July 31, 1928. 1,678,709

W. SCHÜRMANN

SECTIONAL OR LINK SHAFT

Filed July 27, 1926 2 Sheets-Sheet 1

Fig.1.

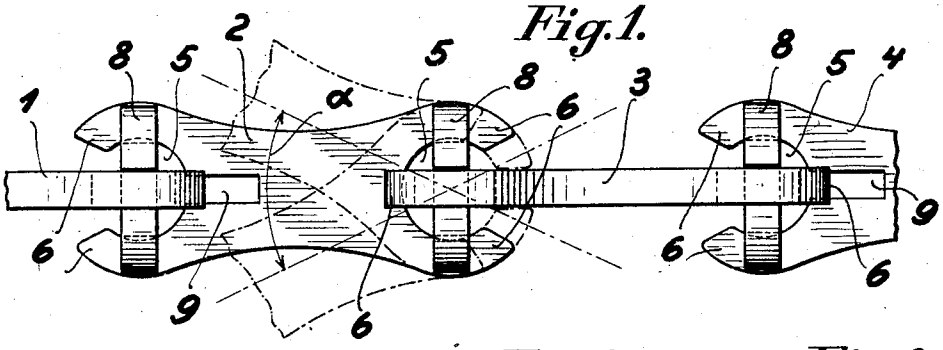


Fig.2.

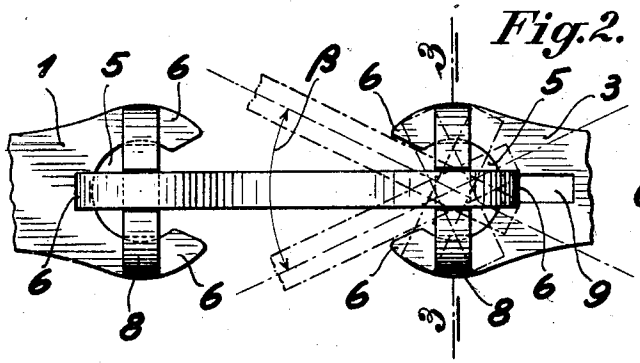


Fig.3.

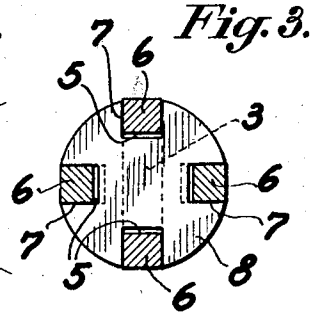


Fig.4.

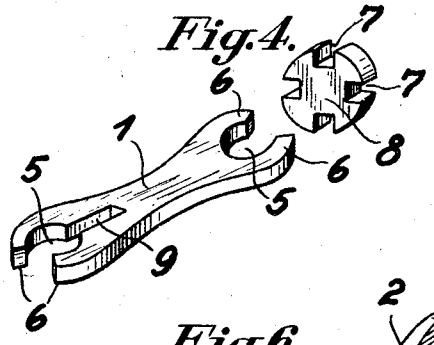


Fig.5.

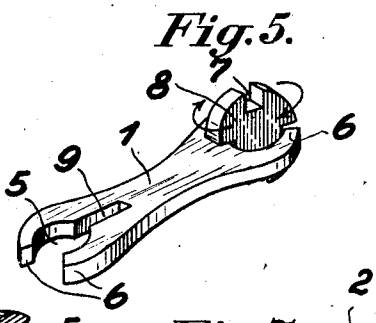


Fig.6.

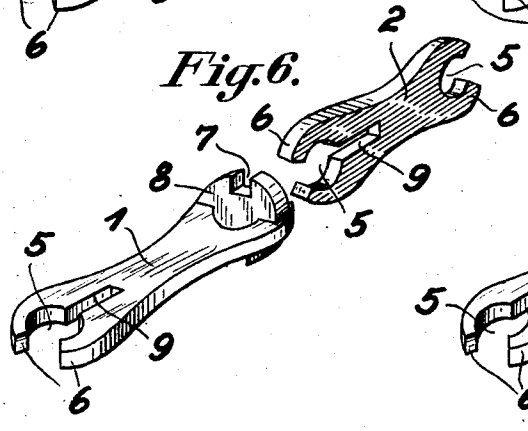
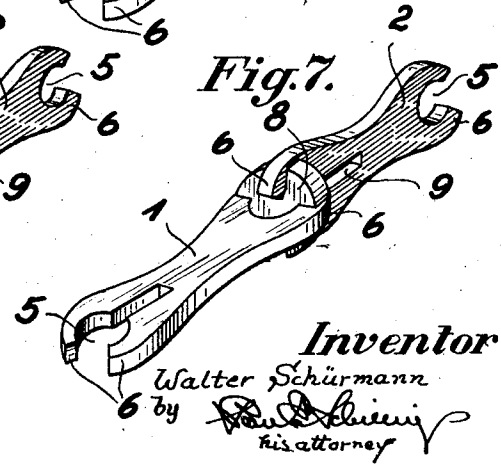


Fig.7.



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SECTIONAL OR LINK SHAFT

Filed July 27, 1926 2 Sheets-Sheet 2

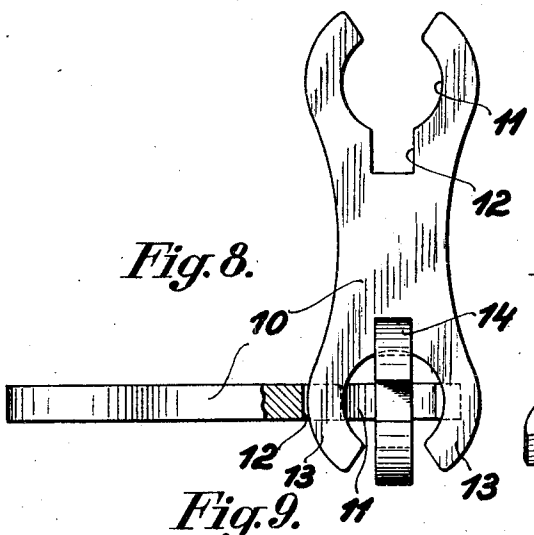


Fig. 8.

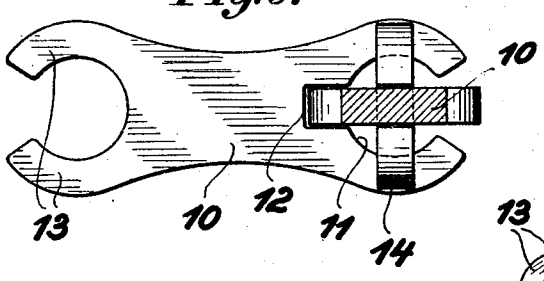


Fig. 9.

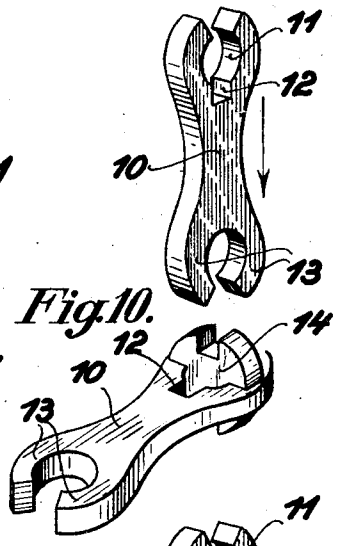


Fig. 10.

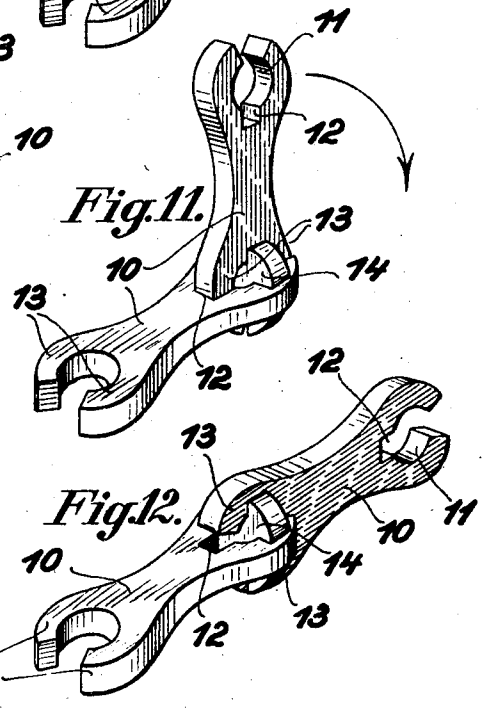


Fig. 11.

Fig. 12.

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Patented July 31, 1928. 1,678,709

UNITED STATES PATENT OFFICE.

WALTER SCHÜRMANN, OF DUSSELDORF, GERMANY.

SECTIONAL OR LINK SHAFT.

Application filed July 27, 1926, Serial No. 125,227, and in Germany October 1, 1925.

This invention has reference to sectional or link-shafts, and it is intended among other objects and advantages to provide shafts of the kind referred to by means of which a greater degree of rigidity and accuracy may be obtained than it was possible to arrive at in link-shafts as heretofore constructed. The link shafts or sectional shafts heretofore known, as far as I am aware are open to the objection that they possess only a comparatively small degree of movability, and that there is so much play and idle motion in the direction of rotation in the joints as to preclude smooth running without the occurrence of jerking and striking movements; and there is, moreover, the inconvenience that with a change of the direction of rotation the shafts will extend or will be reduced in length.

Now, this invention, to be described herewith is adapted to overcome these inconveniencies, and among other advantages it is particularly distinguished by the fact that it posseses a great degree of flexibility, while making provision to avoid all possibilities of idle motion in the direction of movement. In accordance with this invention the joints are constructed substantially on the principle of the universal joints or Cardan-joints and in such a manner that the individual links, when revolved, will be moved without play or dead motion.

The invention will be more fully described by reference to the accompanying drawing, showing by way of exemplification one of the possible embodiments of the principle of this invention. In the drawing:—Figures 1 and 2 represent the sectional or link-shafts in two different elevational views.—Figure 3 is a cross section on the line 3—3 of Figure 2.—Figures 4 to 7 illustrate the assembling of the sections of the shaft.—A somewhat modified construction is shown in two different views in Figures 8 and 9, and Figures 10 to 12 illustrate the manner of assembling the sections.

As will appear from the drawing (Figures 1 to 7) the individual links, 1, 2, 3, 4 and so on may be made from punched out flat pieces of material and each link is provided at its ends with substantially semi-circular recesses or openings 5, and the fork-shaped ends are composed of inwardly curved or hawk-shaped jaws 6 having acutely beveled, outwardly diverging inner faces at their free ends. In the openings 5 separate circular discs 8 with crosswise arranged peripheral slots 7 are inserted, and upon these discs the succeeding links are mounted which are disposed at right angle with relation to the next preceding link. In this manner the sections of the shaft are assembled, so as to produce a link-shaft with Cardan like or universal joints. The recesses 7 of the discs 8 correspond exactly to the thickness of the material of the particular links, and by this means idle movement in the joints during the revolution of the links is avoided. The distance of the fork-like ends 6 of the links from each other governs the movability of the shaft, and, as shown for instance in Figures 1 and 2 of the drawing, the link 2 may be moved in a vertical plane through the angle α with relation to the link 3, and simultaneously through the angle β in the horizontal plane. The said angles comprise each 50 degrees, thereby resulting in a very high degree of movability of the shaft.

Figures 4–7 illustrate the assembling of the shaft. In the recess 5 of the link 1 a disc 8 is mounted by first inserting the disc in the transverse direction according to Figure 5, and then turning it around through 90 degrees, whereupon a second member 2 is pushed onto the disc 8, as shown in Figure 7. This causes the ends 6 of the link or member 2 to be somewhat spring actuatingly spread apart, which is made possible by the slot 9. After the parts have been assembled, unintentional detaching of the same is no longer possible in view of the fact that in the assembled position the links are only adapted to turn relatively to each other through the angles α and β (Figures 1 and 2).

The novel sectional or link-shaft according to this invention may be employed with or without a guide tube. When a guide tubing is used the shaft is very satisfactorily circularly guided within the guiding tube, and inasmuch as the shaft makes contact with the tubing at the narrow joints only, only very slight friction is produced. The operating point of the torque is situated in a very favorable manner at the periphery of the shaft. As a further important advan-

tage it may be mentioned that the new shaft is only about half as heavy as the known sectional or link shafts.

In the modified construction according to Figures 8 to 12 the several members or links 10 are provided at one of their ends with a short recess 12 contiguous with the circular recess 11 of that extremity of the link, the dimensions of the recess 12 corresponding to the thickness and width of the fork-shaped leg 13 of the member 10. When assembling the parts the cross piece 14 is first positioned as in the form of construction first mentioned (Figure 5), whereupon the second member is introduced from above, the recess 12 allowing of the insertion of the leg 13 (Figure 11). Thereupon the second member 10 may be turned into the operative position according to Figure 12. The assembling of the parts is therefore effected without any spring-acting straining of the fork shaped leg 13.

While the invention has been described herein with reference to what are considered two preferred forms of embodiment, it should be understood that it is not limited thereto, but it may find expression in other embodiments and modifications, without thereby deviating from the scope and spirit of the invention, as particularly pointed out in the claims hereunto appended.

I claim:—

1. A flexible shaft or coupling comprising at least two flat link plates having forked end portions and a nearly circular opening between the arms of the forks, and a flat disk within the openings of the forked ends of the link plates and having transverse notches in its periphery arranged in working pairs; one pair of notches receiving the fork arms of one link plate and the other pair of notches receiving the fork arms of the other link plate.

2. A flexible shaft or coupling comprising at least two flat link plates having fork end portions and a nearly circular opening between the arms of the forks, the outer and inner surfaces of the arms extending on arcs, and a flat circular disk within the openings of the forked ends of the link plates and having transverse notches in its periphery arranged in working pairs; one pair of notches receiving the fork arms of one link plate and the other pair of notches receiving the fork arms of the other link plate, the edges of the link plates being longitudinally concaved between its forked ends, whereby each link plate is intermediately contracted.

3. A link shaft comprising cross-linkwise connected flat link members having forked ends with circular recesses for the reception of a connecting member, and a connecting member formed of a flat disk with cross-wise arranged cut-outs for the reception of the forked ends of the links.

4. A flexible shaft or coupling comprising a coupling disk having pairs of peripheral notches at right angles to each other, and flat link plates having forked ends receiving the disk and respectively engaging the notches therein, one of said link plates having an axial slot intersecting its forked end and rendering the jaws of said forked end resilient for spring-apart and spring-reaction actions in engaging and maintaining engagement with the notches in the disk engaged thereby.

In testimony whereof I affix my signature.

WALTER SCHÜRMANN.