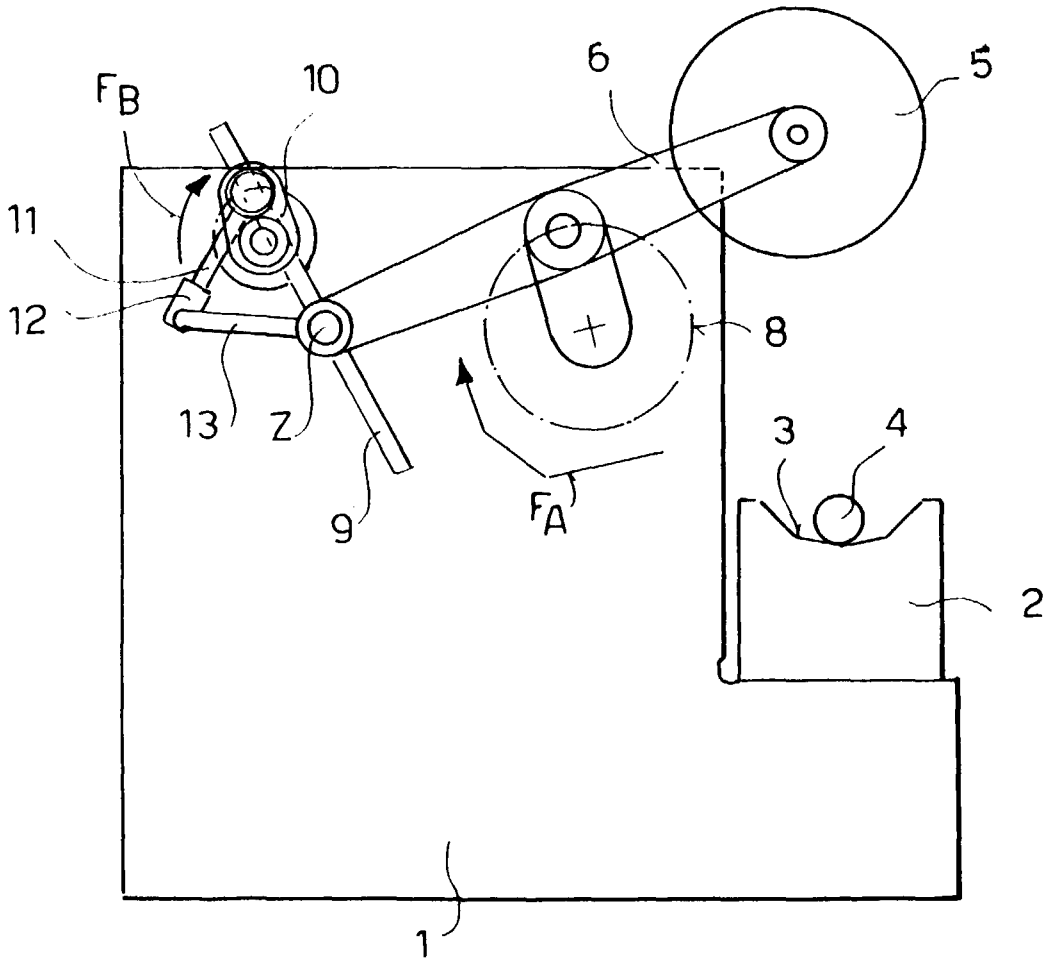


FIG.3

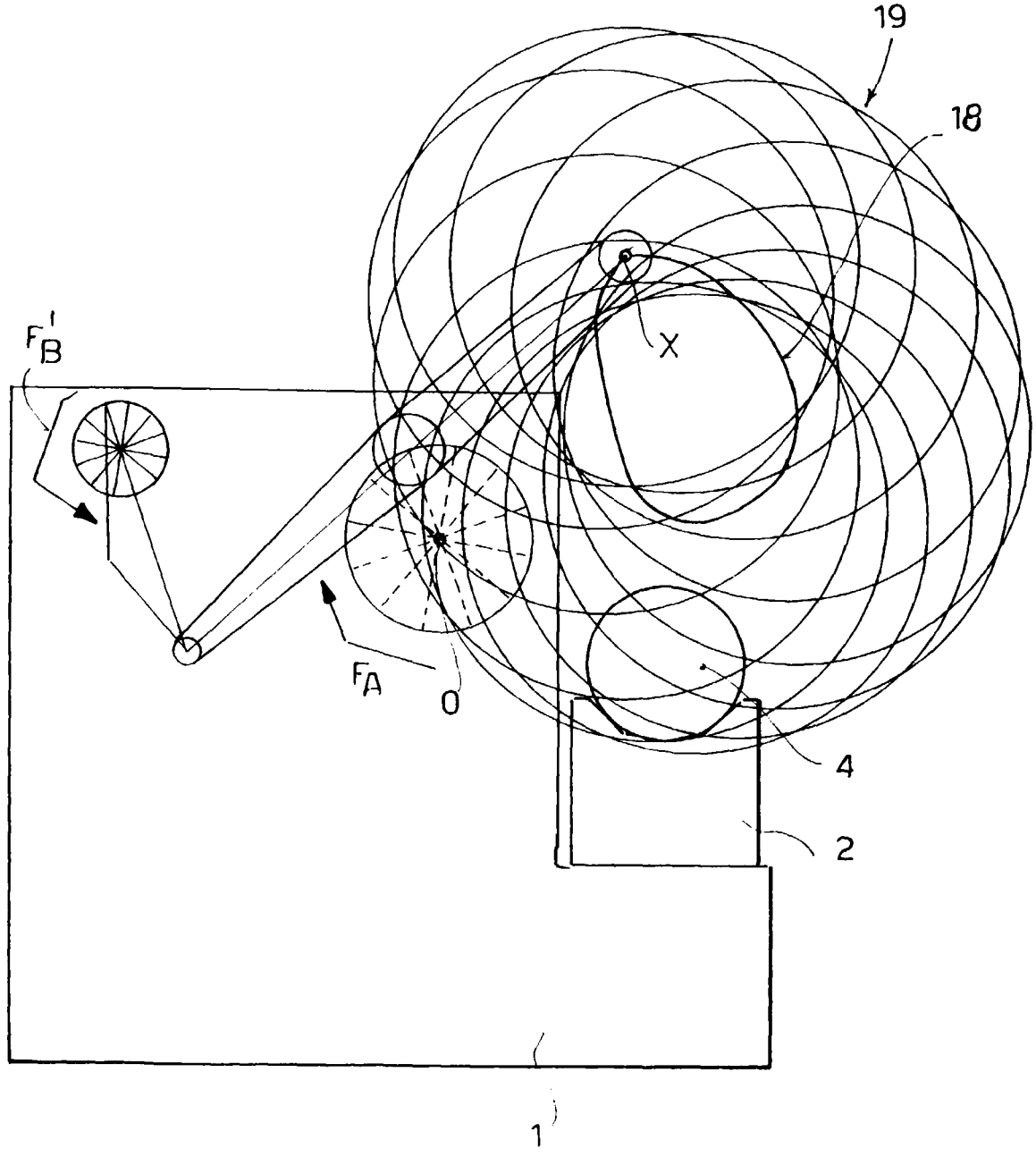


FIG.4