United States Patent [19]

Posen

[11] **3,900,953**

[45] **Aug. 26, 1975**

[54] **ORTHODONTIC MEASURING METHOD AND APPARATUS**

[76] Inventor: **Aaron L. Posen,** 2000 Bathurst St., Toronto 349, Ontario, Canada

[22] Filed: **Aug. 16, 1974**

[21] Appl. No.: **497,955**

[52] **U.S. Cl.** ..... **32/40 R;** 128/2 S

[51] **Int. Cl.** **A61c 3/00**

[58] **Field of Search** ..... 128/2 S, 2 R; 32/21, 40 R, 32/14 R

[56] **References Cited**

UNITED STATES PATENTS

3,680,386	9/1972	Cannon	128/2 S
3,800,782	4/1974	Josephson	128/2 S

Primary Examiner—Robert Peshock

Attorney, Agent, or Firm—Arthur A. Jacobs

[57] **ABSTRACT**

A method of measuring the position of the teeth prior to orthodontic treatment, whereby a mouthpiece which is connected to a gauge through a series of universal and rotational joints, is inserted into the patient's mouth and grasped by the lips, the lips then exerting a pulling force on the gauge to provide a measurement of maximum lip force which, in turn, provides an indication of the position of the teeth.

7 Claims, 5 Drawing Figures

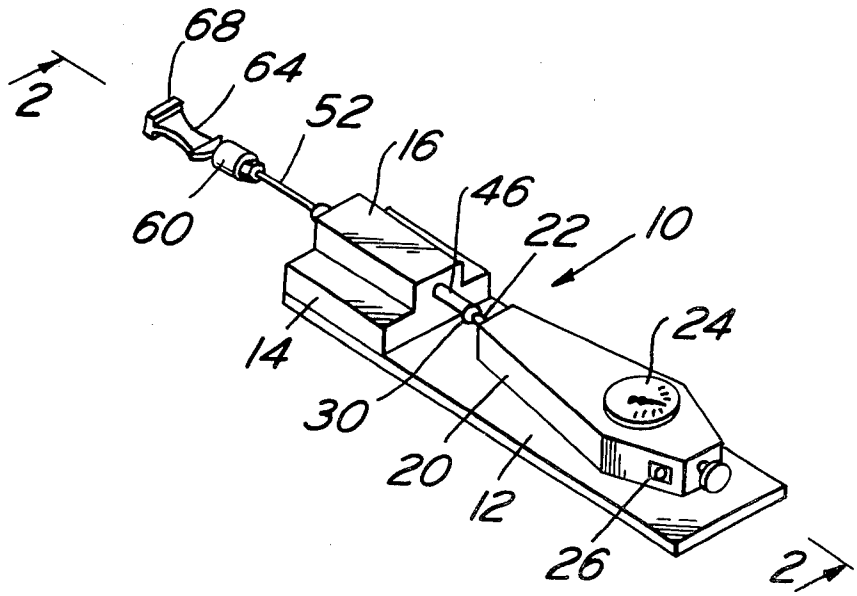


FIG. 4

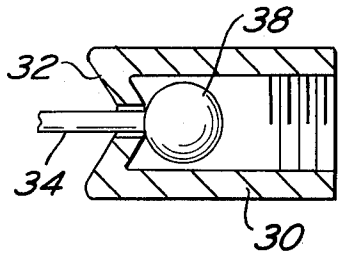


FIG. 1

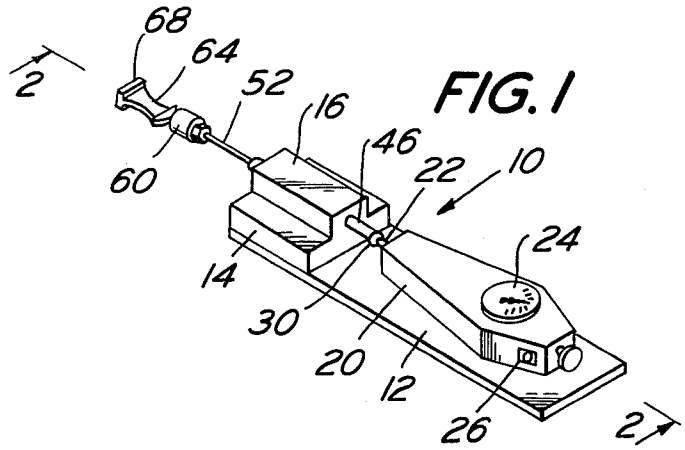


FIG. 5

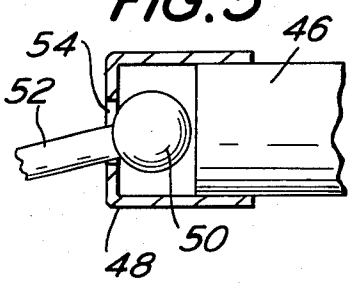


FIG. 2

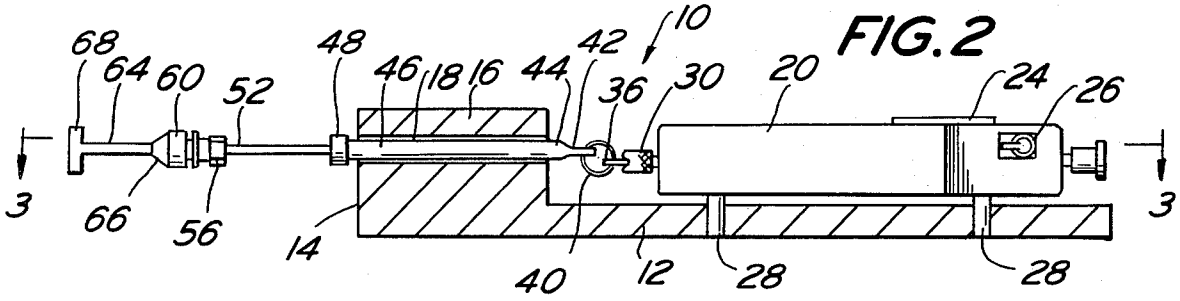
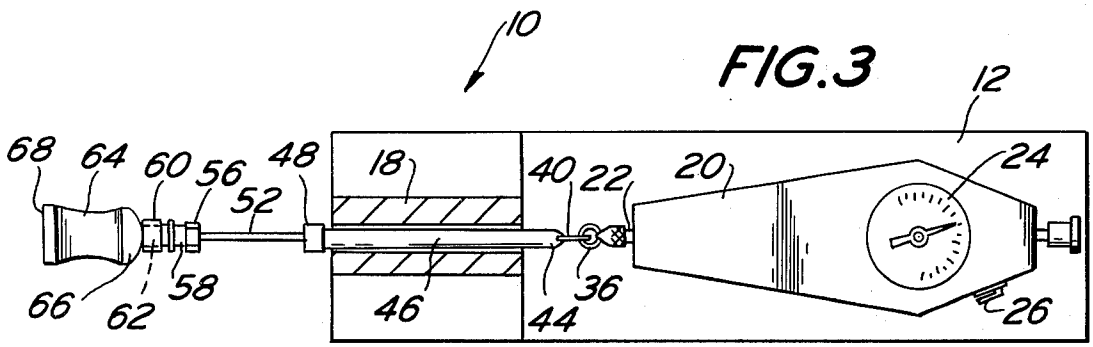


FIG. 3



ORTHODONTIC MEASURING METHOD AND APPARATUS

This invention relates to a method and appartus for orthodontic treatment, and it particularly relates to a method and apparatus for determining the position of the teeth in the mouth of a patient prior to orthodontic work.

The theory has long been held that it is the perioral musculature and tongue which principally determine the position of the teeth. In other words, it was considered that the agency of the lips and tongue is that which determines the position of the teeth themselves. It has now been determined, however, that although tongue pressure generally exceeds lip pressure, the tongue pressure is of little or no consequence because the tongue is suspended in the "mandibular trough". Furthermore, although the dorsal surface of the tongue contacts the palate and the tip of the tongue is in contact with the lingual surfaces of the incisors, the tongue is contained within the oral cavity so that its inherent potential muscle strength does not extend beyond contacting the palate and incisor teeth. In addition, despite the fact that the tongue applies greater force against the teeth during normal deglutition, the teeth are not moved excessively forward by this act. This is probably due to the fact that, in the normal act of swallowing, all the teeth are in occlusal contact. The articulation of the incline planes of the teeth, the roots set in the periodontal ligament, and strong alveolar bone, are more than sufficcient to overcome the force of the tongue in normal function.

The underlying principle of the method constituting the present invention is similar to the principle of the village blacksmith, in that the muscles of the right arm of the village blacksmith (provided that he is right handed) are more developed and stronger than the muscles of his left arm. Therefore, if the right arm rests or acts on an object continuously, it exerts a greater force than his left arm resting on the same object. When one transfers this concept to the areas of the lips. a certain parallel may be noted. The hypertonic perioral muscles resting or acting on the teeth will exert a greater force on the dentition than would less developed or hypotonic perioral muscles.

This consideration of the activity of the perioral muscles is based on sound physiologic principles. Even when muscles are at rest, they exert a certain amount of contraction or "tonus". Continuous and prolonged activity causes them to increase in size — a phenomenon called "hypertrophy". Conversely, when muscles are inactive or are used to produce only weak contractions, the muscles atrophy. Careful scrutiny of the activity emanating from the lips makes one recognize three types of forces of varied intensities. First, there is tonus which acts continuously while the muscles are at rest. Secondly, is the force generated during certain types of functions such as mastication, deglutition and speech, this force being undoubtedly stronger than that of tonus. Thirdly, is the force of maximum activity, as when the lips not only grip an object but also attempt to pull at it at the same time, thereby mustering the strongest amount of force available. This type of activity is well demonstrated by a person who attempts to take excessive amounts of food into the mouth.

The present method rests on the above principle and involves an instrument designed to measure maximum lip force at any given time and requires only a relatively

short period of 3 and 4 minutes for the measurement. The assessment of maximum perioral force may be conveniently and accurately measured and the information made available at the time of initial patientexamination.

In accordance with the present invention, an instrument is used whereby a gauge is provided with a mouthpiece which is inserted into the mouth of a patient who grips the mouthpiece with the lips. By pulling back the entire head, maximum lip force is registered.

The general concept of this invention has been described by the present applicant in an article in the "Angle Orthodontist", Volume 42, No. 4, dated October 1972. However, the apparatus for practicing the invention, as described in this article, was somewhat crude and was found to be unsatisfactory for the intended purpose.

It is, therefore, an object of the present invention to determine the maximum strength (maximum tonicity) of the lip muscles of a patient about to undergo orthodontic treatment, as that information is an important factor in determining the position which the incisor teeth assume in the jaws.

Another object of the present invention is to provide, for the first time, a quantitative assessment of the maximum strength (maximum tonicity) of the lips of the patient in an accurate manner and without subjecting the measuring apparatus to other inadvertantly applied forces.

Another object of the present invention is to provide, for the first time, information which allows one to predict with a high degree of accuracy, the type of conservative treatment response one may expect in the more prevalent types of malocclusions.

Another object of the present invention is to provide information indicating how other types of malocclusions develop and how they may be intercepted in their early development without the extraction of teeth.

Another object of the present invention is to provide information which indicates how certain malocclusions with high hypertonicity should be treated conservatively without the extraction of permanent teeth.

Other objects and many of the attendant advantages of this invention will be readily appreciated as the same becomes better understood by reference to the following description when read in conjunction with the accompanying drawings wherein:

FIG. 1 is a top perspective view of a measuring device embodying the present invention.

FIG. 2 is a sectional view taken on line 2 — 2 of FIG. 1.

FIG. 3 is a top plan view of the device of FIG. 1.

FIG. 4 is an enlarged sectional view showing one joint connection.

FIG. 5 is an enlarged sectional view showing a second joint connection.

Referring now in greater detail to the figures of the drawing wherein similar reference characters refer to similar parts, there is shown a measuring device, generally designated 10, comprising a support plate 12 which may be constructed of the same or a different material as the plate 12. The block 14 is provided with an upstanding housing 16 through which extends a longitudinal bore 18.

Mounted on the plate 12, in spaced relation to the block 14, is a measuring device generally designated 20. The measuring device 20 is a standard gauge de-

vice, such as the "Hunder" gauge (manufactured by the Hunter Spring Division of Ametek, Inc., Hatfield, Pa.). This gauge is calibrated to give a predetermined maximum reading, for example, about **1000** grams, and is capable of registering forces of pull exerted on a rod **22** operatively connected to the pointer of a calibrated dial **24.** A knob **26** is provided which stops the pointer when the maximum reading is registered on the dial. The pointer returns to zero when the knob **26** is pushed back.

The housing of the gauge **20** is rigidly attached to the plate **12** by pins, rivets or any other desirable fastening means, such as shown at **28,** whereby the rod **22** is permitted to move relative to the gauge housing when a pull is exerted on the rod.

Threadedly connected to the rod **22** is a sleeve **30.** The sleeve **30** is open at both ends, one end having internal threads to engage with external threads on the rod **22,** and the other end having an opening of relatively small diameter that is defined by inwardly tapering lips **32.** Extending through the opening defined by the lips **32** is the straight stem portion **34** of a hook **36.** The free end of the stem portion, within the sleeve **30,** is provided with a ball **38.** The hook **36** is adapted to abut against the outer surfaces of the lips **32** to act as a stop against linear motion in one direction while the ball **38** is adapted to abut against the inner surfaces of the lips **32** to act as a stop against linear motion the opposite direction. However, the ball **38** is free to rotate within the sleeve **30** and the stem portion **34** is free to rotate within the opening formed by the lips **32,** so that free rotational movement of the hook **36** relative to the sleeve **30** and rod **22** is provided.

The hook **36** is also loosely connected to a ring **40** extending loosely through an aperture **42** in the flattened nose portion **44** of a rod **46.** The hook **36** is, thereby, free to rotate around the ring **40** while the ring **40** is free both to rotate within the aperture **42** and to swivel therein relative to the nose portion **44.** As a result, the hook-and-ring connection between the sleeve **30** and the rod **46** provides what is, in effect, not only a universal-type joint, but does so with a minimum of frictional binding between the connecting parts of the joint. This is highly important, as well hereinafter, more fully appear.

The rod **46** extends through the bore **18** and is provided at its opposite end with a hollow cap **48.** Positioned within the cap **48** is a ball **50** provided on one end of a rod **52** which extends loosely throuh an aperture **54** in the cap **48.** The ball **50** and cap **48** provide a ball-and-socket joint which combines with the loose fit between the rod **52** and aperture **54** to provide a second universal-type whereby the rod **52** may not only rotate relative to the rod **46** but may also pivot in any direction relative thereto.

A cap **56** is provided on the free end of the rod **52** and, integral therewith, is a stem **58** that is threadedly engaged in a Luer lock **60** which is rotatably positioned the stem **62** of a mouthpiece **64,** such lock allowing for easy removal of the mouthpiece for sterilization. The mouthpiece **64** is an elongated plate which has concave edges that extend from a widened inner end **66** to a straight end flange **68.** The mouthpiece fits into the mouth of the patient without engaging the teeth while the lips of the patient engage the upper and lower portion of the flange **68.**

In operation the patient is seated upright at the edge of the chair and away from the head rest. The chair is adjusted so the mouth of the patient is in line with the mouthpiece attached to the measuring instrument. With the needle of the gauge at zero, the hold knob **26** is slid forward (away from the patient) and the patient is then asked to bring the teeth into occlusal contact, after which the mouthpiece is inserted between the lips in such a way that the surface of the mouthpiece contacts the labial surface of the maxillary incisors. The patient is then instructed to close the lips and pull the head as far back as possible without loosening the grip on the mouthpiece. This activates the gauge whereby the pointer on the gauge records a reading on the dial. The pointer will remain at the maximum point reached because the maximum-hold knob is locked into place. This reading is recorded and the patient is rested for approximately **1** minute. The knob **26** is then released so that the pointer registers zero again. The same procedure is then repeated, and another reading is recorded. Generally, the first reading is higher than the second; the variation usually being between about **5** to **10** grams. The highest reading is the one recorded for the patient. This is generally the first recording because muscular fatigue is likely to reduce the second recording if no rest period is allowed. This method may be repeated after a few hours or a few days because the results are reproducible and the differences have been found to be quite insignificant.

A highly important aspect of the present invention is the provision of the two specific types of universal joints described above, as well as the rotational relationship between the mouthpiece and the collar **60.** The gauge must necessarily be highly sensitive in order to perform its function. But this sensitivity makes the gauge sensitive to even slight pressures such as produced by inadvertant movement of the patient or the operator of the device, or even by any slight binding between the parts of the instrument.

The two types of universal joints described above and the rotational connection of the mouthpiece completely obviate any pressures on the gauge caused by inadvertant movement or binding of parts because any binding between the parts is eliminated by the joint construction while the joints provide sufficient play to dampen any pressure effects caused by movement of the patient or the operator of the device.

The invention claimed is:

1. A method of measuring the maximum strength of the lips of a patient without the interposition of other forces, the maximum strength of the lips influencing the position of the incisor teeth in the patient's mouth, which comprises causing the patient to bring his teeth into occlusal contact, inserting a mouthpiece, connected to a gauge by a universal joint, between the lips of the patient in such a manner that the mouthpiece contacts the labial surface of the maxillary incisors in the patient's mouth, causing the patient to close his lips so that only the lips grasp the mouthpiece, causing the patient to pull back his head while the mouthpiece is grasped only by the lips and while the gauge is free from the action of other forces due to said universal joint, and recording the force of pull of the lips on the gauge.

2. A measurement device for measuring the maximum strength of the lips which, in turn, influences the position of the incisor teeth in a patient's mouth com-

prising a support, a gauge for measuring linear strains mounted on said support, said gauge having a dial including a pointer, a rod means operatively connected to said pointer, said rod means having at least a portion thereof slidably positioned in a guide means mounted on said support, and a mouthpiece connected to said rod means, said rod means comprising at least two rod portions connected to each other by a universal joint, said rod means comprising a first rod protion operatively connected to said pointer, a second rod portion connected to said first rod portion by a universal joint, and a third rod portion connected to said second rod portion by a universal joint, said mouthpiece being connected to said rod portion.

3. The device of claim 2 wherein the universal joint between the first and second rod portions comprises a hook having a stem portion, said stem portion extending loosely through an aperture in a hollow sleeve mounted on said first rod portion, said stem portion having a ball on that end which is within said sleeve to provide a ball and socket connection, said hook being slidably connected to a ring, and said ring being loosely positioned in an aperture in the corresponding end portion of said second rod portion.

4. The device of claim 3 wherein the universal joint between the second and third rod portions comprises a ball and socket connection.

5. A measurement device for measuring the maximum strength of the lips which, in turn, influences the position of the incisor teeth in a patient's mouth comprising a support, a gauge for measuring linear strains mounted on said support. said gauge having a dial including a pointer, a rod means operatively connected to said pointer, said rod means having at least a portion thereof slidably positioned in a guide means mounted on said support, and a mouthpiece connected to said rod means, said means comprising at least two rod portions connected to each other by a universal joint, said mouthpiece being connected to said rod means by a rotatable connection.

6. A measurement device for measuring the maximum strength of the lips which, in turn, influences the position of the incisor teeth in a patient's mouth comprising a support, a gauge for measuring linear strains mounted on said support, said gauge having a dial including a pointer, a rod means operatively connected to said pointer, said rod means having at least a portion thereof slidably positioned in a guide means mounted on said support, and a mouthpiece connected to said rod means, said rod means comprising at least two rod portions connected to each other by a universal joint, said mouthpiece comprising an elongated plate having concave edges between the opposed ends thereof, and a transverse flange on its free end.

7. A measurement device for measuring the maximum strength of the lips which, in turn, influences the position of the incisor teeth in a patient's mouth comprising a support, a gauge for measuring linear strains mounted on said support, said gauge having a dial including a pointer, a rod means operatively connected to said pointer, said rod means having at least a portion thereof slidably positioned in a guide means mounted on said support, and a mouthpiece connected to said rod means, said rod means comprising at least two rod portions connected to each other by a universal joint, and a releasable lock means to lock said pointer in the position corresponding to the maximum strain placed thereon.

* * * * *