Jan. 29, 1952

M. RUSSENBERGER
GRIPPING MEANS FOR SPECIMENS IN
PULSATING TESTING MACHINES
Filed Nov. 26, 1947

2,583,885

FIG. 1

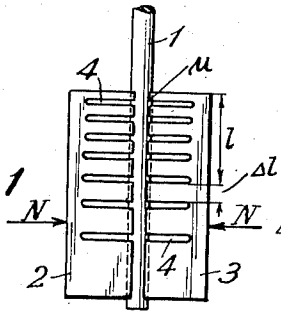


FIG. 3

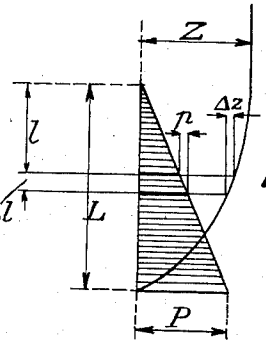


FIG. 2

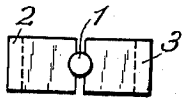


FIG. 8



FIG. 7

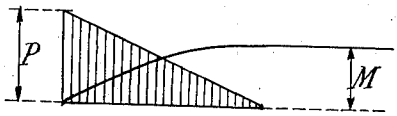


FIG. 4

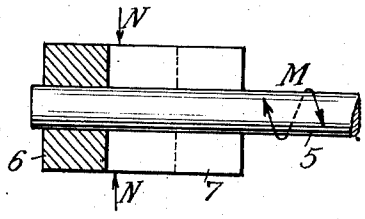


FIG. 6

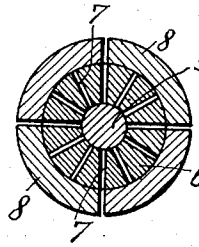
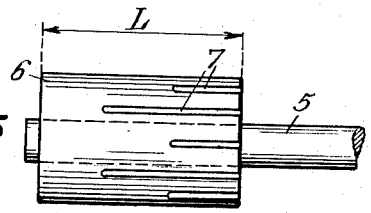


FIG. 5



INVENTOR:
Max Russenberger
by Sommers & Young
Attorneys

Patented Jan. 29, 1952

2,583,885

UNITED STATES PATENT OFFICE

2,583,885

GRIPPING MEANS FOR SPECIMENS IN PULSATING TESTING MACHINES

Max Russenberger, Schaffhausen, Switzerland, assignor to Alfred J. Amsler & Co., Schaffhausen, Switzerland

Application November 26, 1947, Serial No. 788,134
In Switzerland July 1, 1944

Section 1, Public Law 690, August 8, 1946
Patent expires July 1, 1964

5 Claims. (Cl. 73—103)

1

My present invention relates to improvements in the gripping-means for specimens in testing-machines in which the specimen is given repeated alternate or fluctuating stresses, and the main object of my improvements is to provide means which permit of following the elastic deformations of the specimen free of slip so as to prevent the formation of fractures at the transition to a point of restraint.

When testing materials as to their fatigue strength under stress applied by reciprocating and impulsive mechanical means, it is customary to increase the thickness of the specimens at the point of grip or restraint so as to positively put the dangerous cross-section outside the grip. In many cases, however, it is desired to test specimens of constant cross-section, i. e. to provide a uniform cross-section for both the restrained and the free portions of the specimen. When employing the gripping-means known in the art, however, failure always occurs at the point of transition to a point of grip of the test-rod. The reason for such behavior is to be found, above all, in the slipping of the specimen at the transition to its free portion, as the surface is scored and oxidized due to the friction, thus facilitating the initial fracture at the said transition; whereby, however, the values of fatigue strength obtained are adulterated.

The gripping-means for specimens in testing-machines of the pulsating type, according to my present invention comprise jaws provided with resilient fingers in order to permit of following the elastic deformations of the specimen without slip.

Two forms of invention are shown in the accompanying drawing, in which:

Fig. 1 shows the first form in elevation, intended for testing wire as to compressive or tensile fatigue strength,

Fig. 2 a top plan view thereof,

Fig. 3 an appurtenant diagram,

Fig. 4 the second form in axial section, intended for testing smooth wire in a torsional fatigue machine,

Fig. 5 a longitudinal view of Fig. 4,

Fig. 6 is a cross-section of Fig. 4,

Fig. 7 a diagram appurtenant to said second form,

Fig. 8 an elevation of a modified jaw of the first form.

In the first form, the wire 1 is clamped at each end by two gripping-jaws 2, 3 which are accurately fitted to the profile of the wire; and are provided with resilient fingers formed by notches

2

4 transversely disposed in the jaws 2, 3 and of equal depth; the fingers, however, having a thickness gradually decreasing in direction toward the free face of the jaw. The surface pressure lengthwise of the grip or restraint may be biased by the position of the point of engagement of the clamping force N. In the diagram of Fig. 3, a pressure P is assumed which gradually increases in accord with the length L of the gripping-jaws. Thus the variation of the tensile force Z along the gripping-jaw, is also defined.

Such arrangement must satisfy the requirement that the frictional force produced by the surface-pressure increment Δp—at any spacing l for an element Δl, and for a circumference U—be equal to or greater than the tensile-force decrement Δz appearing lengthwise of the said element Δl. Assuming μ as coefficient of frictional adherence, the relation

$$U.\Delta l.\Delta p.\mu \geqslant \Delta z$$

must be satisfied.

A further requirement is that the finger dimensioned according to the said element Δl, produces a resistance—upon following the elongation of the specimen without slip—which is just equal to the tensile-force decrement Δz called for.

The form or shape of the fingers thus is positively defined. One is perfectly free to vary the run of the Z-line as desired, by foregoing the full utilization of the frictional forces, since only the formula given above has to be agreed with.

The fingers also may be gradually stepped transversely (see jaw 2' in Fig. 8) besides lengthwise of the jaw. The dimensions of the fingers may be favorably biased by using a material having a smaller modulus of elasticity than that of the specimen.

In the second form of invention (Figs. 4–6), the wire 5 which is subjected to axial twist M, is frictionally gripped in jaws having a chuck 6. The latter is provided with radial notches or slits 7 extending from one face and uniformly spaced from each other. The notches 7, in the axial direction of chuck 6, are alternatingly of different length so as to form fingers of different width. Chuck 6, from the outside, is compressed by the force N (Fig. 4) by means of solid jaws 8 (Fig. 6). The position of force N in the longitudinal direction here again defines the distribution of the surface pressure along the gripping distance. The variation of the torsional moment M and of the pressure P is illustrated in Fig. 7. Upon twisting the shaft, the indi-

vidual fingers of chuck 6, due to their resilience, follow (on the inside) the displacement of the wire surface, while remaining stationary on the outside.

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

1. In a fatigue strength testing machine of the class described, means for gripping the ends of a specimen, said means including at least two jaws provided with a gripping surface shaped to accurately fit to the specimen, each of said jaws being provided with a series of successively arranged unequally spaced slots extending from said gripping surface into the body of the jaw to thereby provide said jaws with a plurality of resilient fingers having various degrees of stiffness.

2. In a fatigue strength testing machine of the class described, means for gripping the ends of a specimen, said means including at least two jaws provided with a gripping surface shaped to accurately fit to the specimen, each of said jaws being provided with a series of successively arranged unequally spaced slots extending from said gripping surface perpendicularly thereto into the body of the jaws to thereby provide said jaws with a plurality of resilient fingers having various degrees of stiffness.

3. In a fatigue strength testing machine of the class described, means for gripping the ends of a specimen, said means comprising at least two jaws provided with a gripping surface shaped to accurately fit to the specimen, each of said jaws being provided with a series of successively arranged spaced slots of equal length extending from said gripping surface into the body of the jaws, the distances between successive slots gradually increasing towards the end of the specimen to be gripped to thereby provide said jaws with a plurality of resilient fingers of gradually increasing stiffness.

4. In a fatigue strength testing machine of the class described, means for gripping the ends of a specimen, said means including at least two jaws provided with a gripping surface shaped to accurately fit to the specimen, each of said jaws being provided with a series of successively arranged spaced slots extending from said gripping surface into the body of the jaw, said successive slots being of gradually decreasing lengths towards the end of the specimen to be gripped to thereby provide said jaws with a plurality of resilient fingers of gradually increasing stiffness.

5. In a fatigue strength testing machine of the class described, means for gripping the ends of a specimen, said means comprising at least two jaws provided with a gripping surface shaped to accurately fit to the specimen to be gripped, each of said jaws being provided with a series of successively arranged spaced slots extending from said gripping surface into the body of the jaw, the distances between successive slots gradually increasing and the lengths of successive slots gradually decreasing towards the end of the specimen to be gripped to thereby provide the jaws with a plurality of fingers of various stiffness.

MAX RUSSENBERGER.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
526,790	Roberts	Oct. 2, 1894
1,441,284	Johnson et al.	Jan. 9, 1923
1,496,803	Amsler	June 10, 1924

FOREIGN PATENTS

Number	Country	Date
241,944	Switzerland	Aug. 16, 1946
529,002	France	Aug. 30, 1931
637,402	Germany	Oct. 28, 1936