

June 29, 1965

T. WOZAR

3,191,469

TAILSTOCK CENTRE APPARATUS WITH A PRESSURE INDICATOR

Filed July 16, 1962

2 Sheets-Sheet 1

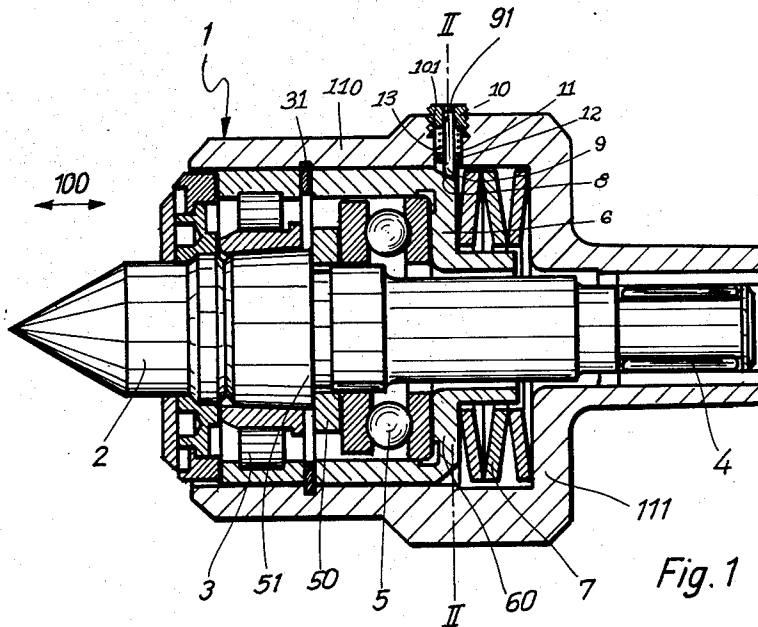
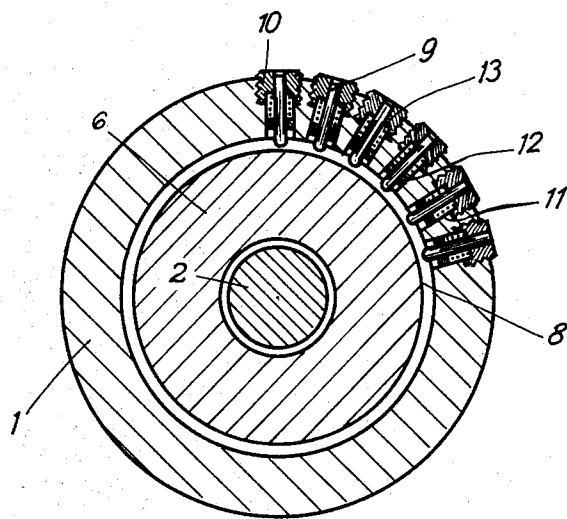


Fig. 2

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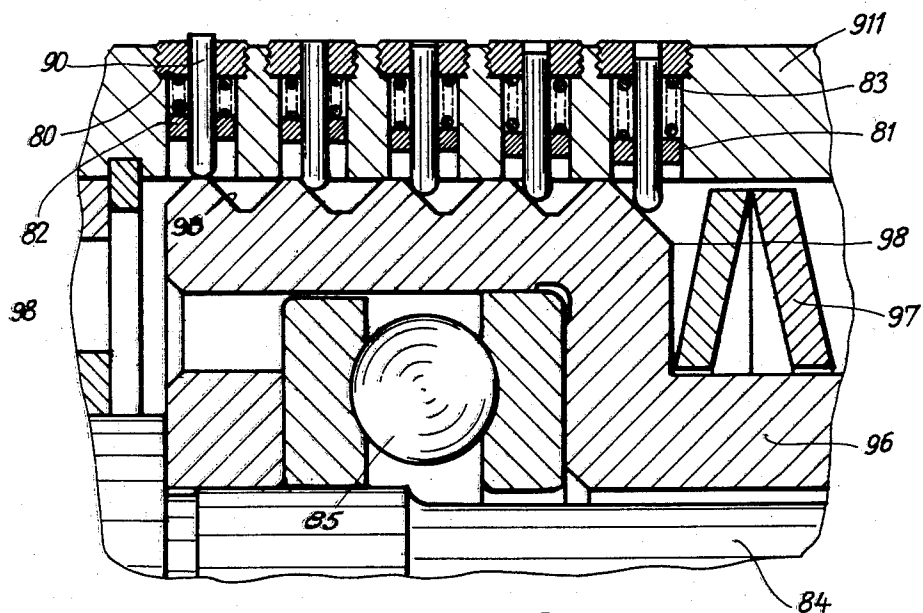


Fig. 3

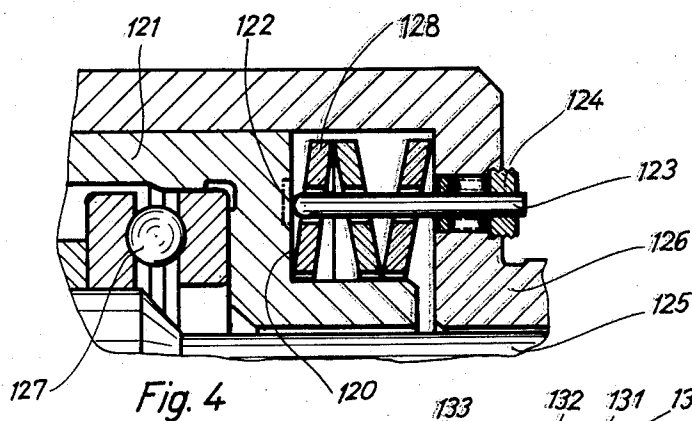


Fig. 4

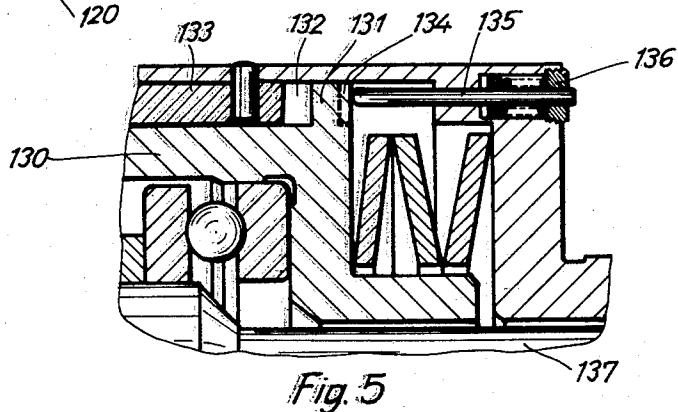


Fig. 5

1

3,191,469

TAILSTOCK CENTRE APPARATUS WITH A PRESSURE INDICATOR

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The invention refers to a tailstock centre apparatus and more particularly to a tailstock centre apparatus having a pressure indicator.

There are known indicating devices for centre apparatus of the above kind. However, these indicating devices are situated on the exterior of the centre housing so as to constitute an impediment for the operator and to be exposed to damages. Other known indicating devices of the kind in question present the draw-back of being not sufficiently exact due to the fact that the axial displacements of the centre are very small, and of it being very difficult to be protected against dirt, oil, and the like.

It is, therefore, the main object of this invention to provide an apparatus of the above described kind in which the indicating device does not substantially project beyond the peripheral surface of the housing.

Another object of the invention is to provide an apparatus of the general character described which is reliable in service and can not be affected by dirt or the like.

A further object of the invention consists in to provide an apparatus of the aforesaid kind with which boring water or borings can not penetrate into its interior.

Still another object of the invention is to provide an apparatus of the above described character with which the pressure indications can be ascertained with the operator in any position, even with an unskilled operator and even with operators having visual defects.

Yet another object of the invention is to provide an apparatus of the above kind with which even smallest indications can be determined with greatest accuracy.

A further object of the invention consists in to provide an apparatus of the above kind with which the pressure indications can be determined visually and—firstly—by touch.

Yet another object of the invention consists in to provide a device of the general character described having a pressure transmitting sleeve and an operating surface on the periphery of said sleeve and having at least one pin slidably lodged in the centre house and the free interior end of which bears against, and cooperates with, said operating surface on said sleeve, whereby upon axial displacement of said centre said pin is urged in outward direction by said operating surface and whereby upon the pressure exerted upon said centre reaching a predetermined value the outer front end of said pin is brought to lie flush with the surrounding outer surface on said housing.

These and other objects, features, and advantages of the present invention will become further apparent from the following detailed description thereof.

Several embodiments of the invention are illustrated, by way of example, in the drawings, in which:

FIG. 1 is a longitudinal sectional view of a resilient tailstock centre according to the invention,

FIG. 2 is a cross-sectional view of the tailstock centre according to FIG. 1 taken along line II—II of FIG. 1,

FIG. 3 is an enlarged longitudinal sectional partial view of an alternative embodiment of the invention,

FIG. 4 is a partial longitudinal sectional view of a further embodiment of the invention, and

2

FIG. 5 is a partial longitudinal sectional view of another embodiment of the invention.

The tailstock centre shown in FIG. 1 contains a cup-like shaped centre housing 1 having a horizontally extending side wall 110 and an inwardly extending bottom wall 111, and a centre 2 which is supported and guided in the said housing by means of the front radial bearing 3, the rear radial bearing 4, and a thrust bearing 5. In the housing there is also accommodated a pressure transmitting sleeve 6 having on its periphery a bevelled operating surface 8 constituting a truncated cone tapering towards the side remote from the work piece. The arrangement is such that the thrust bearing 5 bears on its front side facing the work piece through the medium of the annulus 50 against a shoulder 51 of the centre 2 and on its rear side remote from the work piece against the front side facing the work piece of the inwardly extending wall 60 of the sleeve 6, the opposite side of said wall enclosing together with the front side of the bottom wall 111 of said centre casing plate springs or Belleville spring washers 7. The centre 2, the sleeve 6, and the housing 1 are co-axial. The pressure transmitting sleeve 6—which on its fore margin bears against the spring ring 31—participates in the longitudinal motion of the centre 2 in direction of the arrow 100 which longitudinal motion is caused by the pressure exerted onto the centre 2 upon chucking the work piece and during machining the same. This motion of the sleeve 6 is transmitted via the operating surface 8 to a pin 9 regardless of whether the centre rotates or not during this motion transmitting operation, said pin being supported in the housing 1 so as to be radially slidable therein.

The pin 9 is directed radially to the sleeve and resiliently bears with its inner end—which conveniently may be rounded off—against the conical operating surface 8 of the pressure transmitting sleeve 6. To this purpose, the pin 9 is mounted in a guide bushing 10 so as to be radially slidable therein, the said bushing 10 being screwed more or less deep into a through-hole 11 in the side wall 110 of the said housing. Because of this screw connection the bushing is adjustable within its through-hole. The pin 9 being provided with a guide-disk or shoulder 12 projecting radially to the pin, it is possible for the spring 13 which on its end remote of the centre bears against an inwardly projecting wall 101 of the bushing 10 to bear with its other end against the shoulder or guide-disk 12 of the pin 9 thereby tending to urge this latter towards the interior of the said housing 1 and towards the operating surface 8 of the sleeve 6. Upon longitudinal movement of the centre 2 away from the work piece, the operating surface 8 of the sleeve 6 co-acts with the inner end of the said pin 9 so that this latter is moved to a smaller or greater extent in outward direction. The arrangement is thereby such that when the pressure actually exerted by the work piece onto the centre reaches and has a certain predetermined magnitude, the flat outer end surface 91 of the outer end of the pin 9 lies flush with the surrounding surface of the centre housing 1 and the ring shaped flat end surface of the guide bushing 10. This position of the pin 9 with its outer end surface lying flush with the surrounding surface can be very easily and exactly ascertained by touch and also optically, especially with a certain angle of incidence of the light. In this way, the pressure exerted upon the centre at a certain moment can be exactly controlled.

In an embodiment not shown in the drawings, in the housing 1 there is accommodated a sole pin 9 cooperating with the sleeve 6. In this case, a sole pressure value can be controlled with this centre.

3

As shown in FIG. 2, it is possible without any difficulty to provide several pins 9 within the housing 1 and to arrange these pins so as to lie in spaced side by side relationship on the periphery of the housing 1. It is thereby possible to give the individual pins 9 different lengths in such a manner that the outer ends of the individual pins 9 lie each at different pressures flush with the ring-like outer front surface of the corresponding guide bushing 10, there being allotted to each of said pins a predetermined pressure value. Each of said guide bushings 10 may be provided with a mark or a registration indicating the exact value of the pressure allotted to the respective guide bushing. With a certain pressure, only a sole pin 9 lies flush with the front surface of the corresponding bushing, this pin 9 thereby indicating in that moment the exact value of the pressure actually exerted in that moment upon the centre in question. In that moment, the outer front ends of the pins 9 of the above described series of pins which are allotted to a pressure greater than the pressure actually exerted upon the centre lie below the outer front surface of the respective guide bushing, whereas the outer front ends of the pins allotted to a pressure lower than the pressure actually exerted project beyond the outer front surface of the guide bushings. However, the pin movements caused by these pressure variations are so small that the outwardly projecting ends of the pins do not constitute any hindrance for the operator.

The above described effect can be obtained, as already said, by making the individual pins of different length. However, this effect can be also obtained by screwing the guide bushings 10 more or less deep into the housing or by combining these two measures namely variations in the length of the pins and variations in the depth of the bushing. Another possibility for adjusting the pressure value consists in to vary the spring force.

With the embodiment according to FIG. 3, the individual pins 90 are arranged so as to be spaced from one another in longitudinal direction of the centre housing 91. The pressure transmitting sleeve 96 has several oblique operating surfaces 98 situated one behind the other as viewed in longitudinal direction of the centre. Thereby, these oblique operating surfaces can be so shaped as to constitute a portion of a correspondingly designed groove. The succession of the different pins 90 and the succession of the different operating surfaces are related to one another in like manner as are the graduations on a vernier scale with those on the main scale, i.e. the distances between the successive operating surfaces are somewhat displaced with respect to the distances between the successive pins so that the individual pins 90 run successively—and not simultaneously—onto the respective operating surface allotted thereto, thereby showing and indicating the respective centre pressure. In this case also the arrangement may be such that only one pin 90 indicates the corresponding pressure at a time, whereas the other pins 9 have not yet reached their "flushing position" or have already passed the bushing 10. As in the previously described embodiments of the invention, the pins are slidably accommodated in guide bushings 80 within the holes 81 and provided with annular projections 82 which are under the influence of springs 83. A thrust bearing for supporting the centre 84 is shown at 85. The pressure transmitting sleeve 96 is under the influence of the Belleville spring 97.

In the embodiment according to FIG. 4, the operating surface 122 is provided on the outer front face 120 of the pressure transmitting sleeve 121, whereby a sole pin 123 or several pins are accommodated in guide bushings 124 in the housing 126 and extending longitudinally to the centre 125. The thrust bearing supporting the centre 125 is shown at 127. In the case of several pins 123 these pins are arranged along a curve on the outer front end of the housing 126. In this case, the pins 123 penetrate axially through the Belleville springs 128.

4

A further embodiment of the invention is shown in FIG. 5. In this case, the pressure transmitting sleeve 130 has a radial projection 131 lodged within the recess 132 of the housing 133, this projection presenting on its side turned away from the work piece an operating surface 134 which cooperates with the pins 135 slidably arranged in the guide bushings 136. Pins and guide bushings extend thereby longitudinally to the housing 133 of the centre 137.

Although my invention has been illustrated and described with reference to the preferred embodiments thereof I wish to have it understood that it is in no way limited to the details of such embodiments, but is capable of numerous modifications within the scope of the appended claims.

Having thus fully disclosed my invention, what I claim is:

1. A tailstock centre apparatus comprising in combination a centre means extending centrally and longitudinally of the apparatus; a sleeve means co-axial with and surrounding, said centre means, and having a radially extending wall portion, said centre means being supported for rotary movement within said sleeve means, said centre means and said sleeve means being interconnected for resilient to and fro movement in the axial direction; a hollow housing co-axial with, and surrounding, said sleeve means and having a radially extending wall portion opposite said radially extending wall portion of said sleeve means, said sleeve means and said centre means being axially displaceable within said housing; resilient means resiliently acting in the axial direction and interposed between said radially extending wall portions of said sleeve means and said housing; at least one through-bore in said housing extending from the outside to the interior thereof; an operating surface on said pressure transmitting sleeve; a pin having an inner and outer end and received in said through-bore for slidable to and fro movement; the inner end of said pin bearing against, and cooperating with, said operating surface, whereby upon an axial movement of said centre taking place under the influence of pressure exerted by the work-piece upon said centre a movement of said pin relative to its respective through-bore is caused to take place, said pin being of such length that upon the pressure exerted by the work-piece upon said centre reaching a predetermined value the outer front end of the pin lies flush with the outer surface of said housing surrounding said pin.

2. The tailstock centre apparatus set forth in claim 1, in which said operating surface is on the periphery of said pressure transmitting sleeve and constitutes a bevelled surface tapering towards the side turned away from the work piece.

3. The tailstock centre apparatus set forth in claim 2, wherein several pins and through-bores are provided, in co-operative relationship with said operating surface, each of said pins being allotted to a predetermined pressure value, whereby upon the pressure exerted by the work-piece reaching successively one of said predetermined pressure values only one of said pins namely the pin allotted to the respective pressure value is so moved as to bring its outer front end to lie flush with said outer surface of said housing surrounding said pin.

4. The tailstock centre apparatus set forth in claim 3, wherein said operating surface cooperating with said several pins runs around the periphery of said pressure transmitting sleeve and constitutes the periphery of a truncated cone tapering towards the side turned away from the work piece.

5. The tailstock centre apparatus set forth in claim 4, wherein said several pins and through-bores are spacedly arranged along the periphery of said housing in a radial plane.

6. The tailstock centre apparatus set forth in claim 3, wherein said several pins and through-bores are arranged on said housing so as to be interspaced in axial and longi-

5

tudinal direction, said pressure transmitting sleeve being provided with several operating surfaces arranged so as to be interspaced in axial and longitudinal direction and corresponding in number to said several pins, the succession of said different pins and the succession of said different operating surfaces being related to one another in like manner as are the graduations on a vernier scale with those on the main scale, the distances between the successive operating surfaces being somewhat displaced with respect to the distances between the successive pins.

7. The tailstock centre apparatus set forth in claim 3, wherein said several pins are of different length.

8. The tailstock centre apparatus set forth in claim 1, wherein said pin is accommodated within a guide bushing fixedly arranged in said through-bore in said housing, whereby upon the pressure exerted upon said centre reaching a predetermined value the outer front end of said pin lies flush with the outer front surface of said bushing.

9. The tailstock centre apparatus set forth in claim 1,

6

wherein said counter-bore extends axially with respect to said centre, said through-bore being located in the rear wall of said housing.

10 19. The tailstock centre apparatus set forth in claim 9, wherein said operating surface is provided on the rear face of said sleeve facing said rear wall of said housing receiving said pin.

11. The tailstock centre apparatus set forth in claim 9, wherein said operating surface is provided on a collar-like radial projection of said pressure transmitting sleeve.

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20 WILLIAM W. DYER, JR., *Primary Examiner.*