M. MAAG AND E. BUCHTER.

DEVICE FOR TIGHTENING BANDS OF ROLLS SIMULTANEOUSLY AND EQUALLY.

APPLICATION FILED AUG. 4, 1920.

1,405,852. **Patented Feb. 7, 1922.**

Fig. 1

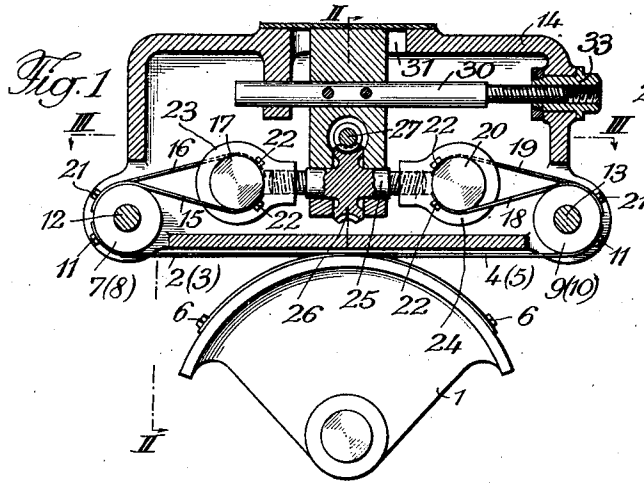


Fig. 2.

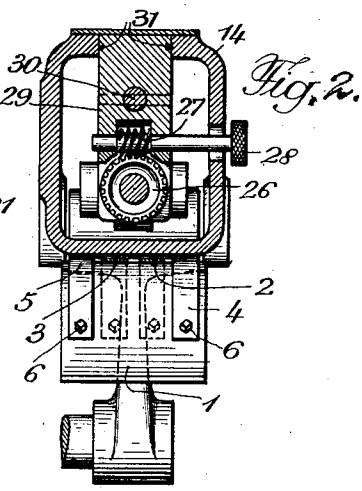


Fig. 3.

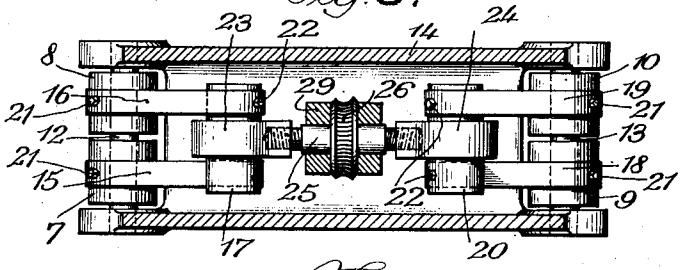


Fig. 4

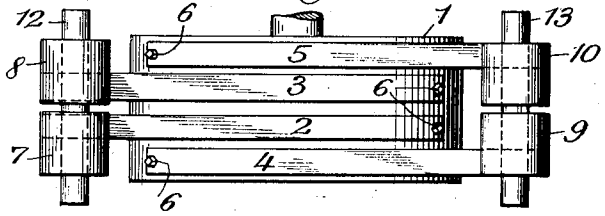


Fig. 6

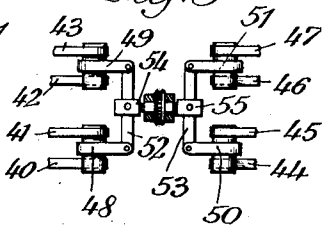
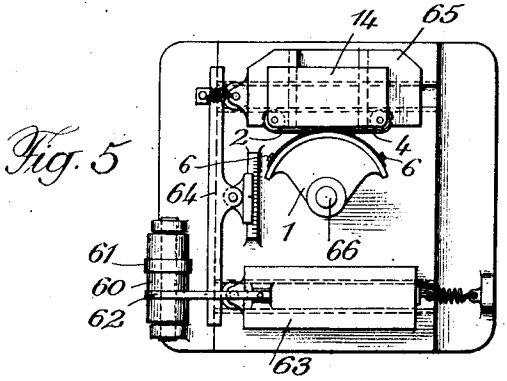


Fig. 5



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DEVICE FOR TIGHTENING BANDS OF ROLLS SIMULTANEOUSLY AND EQUALLY.

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Application filed August 4, 1920. Serial No. 401,201.

To all whom it may concern:

Be it known that we, MAX MAAG and EMIL BUCHTER, both citizens of the Republic of Switzerland, and both residing at Zurich, Hardstrasse 219, Switzerland, have invented certain new and useful Improvements in a Device for Tightening Bands of Rolls Simultaneously and Equally; and we do hereby declare the following to be a clear, full, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawing, and to letters or figures of reference marked thereon, which form a part of this specification.

The present invention relates to a device for tightening bands of rolls simultaneously and equally.

For the purpose of converting a rectilinear motion into a circular motion and vice versa rolling segments and steel bands are preferably used in the construction of machine tools and particularly in gear cutting machines. As a rule two or four steel bands are used which have been tightened heretofore severally and quite approximately. In consequence thereof the various bands show frequently unequal tensions whereby defects in the uniform transmission of the motion are caused.

These disadvantages are overcome by the tightening device according to the invention whereby the single band spanners are replaced by a common tightening device which tightens all the bands simultaneously and equally and which permits a perfect equalization of the tensions of the various bands. Moreover the new tightening device enables the tightening to be carried out quicker and without trouble.

An exemplification of the invention employed for converting a rectilinear motion into a circular motion by means of four bands is illustrated on the accompanying drawing, in which—

Fig. 1 is a vertical section through the device;

Fig. 2 is a cross-section along line II—II of Fig. 1;

Fig. 3 is a horizontal section along line III—III of Fig. 1;

Fig. 4 is a plan view of the rolling segment, of the four bands and the guide rolls of the exemplification shown in Figs. 1—3, the other parts being omitted;

Fig. 5 illustrates on a smaller scale the tightening device fitted to the blank carrier of a known gear cutting machine;

Fig. 6 is a modification of a detail of a tightening device containing eight bands.

Four steel bands 2, 3, 4 and 5 are each fixed with their one ends by means of set screws 6 fixed to a rolling segment 1 and with their other ends to allotted rolls 7, 8, 9, 10, respectively, each with set screws 11. The rolls are rotatably mounted on pivots 12 and 13 secured to the casing 14. Short equalizing bands 15 and 16 connect an equalizing roll 17 to the rolls 7 and 8 respectively; similarly, equalizing bands 18, 19 connect an equalizing roll 20 to the rolls 9 and 10 respectively, and, as is shown in Fig. 1, the two bands 15 and 18 engage the rolls 17 and 20 respectively from below and the bands 16 and 19 the same rolls from above. This arrangement has the same effect as if the two bands 2, 3 and 4, 5 respectively were considered to be mounted from opposite sides to the equalizing rolls 17 and 20 respectively. The bands 15, 16, 18 and 19 are each secured at their one ends by set screws 21 and at their other ends by set screws 22 to the respective rolls. The rolls 17 and 20 are mounted in bearing parts 23 and 24 respectively, which are provided with internal screw threads and are screwed upon the ends provided with opposite screw threads and are screwed upon the ends provided with opposite screw threads of the axle 25 of a worm-wheel. A worm-wheel 26 which is integral with the axle 25 can be rotated by means of a worm 27 and a milled knob 28 fixed to the axle of the latter and projecting through the casing 14. Worm 27 and worm-wheel 26 are mounted in a guide piece 29 which is secured to a displaceably arranged rod 30 and which is secured against being rotated by guide facings 31 arranged inside the casing 14. The rod 30 is provided at its one end with screw threads 32 and can be displaced by means of a nut 33 mounted in the casing 14.

The bands 2—5 are provided of different length and thickness to correspond to different sizes of rolling segments and are easily exchanged and screwed onto the corresponding rolls and segments from outside, whereas the bands 15, 16, 17, 18 in the interior of the casing need not be exchanged. After the bands 2—5 have been fixed in position without tension, the milled knob 28

is turned which causes the rotation of the worm 27 and the worm-wheel 26 whereby the bearing parts 23 and 24 are brought nearer to each other. If now for example the band 2 shows the greatest tension it will turn roll 7 in an anti-clockwise direction and will cause through the interposition of band 15 a rotation of roll 17 in a clockwise direction, whereby the band 16, which is also fixed to the roll 17 is tensioned, which band 16 will tighten band 3 as both are fixed to roll 8. A similar equalization of the tension takes place at the opposite side, for instance, from band 4 over band 18, roll 20, band 19 and finally to band 5. As the rolling segment 1 is rotatably mounted the tensions of the bands 2 and 3 on one side are getting equalized with the tension of bands 4 and 5 on the other side, so that all the four bands are equally tightened.

As the worm 27 and worm-wheel 26 constitute a high ratio in transmitting power, only a small force has to actuate the knob 28 in order to tighten the bands effectively. In order to place the center of the periphery of the rolling segment 1 exactly opposite a given point the nut 33 is turned, which causes a displacement of rod 30, of the part 29 and of all the parts connected to the latter and thus a rolling on and off respectively of the bands until the rolling segment is in the required position.

In case only two bands are used of them is led over a guide roll and their upper ends fixed to parts provided with internal threads which are screwed towards each other when the bands are tightened similarly as described above.

Fig. 6 shows in a diagrammatic manner a modification of the tightening device by which the tension of eight bands 40, 41, 42, 43, 44, 45, 46, 47 can be equalized. In this arrangement two bearing parts 48 and 49 and 50 and 51 respectively are provided on either side of the device, which carry rolls 52, 53, 54 and 55 respectively to which the ends of the bands or of intermediate bands are fixed in the same manner as has been described above for a tightening device containing four bands. The two bearing parts on either side (48, 49 and 50, 51) are each pivotally connected to the ends of double-armed levers 52 and 53 respectively, which swing around fulcrums mounted on parts 54 and 55 respectively, which parts are provided with internal screw threads, with which the axle of the worm-wheel co-acts in the above described manner. The pivotally mounted levers cause an equalization of the forces acting upon the bearing parts and thereby a uniform tension in all eight bands.

Fig. 5 shows a tightening device according to the invention fitted to the blank carrier of a known gear cutting machine. This blank carrier is hinged to a table, not shown in the drawing, with which it oscillates and the rolling movement of the blank is derived from the oscillating movement of the table by means of a plurality of rolls and bands, of which roll 60 with bands 61 and 62 is shown. The roll 60 transmits the motion by means of a band 62 to a lower horizontal slide 63 from where it is transmitted through the interposition of the pivoted rule 64 to the upper slide 65. The reciprocating motion of the upper slide 65 is then converted into a rotary motion of the axis 66 of the blank by means of the steel bands 2, 4 and the like and a rolling segment 1. The tightening device according to the invention is fitted to the upper slide 65 and the bands fixed to the rolling segment 1 are tightened by means of this device.

We claim:

1. A device for tightening bands of rolls simultaneously and equally, comprising in combination a rolling member, a plurality of bands, one end of each of which is fixed to said rolling member, said bands extending from the latter toward opposite sides of said rolling member, guide rolls over which said bands are led, equalizing rolls adjacent said guide rolls, means connecting said guide rolls with said equalizing rolls, and means to bring said equalizing rolls nearer together for the purpose of tightening said bands.

2. A device for tightening bands of rolls simultaneously and equally, comprising in combination a rolling member, a plurality of bands, one end of each of which is fixed to said rolling member, said bands extending from the latter toward opposite sides of said rolling member, guide rolls over which said bands are led, equalizing rolls adjacent said guide rolls, independent bands connecting said guide rolls with said equalizing rolls, and means to bring said equalizing rolls near together for the purpose of tightening said first mentioned bands.

3. A device for tightening bands of rolls simultaneously and equally, comprising in combination a rolling member, a plurality of bands, one end of each of which is fixed to said rolling member, said bands extending from the latter toward opposite sides of said rolling member, guide rolls over which said bands are led and to which said bands are attached at their opposite ends, equalizing rolls adjacent said guide rolls, means connecting said guide rolls with said equalizing rolls, and means to bring said equalizing rolls nearer together for the purpose of tightening said bands.

4. A device for tightening bands of rolls simultaneously and equally, comprising in combination a rolling member, a plurality of bands, one end of each of which is fixed to said rolling member, said bands extending

from the latter toward opposite sides of said rolling member, guide rolls over which said bands are led and to which said bands are attached at their opposite ends, equalizing rolls adjacent said guide rolls, independent bands attached to said guide rolls and connected to said equalizing rolls, and means to bring said equalizing rolls nearer together for the purpose of tightening said first mentioned bands.

5. A device for tightening bands of rolls simultaneously and equally, comprising in combination a rolling member, a plurality of bands, one end of each of which is fixed to said rolling member, said bands extending from the latter toward opposite sides of said rolling member, guide rolls over which said bands are led and to which said bands are attached at their opposite ends, equalizing rolls adjacent said guide rolls, independent bands attached to said guide rolls and extending to opposite sides of said equalizing rolls, and means to bring said equalizing rolls nearer together for the purpose of tightening said bands.

6. A device for tightening bands of rolls simultaneously and equally, comprising a rolling member, a plurality of bands one end of each of which is fixed to said rolling member, said bands extending from the latter toward opposite sides, rolls over which said bands are led, equalizing bands connected to said rolls, bearing members to which the opposite ends of said equalizing bands are operatively connected, and means to bring said bearing members nearer to each other for the purpose of tightening the bands.

7. A device for tightening bands of rolls simultaneously and equally, comprising a rolling member, a plurality of bands one end of each of which is fixed to said rolling member, said bands extending from the latter toward opposite sides, guide rollers over each of which one band is led, equalizing members having equalizing bands attached thereto, the opposite ends of said equalizing bands being attached to said guide rolls, bearing members carrying said equalizing members, and means to bring said equalizing members nearer to each other for the purpose of tightening the bands.

8. A device for tightening bands of rolls simultaneously and equally, comprising a rolling segment, two bands one end of each of which is fixed to said rolling member and extending along its rolling face in one direction, two bands, one end of each of which is fixed to said rolling member and extending along its rolling face in the opposite direction, guide rolls over each of which one of said bands is led, equalizing rolls to each of which the ends of equalizing bands are fixed, the opposite ends of said equalizing bands being attached to said guide rolls, bearing members on which said equalizing rolls are rotatably mounted, and means to bring said equalizing rolls nearer to each other for the purpose of tightening the bands.

9. A device for tightening bands of rolls simultaneously and equally, comprising a rolling segment, two bands one end of each of which is fixed to said rolling member, said bands extending along its rolling face in one direction, two bands one end of each of which is fixed to said rolling member, said bands extending along its rolling face in the opposite direction, guide rolls over each of which one of said bands is led, equalizing rolls having equalizing bands attached thereto to each of which the ends of two equalizing bands are fixed which ends engage the equalizing roll in opposite directions, the opposite ends of said equalizing bands being attached to said guide rolls, bearing members on which said equalizing rolls are rotatably mounted, and means to bring said equalizing rolls nearer to each other for the purpose of tightening the bands.

10. A device for tightening bands of rolls simultaneously and equally, comprising a rolling segment, two bands one end of each of which is fixed to said rolling member, said bands extending along its rolling face in one direction, two bands one end of each of which is fixed to said rolling member, said bands extending along its rolling face in the opposite direction, guide rolls over each of which one of said bands is led, equalizing rolls to each of which the ends of two equalizing bands are fixed which ends engage the equalizing roll in opposite directions, the opposite ends of said equalizing bands being attached to said guide rolls, bearing members on which said equalizing rolls are rotatably mounted, said bearing members being fitted with internal screw threads, a worm-wheel engaging a worm and fitted with an axle the ends of which are provided with left and right-handed screw-threads co-acting with the internal screw-threads whereby said equalizing members are brought nearer to each other for the purpose of tightening the bands by rotation of said worm and worm wheel.

In testimony that we claim the foregoing as our invention, we have signed our names.

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EMIL BUCHTER.