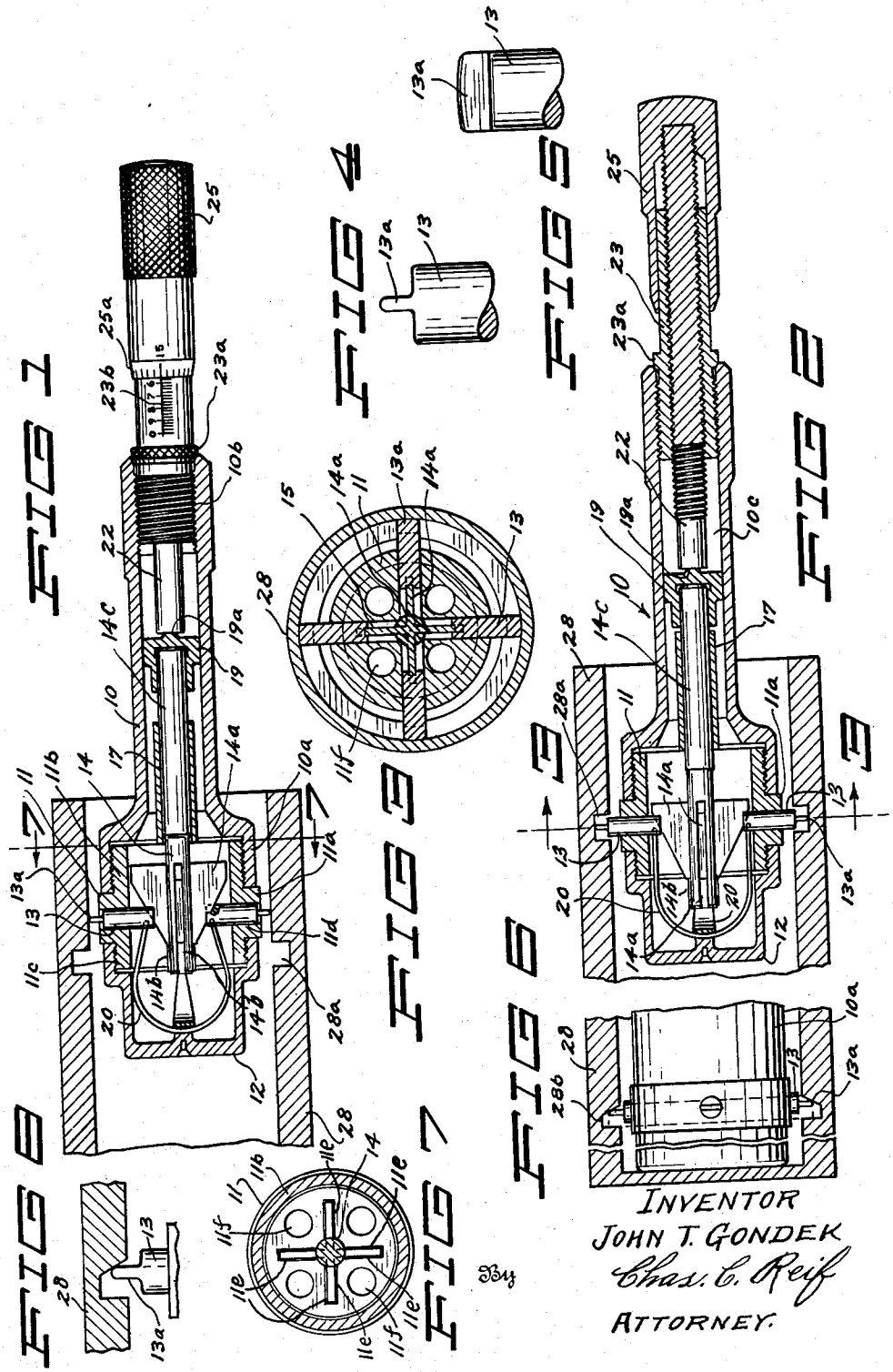
May 25, 1954 J. T. GONDEK 2,679,107

MICROMETER FOR CIRCULAR SIZE, ESPECIALLY OF GROOVES

Filed June 19, 1950



Patented May 25, 1954

2,679,107

UNITED STATES PATENT OFFICE

2,679,107

MICROMETER FOR CIRCULAR SIZE, ESPECIALLY OF GROOVES

John T. Gondek, Minneapolis, Minn., assignor to Northern Pump Company, Minneapolis, Minn., a corporation of Minnesota

Application June 19, 1950, Serial No. 169,014

3 Claims. (Cl. 33—178)

1

This invention relates to a micrometer structure and particularly to a micrometer for measuring cylindrical surfaces such as the walls of bores. There are at present micrometers on the market which are constructed for measuring concave cylindrical surfaces. Such micrometers comprise radially movable pins adapted to engage such cylindrical surfaces. Said pins however have a very small amount of radial movement and are not suitable for measuring depressions such as grooves on the surfaces of cylindrical bores.

It is an object of this invention to provide a micrometer having radially movable pins which are guided in apertures in a casing and are arranged for quite a long range of movement.

It is another object of the invention to provide a micrometer structure comprising a substantially cylindrical casing having a plurality of circumferentially spaced apertures therethrough, a plurality of radially movable pins disposed respectively in said apertures and a member in said casing movable longitudinally thereof having a plurality of circumferentially spaced portions having outer surfaces inclined at an angle to the radii of said pins respectively, said pins having slots in their inner ends receiving said portions, the bottoms of said slots respectively engaging said surfaces, said pins being adapted to be moved outwardly by longitudinal movement of said member.

It is also an object of the invention to provide such a structure as set forth in the preceding paragraph, together with resilient means urging said pins inwardly.

It is still another object of the invention to provide a micrometer structure comprising a casing of general cylindrical form having a plurality of circumferentially spaced apertures therethrough, the axes of which extend radially respectively of said casing, a plurality of pins movable in said apertures respectively, a member in said casing having circumferentially spaced radial slots therein, and a member having a plurality of circumferentially spaced radially extending ribs disposed respectively in said slots, said pins engaging said ribs, and being moved outwardly by said ribs, said pins having outer terminal portions of reduced diameter, the outer surfaces of which are preferably semi-cylindrical in form.

It is more specifically an object of the invention to provide a micrometer structure comprising a casing of general cylindrical form having a plurality of circumferentially spaced holes therethrough and having circumferentially spaced

2

slots extending longitudinally thereof, a plurality of pins fitting in and movable in said holes respectively, said pins being disposed radially of said casing, a member for moving said pins outwardly having circumferentially spaced ribs with outer sides disposed at an angle to the radii of said pins respectively, said ribs being movable in said slots, the inner ends of said pins having interfitting engagement with said ribs, the inner ends of said pins preferably having slots therein, the bottoms of which engage the outer surfaces of said ribs, together with means for moving said pins inwardly.

These and other objects and advantages of the invention will be fully set forth in the following description made in connection with the accompanying drawings in which like reference characters refer to similar parts throughout the several views and in which:

Fig. 1 is a view of the device mostly in central longitudinal section and partly in side elevation, also showing a member to be measured;

Fig. 2 is a view similar to Fig. 1 showing the parts in different positions;

Fig. 3 is a vertical section taken on line 3—3 of Fig. 2, as indicated by the arrows;

Fig. 4 is a partial view showing one end of one of the pins used;

Fig. 5 is a view similar to Fig. 4, as seen from the right of Fig. 4;

Fig. 6 is a partial view in side elevation showing one use of the device in a member shown in central vertical section;

Fig. 7 is a vertical section taken on line 7—7 of Fig. 1 and shown on a reduced scale; and

Fig. 8 is a partial view similar to Fig. 6 shown on an enlarged scale.

Referring to the drawing, a micrometer structure is shown comprising a casing 10. Casing 10 is preferably of general cylindrical form and has an enlarged interiorly threaded end portion 10a. Member 10 is also interiorly threaded at its other end portion 10b, said latter portion being shown as of somewhat increased exterior diameter. A member 11 is provided having a central annular portion 11a and reduced exteriorly threaded end portions 11b and 11c. End portion 11b is threaded into the end of portion 10a, the end of portion 10a engaging portion 11a. An end member 12 has an enlarged interiorly threaded end portion which is threaded on portion 11c and the end of which engages portion 11a. Member 11 is closed at its other end. Member 11 is provided in its portion 11a with a plurality of circumferentially spaced apertures, bores or holes

11d and while these might be variously formed, they are preferably cylindrical. In the embodiment of the invention illustrated, four of these holes are shown, opposite pairs being coaxial with the axes of said pairs disposed at right angles. Member 11 is also provided with circumferentially spaced slots 11e equal in number to the number of holes 11d, which slots extend longitudinally of member 11 and the axes of holes 11d lie in the central planes of slots 11e. Member 11 is shown as having circumferentially spaced longitudinally extending holes 11f, for reducing the weight of member 11. Pins 13 fit in and are movable respectively in the holes 11d. While these pins could be variously formed, in the embodiment of the invention illustrated they are shown as having terminal ribs 13a at their outer ends which extend thereacross, said ribs having their outer ends of semi-circular form in cross section. A member 14 of cylindrical rod-like form is provided which has extending therefrom adjacent one end a plurality of circumferentially spaced flat ribs 14a disposed at right angles to each other and disposed in and movable in the slots 11e of member 11. As shown in Figs. 1 and 2, the rear ends of ribs 14a extend substantially at right angles to the axis of member 14 while the outer sides of said ribs for most of their length have outer flat surfaces disposed at an acute angle to the axis of member 14 and to the axes of the pins 13. Said ribs have front portions 14b extending substantially parallel to the axis of member 14. Member 14 is disposed coaxially of casing 10 and is longitudinally movable in casing 10 and in member 11, said member having a slightly enlarged rear portion 14c which is slidable in a sleeve 17 secured in casing 10. The end portion of member 14 fits in and is held in a member 19 which is provided with a cylindrical portion fitting in and slidable in the bore 10c in one end of casing 10. The pins 13 have interfitting engagement with the ribs 14a, the pins being shown as having slots at their inner ends having parallel sides and a bottom at right angles thereto, as clearly shown in Fig. 3. Said slots have bottoms extending at an angle to the radii respectively of pins 13, said bottoms engaging and riding on the inclined outer sides of ribs 14a. Ribs 14a are substantially rectangular in radial section, as clearly shown in Figs. 3 and 7. The angle said bottoms make with the axes of said pins is substantially equal to the angle which the inclined sides of the ribs make with the axes of said pins. The pairs of pins on opposite sides of casing 10 have transverse slots adjacent their inner ends in which are disposed the ends of bow spring members 20 disposed at right angles to each other. Members 20 are disposed in members 11 and 12, one of them having its bight portion disposed inwardly of the other and engaging said other, the other spring engaging a lug projecting inwardly from the closed end of member 12. Springs 20 are widest at their mid-portions and taper in width toward their ends, the end portions thereof having parallel sides. It will be seen that springs 20 tend to move pins 13 inwardly.

Member 19 has a small central projection 19a which is engaged by one end of a screw 22 which is threaded into a member 23 in turn threaded into portion 10b of casing 10. Member 23 has an enlarged portion 23a knurled on its outer surface which is in substantial engagement with the end of member 10. Member 23 has an outer smooth cylindrical portion on which a member 25 fits and is rotatable. Screw 22 is secured at its outer end to member 25 by being threaded therein. The smooth portion of member 23 is provided with graduations 23b spaced longitudinally thereof and which are appropriately numbered. The inner end of member 25 is beveled and its beveled surface is provided with circumferentially spaced graduations 25a adapted to cooperate with graduations 23b and with a longitudinal line extending longitudinally of member 23. The graduations 25a are appropriately numbered.

In operation, when it is desired to measure the interior of a bore or a concave cylindrical surface, member 25 will be rotated and this will move screw 22 longitudinally. Screw 22 engages member 19 and member 19 together with member 14 is moved longitudinally of casing 10. The outer surfaces of ribs 14a engage the bottoms of the slots in pins 13 and said pins are moved outwardly until their terminals engage the surface to be measured. The ribs 14a and thus member 14 are guided by the slots in the ends of pins 13. The dimension can then be read on the graduations 23b and 25a. When member 25 is rotated in the opposite direction, member 22 will be moved toward member 23 and the springs 20 will then move the pins 13 inwardly as permitted by the ribs 14a. It is now common to have annular grooves in bores such as shown by the grooves 26a in the member 26. Such grooves are commonly used to receive O-rings now used in large numbers for sealing purposes or to receive snap ring fasteners. O-rings are now well known in the art and are shown in U. S. Patent No. 2,394,364. The portions 13a on the pins 13 are very well suited for measuring the diameter of the grooves 26a, as shown in Fig. 2. In some cases the grooves are narrow so that only portions 13a can enter the same. It is common to have grooves, such as shown at 26b in member 26, as shown in Fig. 2, which grooves 26b are of trapezoidal form in cross section. These grooves have to be very accurately made and it has heretofore been difficult to accurately locate and finish the same. With the present mircrometer the inclined side of the groove can be engaged by the semi-circular surface on portions 13a, as shown in Figs. 6 and 8, and the inclined side can thus be finished to properly receive a snap ring which has an inclined side engaging the inclined side of the groove. The end of member 10 will be placed in contact with one end of the bore 26, as shown in Fig. 6. The proper finishing of the groove is made much easier since fewer dimensions are necessary. The semi-circular surface of the portions 13a will engage the inclined side of the groove at a point equal to the diameter of the sealing ring. The angle of the inclined side of the groove is known and the diameter of the semi-circular surface on portion 13a is known as is the distance of the pins 13 from the end of bore 26 so that the inclined side can thus be accurately measured and finished.

The disclosed structure of micrometer has several advantages over the standard structures now on the market. The pins 13 are engaged at spaced points. They are held at their inner ends by the engagement of the grooves therein with the ribs 14a and are guided accurately in the holes in casing 11a. With the described struc-

ture a large range of movement is possible for the pins 13. In the present standard micrometers the range of movement is very small. The bores or holes 11*d* have considerable length and a long bearing surface is provided for pins 13 which results in great accuracy.

From the above description it will be seen that I have provided a novel structure of micrometer and one which performs new functions and attains new results. The structure is comparatively simple and is easily operated. The device has been amply demonstrated in actual practice and found to be very successful and efficient.

It will of course be understood that various changes may be made in the form, details, arrangement and proportions of the parts, without departing from the scope of applicant's invention, which generally stated, consists in a device capable of carrying out the objects above set forth, in the parts and combinations of parts disclosed and defined in the appended claims.

What is claimed is:

1. A micrometer structure having in combination, a casing having a central longitudinal axis and three or more substantially equally and circumferentially spaced apertures extending radially therethrough, a cylindrical pin fitting in and movable radially of said casing in each of said apertures, each of said pins having a groove in its inner end extending transversely thereof, a wedge member having circumferentially spaced ribs with flat outer surfaces extending at an acute angle to said axis, said ribs fitting in said grooves in the bottoms of said pins respectively, said ribs being slidable in said grooves so that the bottoms of said grooves bear on said outer surfaces of said ribs and the sides of said grooves engage the sides of said ribs, means for moving said wedge member longitudinally of said axis, and resilient means for moving said pins inwardly and holding the same against said ribs.

2. The structure set forth in claim 1, said casing being substantially cylindrical in form and having a closed chamber therein extending in front of and enclosing said wedge member.

3. A micrometer structure having in combination, a casing of general cylindrical form thus having a central longitudinal axis, said casing having four circumferentially and substantially equally spaced cylindrical apertures extending radially therethrough, a cylindrical pin movable radially in and fitting in each of said apertures, said pins being disposed and movable solely in said casing, a member movable in said casing longitudinally thereof having four circumferentially and substantially equally spaced ribs with flat outer sides inclined at an acute angle to said axis, said ribs having sides at right angles to said outer sides, the inner ends of said pins having slots in the bottoms thereof shaped to fit over said ribs with the bottoms of said slots bearing on said outer surfaces of said ribs, means for moving said member longitudinally of said casing, and resilient means engaging said pins for moving the same inwardly, said pins having narrow ribs extending from their outer ends centrally thereof having outer convex surfaces whereby said last mentioned ribs can engage circumferentially spaced points of a cylindrical surface.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
536,676	Wilcox	Apr. 2, 1895
691,682	Weimar	Jan. 21, 1902
794,094	Glover	July 4, 1905
1,760,717	Peglow	May 27, 1930
2,135,912	Rae	Nov. 8, 1938
2,591,452	Maag	Apr. 1, 1952

FOREIGN PATENTS

Number	Country	Date
336,996	Germany	May 21, 1921
524,392	France	Sept. 2, 1921
372,013	Germany	Mar. 23, 1923
738,834	France	Dec. 30, 1932
208,011	Switzerland	Mar. 16, 1940
612,457	Great Britain	Nov. 12, 1948