# United States Patent

**Guichet**

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## [54] ADHESIVE PAPER


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**Related U.S. Application Data**

[63] Continuation-in-part of Ser. No. 681,785, Nov. 9, 1967, Pat. No. 3,490,146, Continuation-in-part of Ser. No. 348,013, Feb. 28, 1964, Pat. No. 3,431,649.

[52] **U.S. Cl.** .....**161/6,** 117/68.5, 117/76 A, 117/122 P, 161/167, 161/406, 161/413, 346/77 E

[51] **Int. Cl.** .....**B44f 1/00,** B41m 5/00

[58] **Field of Search** .....161/406, 6, 167, 413; 117/68.5, 122 P, 76 A, 36.7; 346/77



[56] **References Cited**

UNITED STATES PATENTS

| | | | |
|---|---|---|---|
| 2,677,728 | 5/1954 | Kolb et al. | 117/239 UX |
| 3,252,234 | 5/1966 | Goodman | 117/68.5 UX |
| 3,497,969 | 12/1967 | Schwoegler | 117/68.5 UX |



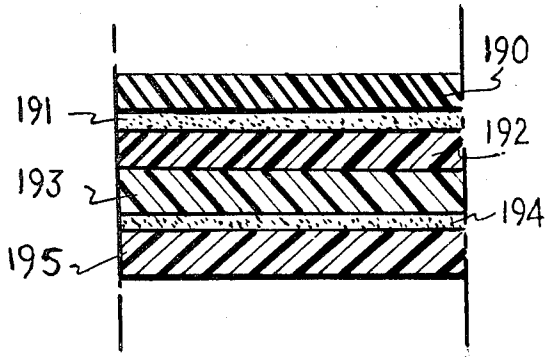
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[57] **ABSTRACT**

The invention comprises pressure-sensitive recording papers comprising in successive layers, a backing paper carrier, a releasable adhesive, a pressure-sensitive coating and a clear protective overlay on a second carrier with a releasable adhesive. This recording paper is suitable for use in any recording device and is particularly suitable for use with the dental pantograph described herein.

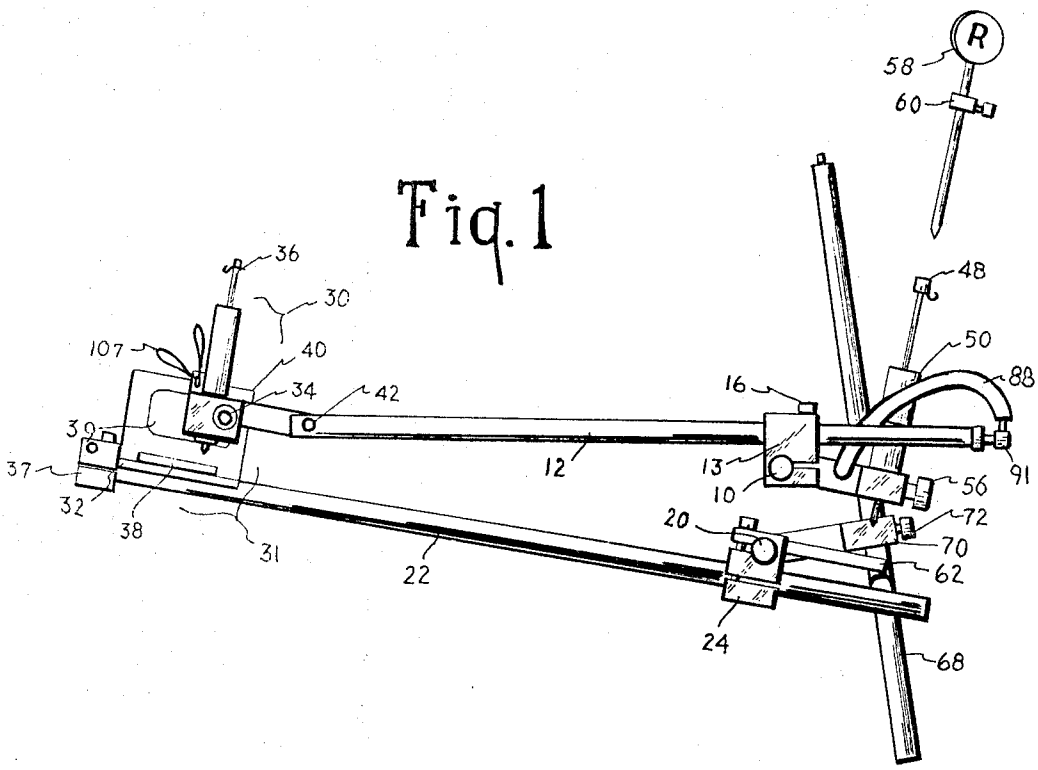

**10 Claims, 3 Drawing Figures**



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Fig. 1



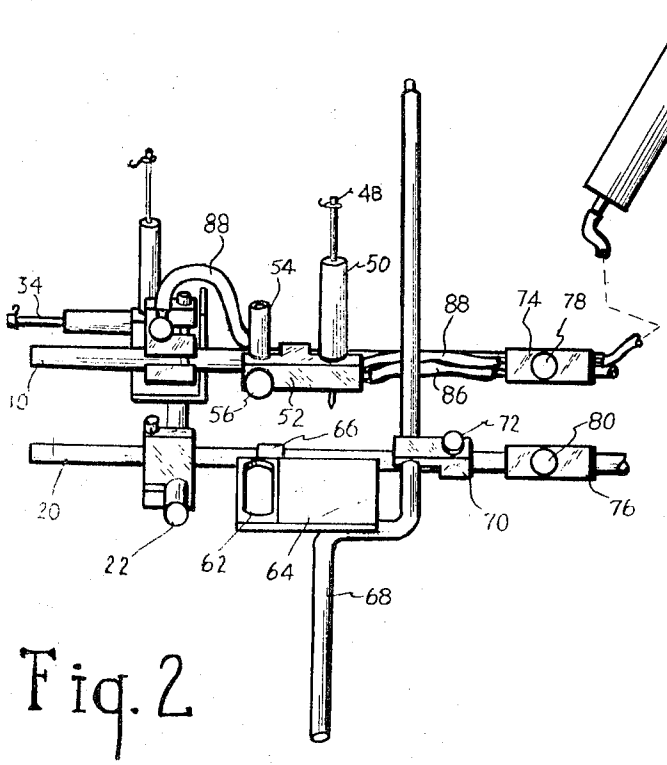




Fig. 2

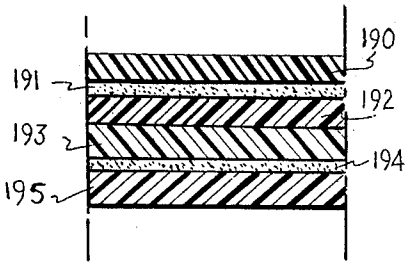



Fig. 3

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# ADHESIVE PAPER

## DESCRIPTION OF THE INVENTION

This application is a continuation-in-part of my copending application Ser. No. 681,785, filed Nov. 9, 1967 and Pat. No. 3,490,146 which is a continuation-in-part of my copending application, Ser. No. 348,013, filed Feb. 28, 1964 and now U.S. Pat. No. 3,431,649.

This invention relates to improvements in pressure-sensitive paper which can be supported on a dental pantograph such as that described in the aforementioned patents for obtaining tracings of the mandible.

Pantographs have been employed for obtaining tracings of the paths of movement of the human mandible and these devices generally comprise a first face bow which is secured to the maxilla and a second face bow which is secured to the mandible. Scribers are carried by one of these face bows positioned opposite to recording tables on the other face bow. The face bows are commonly mounted on the maxilla and the mandible by dental clutches. The tracing obtained with the pantograph are mounted on a dental articulator and are used to set the articulator to follow the tracings and duplicate the mandible excursions.

The face bows commonly support the tracing means, i.e., styli and recording tables externally of the human jaw. Since the lateral excursions of the mandible are translational and/or rotational about one or the other of the condyles of the mandible and since the recording tables are mounted away from the exact center of these movements, the excursions are recorded by the scribers as lines or arcs moving with or about the rotational centers.

The pantographs have also heretofore been employed with a recording table on which is dispersed a coating of talc in a volatile solvent such as an alcohol. The solvent evaporates and leaves a talc coating on the table which is scratched by the recording scriber for obtaining the record of the mandible movement. To protect the tracings, an adhesive transparent tape is placed on the talc coating from and then pulled off carrying with it most of the talc coating from the table after the articulator has been set on the proper movements.

It is an object of this invention to provide pressure-sensitive recording paper that can be readily applied to and removed from a recording device.

It is a further object of this invention to provide such sensitive recording paper laminated with an adhesive coating for facile application to a recording device.

It is also an object of this invention to provide a dental pantograph in combination with sensitive chart paper that is laminated with adhesive and protective coatings for facile use and preservation.

Other and related objects will be apparent from the following description of the invention.

The invention will now be described by reference to the FIGURES, of which:

FIGS. 1 and 2 illustrate a dental pantograph assembly; and

FIG. 3 illustrates a cross section of the laminated pressure-sensitive recording papers of my invention that can be used with the pantograph or other recording device.

Referring now to FIG. 1, there is illustrated the pantograph assembly. This assembly comprises an upper and lower face bow. The upper face bow comprises a first crossbar **10** to which are affixed sidearms such as **12** by lock clamps such as **13**. These lock clamps have transverse bores which are slotted as shown and have a compression screw such as **16** that can be tightened to compress the slots and bind the clamp against the crossbar and sidearm. Affixed to the lower crossbar **20** are similar sidearms **22**. The posterior of the sidearms support the recording tables and the tracing styli. The sidearms are interchangeable so that either face bow can support the recording styli. As shown, the upper face bow supports the styli assembly **30** and the opposite face bow supports the recording table assembly **32**. The styli assembly has a horizontal recording stylus **34** and a vertical recording stylus **36**. These are



adapted for pneumatic actuation to permit remote control of the recording function.

The recording tables carry removably mounted pressure-sensitive paper **38** and **39** which comprise the subject matter of this application. These papers comprise a clear protective overlay identified as **190** in FIG. **3**; an adhesive layer **191**; a scratch coating **192**; a backing **193**; an undersurface adhesive **194**; and a protective layer **195**. The adhesive coating **194** is releasable and is used to secure the papers to the recording tables as described in greater detail hereinafter. The scratch coating is for recording styli movement and the protective overlay and its adhesive coating protect the scratch coating. The structure and composition of these layers and their function will be described in greater detail after the following discussion of the pantograph and its construction.

FIG. **1** shows the posterior styli supported on the upper face bow. The alternative arrangement, i.e., the posterior styli on the lower face bow is preferred for ease of mounting the dental casts as described in my aforementioned patent. In FIG. **1**, the hinge axis centering pins are mounted to the rear of **39** by block clamps **37**. When the lower face bow carries the styli assembly, the hinge axis centering pin is removably attached to this assembly as shown in FIG. **4**.

The anterior of the pantograph has recording means for anterior tracings. These are illustrated in the view presented in FIG. **2**, which shows the right side of the assembly. The recording stylus **48** is carried by the upper face bow opposite recording table **64** of the lower face bow. The assemblies are preferably combined with check bite reference means comprising at each side, a check bite pin holder **54** which supports a pin such as **58**. The pin holder **54** is mounted opposite a check bite tray **62** on the opposite face bow. The check bite support and the recording stylus assembly are combined in a single unit comprising T-shaped clamp **52** that is secured to crossbar **10** with a compression screw that passes through transversely to a slot in the rear face of **52** and that intersects the bore through **52** surrounding bar **10**. The check bite holder comprises cylinder **54** and setscrew **56** which extends into the cylinder to bind the check bite pin **58** in the holder.

The check bite pin has an identifying flag as shown to indicate that the pin is used for the right centric position. A clamp **60** with a setscrew is provided on this pin and rests upon the top of cylinder **54** to record the depth of the pin within this cylinder when the centric position is recorded on the patient. The lower end of the pin indents the wax or plastic on the impression tray **62** in this position.

Adjacent the recording table and wax impression tray assembly is the clamp for the reference plane support rod **68** used to orient the lower face bow to the proper vertical position with reference to a horizontal reference plane that passes through the axis of the condyles. This support rod **68** is suitably and movably mounted with a block clamp **70** having a compression screw **72** for locking the vertical position of the rod to the clamp with a compression screw **74** to lock the block clamp **70** to the lower crossbar **20**.

The upper and lower crossbars carry, at their approximate centers, blocks **74** and **76** that are permanently secured to the crossbars and that bear, on their posterior surfaces, a lateral track that runs parallel to the crossbar for indexing thereto clutches formed in accordance with my invention described in copending application, Ser. No. 625,213, filed Mar. 22, 1967 and now U.S. Pat. No. 3,508,333. Screws **78** and **80** extend posteriorly through these blocks and into the track to engage a threaded boss on the clutch thereby temporarily and rigidly securing and indexing the clutches to their respective face bows in a fixed and predetermined orientation. The nature of the clutches and the manner in which they are keyed to the face bows is described in greater detail in the aforesaid copending application.

A preferred embodiment of the pantograph comprises remotely controlled styli which are actuated by fluid pressure, preferably pneumatic. This pressure is supplied from a suitable source and is controlled by hand valve **82** having a finger-

actuated plunger **84**. Flexible tubing communicating with a source of fluid pressure, e.g., compressed air, connects to the valve **82** and a manifold in block **74**. Tubing branch lines **88** and **86** extend to the recording styli. Tubing **88** passes through block **52** and terminates with a male fitting **91** that seats in a plastic insert **90** on the end of upper sidearm **12**. A tubing extends through this arm and connects to the posterior tracing assembly **30**. The posterior recording styli are described in greater detail in my aforementioned patent. Briefly each comprises a stylus on the end of a rod that supports a piston slidably mounted in a cylinder connected to the fluid pressure line. Rubber bands **107** are secured to a hook **109** on the styli to bias against the fluid pressure.

Referring now to FIG. **3**, there is illustrated a cross section of the removable pressure-sensitive recording papers used with my pantograph. These papers have a pressure-sensitive coating and have adhesive for mounting to the tables. The components of this laminated paper comprise a clear protective overlay **190** which can be of a clear vinyl, e.g., vinyl acetate having from about 1 to 15 mils; preferably about 3 mils thickness. The overlay has an adhesive firmly secured to its undersurface as shown at **191** so that it can be applied to the recording paper after the latter has been applied to the table and the recording obtained. The upper surface of the paper thus exposed is shown as **192** and comprises a scratch coating, e.g., a wax layer from about 1 to about 10 mils thickness; preferably about 3 mils. This coating can be scribed by the styli with light pressure of about 0.05 to 0.5 ounce to leave a tracing on the surface of the paper.

The paper comprises a backing **193** which can be a paper such as a 25-pound stock having a thickness from about 1 to about 10 mils thickness. The undersurface of the backing has a releasable adhesive, hereinafter described, firmly secured to its undersurface.

The releasable adhesive secures the transfer paper to the recording tables and is protected by a thin protective layer **195** which can be a thin sheet of waxed or other protective paper. The combination of the pressure-sensitive recording paper and the transparent desensitizing protective overlay **190** provide a highly useful recording means in combination with the remotely controlled styli of the pantograph of my invention. The recording blanks are fabricated from the paper stock that has been coated with coating **192**, **194** and protected with layer **195**. In the fabrication of the blanks **30** and **38**, a metal die is used to cut the blanks from the aforementioned paper stock and similarly cut overlays **190** are also provided.

The adhesive coatings **191** and **194** are the pressure-sensitive type adhesives well known in the art. These actually are formed generally with at least two coatings on the backing paper or fabric. The first coating is a primer or anchor coating to obtain maximum adhesion between the adhesive coating and the backing. Primer coatings which are useful include blends of natural rubber latex with casein, polyvinylalcohol, hydrophilic colloid latex, terpolymers of butadiene, styrene and acrylonitrile, mixtures of casein and polyvinyl pyrrolidone in latex rubber, etc.

The adhesive is a permanently tacky coating. Suitable adhesives are formed with a natural or synthetic, e.g., butadiene-styrene, rubber matrix into which is incorporated a tackifying resin. Wood rosin, esters thereof, coumarone-indene resins, polyterpene resins, pinene phenolic condensates and phenolic resins can be used as tackifying resins. Pigments can be optionally added to increase adhesion and the coating can also be vulcanized to increase its solvent resistance.

The following illustrate tackifying resin compositions which can be incorporated in a latex matrix in an amount from about 5 to 35 weight percent to obtain the adhesive coating:

| | | Parts |
|---|---|---|
| 1. | Hydrogenated methyl abietate | 50 |
| | Rosin | 50 |
| 2. | Hydrogenated ethyl abietate | 40 |
| | Coumarone-indene resin | 60 |
| 3. | Hydrogenated benzyl abietate | 70 |
| | Rosin | 30 |

The relative adhesive strength of coatings **191** and **194** can suitably be achieved by using greater concentrations of the tackifying resin in the more adhesive coating. This adhesive force is commonly measured by the stripping force to remove the tape in a standardized testing procedure.

The recording blanks, die-cut to proper dimensions, comprising layers **192**, **193** and **194** are removed from their carrier (or vehicle) layer **195** and are applied to the tables and the patient is instructed to move his mandible. The styli are urged into a recording position against the pressure-sensitive paper by proper control of the valve **82**. After recording, overlays comprised of layers **190** and **191** are placed over the papers to protect them against erasure or accidental scratching. After the recordings have been used to set the articulator, the entire assembly of recording paper and protective overlay is removed by parting the bond between the releasable adhesive layer **194** and the table and the recordings can be preserved for further reference. To facilitate this removal, the adhesion of coating **191** should be greater than that of coating **194**.

The operation of the pantograph is fairly obvious from the preceding description. The pantograph is positioned on the patient's face by placing the lower clutch and lower face bow assembly on the patient's mandible and using the hinge axis pins **155** which are threaded into the threaded bores on the inside surface of the horizontal recording styli cap as described with reference to FIG. **4**. These pins are oriented to the reference points on the patient's face which have previously been located on the hinge axis with a hinge axis locator. The hinge axis centering pins **155** are then removed and the upper face bow is placed on the patient's maxilla. Since the anterior of the sidearms of the upper face bow preferably support the recording table, these tables with the pressure-sensitive papers applied thereto are inserted between the posterior recording styli and the side of the patient's face. These posterior recording tables are adjusted into the proper spacial relationship and secured by tightening the screws of the clamps on the upper crossbar.

The reference plane support rod clamp **70** is adjusted parallel to the reference plane scribed on the patient's face and the anterior recording tables such as **64** are adjusted parallel to the sidearms of the face bow. The anterior scriber support clamps are adjusted so the centric check bite cylinders such as **54** are vertically positioned above the wax wells **62**. The pneumatic connectors **91** are seated into the plastic caps **90** and the stylus control valve is connected to the air syringe and to the pantograph manifold in block **74**. The air pressure supplied to the styli force the styli away from the recording papers and the elastic bands **106** and **107** are secured to their hooks such as **105** to urge the styli into a recording position. The patient is then instructed in the movements and when thoroughly familiar with the pantograph, button **84** is depressed, releasing the air pressure and permitting the elastic bands to move the styli into a recording engagement with the sensitive papers.

After the recording, the anterior reference plane support rod is oriented on the pantograph. A plane locator which is a flat L-shaped sheet of thin plastic or metal is placed on the top of the rod and the rod is moved in its clamp until the plane locator is oriented in a horizontal plane passing through the hinge axis. The clamp **70** is then used to lock the rod in this position. The pantograph is then removed from the patient and the tracings on the papers are protected by covering with the clear plastic overlays **190**.

The invention has been described in reference to a particular and illustrated embodiment of the pantograph and recording papers useful in combination therewith. It is not intended that the invention be unduly limited by this illustration but, rather, it is intended that the invention include all obvious modifications and equivalents.

I claim:

1. Pressure-sensitive recording paper and protective overlay therefor that comprises: (1) a recording paper backing, (2) a first releasable adhesive coating on one side of said backing adapted to secure said paper to a table, (3) a pressure-sensi-

tive coating deformable by styli to leave a tracing thereon on the opposite side of said backing, and (4) a transparent, desensitizing overlay above said pressure-sensitive coating to protect it against accidental scratching with (5) a second releasable adhesive coating applied with its adhesive side on said pressure-sensitive coating, the adhesion of said second releasable adhesive coating to said pressure-sensitive coating being greater than the adhesion of said first releasable coating to said table.

2. Pressure-sensitive recording paper and protective overlay according to claim 1, where a temporary protective layer is releasably secured to said first releasable adhesive coating.

3. The combined paper of claim 1 wherein said pressure-sensitive coating comprises a scratch coating of a soft material deformable by styli with tracing pressures of from about 0.05 to 0.5 ounce.

4. The combined paper of claim 3 wherein said scratch coating comprises a wax coating.

5. The combined paper of claim 1 wherein said releasable adhesive coating (2) is a permanently tacky adhesive.

6. The combined paper of claim 1 wherein said backing has a thickness from 1 to about 10 mils.

7. The combined paper of claim 1 wherein said overlay is a vinyl plastic having a thickness from 1 to about 15 mils.

8. The combined paper of claim 7 wherein the thickness of said overlay is about 3 mils.

9. The combined paper of claim 4 wherein said wax coating has a thickness of about 1 to 10 mils.

10. The combined paper of claim 9 wherein said wax coating has a thickness of about 3 mils.

* * * * *