Sept. 13, 1927. 1,642,602

G. CONSTANTINESCO

ELASTIC LINK

Filed Dec. 16, 1925 2 Sheets-Sheet 1

Fig. 3.

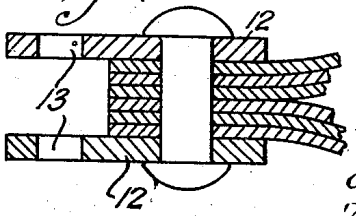


Fig. 1.

Fig. 1a.

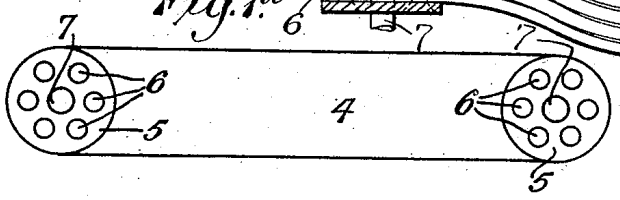


Fig. 2.

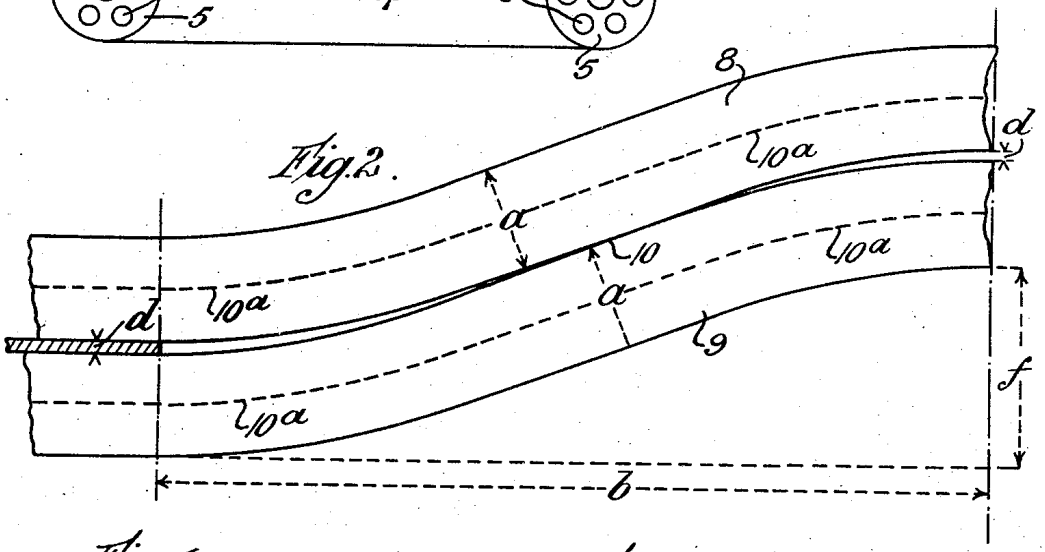


Fig. 4.

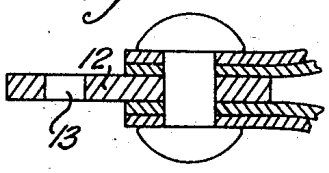


Fig. 5.

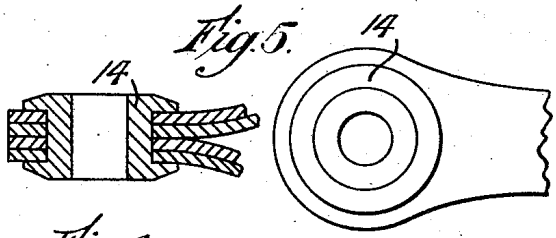


Fig. 6.

INVENTOR
G. CONSTANTINESCO,
BY
ATTORNEY

Sept. 13, 1927. 1,642,602

G. CONSTANTINESCO

ELASTIC LINK

Filed Dec. 16, 1925 2 Sheets-Sheet 2

Fig. 7.

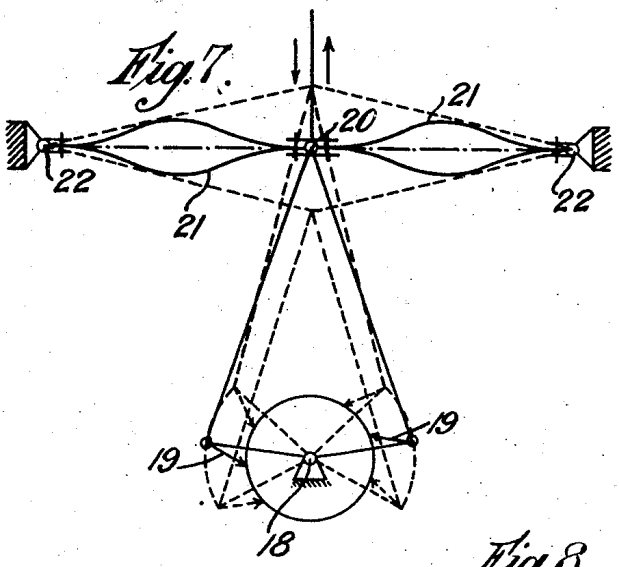


Fig. 8.

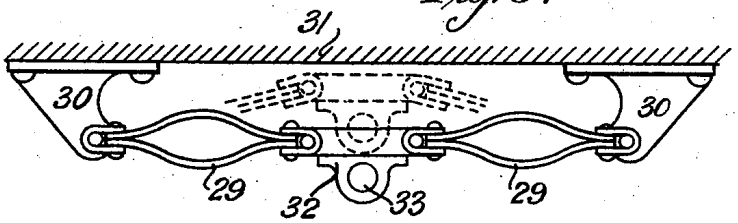


Fig. 9.

Fig. 10.

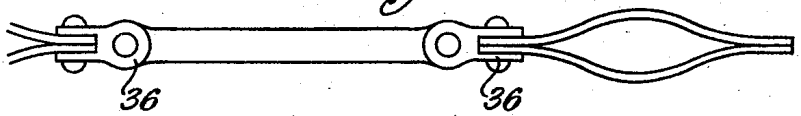
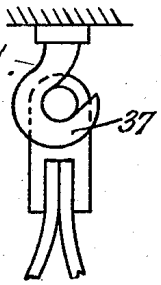


Fig. 11.



INVENTOR
G. CONSTANTINESCO,
BY
ATTORNEY

Patented Sept. 13, 1927. 1,642,602

UNITED STATES PATENT OFFICE.

GEORGE CONSTANTINESCO, OF WEYBRIDGE, ENGLAND.

ELASTIC LINK.

Application filed December 16, 1925, Serial No. 75,821, and in Great Britain October 7, 1925.

The invention relates to loop or bow shaped plate or strap springs, each side of the loop or bow being formed of curved plates secured together at their ends. Such springs have been proposed for various purposes as elastic links adapted to be stressed by collinear forces applied at the ends, for example, in chains and spring balances. The object of this invention is to obtain in compact form a device capable of storing a large amount of elastic energy and of acting also as a resilient stop when the load exceeds a given limit without creating excessive stresses in the material used. The invention is intended mainly for use as a stabilizing spring link for my power converter, such as is described in my specifications Serial Nos. 688,789, 701,539, and 727,774 and Patents Nos. 1,545,401, 1,569,719 and 1,582,734, but it has numerous other applications such as to elastic coupling rods generally, to motor car and vehicle springs, generally, to spring balances, as coupling springs, to cranes or other machines for lifting weights, and to chains generally. In the application to these and similar cases the link combines the functions of a spring and a stop, since as the tension increases the leaves tend to straighten, the rate of deformation tending progressively to zero as a limit. According to my invention each side of the loop or bow is built up of a number of plates or laminæ bent into approximately sine curve form. The plates are assembled so that when under no load each of them touches the adjacent plates at or near the point of inflexion that is to say, where the curvature is zero, but are separated elsewhere, this separation being effected by thickening the plates or by distance pieces. The plates or laminæ are securely fastened together at the places where the sides of the bow or loop meet, but if they are bent into a number of waves it is not necessary for them to be fastened together at intermediate points where they meet or approach.

In the annexed drawings, which show practical embodiments and applications of my invention, Figs. 1 and 1ª show respectively in elevation and plan a single bow spring each side of which is composed of several leaves, Fig. 2 shows on a greatly exaggerated scale a part of one side of the spring shown in Figure 1, Figs. 3, 4 and 5 show alternative means for connecting the leaves together, Fig. 6 shows an elastic tension rod comprising several bows, each side consisting of a plurality of leaves, Fig. 7 shows the application to my power converter, Fig. 8 shows the application to a vehicle as a shock-absorber, Fig. 9 shows the application to a chain flexible in one plane only, Figure 10 shows the application to a chain flexible universally, and Fig. 11 shows the application to a crane.

It will be understood that as regards the plates, Figs. 1 and 3 to 11 inclusive are diagrammatic only in that they do not show a separation between the leaves and in some cases show only one leaf. The construction shown in Fig. 2 applies to them all, and in every case the sides of the bows or loops consist of a plurality of leaves.

Figs. 1 and 1ª show respectively a bow in elevation and plan each side consisting of four leaves, two of which are referred to by the numeral 4. The leaves form sine curves and their ends are secured together by plates 5 and rivets 6. 7 are pins passing through holes in the leaves by which the spring is secured to an adjacent object.

Figure 2 shows on an exaggerated scale parts of two adjacent leaves of the arrangement shown in Figure 1, and applies to all cases in which the sides of the bows consist of more than one leaf. The figure shows two leaves shaped so that in their unstrained state the medial lines 10^a of their longitudinal sections form sine curves. The object is to ensure that each leaf may bend or straighten freely without frictional or other interference from the adjacent ones. The feature to be noted is that the two leaves 8 and 9 are separated at their ends by an interval d. This avoids frictional or other interference between the leaves which when assembled touch if at all at their points of inflexion while unstrained, as shown at 10 in the figure. When tension is applied to the ends of a spring so built up the leaves tend to separate and no frictional or rubbing effect arises between them. The diagram is as stated very much exaggerated. For example if the dimension b is 120 mm. and f 30 mm., a will be about 1 mm. and d about .1 mm. An approximate dimension is given by $d=a/10$ if $b=4f$. It will therefore be sufficient in general to coat the ends of the leaves with paint, or still better with tin, or to galvanize with a coating of metal 1/20 mm.

thick in the above example, or to insert layers of paper or metal before riveting the ends.

According to another method each leaf may be made of thicker section at its ends. This may be effected by stretching the leaves when softened by heat, the ends being firmly held.

Figure 3 shows another mode of assembly in which two plates 12 are riveted outside the leaves, securing holes 13 being bored in the plates 12.

Figure 4 shows a similar method, in which a single plate is used.

Figure 5 shows a method of assembly in which the leaves are secured together by eyelets or sleeves 14 which are riveted over as shown.

Figure 6 shows an elastic tension rod consisting of plates or leaves bent so as to form a number of bows; each side 15 and 16 may consist of several leaves as in the case of a single bow. The leaves are fastened together at the ends only. There is no occasion to fasten them together at the intermediate points 17.

Figure 7 shows the application to a rotary power converter such as is described in my prior specifications above referred to. 18 is a shaft to which unidirectional motion is communicated by ratchets or the like 19 which are linked to a common pivot 20. The pivot 20 receives reciprocating motion from a power converter or other such source which it is unnecessary to illustrate. The details shown serve to convert this reciprocatory motion into unidirectional motion, the links 21 stabilizing the motion of the pivot 20. The limits of their motion is shown by the dotted lines forming the parallelogram, the extreme positions of the other parts of the mechanism being similarly indicated. It may be necessary to stabilize or limit the motion of this pivot which is reciprocated in the direction of the arrows by means described in the said prior specifications. In the form shown this stabilization or limitation is effected by a pair of bow or loop springs 21 such as are described above which are connected to the pivot 20 and to fixed supports 22 about which they can turn. In a modification one bow or loop only, such as 21, is used, the other being an ordinary link. In this case the pivot 20 will describe a circular arc instead of a straight line. For reasons already stated the linkage acts as a stop.

Figure 8 shows the application to a spring balance. A bow or loop spring 23 such as that described above is secured to a member which carries a graduated scale 24 and also the pivot 25 of a pointer 26. The pointer is actuated by rods 27 which connect the pointer to eyelets 28 on the sides of the spring.

Figure 9 shows a succession of spring bows such as are described above made up into a chain which can be bent in one plane. The plates of each bow are directly connected to those of the next as shown at 34, and the extreme ends may be provided with shackles or the like 35.

Figure 10 shows a chain in which the planes of the bows are alternately at right angles to one another, each bow being connected to the next by a coupling 36 which permits universal flexibility.

Figure 11 shows by way of example the application to crane mechanism for the purpose of avoiding shocks. The crane hook 37 is connected to the article to be lifted by a spring bow 38 of the character above described. The invention is also applicable to connecting and coupling rods, the body of the rod being formed wholly or in part of one or more spring bows constructed as above described.

What I claim is:—

An elastic link consisting of metal plates bent into sine curve form and firmly secured together at their ends, so as to form a symmetrical loop, each side of said loop consisting of a plurality of plates, and said plates being provided at their ends with separating means, such that each plate touches its neighbor at or near its point of inflexion when the link is unstrained.

In testimony that I claim the foregoing as my invention, I have signed my name this 24th day of November, 1925.

GEORGE CONSTANTINESCO.