Feb. 11, 1958 C. R. CAMPANA 2,822,686

WEAR AND ABRASION TESTING MACHINE

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Fig. 1.

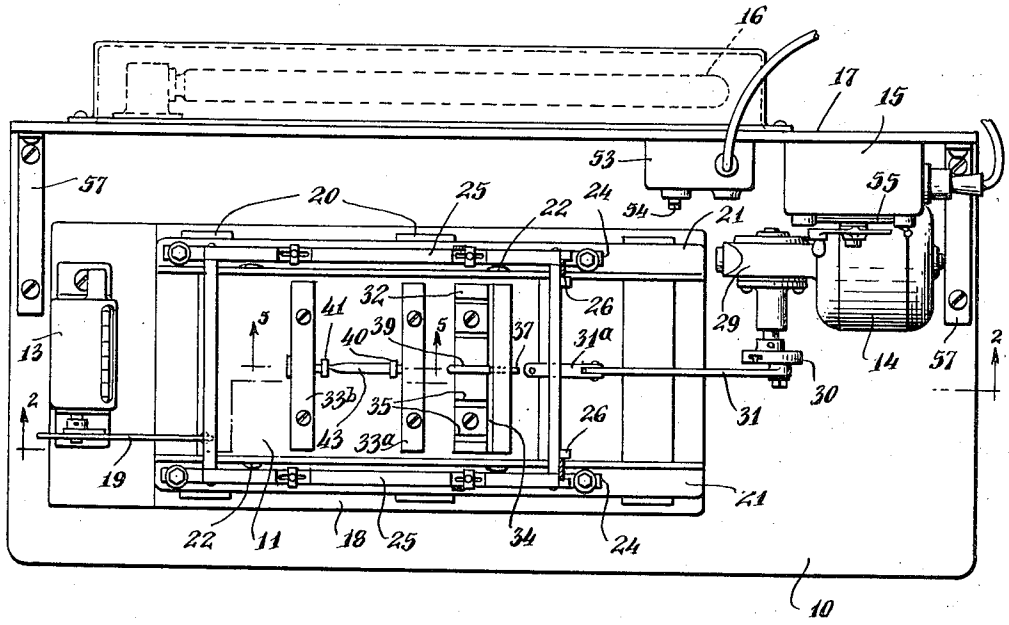

Fig. 2.

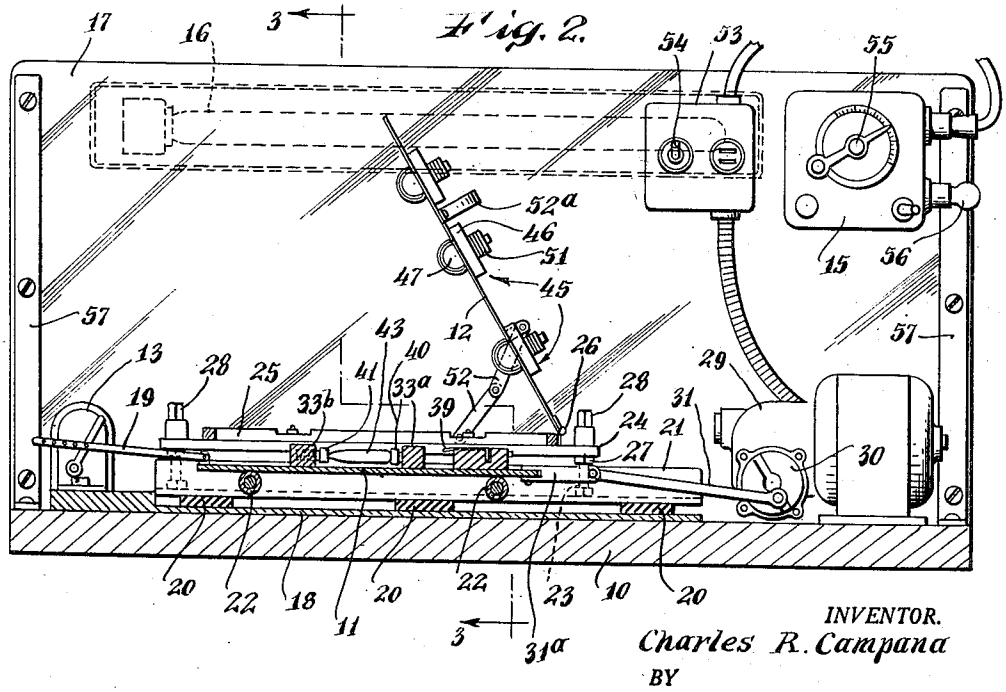

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Fig. 4.

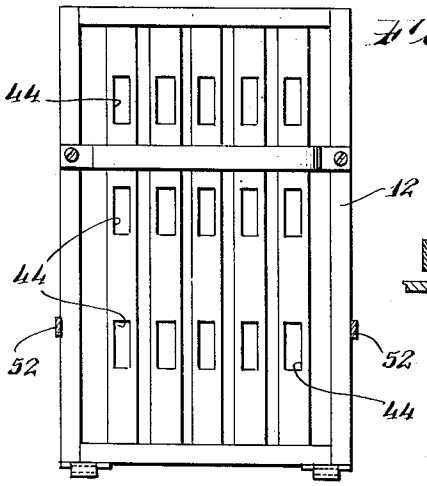


Fig. 5.

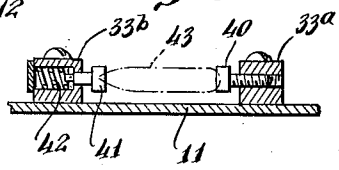


Fig. 3.

Fig. 8.

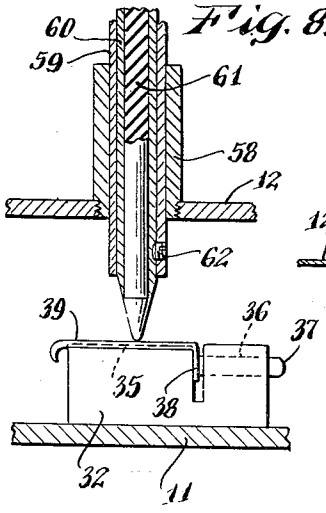


Fig. 6.

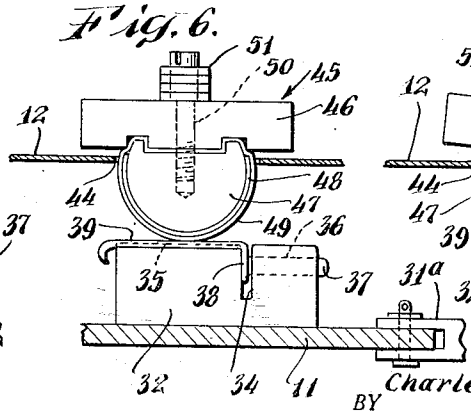
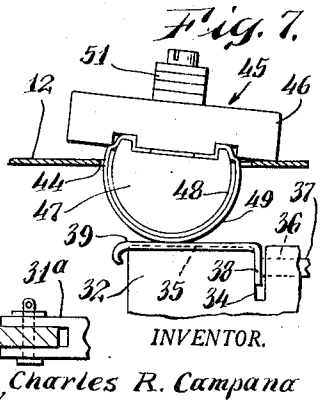


Fig. 7.



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2,822,686

WEAR AND ABRASION TESTING MACHINE

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4 Claims. (Cl. 73—7)

The present invention relates to a wear and abrasion testing machine, and more particularly to a machine for testing the wear resistance of gold plated articles.

In the mass production of gold plated articles of commerce such as ball point and fountain pen parts, mechanical pencil parts, items of jewelry, etc., the demand of the trade is such that the manufacturer must know the probable life or duration of the gold plated surface when the articles are subjected to ordinary wear. The commercial plating establishments must also know, for competitive reasons, the wear resistance of plated surfaces which will satisfy manufacturer's demand.

Wear resistance is dependent upon the composition and the thickness of the gold plate since certain plate coating compositions containing less gold but greater thickness have a longer useful life than other compositions containing more gold and less thickness. The hardness of the plated coating also constitutes an important factor in the wearability of the article. Hence, without knowledge in advance of the probable useful life of the plated surface, a manufacturer cannot be certain that his product reputation may not be impaired.

Prior to the present invention, so far as I am aware, no simple and accurate means were available for determining the wear resistance of a plated article or for making comparisons of the wear resistance of plated articles originating from the same or different plating establishments.

Accordingly, it is a primary object of the present invention to provide a testing machine wherewith various types of plated articles, and particularly gold plated articles, can be quickly and accurately tested for wear resistance.

A further object of the invention is to provide a machine of the character set forth wherewith comparative tests may be made, either simultaneously or at different times, of the surfaces of articles plated under different conditions or with different plating compositions, by one plating establishment or by a competitor.

A still further object of the invention is to provide a machine of the character set forth, adapted to removably accommodate jigs for supporting different types of plated articles to be tested.

A still further object of the invention is to provide a machine of the character set forth wherein the probability of error is reduced to a minimum.

Yet a further object of the invention is to provide a machine of the character set forth wherewith it can be quickly determined whether the thickness of the plated coating should be increased or decreased to meet certain specifications.

The foregoing and other objects of the invention not specifically enumerated, I accomplish by providing a machine wherein, by repeatedly moving the plated article to be tested and an abrasive carrying material relatively to each other, a predetermined number of times, under controlled conditions of speed of movement, coefficient of friction and character of abrasive used, comparisons

can be made of the plated surfaces to be tested with plated articles having known properties of abrasion resistance. Preferably, in the operation of the machine the abrasive carrying element is floatingly supported on the article to be tested and is loaded with a predetermined force which may be varied as desired, or standardized. The invention, the machine embodying the same and its operation will be readily understood from a consideration of the detailed description which follows, when considered in connection with the accompanying drawings, wherein:

Figure 1 is a top plan view of the machine embodying the invention, the frame for supporting the abrasive carrying elements being omitted.

Fig. 2 is a longitudinal sectional view taken along the broken line 2—2 of Fig. 1, showing the frame with the abrasive carrying elements in raised or inoperative position.

Fig. 3 is a transverse view taken along the line 3—3 of Fig. 2 and showing the abrasive carrying elements in operative position.

Fig. 4 is a top plan view of the frame for the abrasive carrying element.

Fig. 5 is a sectional view taken on the line 5—5 of Fig. 1.

Fig. 6 is a detailed side elevational view of the relationship of an abrasive element as shown in Figs. 2 and 3, in operative neutral testing position on a test piece.

Fig. 7 is a view similar to Fig. 6 showing the abrasive element in the position that it will occupy when the jig support has been moved to its left limiting position.

Fig. 8 is a fractional sectional side view similar to Fig. 6, of a modified form of the invention.

Referring first to Figs. 1 to 7 of the drawings, the abrasion testing machine consists essentially of a bed **10**, a reciprocating jig support **11**, an abrasive element supporting frame **12**, an odometer **13**, an electric motor **14**, a timer **15**, a light source **16** and a light diffuser **17**.

Mounted on the bed **10** is a base plate **18**, at one end of which is supported the odometer **13**, which is connected through a pitman **19** to the reciprocable jig support **11** to record the number of reciprocations of of said jig support. Also mounted on the base plate **18** are a plurality of crossties **20** to which are secured a pair of parallelly disposed angle members **21**, which, in turn, support a plurality of anti-friction rollers **22** over which the jig support is reciprocated. Also mounted on the angle members **21** are a plurality of upstanding bolts **23** adapted to adjustably support, in spaced relation to the reciprocable jig support **11**, a stationary frame member **24** which carries a secondary frame member **25**, to one end of which is pivotally connected by hinges **26** the abrasive element supporting frame **12**. Vertical adjustment of the frame **24** is accomplished through adjusting nuts **27** and **28** on the bolts **23**. Also mounted on the bed **10** is the motor **14** which, through a reducing gear box **29**, rotates a disc **30** to which is eccentrically and pivotally connected one end of a pitman **31**, the other end of which is pivotally connected to an extension member **31***a* mounted on the jig support **11**. It is through the motor **14**, reducing gear box **29**, disc **30** and pitman **31** that the jig support is reciprocated. The jig support **11**, which is in the form of a plate, is adapted to have removably mounted thereon various types of jigs, adapted to hold test pieces, two such types being shown. One of said jigs **32** is adapted to hold clips for fountain pens, pencils and the like, and another two-part jig **33***a*, **33***b* is adapted to hold barrels for pens, pencils and the like. The jig **32** is formed with a longitudinal slot **34** (Figs. 6 and 7) and with

a plurality of transverse grooves **35** and with transverse holes **36** extending from one end of the jig into the slot **34** and adapted to accommodate plugs **37** for frictionally holding the bent end **38** of a clip **39** within the grooves **35**. Only one such clip **39** and plug **37** is shown as mounted in the jig **32** on Fig. 1, although it will be apparent from an inspection of said figure that the jig is adapted to accommodate five such clips. The part **33***a* of the two-part jig (Fig. 5) carries a plurality of adjustable barrel supports **40**, while the part **33***b* carries a plurality of spring-pressed barrel tip supports which are urged outwardly from the support by coil-springs **42**. It will thus be seen that the barrel members **43** will be spring-held within the two-part jigs **33***a* and **33***b* and can be readily removed therefrom by moving the barrel tip support **21** rearwardly against the force of the spring **42**. Obviously, the jigs **32**, and **33***a*, **33***b* may be of any desired construction depending upon the shape of the test piece which it is intended to hold.

The abrasive element-supporting frame **12** as shown in Figs. 2, 3, 4, 6 and 7 consists of a rectangular plate having a plurality of aligned, spaced, rectangular sockets **44** each of which is adapted to have mounted therein an abrasive carrier **45**, which, when mounted in a socket, will overlie a test piece in a jig to be floatingly supported by the test piece. The abrasive carrier consists of a head **46** and a substantially semi-cylindrical body **47** having secured to its peripheral surface a deformable elastic cushioning strip **48** and an abrasive element **49** which is softer than the test piece. The abrasive element is clamped between the head and the body by a screw **50**. Preferably the head and body are formed of a heavy metal, the weight of which will, of course, be applied to the abrasive strip to produce a desired coefficient of friction between the abrasive element and the test piece. If it is desired to vary the force or total weight of the abrasive carrier, the screw **50** may be made longer than is necessary and may have split washers **51** mounted thereon. Preferably the sockets **44** are of somewhat larger dimension than the diameter of the body members **47** so as to permit a slight rocking movement of the abrasive element over the test piece as the test piece is reciprocated in frictional contact with the abrasive element. In Fig. 7 there is shown the relationship of the abrasive carrier to the test piece at the forward end of the stroke of the reciprocable jig support **11**. To hold the abrasive element supporting frame **12** in inoperative position so as to permit inspection of the test piece after it has been subjected to a predetermined number of reciprocations in contact with the abrasive element, the supporting frame **12** and the secondary frame member **25** may be connected together by toggles **52** and the supporting frame with a lifting bail **52***a*.

The motor **14**, as will be apparent, is adapted to receive its electrical energy from any source, herein shown as an outlet box **53** having a control switch **54**. The motor is connected to the timer **15** which, knowing the speed of the motor, the number of reciprocations of the support jig may be controlled by a dial **55**. To apprise an operator in carrying out a test that the predetermined reciprocations have been completed, there is associated with the timer a visible indicating means such as an electric light bulb **56**, and if desired, there may be also associated with the timer an audible signaling means such as a buzzer (not shown). The outlet box **53** and the timer **15** may be mounted at any desired location but, in order that the testing machine be constituted as a single unit, said parts are mounted on the light diffuser plate **17**, which is herein shown as supported on the bed **10** by a pair of angle brackets **57**.

The light source **17** herein shown as a fluorescent tube **16** is also preferably mounted to the rear of the light diffuser plate **17** so as to provide a diffused light under which test pieces may be examined during or at the completion of a test.

In Fig. 8 of the drawings I have shown a modified form of abrasive carrier which may be used for certain types of tests. As shown in said figure, the abrasive element-supporting frame **12** is formed with a rigid tubular member **58** within the bore of which is floatingly mounted an abrasive carrier **59** in the form of a metal tube, within which is mounted a pencil-like abrasive-containing member **60** having a core **61** formed of deformable elastic material such as the conventional rubber eraser material used in typewriter erasers of the pencil type. If desired, the pencil-like member **60** may be fixedly secured to the carrier **59** by a set-screw **62**.

With a testing machine as hereinbefore described and illustrated in the drawings, it will be apparent that the hardness or wear resistance of a plated coating such as a gold plate on a base metal part may be quickly, accurately and economically determined, and while I have shown certain preferred embodiments of the invention, it will be understood that changes in constructional details thereof may be resorted to within the range of engineering and mechanical skill without departing from the spirit of the invention as claimed.

What I claim is:

1. A machine for testing the wear resistance of a plated article, comprising a base member, a jig for holding a plated test piece, said jig being movably supported on the base member, a stationary frame member supported on the base member and having a socket therein overlying the jig, an abrasive element and a carrier therefor floatingly disposed in the socket in the frame, said abrasive element being elastically deformable and softer than the plated test piece with which it is to cooperate and under the weight of the carrier being adapted to bear upon such test piece when mounted in the jig, and means for reciprocating the jig so that the abrasive element will rub over the plated surface of the test piece when mounted in the jig.

2. A machine according to claim 1 wherein the abrasive element and the carrier therefor as a unit has a convex surface for contacting the test piece so as to be rockable by the test piece as the jig is reciprocated.

3. A machine according to claim 1 wherein the carrier for the abrasive element is a floating plunger vertically movable in the socket in the frame member and the abrasive element is of deformable elastic material.

4. A machine according to claim 3, wherein the plunger is a pencil-like member having a core of rubber erasure material which extends through the lower end of the plunger.

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