

A. S. McCASKEY,
FLEXIBLE SHAFT.
APPLICATION FILED NOV. 15, 1918.

1,314,600.

Patented Sept. 2, 1919.

Fig. 1

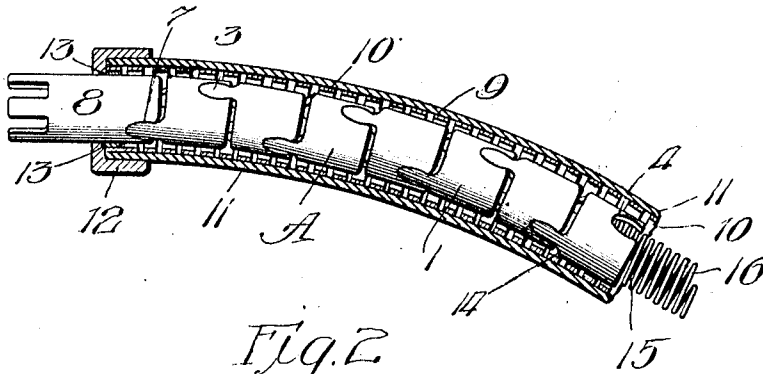


Fig. 2

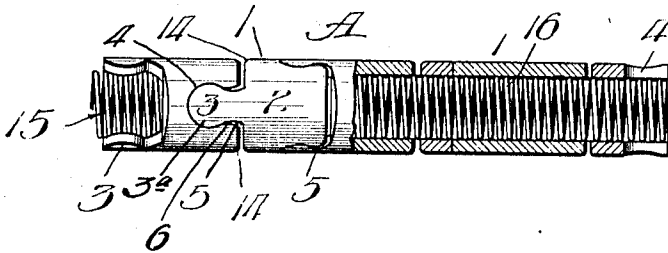
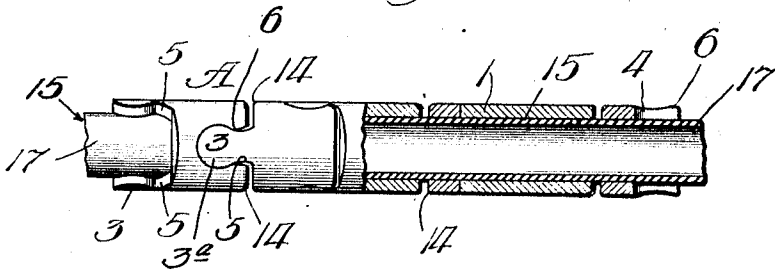


Fig. 3



Witnesses:

Harry S. Gauthier
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Inventor:

Alfred S. McCaskey
by *John E. Brown* Att'y

UNITED STATES PATENT OFFICE.

ALFRED S. McCASKEY, OF CHICAGO, ILLINOIS.

FLEXIBLE SHAFT.

1,314,600.

Specification of Letters Patent.

Patented Sept. 2, 1919.

Application filed November 15, 1918. Serial No. 262,646.

To all whom it may concern:

Be it known that I, ALFRED S. McCASKEY, a citizen of the United States, and a resident of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Flexible Shafts; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to improvements in flexible shafts, and more particularly to an improvement upon that class of shafts set forth, described and claimed in Letters Patent of the United States, No. 1,258,233, issued to me on the 5th day of March, 1918.

The object of the invention is to provide a hollow, flexible shaft, which is cheap to manufacture, easy to assemble, efficient in operation for its intended purpose, and strong and durable, thus insuring a greater amount of service than has heretofore been obtainable in flexible shafts as now made.

Another object of the invention is to simplify and cheapen the construction of the type of shafts set forth in the aforesaid Letters Patent.

Other objects and advantages will appear as I proceed with my specification.

In the drawings:

Figure 1 is a view in side elevation of my improved flexible shaft as it appears within its sheath or covering, the latter being in section.

Fig. 2 is a view on a slightly enlarged scale, showing a portion of the flexible shaft made in accordance with my invention, partly in side elevation and partly in section.

Fig. 3 is a similar view showing a modified form of my invention.

Referring now to that embodiment of my invention as illustrated in the drawings, and more particularly to that form shown in Figs. 1 and 2,—A indicates as a whole, a short section or length of my improved flexible shaft. Said shaft comprises a plurality of substantially short, tubular units or links 1, which are coupled or connected together in a manner preventing relative longitudinal displacement between them but permitting of a range of flexible movement between each adjoining unit.

Each unit or link 1 has a tubular body

portion 2, preferably made of a length approximating its diameter. Manifestly this proportion may be varied without departing from the spirit of the invention.

The tubular body 2 of each unit is provided at one end with a pair of longitudinally extending, diametrically opposed lugs 3, 3, and is provided at its other end with complementary shafts bearing notches 4, 4. The lugs 3, 3, of one unit or body portion 2 are adapted to engage in the notches 4, 4 of the adjoining unit, thus coupling the two units together. The diametric plane of the lugs 3, 3 of one unit is arranged at right angles to the corresponding plane of the bearing notches 4, 4, in the same unit. The advantage of this arrangement is manifest.

Each of the lugs 3, 3, consists of a head 3^a which is connected to the end of the associated body by means of a neck 5, the lateral edges of which diverge outwardly as they approach said body. Each bearing notch 4, formed in the opposite end of said body 2 is of a contour corresponding to and adapted to receive the lugs 3 of an adjoining unit and each of said bearing notches opens into the free end of said body 2 by means of a somewhat restricted passage or throat 6. This passage or throat 6 is so constructed that the neck 5 of an associated lug 3 may extend through it when said units are coupled or connected together, as clearly shown in Figs. 2 and 3.

As shown in Fig. 1, the left hand, end most unit 1 is coupled or connected by means of its lugs 3 in bearing notches 7 (which are identical with the bearing notches 4 heretofore mentioned) formed in a terminal unit 8. Said terminal unit 8 may be either a tool holding chuck or the like, or it may constitute a coupling connection with a suitable driven member. 9 indicates a suitable sheath or covering for the shaft which generally comprises an inner metal member of coiled wire 10 and an outer member of flexible material 11, such as rubber or textile tubing. A collar 12 is fixed to the terminal end of the sheath 9 and a bearing ring 13 is placed within said collar 12 to provide a proper bearing for the terminal unit. To prevent any tendency of the several, coupled-together or connected units to pinch or cut into the sheathing, and to prevent binding between the adjoining ends of the units, especially when the shaft as a whole is arranged on a curve or arc as illustrated in

Fig. 1, I prefer to round off the sharp edge at the ends of the body 1 of each unit as indicated at 14.

In order to prevent lateral displacement between the several units, I insert inside of said units from end to end, of the number of units constituting a shaft of given length, a suitable flexible member 15 of such diameter as to substantially bear against the inside circumferential surface of the several units. In Figs. 1 and 2 this flexible member is shown in the form of a coiled spring 16, while in the modification shown in Fig. 3, this flexible member 15 is illustrated in the form of a flexible tube 17. When the spring is used, the convolutions of the spring may be more or less close together, depending upon the nature of the work required of the flexible shaft, as a whole,—the consideration being that such convolutions will be close enough to each other to give the necessary rigidity to the spring to resist any tendency to lateral displacement of the units of the shaft, and that the spring as a whole have sufficient resiliency not to interfere with the desirable flexibility of the shaft as a whole.

With respect to the tubular member 17, it is manifest that the same may be of rubber or of suitable metal having sufficient strength to resist any tendency to lateral displacement of the units of the shaft, and at the same time to afford the necessary flexibility of the shaft.

One of the advantages of having the flexible member 15 hollow or tubular is that it affords a channel through which may be laced electric wires, which are necessary in certain uses to which my improved flexible shaft will be put. Another advantage of the tubular inner member shown in Fig. 3 is that it affords a convenient passage or channel for a suitable fluid.

It will be understood, of course, that the use of the spring or the flexible tube, interiorly of my flexible shaft, will not interfere with the rotation of said shaft in practice, in the event of such use being made thereof as might necessitate the holding of said spring or tube in a non-rotating position while the shaft is rotated. Normally, however, the spring or insert used will rotate with the flexible shaft.

While flexible tubing 17 or other insert used, in the best practice, will be of such

diameter as to contact with the inner surface of the shaft units, it will be manifest that there may be some very slight play between the parts, sufficient for purposes of lubrication, but not enough to interfere with the primary function of the insert, which as heretofore stated, is to hold the several flexibly interlocked units of the shaft against displacement.

While, therefore, in describing my invention, I have referred to details of mechanical construction and arrangement of parts, it is manifest that slight mechanical changes may be made without departing from the principle or spirit of my invention. I therefore do not wish to be limited to the details shown and described, except as may be pointed out in the appended claims.

I claim as my invention:

1. A flexible shaft comprising a plurality of units, each of said units comprising a tubular body part having at one end diametrically opposite bearing notches and at its other end longitudinally extending diametrically opposite bearing lugs arranged at right angles to said notches, said lugs being adapted to engage within the bearing notches of the adjoining unit in a manner permitting of a flexible movement between said units, and a flexible member extending lengthwise within said units and adapted to retain said lugs within said bearing notches.

2. A flexible shaft comprising a plurality of units, each of said units comprising a tubular body part having at one end diametrically opposite bearing notches and at its other end longitudinally extending diametrically opposite bearing lugs arranged at right angles to said notches, said lugs being adapted to engage within the bearing notches of the adjoining unit in a manner permitting of a flexible movement between said units, and flexible means located within said units and extending lengthwise of the shaft to prevent lateral movement between said units.

In testimony that I claim the foregoing as my invention I affix my signature, in the presence of two witnesses, this 31st day of October, A. D. 1918.

ALFRED S. McCASKEY.

Witnesses:

TAYLOR E. BROWN,
BERTHA L. MACGREGOR.