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Bourgeois

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[54] **TRANSMISSION DEVICE FOR DRIVING COAXIAL PINIONS, PARTICULARLY FOR THE SYNCHRONISED DRIVING OF TWO NEEDLE BEDS OF A CIRCULAR KNITTING MACHINE**

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[52] **U.S. Cl.** **66/28,** 66/56, 74/395

[51] **Int. Cl.** **D04b 9/06**

[58] **Field of Search** 66/28, 8, 56; 74/395, 396

[56] **References Cited**

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[57] **ABSTRACT**

In a circular knitting machine with two needle beds and a pair of coaxial pinions each meshing with a toothed crown integral with a respective needle bed, the pinions are driven by two members each coaxial to and integral with a respective one of the pinions and secured together with a wedge-shaped part between two spaced-apart facing bearing surfaces of the members. By inverting the wedge-shaped part, the relative angular disposition of the pinions is modified and consequently the needles of one bed are shifted in relation to the needles of the other bed.

6 Claims, 6 Drawing Figures

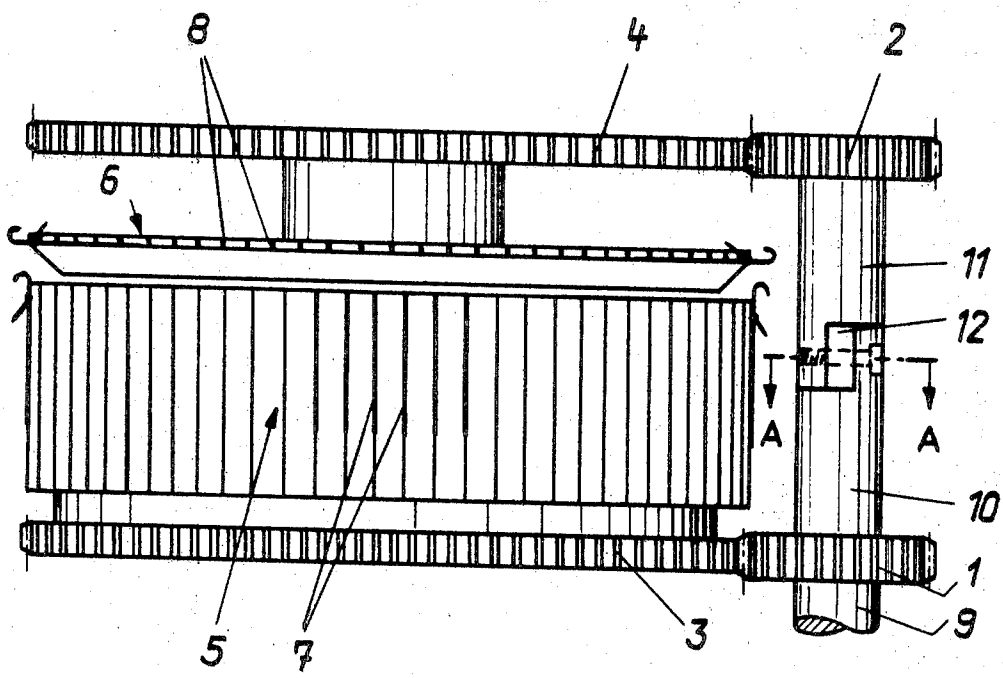


Fig. 1

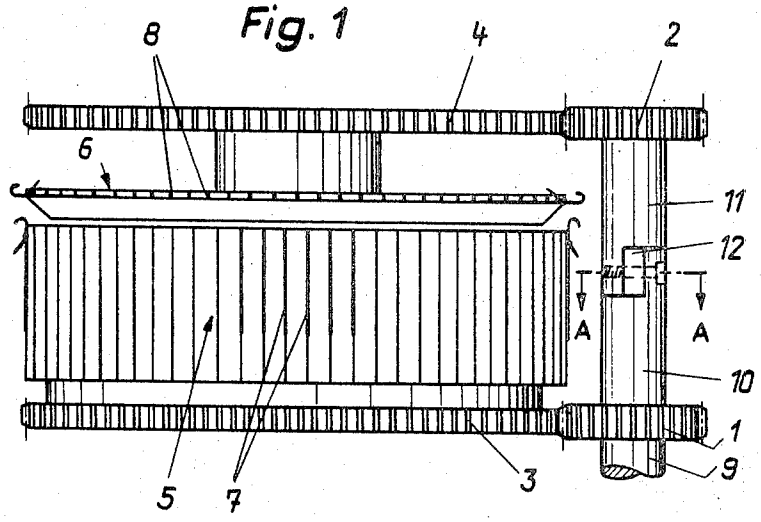


Fig. 3

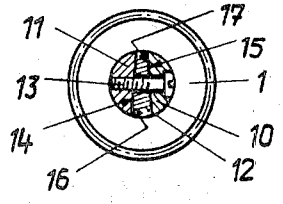


Fig. 2

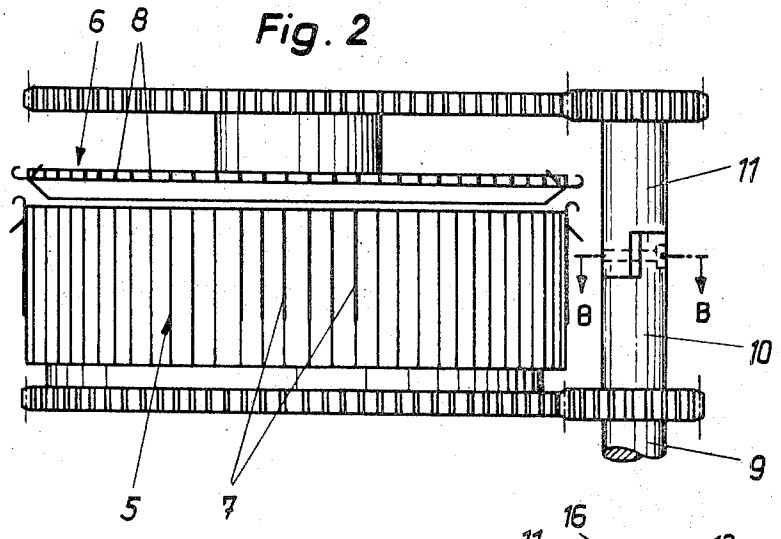


Fig. 4

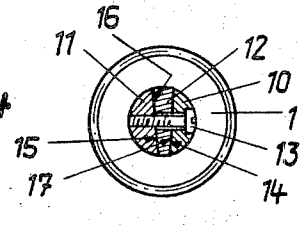


Fig. 5

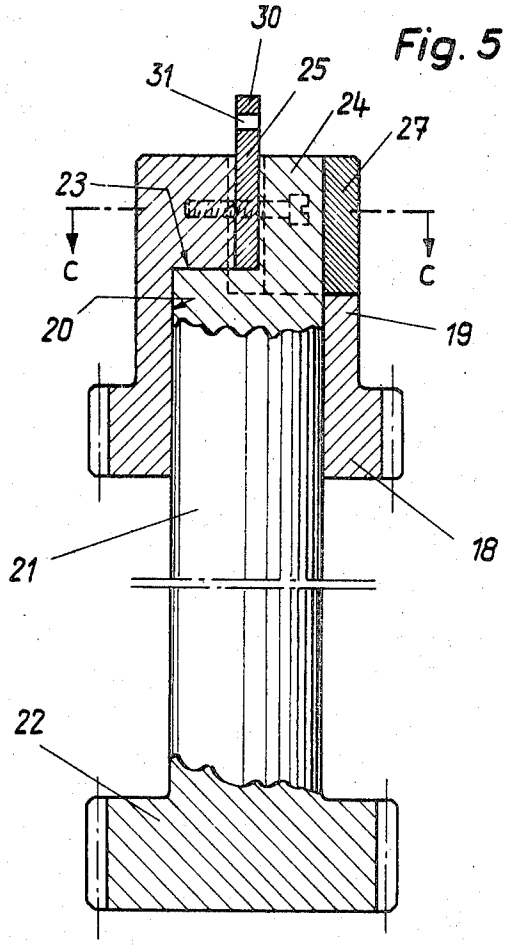
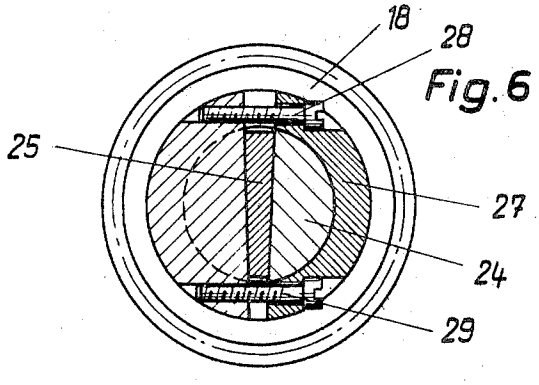


Fig. 6



TRANSMISSION DEVICE FOR DRIVING COAXIAL PINIONS, PARTICULARLY FOR THE SYNCHRONISED DRIVING OF TWO NEEDLE BEDS OF A CIRCULAR KNITTING MACHINE

BACKGROUND OF THE INVENTION

The invention relates to transmission devices for driving two coaxial pinions and more particularly concerns devices for the synchronised driving of two needle beds of a circular knitting machine, of the type comprising at least one pair of coaxial pinions each meshing with a toothed crown integral with one of the needle beds, means for connecting the two coaxial pinions, and means for adjusting the relative angular position of these needle beds.

On most of these machines, and according to the type of stitches to be knitted, it is necessary to be able to modify the relative disposition of the needles carried by each bed. Thus, to provide basic rib stitches, the needles of one bed must be alternately disposed in relation to the needles of the opposed bed whilst, to the contrary, the knitting of basic interlock stitches requires the needles of the opposed beds to be disposed face to face.

In these two cases, this relative disposition of the needles must be extremely precise, especially for machines intended for the knitting of fine rib stitches, in which the space available between two alternate needles may be less than a tenth of a millimetre. Any adjustment of this disposition thus implies a very delicate manoeuvre.

On certain machines of the cited type, at least one of the toothed crowns is provided with a helicoidal toothing, the corresponding pinion being axially movable to enable the obtention of a slight angular staggering between the respective teeth of the crowns associated with the two needle beds. In addition to the difficulties of manufacturing such gears, especially the provision of homothetic teeth for both the crowns and the pinions, there is a possibility of a slight play occuring in the drive of the movable pinion, and a risk of accidental movement thereof during operation which would cause knitting faults and, in certain cases, serious damage to the needles.

In another known construction, one of the pinions is caused, by means of an eccentric, to pivot about the control shaft which comprises a shoulder on which this pinion can be rigidly fixed. This construction requires the use of numerous fixing screws so as to provide a maximal reduction of the possibilities of sliding, which does not facilitate the operator's task. Moreover, adjustment of the position of the pinion by means of an eccentric does not always enable the required precision to be achieved.

SUMMARY OF THE INVENTION

A principle object of the present invention is to remedy these drawbacks.

According to the invention, a transmission device for driving two coaxial pinions comprises two members coaxial to the pinions and each integral with a respective one of the pinion. The members have two spaced-apart facing bearing surfaces lying in planesparallel to the axis of the members and pinions. An intermediary wedge-shaped part having two non-parallel faces bears against and fits between the bearing surfaces. Means are provided for securing the wedge-shaped part between the members in either one of two relatively inverted positions, in which two positions of the wedge-shaped part the relative angular disposition of the two pinions is different.

The two pinions of such a device may be respectively in driving relationship with a toothed crown integral with a respective one of two needle beds of a circular knitting machine. Advantageously, in this construction, the angle formed between the non-parallel faces of the wedge-shaped part is such that the different relative angular disposition of the pinions in the two positions of the wedge-shaped part corresponds to a displacement of the needles of one bed by half a spacing in the relation to the needles of the other bed.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings show, by way of example, two embodiments of the device according to the invention. In the drawings:

FIG. 1 is a front elevational view of a first embodiment of device applied to a circular knitting machine with schematically represented vertical and horizontal needle beds;

FIG. 2 is a view similar to FIG. 1 showing the device in another position;

FIGS. 3 and 4 are cross sectional views respectively taken along lines A—A and B—B of FIGS. 1 and 2;

FIG. 5 shows a second embodiment of device partially in cross section;

FIG. 6 is a cross section taken along line C—C of FIG. 5.

DETAILED DESCRIPTION OF THE INVENTION

The device shown in FIGS. 1 to 4 comprises two straight toothed pinions 1 and 2 coaxially arranged one above the other and respectively meshing with toothed crowns 3 and 4 integral with two corresponding needle beds, a vertical needle bed 5 and a horizontal needle bed 6, carrying respective needles 7 and 8 in their grooves; the lower pinion 1 is rotatably driven by a control shaft 9 connected to a motor, not shown.

The connection between the two coaxial pinions 1 and 2 is provided by means of two shaft sections 10 and 11 aligned with the shaft 9 and respectively fixed to the pinions 1 and 2. These shaft sections 10 and 11 are recessed at their inner cooperating ends so as to interfit whilst leaving therebetween, disposed about an axial plane, a space in which an intermediary wedge-shaped part 12 is inserted. The two shaft sections 10 and 11 and the part 12 are assembled by means of a schematically indicated screw 13.

Referring to FIGS. 1 and 3, the two inclined faces 14 and 15 of the wedge-shaped part 12 respectively come into engagement with facing surfaces 16 and 17 of the recesses at the ends of the shaft sections 10 and 11. The respective teeth of the pinions 1 and 2 are in alignment and the needles 7 and 8 of the two needle beds 5 and 6 are disposed alternately.

FIGS. 2 and 4 show the device after inverting the position of the part 12 by 180° in relation to the position shown in FIG. 3, the inclined faces 14 and 15 of the part 12 this time respectively cooperating with the facing surfaces 17 and 16. As a result of the relative angular displacement between the shaft sections 10 and 11, the respective teeth of the pinions 1 and 2 are slightly angularly staggered in relation to one another and cause a relative angular displacement of the two needle

beds, so that the needles 7 and 8 are disposed face to face.

In the second embodiment shown in FIGS. 5 and 6, the upper pinion 18 is provided on the base of a cylindrcal sleeve 19 which has a concentric housing 20 in which the upper part of a shaft 21 integral with the lower pinion 22 fits, a shoulder 23 of the housing coming to bear against the surface of a notch-like recess or shoulder provided at the end of the shaft 21.

The upper end part of the sleeve 19 also includes a housing accomodating a terminal part 24 of the shaft 21, whilst allowing a sufficient space on either side of an axial plane for the insertion of an intermediary wedge-shaped part 25. The end of the sleeve 19, the intermediary part 25 and the terminal part 24 of the shaft 21 are securely assembled by means of a removable segment 27 of the sleeve 19 fixed thereon by means of two screws 28 and 29. The intermediary part 25 comprises a protruding part 30 with an aperture 31.

To carry out a 180° inversion of the intermediary part 25, it is sufficient to slightly unscrew the two screws 28, 29, axially withdraw the intermediary part 25 by inserting a hook-member through the aperture 31, and replace the intermediary part in its new alignment.

The described device is easy to manoeuvre, practically impossible to deregulate during operation of the machine, economical to manufacture, and ensures an extremely precise adjustment.

What is claimed is:

1. In a circular knitting machine with two needle beds and a pair of coaxial pinions each in driving relationship with a toothed crown integral with a respective one of said needle beds, the improvement in which a transmission element for driving said pinions comprises two members each coaxial and integral with a respective one of said pinions, said members having two

spaced-apart facing bearing surfaces lying in planes parallel to the axis of said members and pinions, an intermediary wedge-shaped part having two non-parallel faces bearing against and fitted between said bearing surfaces, and means for securing the wedge-shaped part between said members in either one of two relatively inverted positions, in which two positions of said wedge-shaped part the relative angular disposition of the two pinions is different.

2. A circular knitting machine according to claim 1, in which said bearing surfaces are symmetrically spaced apart on eiether side of an axial plane of said members and pinions, said wedge-shaped part being invertable by a 180° displacement about said axial plane.

3. A circular knitting machine according to claim 1, in which said two members are sections of a driving shaft with recessed interfitting ends defining said bearing surfaces, said ends being disposed between the pinions.

4. A circular knitting machine according to claim 1, in which said wedge-shaped part and said bearing surfaces are disposed outside said two pinions.

5. A circular knitting machine according to claim 4, in which one of said members is a shaft section integral with one of the pinions and extending through an aperture in the other pinion, the other of said members being a sleeve section integral with said other pinion.

6. A circular knitting machine according to claim 1, in which the angle formed between the non-parallel faces of the wedge-shaped part is such that the different relative angular displacement of the pinions in the two positions of the wedge-shaped part corresponds to a displacement of the needles of one bed by half a spacing in relation to the needles of the other bed.

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