March 18, 1941. H. R. SIMONDS 2,235,730

CENTERING DEVICE

Filed Oct. 17, 1940

Fig.1

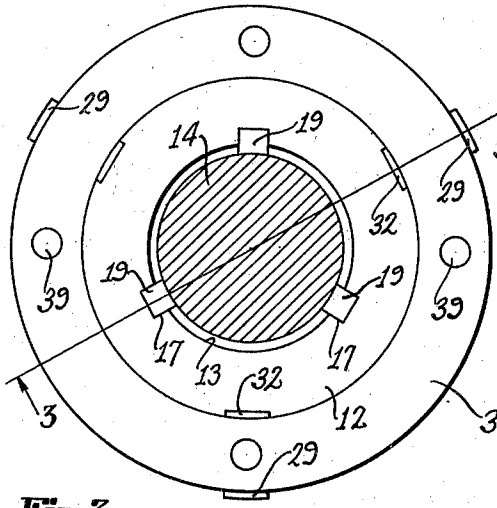


Fig.2

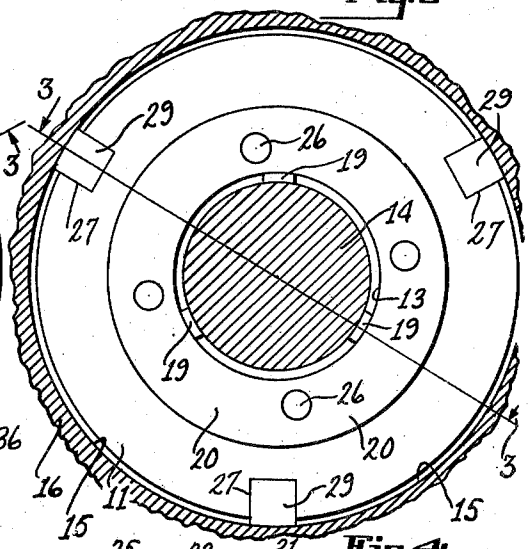


Fig.3

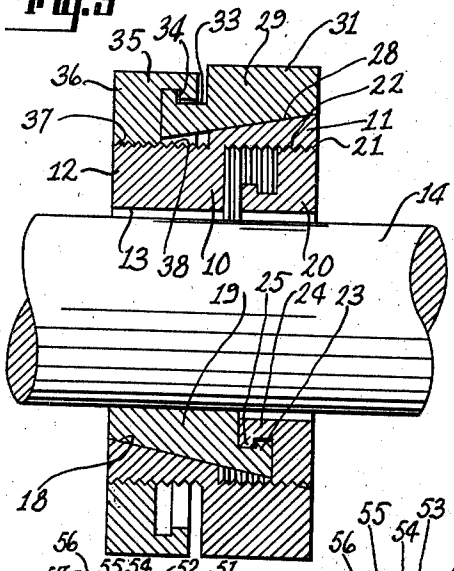


Fig.4

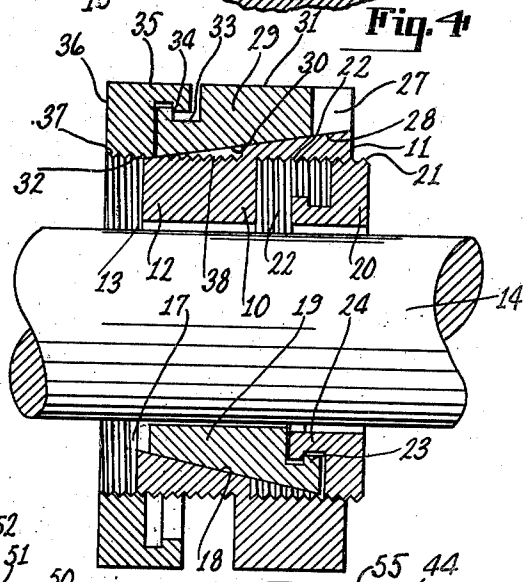


Fig.5

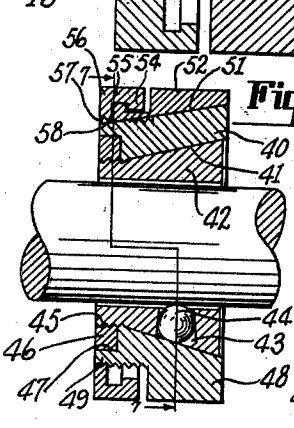


Fig.6

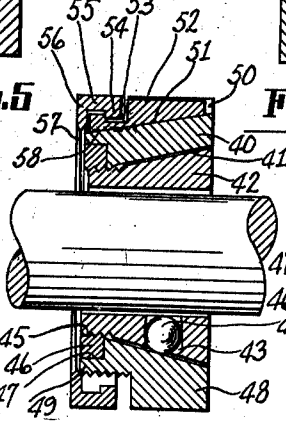
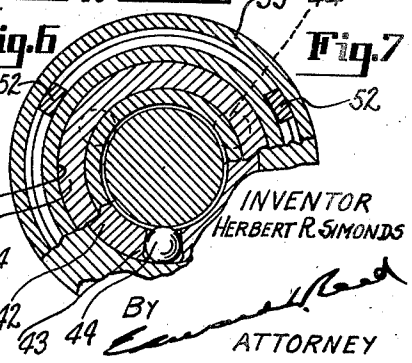


Fig.7



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CENTERING DEVICE

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13 Claims. (Cl. 51—163)

This invention relates to a centering device and more particularly to a device for centering a rotatable member, such as a grinding wheel, on its supporting shaft.

It is of major importance that a grinding wheel shall be accurately balanced about the axis of its supporting shaft. Such a grinding wheel is accurately balanced about its true axis by the manufacturer but to retain this balance in operation it must be accurately centered on its shaft. When the opening in the grinding wheel is larger than the shaft difficulty is often experienced in properly centering the same and one object of the invention is to provide means whereby a grinding wheel or the like may be easily and positively centered on its shaft, so that it will be in perfect balance.

A further object of the invention is to provide a centering device of strong durable construction which will rigidly connect the grinding wheel to its shaft in centered relation thereto.

A further object of the invention is to provide such a centering device which will be of simple construction and can be produced at a low cost.

Other objects of the invention may appear as the device is described in detail.

In the accompanying drawing Fig. 1 is an elevation of one end of a centering device embodying my invention; Fig. 2 is an elevation of the other end of such a centering device showing a portion of a grinding wheel mounted thereon; Fig. 3 is a section taken on the line 3—3 of Fig. 1, showing the device in its operative position; Fig. 4 is a similar view showing the device in its inoperative position; Fig. 5 is a sectional view taken centrally through a modified form of the invention, showing the same in its operative position; Fig. 6 is a similar section showing the device in its inoperative position; and Fig. 7 is a section taken on the line 7—7 of Fig. 5, looking in the direction of the arrows.

In this drawing I have illustrated one embodiment of my invention, together with a minor modification thereof, and have shown the same as designed for use with grinding wheels. It will be understood, however, that the invention may take various forms and may be used for various purposes.

In its preferred construction the centering device comprises a body portion which is provided with an axial opening, or bore, to receive the shaft and is adapted to extend into the axial opening in the grinding wheel or other element which is to be mounted on the shaft. Centering elements are interposed between the body member and the shaft and between the body member and the grinding wheel and are operable to center the device with relation to the shaft and to center the grinding wheel with relation to the device, and to rigidly secure the grinding wheel to the shaft in its centered and balanced position.

In that embodiment illustrated in Figs. 1 to 4 the body member 10 has its end portions of different diameters, the larger end portion 11 having in the present instance an internal diameter approximately equal to the external diameter of the smaller end portion 12. The body member is provided with a longitudinal bore 13 to receive a shaft 14, and the larger portion 11 of the body member is adapted to extend into the central opening 15 of the grinding wheel 16, a portion of which is shown in Fig. 2. The centering elements may take various forms and may be actuated in various manners but as shown in these figures the wall of the bore 13 is provided with a plurality of longitudinal slots 17, preferably three in number and spaced equal distances about the bore. The outer wall 18 of each of these slots is inclined with relation to the axis of the device and preferably slopes outwardly and toward the larger end of the body member. Slidably mounted in each of these slots is a centering element 19 which is here shown as tapered or wedge-shaped in form, the outer edge of the element being inclined to conform to the inclined surface of the slot in which it is mounted and the inner edge thereof being substantially parallel with the axis of the device and adapted to engage the shaft 14. Due to the sloping contact surfaces each centering element will be moved toward or from the shaft by the longitudinal movement of the centering element. Any suitable means may be provided for imparting this longitudinal or operative movement to the centering elements but preferably they are actuated in unison and are of such radial width and so arranged with relation to the body member that their contact with the shaft will accurately center the centering device as a whole with relation to that shaft. In the present instance, the actuating device is in the form of an annular member 20 mounted in the larger end portion of the body member and has its outer periphery screw threaded at 21 to engage internal screw threads 22 in the body member, so that the rotation of the actuating member will cause the same to be moved axially with relation to the body member. The connection between the actuating member and the several centering elements may take various forms

but, as here shown, each centering element has a portion of reduced width projecting beyond the slot 17 into the larger end portion of the body member and provided with an inwardly extending lug 23 which forms a recess between the same and the body of the centering element. The actuating member has its inner portion reduced, as shown at 24, and provided at its inner edge with an outwardly extending flange 25 which extends into the recesses in the several centering elements, so that longitudinal movement is imparted to the centering elements by the rotation of the actuating member. The screw threaded connection between the actuating member and the body member not only enables the centering elements to be forced into very firm clamping engagement with the shaft but due to the low pitch of the threads the centering elements are positively retained in their clamping positions and the centering device is thus firmly secured to the shaft for rotation therewith. The actuating member 20 may be rotated in any suitable manner and it as here shown is provided in its outer face with a series of recesses 26 adapted to receive a spanner wrench or other implement by means of which the actuating member may be rotated.

The larger end portion 11 of the body member is provided in its periphery with longitudinal slots 27 the inner walls 28 of which are inclined and slope inwardly toward the smaller end of the body member. There may be any suitable number of these slots and, in the present instance, I have shown three, spaced substantially equal distances about the periphery of the body member. Slidably mounted in each slot is a centering element 29 the inner surface 30 of which is inclined to correspond to the inclination of the wall of the slot in which it is mounted and the outer surface 31 of which is substantially parallel with the axis of the centering device as a whole and is adapted to engage the inner wall of the opening 15 in the grinding wheel 16, as shown in Fig. 2. Each of the centering elements 29 extends beyond its slot 27 and overhangs the smaller portion 12 of the body member, the latter being in the present instance provided with shallow slots 32 to permit of the full retraction of the centering elements. Each centering element 29 has in its outer edge, adjacent the rear end thereof, a recess 33 adapted to receive a flange 34 on the overlapping portion 35 of an annular actuating member 36, which is provided with internal screw threads 37 to cooperate with external threads 38 on the smaller end portion of the body member, so that the rotation of the actuating member on the body member will impart longitudinal movement to the several centering elements 29 in unison, and when the actuating member is rotated in one direction the centering elements will be pressed into and retained in firm centering and clamping contact with the inner wall of the opening in the grinding wheel. The actuating member 36 is also, in the present instance, provided with openings 39 to receive a spanner wrench, or similar actuating implement.

In mounting the grinding wheel on the shaft the centering device is first placed upon the shaft and the inner group of centering elements 19 actuated to cause the centering device to be centered with relation to the shaft and to clamp the same firmly thereto. The grinding wheel is then placed about the periphery of the centering device and the outer group of centering elements 31 actuated to center the wheel with relation to the centering device and firmly clamp the same thereto.

In Figs. 5, 6 and 7, I have illustrated a modified form of the centering device which may be preferable in some instances, particularly for grinding wheels of a relatively small size. As there shown, the body member 40 is provided with a tapered bore 41 through which the shaft extends and mounted in this tapered bore is a substantially frusto-conical tubular member 42, the inclination of the outer wall of which conforms to the inclination of the tapered wall of the bore. This tubular member is provided with a plurality of openings 43 in which are movably mounted centering elements, here shown as balls 44. The balls are of a diameter slightly greater than the depth of the opening so that they may contact with the inclined surface of the bore and with the shaft. The openings 43 are of a width approximately equal to the diameter of the balls so that the latter will move with the tubular member and will be caused thereby to move over the inclined surface of the wall of the bore. The tubular member may be actuated in any suitable manner. In the present instance it has at its smaller end a threaded portion 45 on which is mounted an annular actuating member 46 which is seated in an annular recess 47 in the body member adjacent the smaller end of the tapered bore. Thus the rotation of the actuating member 46 will impart axial movement to the tubular member 42 and cause the centering elements or balls 44 to be wedged tightly between the wall of the bore and the shaft, thereby centering the device as a whole on the shaft and firmly securing it thereto. That portion of the body 40 adjacent the larger end of the tapered bore is of greater diameter than the opposite end portion 49 of the body and this larger portion 48 is provided with a series of peripheral slots 50, preferably three, the inner wall of each slot being inclined inwardly toward the smaller end of the tapered bore. Mounted in each of these slots is a centering element 52 having an inner inclined surface to conform to the slope of the wall of the slot and having one end projecting beyond the slot and provided in its outer edge with a recess 53 to receive an annular flange 54 on an inwardly extending portion 55 of an actuating member 56, which is provided with an internal thread 57 to engage threads 58 on the body member and thus move the several centering elements 52 into and out of their operative or centering positions. The actuating members 46 and 56 may be actuated in any suitable manner, as by providing them with recesses to receive a spanner wrench or other implement.

It will be apparent from the foregoing description that the centering device is simple of construction and easy of operation. It includes only a small number of parts and these parts are of such a character that they may be easily produced and will have ample strength and durability for their intended purposes. It will be understood that the device may be made in any suitable size, but in the present drawing both forms of the device are shown as of approximately twice the size of the actual devices.

While I have shown and described one embodiment of my invention, together with a minor modification thereof, I wish it to be understood that I do not desire to be limited to the details thereof as various modifications may occur to a person skilled in the art.

Having now fully described my invention, what

I claim as new and desire to secure by Letters Patent, is:

1. A device for centering a rotatable member on a shaft comprising a body member having an axial bore to receive said shaft and a peripheral portion to enter an axial opening in said rotatable member, means carried by said body member and movable with relation thereto to engage said shaft and center said body member with relation thereto, means for actuating said shaft engaging means, means carried by said body member and movable with relation thereto to engage the wall of the opening in said rotatable member and center the latter with relation to said body member, and means for actuating the last mentioned centering means.

2. A device for centering a rotatable member on a shaft comprising a body member having an axial bore to receive said shaft and a peripheral portion to enter an axial opening in said rotatable member, the wall of said axial bore having a plurality of recesses spaced about the same, shaft engaging elements supported in said recesses for movement into centering engagement with said shaft, the peripheral portion of said body member having a plurality of recesses spaced about the same, elements supported in said peripheral recesses for movement into centering engagement with a rotatable member mounted on said body member, and means for actuating said movable elements to center said body member on said shaft and to center said rotatable member on said body member.

3. A device for centering a rotatable member on a shaft comprising a body member having an axial bore to receive said shaft and a peripheral portion to enter an axial opening in said rotatable member, the wall of said axial bore having a plurality of recesses spaced about the same, shaft engaging elements supported in said recesses for movement into centering engagement with said shaft, the peripheral portion of said body member having a plurality of recesses spaced about the same, elements supported in said peripheral recesses for movement into centering engagement with a rotatable member mounted on said body member, and means carried by said body member and rotatable with relation thereto for actuating said movable elements.

4. A device for centering a rotatable member on a shaft comprising a body member having an axial bore to receive said shaft and a peripheral portion to enter an axial opening in said rotatable member, centering elements adapted to be interposed between said body member and said shaft and movable with relation to said body member into and out of engagement with said shaft, other centering elements adapted to be interposed between said body member and said rotatable member and movable with relation to said body member into and out of engagement with said rotatable member, and means rotatable with said body member and movable with relation thereto to actuate said centering elements.

5. A device for centering a rotatable member on a shaft comprising a body member having an axial bore to receive said shaft and a peripheral portion to enter an axial opening in said rotatable member, centering elements adapted to be interposed between said body member and said shaft and movable into and out of engagement with said shaft, a device mounted on said body member for rotation therewith and for axial movement with relation thereto to actuate said centering elements, other centering elements adapted to be interposed between said body member and said rotatable member and movable into and out of engagement with said rotatable member, and a device mounted on said body member for rotation therewith and for axial movement with relation thereto to actuate the last mentioned centering elements.

6. A device for centering a rotatable member on a shaft comprising a body member having an axial bore to receive said shaft and a peripheral portion to enter an axial opening in said rotatable member, two groups of centering elements carried by said body member and arranged respectively to center said body member with relation to said shaft and to center said rotatable member with relation to said body member, said centering elements being movable axially with relation to said body member and being movable radially by said axial movement thereof, and means carried by said body member for actuating said centering elements.

7. A device for centering a rotatable member on a shaft comprising a body member having an axial bore to receive said shaft and a peripheral portion to enter an axial opening in said rotatable member, two groups of centering elements carried by said body member and arranged respectively to center said body member with relation to said shaft and to center said rotatable member with relation to said body member, said centering elements being movable axially with relation to said body member and being movable radially by said axial movement thereof, and actuating devices rotatably mounted on said body member, operatively connected with the centering elements of the respective groups and having means controlled by the rotation thereof with relation to said body member to actuate said centering elements.

8. A device for centering a rotatable member on a shaft comprising a body member having an axial bore to receive said shaft and a peripheral portion to enter an axial opening in said rotatable member, the wall of said bore having slots extending lengthwise thereof, wedge-shaped elements mounted in said slots and having means controlled by the longitudinal movement thereof to center said body member with relation to said shaft, centering elements carried by the peripheral portion of said body member to engage said rotatable member and center the same with relation to said body member, and means for actuating said elements.

9. A device for centering a rotatable member on a shaft comprising a body member having an axial bore to receive said shaft and a peripheral portion to enter an axial opening in said rotatable member, centering elements movably mounted on the wall of said bore, the peripheral portion of said body member having slots extending lengthwise thereof, wedge-shaped elements movably mounted in said slots and having means controlled by the movement thereof to center said rotatable member with relation to said body member, and means for actuating said elements.

10. A device for centering a rotatable member on a shaft comprising a body member having an axial bore to receive said shaft and a peripheral portion to enter an axial opening in said rotatable member, the wall of said bore having slots extending lengthwise thereof, wedge-shaped elements mounted in said slots and having means controlled by the longitudinal movement thereof to center said body member with relation to said

shaft, the peripheral portion of said body member having slots extending lengthwise thereof, wedge-shaped elements mounted in said peripheral slots and having means controlled by the longitudinal movement thereof to center said rotatable member with relation to said body member, and means rotatably supported on said body member to impart longitudinal movement to said wedge-shaped elements.

11. A device for centering a rotatable member on a shaft comprising a body member having an axial bore to receive said shaft and a peripheral portion to enter an axial opening in said rotatable member, the wall of said bore and said peripheral portion of said body member having inclined surfaces, centering elements movable axially over the respective inclined surfaces and movable radially thereby, and means carried by said body to actuate said centering elements.

12. A device for centering a rotatable member on a shaft comprising a body member having an axial bore to receive said shaft and a peripheral portion to enter an axial opening in said rotatable member, the wall of said bore and said peripheral portion of said body member having inclined surfaces, centering elements movable axially over the respective inclined surfaces and movable radially thereby, and actuating devices separately rotatable on said body member for moving said centering elements over the respective inclined surfaces.

13. A device for centering a rotatable member on a shaft comprising a body member having an axial bore to receive said shaft and a peripheral portion to enter an axial opening in said rotatable member, the wall of said bore and said peripheral portion of said body member having inclined surfaces, centering elements movable axially over the respective inclined surfaces and movable radially thereby, and annular actuating members having screw threaded connection with said body member and connected with the respective centering elements to move the latter over the respective inclined surfaces.

14. A device for centering a rotatable member on a shaft comprising a body member having an axial bore to receive said shaft and a peripheral portion to enter an axial opening in said rotatable member, the wall of said bore and said peripheral portion of said body member having inclined surfaces, centering elements movable axially over the respective inclined surfaces and movable radially thereby, an actuating member having screw threaded connection with said body member and connected with a part of said centering elements to move the latter from said inclined peripheral surface, and a second actuating member rotatably supported on said body member and having screw threaded connection with another part of said centering elements to move the latter over the inclined surfaces of the wall of said bore.

15. A centering device comprising a body member having end portions of different diameters and having an axial bore, the smaller end portion of said body member having internal longitudinal slots, centering elements mounted in said slots, the larger end portion of said body member having external longitudinal slots, centering elements mounted in said external slots, an actuating member mounted in said larger end portion, having screw threaded connection therewith and operatively connected with the centering elements in said smaller end portion, and a second actuating member mounted on said smaller end portion, having screw threaded connection therewith and operatively connected with the centering elements on said larger end portion.

16. A centering device comprising a body member having an axially tapered bore and a seat adjacent the smaller end of said bore, an annular element slidably supported in said bore and having substantially radial openings therein, centering elements in said openings and engaging the wall of said bore, a rotatable actuating member engaging said seat and having operative connection with said annular element, a peripheral portion of said body member having external longitudinal slots, centering elements mounted in said slots, and an actuating member having screw threaded connection with said body and operatively connected with the last mentioned centering element.

17. A centering device comprising a body member having an axially tapered bore and a seat adjacent the smaller end of said bore, a frustoconical tubular element slidably mounted in said bore and having a plurality of openings therethrough, centering elements in said openings, an annular actuating member engaging said seat and having screw threaded connection with said tubular element, the peripheral portion of said body member having external longitudinal slots, the inner walls of which slope toward the smaller end of said bore, centering elements mounted in said slots, and an actuating member mounted on and having screw threaded connection with said body member adjacent the smaller end of said bore and operatively connected with the centering elements in said peripheral slots.

18. A centering device comprising a body member having an axially tapered bore, a frustoconical tubular element slidably mounted in said bore and having a plurality of openings therethrough, centering elements mounted in said openings, and means carried by said body member for actuating said tubular elements.

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