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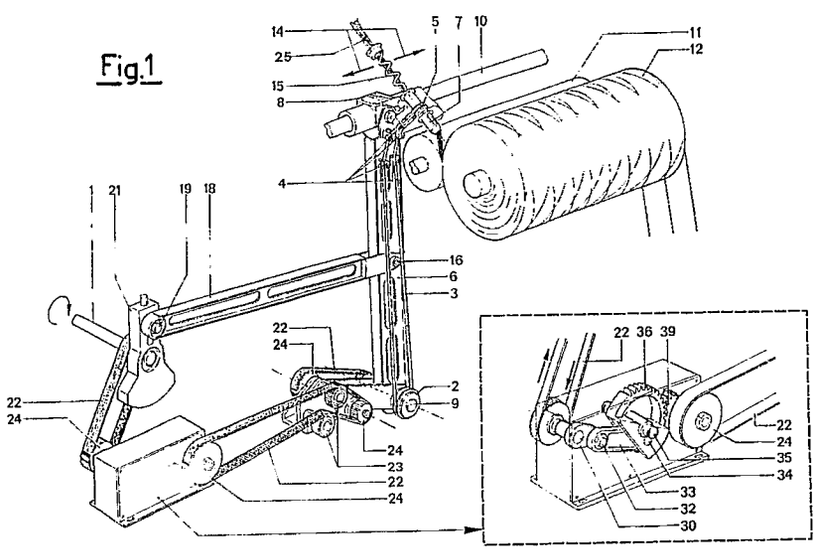
(54) Improved twister device for a winding carriage enabling a bobbin of perfectly cylindrical shape to be formed.

(57) This invention relates to an improved twister device for a winding carriage collecting onto a bobbin the sliver emerging from the gill box or derived machine.

More specifically, the present invention proposes a device which enables bobbins of perfect cylindrical form to be obtained, by comprising drive means which rotate the rotary trumpet of the known mobile twister unit independently of the to-and-fro linear movement of said mobile unit of the winding carriage, for the purpose of reversing the rotation at the middle of the bobbin under formation.

The improved twister device of the present invention also enables rotation reversal of the rotary trumpet to be achieved at two symmetrical points, each lying within one of the two sections between the middle and end of the bobbin under formation, said two points being symmetrical about the middle.

Fig.1



EP 0 434 129 A2

IMPROVED TWISTER DEVICE FOR A WINDING CARRIAGE ENABLING A BOBBIN OF PERFECTLY CYLINDRICAL SHAPE TO BE FORMED

This invention relates to an improved twister device for a winding carriage, which enables the sliver leaving the gill box to be collected onto a bobbin which forms with perfect cylindrical geometry.

In the following description and claims the term "sliver" is used to indicate a textile fibre roving, a textile fibre sliver or any other textile fibre aggregate.

In gill boxes with sliver collection onto bobbins the sliver leaving the known calender units of the gill box must be subjected to a so-called "false twist" operation before being wound onto the mandrel of the winding carriage.

The "false twist" is imparted to give the sliver the necessary roundness and strength so that its subsequent unwinding can take place without difficulty and without breakage.

In this respect, when such a non-twisted or imperfectly wound sliver is subsequently unwound from its collection bobbin it can easily suffer breakage. Rotary funnel twister and condenser devices, conventionally known in the art as trumpets, are normally used in textile machines such as gill boxes to condense or compact a sliver in the form of loose textile fibres before its positioning and collection in helix form on the circumferential surface of the bobbin under formation.

The sliver fed into the trumpet is substantially without twist, and when this sliver passes through the trumpet false twist device it is twisted about itself to assume compactness and a reduction in its transverse dimension, so reducing its volume in that the retained air is eliminated and the individual fibres are twisted together. It is apparent that the twist imparted upstream is nullified by the twist imparted downstream, as the trumpet acts as a false twist element.

To achieve this, the trumpet is constructed and operated in the manner traditional in the art, it consisting essentially of a funnel rotating about its axis while being simultaneously subjected to axial to-and-fro movement along a path equal in length to the length of the desired bobbin. During said to-and-fro movement the funnel reverses its direction of rotation at the ends of the bobbin under formation, it rotating reciprocatingly in the two directions according to its direction of linear movement. This rotation in the two directions is induced by the rolling of a pulley associated with the rotary funnel along a fixed flat element, as is well known in the art in terms of the methods used up to the present time.

It is apparent that the sliver is deposited at the ends without substantial twist and thus poorly compact. This traditional method of application is frequently accompanied by a falling away of the lateral surfaces of the bobbin, causing a deterioration in the bobbin quality.

In fact when such a bobbin is used to feed subsequent machinery difficulties arise in unwinding the sliver, which is subjected to elongation and in the limit to breakage. It is understandable that a breakage of this kind interrupts the production process, requiring the intervention of service personnel. The labour cost of these operations represents a considerable factor in the overall production cost calculation. To overcome this winding problem the invention proposes an improved twister device for a winding carriage collecting the sliver emerging from the gill box, which is able to wind bobbins in perfect cylindrical form using drive means which rotate the rotary trumpet independently of its to-and-fro linear movement, for the purpose of reversing the rotation substantially at the middle of the bobbin under formation. Said drive means comprise components which receive rotation from the drive shaft, to operate a crank-connecting rod mechanism arranged to angularly reciprocate a toothed sector, this latter engaging a toothed pinion to transmit reciprocating rotary motion in the two directions, via a linkage comprising pulleys, belts and cables, to the trumpet, which then imparts the false twist to the sliver an instant before this latter is deposited as a crossed winding on the circumferential surface of the bobbin under formation.

According to a preferred embodiment the improved twister device for a winding carriage comprises drive means which impress on the rotary funnel-type trumpet reciprocating rotations with rotation reversal at points on the transverse path of the trumpet which do not coincide with the two ends of the bobbin under formation, this being possible by suitably positioning between them the components of said drive means. The device according to the invention therefore allows the rotation reversal points of the trumpet to be chosen within any part of the transverse path which does not coincide with the ends of the bobbin under formation, and thus achieve improved binding of the various layers in which the sliver is collected, to consequently allow the subsequent unwinding to take place without any abnormal tension and thus without breakage of the sliver. With reference to the aforegoing, the accompanying drawings show a preferred embodiment, which is non-limiting in terms of the relative positions of the components

and the consequent simplifications which can derive therefrom. Said embodiment is described with reference to the following figures:

Figure 1 is an axonometric perspective schematic view of the device of the present invention showing the entire motion transmission, together with a detailed view of the drive means for the toothed sector, which is advantageously disposed in a gearbox; Figure 2 shows the linkage scheme for the operating elements within the toothed sector gearbox, and represents the motion configuration at the instant in which the toothed sector reverses its angular rotation;

Figure 2a is a schematic view of the rotary funnel-type trumpet of the mobile twister unit in a middle position on the bobbin under formation, in said middle position the trumpet reversing its direction of rotation at the instant corresponding to the reversal of the angular rotation of the toothed sector, as shown in the linkage scheme of Figure 2;

Figure 3 shows the linkage scheme for the operating elements within the toothed sector gearbox, and represents the motion configuration at the instant in which the toothed sector is substantially at the mid point of its angular rotation in a given constant direction;

Figure 3a is a schematic view of the rotary funnel-type trumpet of the mobile twister unit in an end position on the bobbin under formation, in said end position the trumpet having and maintaining the same direction of rotation as the angular rotation of the toothed sector, as shown in the linkage scheme of Figure 3; Figure 4 shows the linkage scheme for the operating elements within the toothed sector gearbox, and represents the motion configuration at the instant in which the toothed sector reverses its angular rotation at the opposite end of its path to that shown in Figure 2;

Figure 4a is a schematic view of the rotary funnel-type trumpet of the mobile twister unit in a middle position on the bobbin under formation, in said middle position the trumpet reversing its direction of rotation at the instant corresponding to the reversal of the angular rotation of the toothed sector, as shown in the linkage scheme of Figure 4;

Figure 5 shows the linkage scheme for the operating elements within the toothed sector gearbox, and represents the motion configuration at the instant in which the toothed sector is substantially at the mid point of its angular rotation in the opposite direction of rotation to the given direction of Figure 3;

Figure 5D is a schematic view of the rotary funnel-type trumpet of the mobile twister unit in an end position on the bobbin under formation, in said end position the trumpet having and maintaining the same direction of rotation as the angular rotation of the toothed sector, as shown in the linkage scheme of Figure 5. Said trumpet rotation is in the opposite direction to that shown in Figure 3a;

Figure 6 is a schematic view of the rotary funnel-type trumpet of the mobile twister unit at any point between the midpoint and one end of the surface of the bobbin under formation. At said point the trumpet reverses its direction of rotation. The figure represents the instant in which the trumpet is not rotating, as it is in the process of passing from one direction of rotation to the opposite direction of rotation.

In the figures equal elements or those of equal or equivalent function carry the same reference symbols. In said figures: 1 is the drive shaft which rotates with constant rotation to transversely drive the mobile twister unit 8 and rotate the twister device of the present invention; 3 is a belt, cord or any flexible element transmitting rotary motion from the transmission pulley 2 to the pulley 5 via the idle deviation pulleys 4. The pulley 2 is rigid with the shaft 9 and the pulley 5 is rigid and integral with the trumpet 7 of the mobile twister unit 8; 6 is the rocker arm or bar pivoted about the shaft 9, this being mobile to enable the unit 8 to travel with sliding to-and-fro movement along the guide shaft 10, in the direction of the arrows 14. Said arm 6 rocks angularly by the action of the connecting rod 18 which is connected to it by a connection member 16. Said connecting rod 18 is driven by the crank 21 via the connection pin 19, the crank 21 being rotated by the drive shaft 1 on which it is rigidly fixed; 11 is the drive roller for the bobbin 12 under formation, on which the fibre sliver 25 is wound; 15 is a spiral in the form of a helical spring within which the fibre sliver slides before entering the rotary trumpet 7. Said spiral 15, rigidly fixed to the unit 8, helps to compact the sliver 25, as is well known in the art; 22 are flexible belts or similar elements, advantageously toothed, to transmit motion via the toothed wheels 24, without the minimum slippage. This is extremely important in order to maintain the position of the stable point of reversal of the direction of rotation of the rotary trumpet 7 unaltered; 23 are idle toothed wheels for angularly deviating the belt 22; 30 is a crank pivoted by the pin 32 to the connecting rod 33 to drive the toothed sector 36 via the pin 34, which moves with a periodic angular movement in both directions of rotation; 39 is a pinion gear rotated reciprocatingly by the action of the toothed sector 36 with which it engages; the line A represents the middle of the axial extension of the bobbin 12 under formation; B and D represent the ends of bobbin 12; 31 is an arrow indicating the constant input rotation of the linkage which operates the improved twister device for a winding carriage of the present invention; C_1 and C_2 are lines representing the reversal points of the rotary trumpet 7 within a complete transverse

to-and-fro cycle of the mobile unit 8 when the linkage members are assembled to set the rotation reversal at any point on the surface of the bobbin 12 which does not coincide with the middle A.

Those devices and mechanisms of the gill box or derived machine which operate in mutual cooperation with the device of the invention are not illustrated nor is their operation described, in that they are already known and also because they are not concerned in the operation of the device of the present invention, which is easily understood.

Thus for example the motor driving the drive shaft 1 which rotates constantly in the same direction is not shown. Said shaft 1 simultaneously drives the crank 21 and the toothed belt 22. This latter generates, via the toothed wheel 24,the crank 30 and the connecting rod 33, an angular reciprocating movement of the toothed sector 36, which engages the pinion 39 to transmit reciprocating rotary movement in the two directions to the trumpet 7 of the mobile unit 8 via the linkage formed by the pulleys 24 and 23, the belts 22 and the belt 3. Simultaneously, the mobile unit 8 slides linearly along the guide shaft 10 with a to-and-fro movement through a distance substantially equal to the axial dimension of the bobbin 12 under formation.

Said to-and-fro linear movement is generated by said crank 21 which drives the connecting rod 18 and hence the arm 6, which rocks about the shaft 9 to cause the twister unit 8 to move with a linear to-and-fro movement in accordance with the arrows 14. This latter linkage represents a well known application in the case of a gill box winding carriage.

The operational stages will be more apparent from the following description:
it will be assumed the the initial state corresponds to the linkage scheme shown in Figure 2, which corresponds to a position of the rotary trumpet 7 at the middle as shown in Figure 2A. From said initial position the crank 30 is subjected to a rotation 31 and moves the connecting rod 33 into the position shown in Figure 3.

The toothed sector 36 has rotated through substantially one half of its angular travel and the rotary trumpet 7 has moved from the middle A to the end B of the bobbin 12. During said movement it rotates about itself with clockwise rotation, as can be seen from Figure 3B. From the position shown in Figure 3 the linkage moves into the position shown in Figure 4 under the continuous action of the crank 30.

In this latter position the toothed sector 36 is at one end of its angular travel, so that Figure 4 represents the instant in which said toothed sector reverses its direction of angular rotation, while the rotary trumpet again assumes a position at the middle A of the bobbin 12, as shown in Figure 4A. At said instant it reverses its direction of rotation from clockwise to anticlockwise.

From the position shown in Figure 4 the linkage moves to the position shown in Figure 5 under the continuous action of the crank 30.

In said position the toothed sector 36 is substantially at the half-way point in its angular travel, and the rotary trumpet 7 has moved from the middle A to the end D of the bobbin 12. During said movement it rotates about itself with anticlockwise rotation, as can be seen from Figure 5D, this anticlockwise rotation continuing until it returns to the middle A of the bobbin 12. By setting a different initial position of the mobile twister unit 8 relative to the position of the toothed sector 36, or more precisely by setting the connecting rods 21, 18 differently relative to the connecting rods 30, 33 the rotation reversal of the rotary trumpet 7 occurs at C_1, being any point on the surface of the bobbin 12 within the portion between the middle A and the end D.

Within a complete transverse to-and-fro cycle of the unit 8 two reversals of the linkage of the present invention take place. In addition to said point C_1 the rotary trumpet 7 reverses its direction of rotation at C_2, this latter point being positioned symmetrically to C1 about the middle line A. This is apparent from Figure 6.

Modifications and additions can be made to the details of the device by the expert of the art, but without leaving the general idea of the present invention.

Claims

1. An improved twister device for a winding carriage collecting onto a bobbin the sliver emerging from the gill box, resulting in bobbins of perfect cylindrical form, characterised by comprising drive means which rotate the rotary trumpet of the mobile twister unit independently of the to-and-fro linear movement of said mobile unit, for the purpose of reversing the rotation substantially at the middle of the bobbin under formation; said drive means comprising components which receive rotation from the drive shaft, to operate a crank-connecting rod mechanism arranged to angularly reciprocate a toothed sector, this latter engaging a toothed pinion to transmit reciprocating rotary motion in the two directions, via a linkage comprising pulleys, belts and cables, to the trumpet of the twister unit, which then imparts the false twist to the sliver an instant before this latter is deposited as a crossed winding on the circumferential surface of the bobbin under formation.

2. An improved twister device for a winding carriage as claimed in claim 1, characterised in that the drive means which impress reciprocating rotation on the rotary funnel-type trumpet of the twister unit comprise components positioned and mutually engaged in such a manner as to effect rotation reversal at any point along the bobbin surface which does not coincide with the two ends of the bobbin under formation.

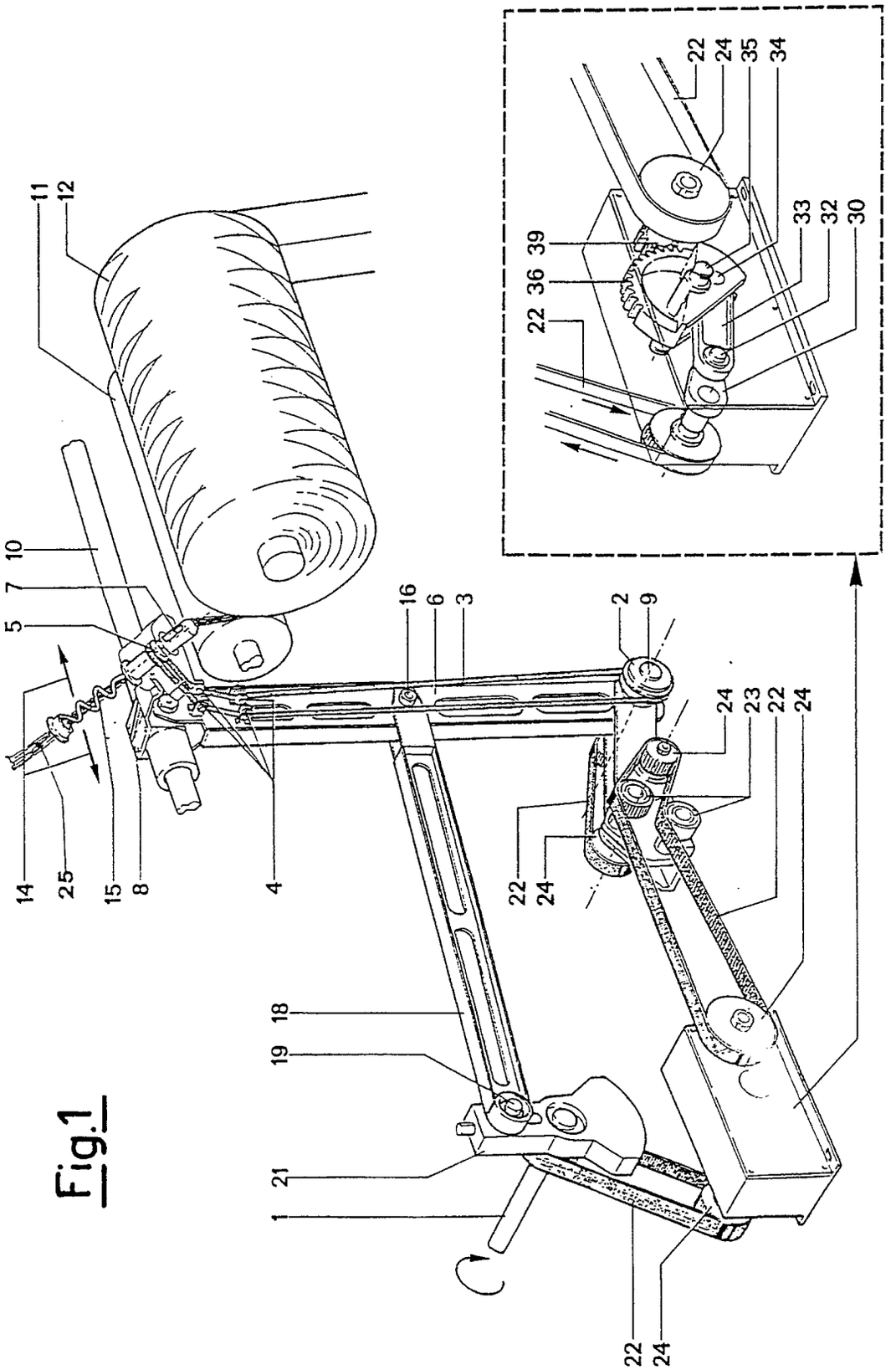

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Fig.1

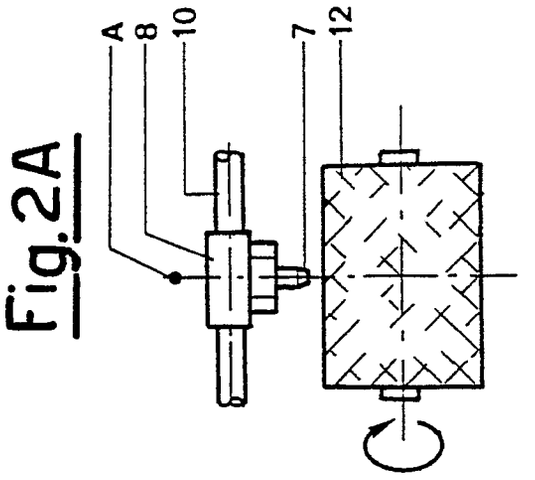

Fig.2A

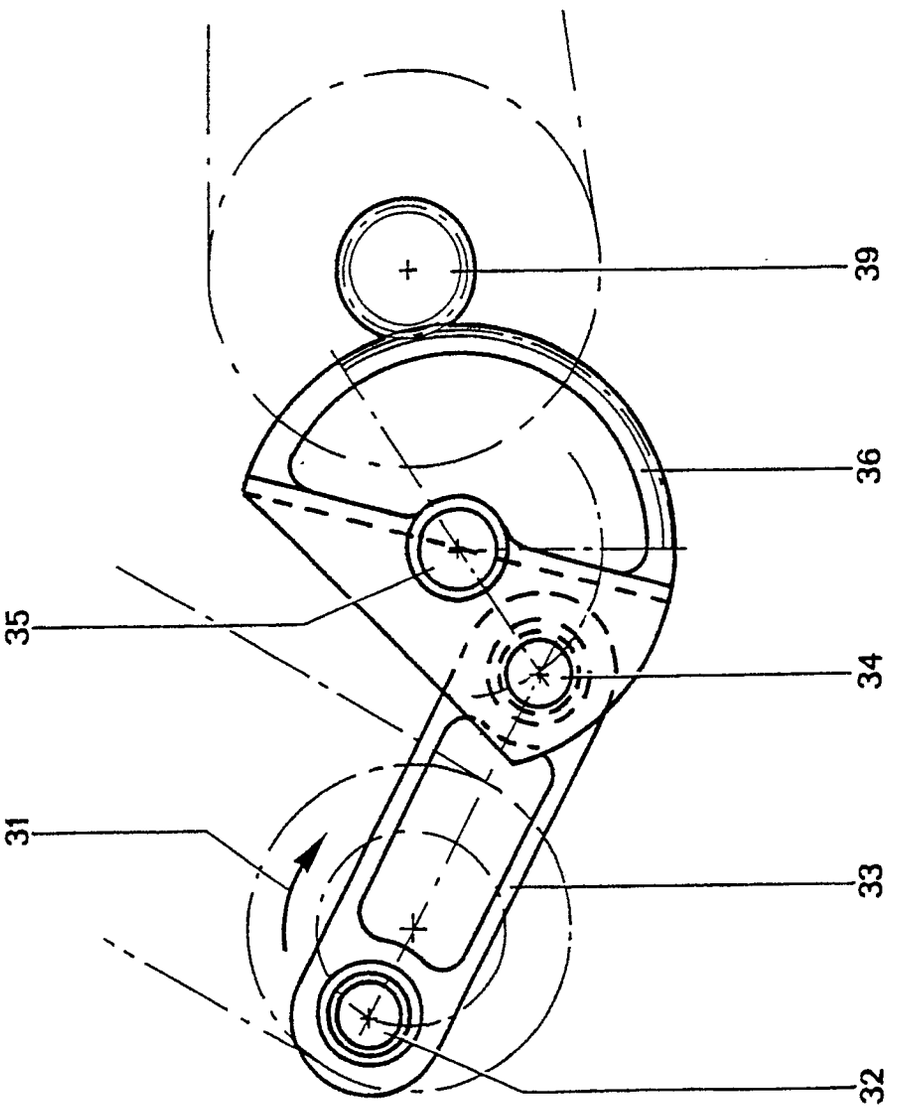

Fig.2

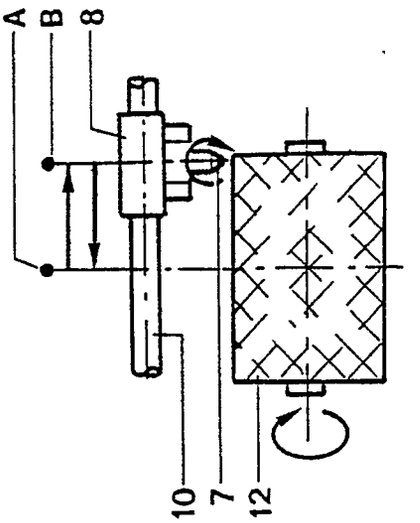

Fig.3B

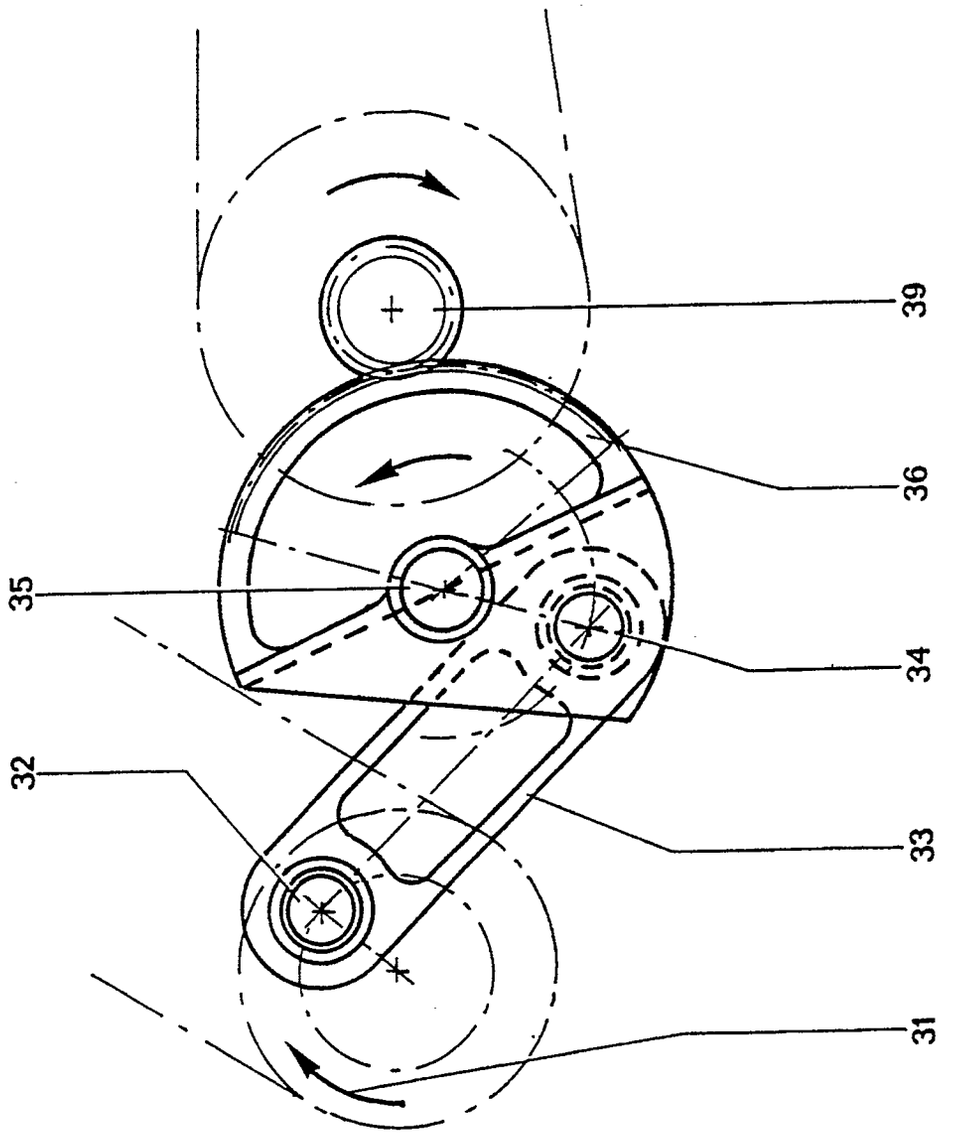

Fig.3

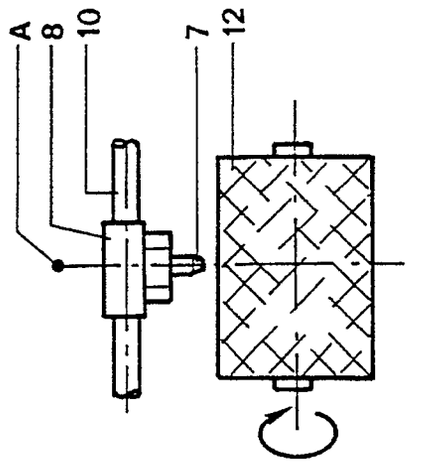

Fig.4A

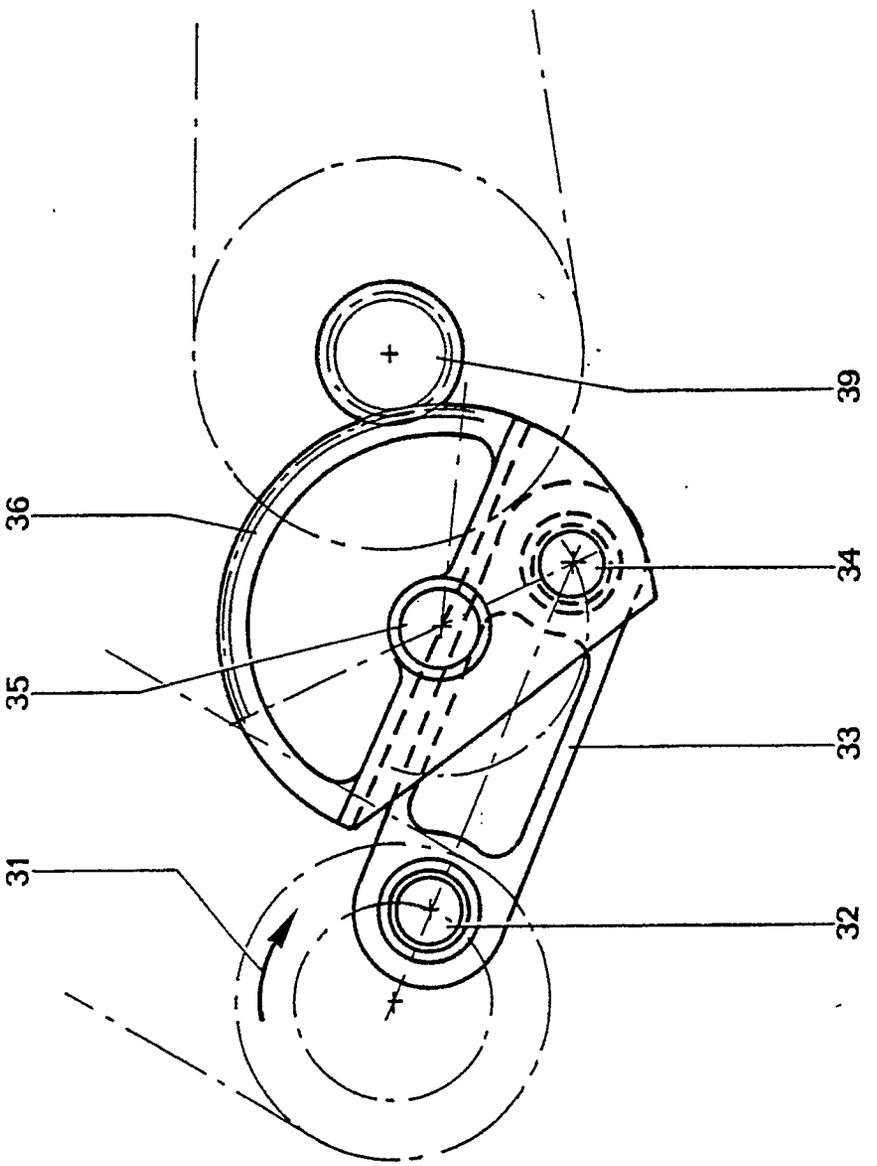

Fig.4

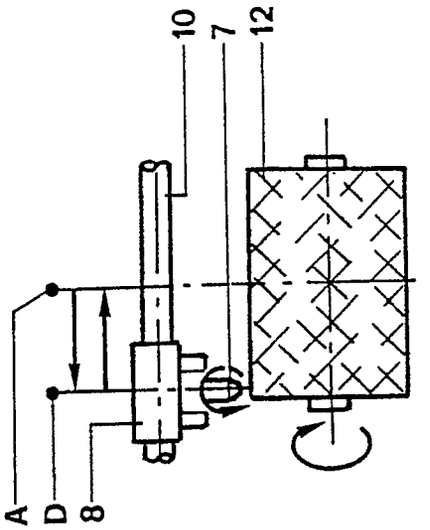

Fig.5D

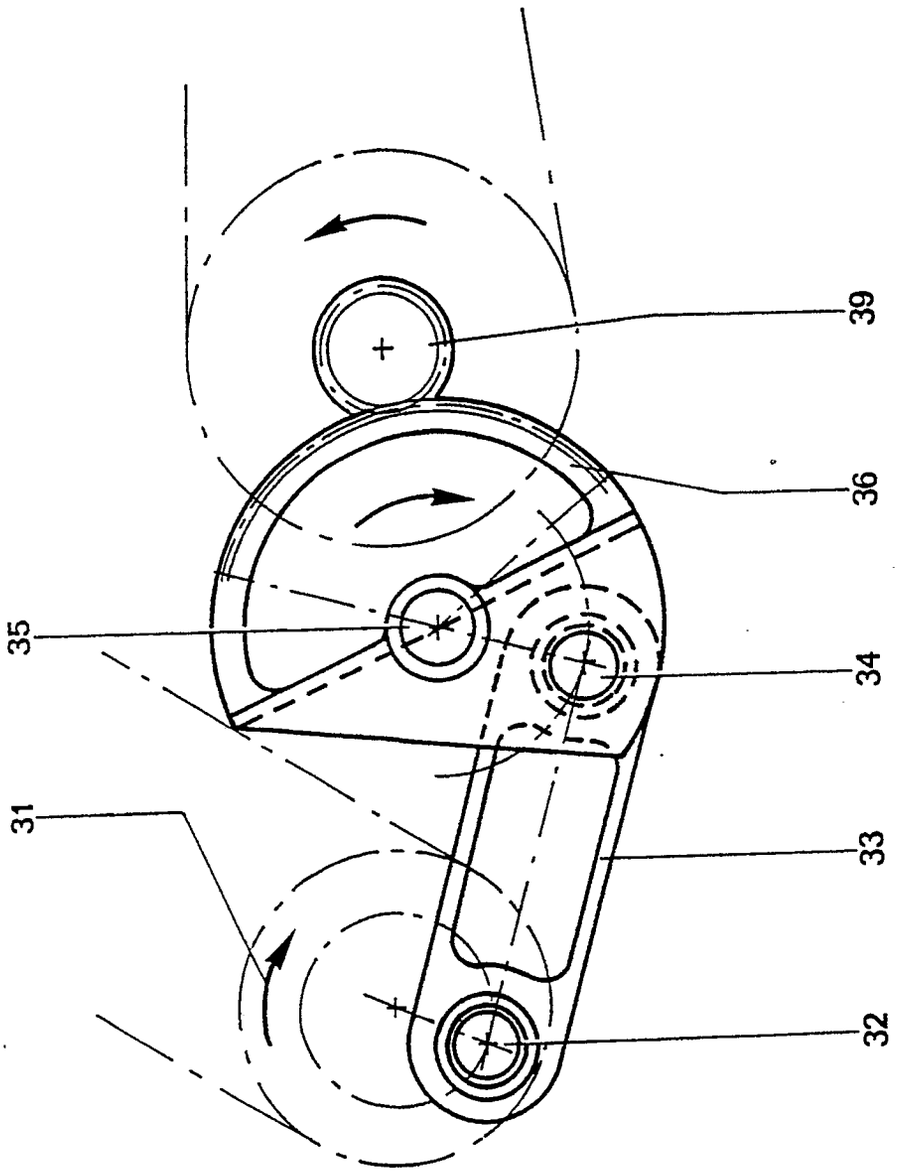

Fig.5

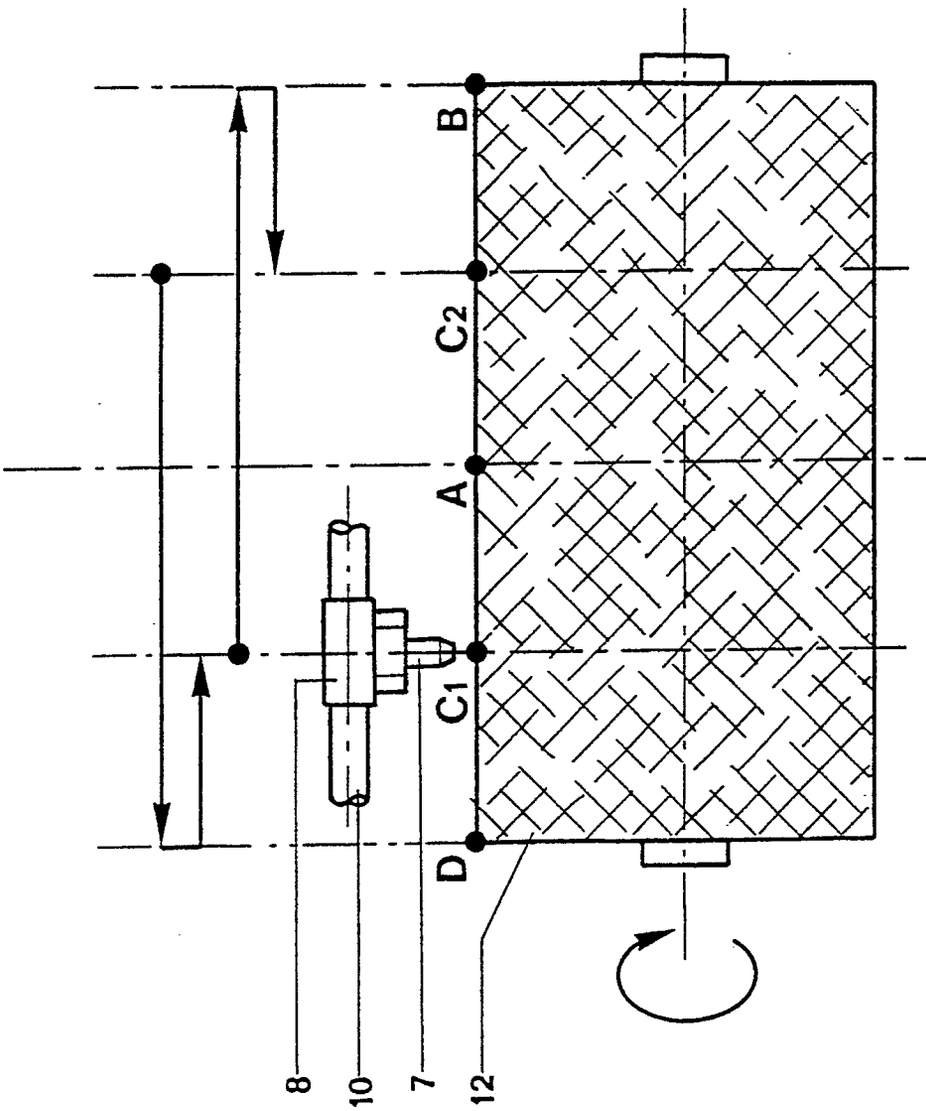

Fig.6