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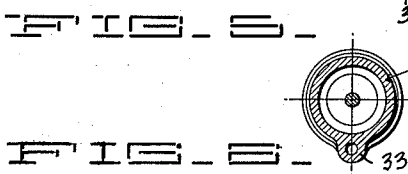
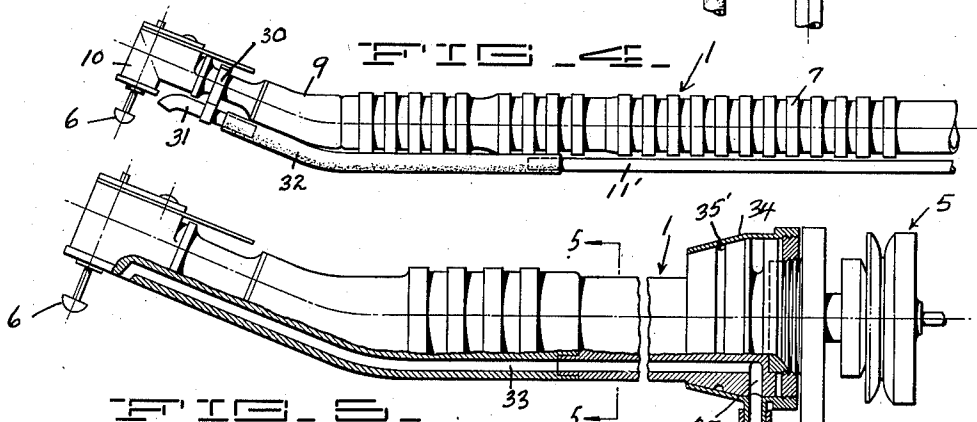
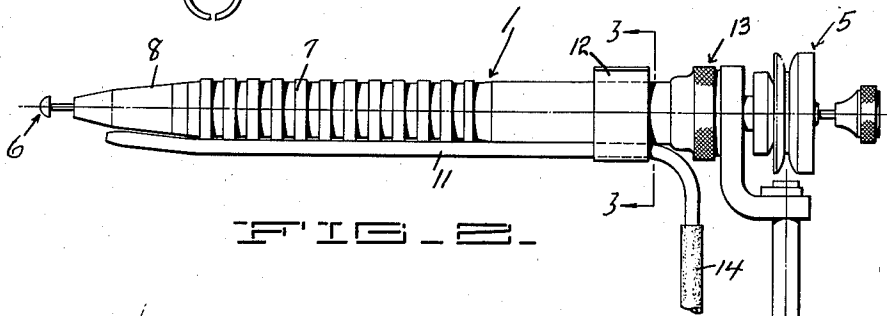
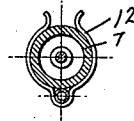
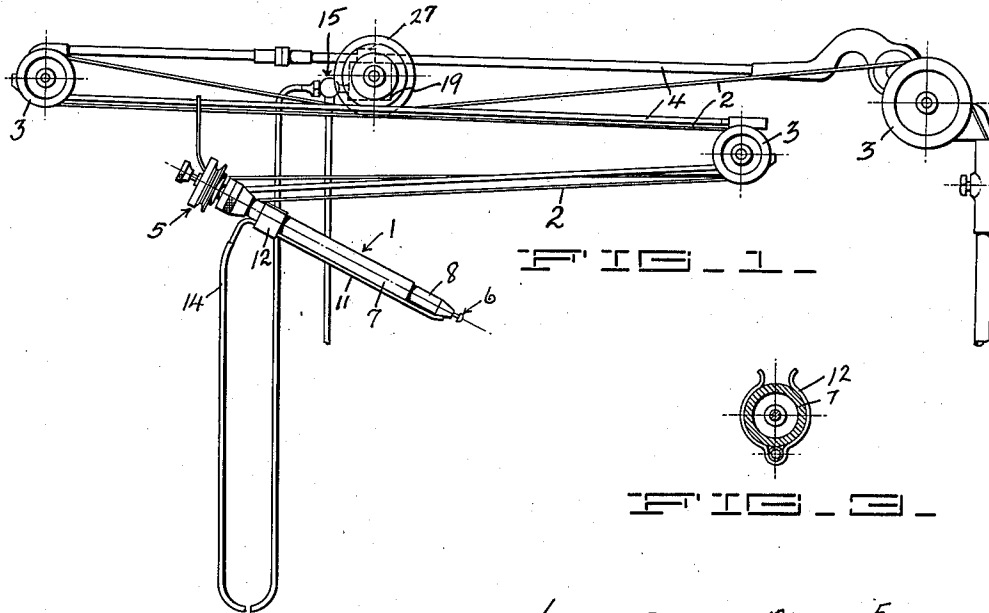
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2,231,393

DENTAL APPARATUS

Filed Nov. 13, 1939

2 Sheets-Sheet 1



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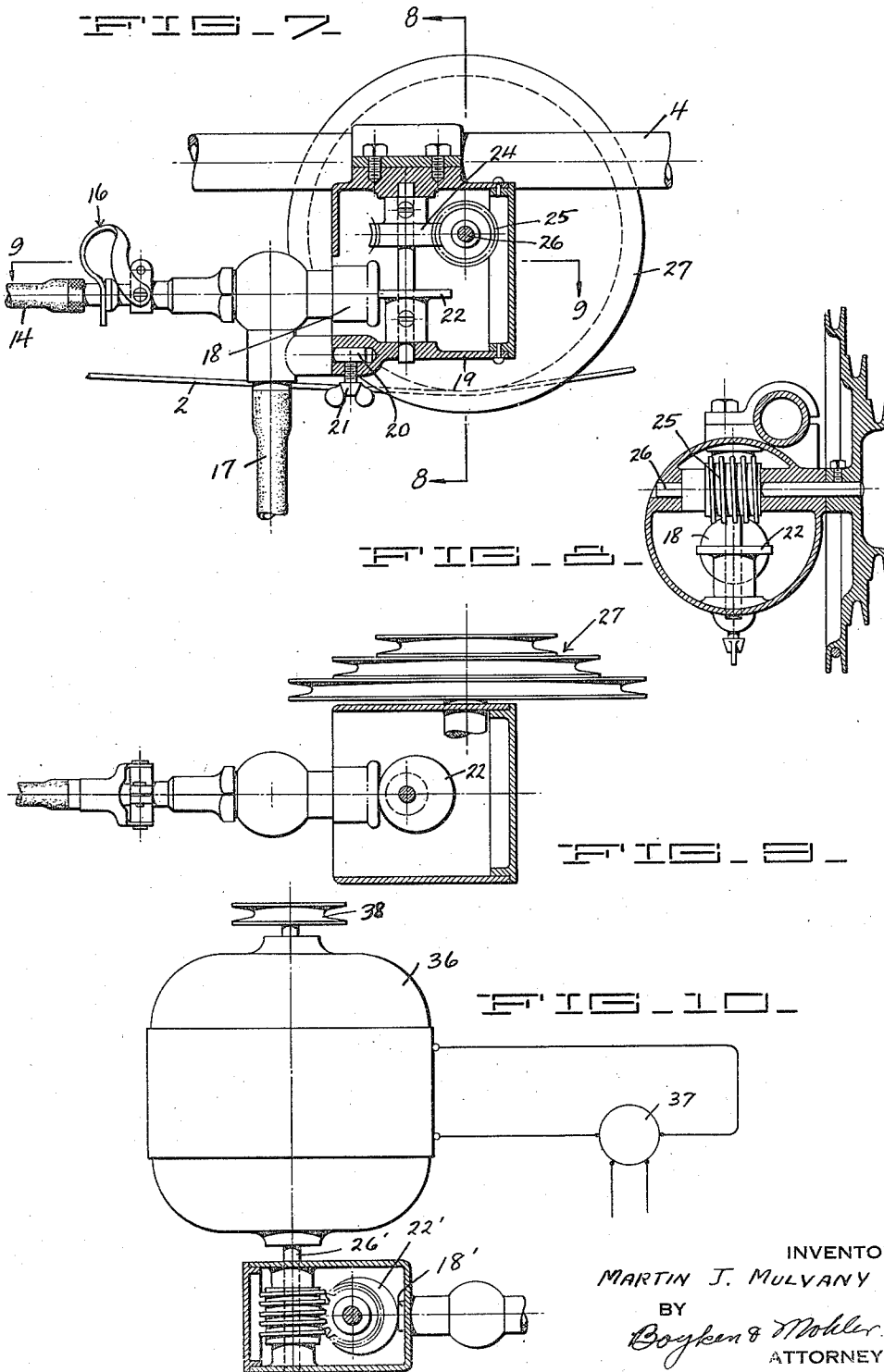
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2 Sheets-Sheet 2



UNITED STATES PATENT OFFICE

2,231,393

DENTAL APPARATUS

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Application November 13, 1939, Serial No. 304,066

6 Claims. (Cl. 32—28)

This invention relates to dental apparatus and has for its objects a simple and improved means for automatically ejecting air towards a tooth of a patient while the dentist is working on said tooth for automatically cleaning the tooth of loose material etc. Another object is means of the above character that is automatically operative at periodic spaced intervals of time, and a still further object is means of the above character in which the air is ejected toward the tooth at periods of time directly proportional in frequency to the speed of the drill, burr, or other tool used for cutting or cleaning the tooth, the frequency of air ejection being greater as the speed of the tool is increased, and reduced as the speed decreases.

Other objects and advantages will appear in the specification and drawings annexed hereto.

In the drawings, Fig. 1 is a fragmentary elevational view of conventional dental engine arms with my invention attached thereto.

Fig. 2 is an enlarged elevational view of a conventional hand piece with my air nozzle and air line connected thereto.

Fig. 3 is a sectional view taken along line 3—3 of Fig. 2.

Fig. 4 is an enlarged elevational view of a conventional contra-angle head on a dental hand piece with my air nozzle and air line attached thereto.

Fig. 5 is a hand piece of the type illustrated in Fig. 4, but in which my air line is formed integrally with the hand piece.

Fig. 6 is a sectional view along line 5—5 of Fig. 5.

Fig. 7 is a sectional view of the means for automatically controlling the air supply to the air ejection nozzle with the said means attached to the conventional valve in the supply line from the compressor.

Fig. 8 is a sectional view along line 8—8 of Fig. 7.

Fig. 9 is a sectional view along line 9—9 of Fig. 7 with the pulley and valve shown in elevation.

Fig. 10 is a modified form of the invention in which the air valve is controlled by a motor separate from the dental engine motor.

Briefly described, the conventional dental equipment includes an air line, a finger operated valve and an air ejection nozzle for cleaning away loose material from the tooth being operated on. However, in using this conventional equipment the dentist must first hang up the dental tool he is using, which includes the hand piece, and then as a separate operation, take the air nozzle and clean the cavity or area on which he is working, and then go back to the hand piece after hanging up the air nozzle. All this is a waste of time

and in any event the main operation being done is interrupted at times when least desired and as a result the quality of the work done may actually suffer thereby.

With my invention, the tooth or the area in which the dentist is working is automatically kept clean by air without cessation of the work and without discomfort to the patient, and when the dental engine stops the air stops and when the drilling is rapid the air ejection is more frequent while with slower drilling the ejection intervals are less frequent.

In the drawings, the body of the dental hand piece 1 is connected with the dental engine by belt 2 in the usual manner, the said belt passing over suitable pulleys 3 respectively positioned at pivoted joints connecting engine arms 4. At the juncture between the hand piece 1 and the arm carrying the same, there is generally a pulley 5 over which the belt passes which pulley is connected by means of mechanism in the hand piece with the drill or burr 6 for rotating the latter.

The hand piece itself has a tubular member 7 with a removable outer end portion 8 (Fig. 2) which may be substituted for an angle end portion 9 (Fig. 4) as desired, in which latter instance the chuck 10 carrying the burr 6, or the drill or saw or the like, is adapted to support the shank of such burr in a position disposed generally transversely of the longitudinal axis of the member 7, whereas in Fig. 2 the longitudinal axis of such shank is in coaxial alignment with said axis.

In carrying out my invention with respect to Figs. 1, 2, I provide an air conduit 11 alongside said member 7, extending longitudinally of the latter and terminating at one end alongside the end portion 8 in an open end or nozzle, having its discharge opening directed toward said burr. This nozzle is preferably spaced from the burr and alongside the portion 8, so that air ejected from the nozzle will be directed against the portion of the tooth being operated on.

The conduit 11 in Figs. 1, 2, is preferably rigid, and is clamped to the member 7 by the spring arms of a clamp 12, or by any other suitable means.

Adjacent the connection 13 that rotatably supports the member, the said conduit is connected with one end of a flexible air line 14, which line 14 connects with a constant source of air under pressure as is incorporated in practically all modern dental drilling and polishing devices. The opposite end of said air line communicates with the discharge port of a valve 15 by a removable clamp 16 (Fig. 7) and the intake port of said

valve connects by an air line 17 with any suitable source of compressed air.

The valve 15 is conventional with a quick acting valve having a reciprocable exposed head 18 (Fig. 7) projecting from one side of the valve casing for moving the valve to open position upon pressing the head 18 toward the valve casing and a conventional spring within said casing (not shown) yieldably forces the valve head outwardly and closes the valve when the pressure on the head is removed. In conventional dental apparatus this valve, as described above, is manually operated, the operator depressing head 18 with the thumb to open the valve.

A small gear housing 19 is secured to said valve by any suitable means, such as by a pin 20 projecting from a portion of the valve case into a socket in said housing 19, and which pin is held on the pin by a set screw 21. Obviously any other suitable means may be employed, but any such means should provide for ready removal of the gear housing 19 if desired, although this is not absolutely necessary.

Within housing 19 is a cam 22 secured on a shaft 23, said shaft being rotatable in bearings carried by the housing. A spiral gear 24 is also secured on shaft 23 which gear is in mesh with a worm gear 25 that is secured on a shaft 26. Shaft 26 is rotatable in bearings carried by the housing, and one end of said shaft extends outwardly of the housing, which outwardly extending end carries a multiple pulley 27 made up of several pulleys of different diameters.

The housing 19 is preferably clamped to one of the arms 4 of the dental engine in a position whereby one of the runs of belt 2 may be drawn into frictional engagement with any one of the pulleys comprising said multiple pulley 27.

When the housing 19 is secured to the valve casing already described, and one of the pulleys 27 in engagement with belt 2, the cam 22 is in a position adapted to engage head 18 of the valve as the cam is revolved for opening and closing said valve. As the high side of the cam presses valve head 18 inwardly, the valve will open and the head will automatically return to closed position as the low side of the cam moves toward said head. Thus air in lines 17, 14 will be ejected intermittently from the nozzle end of conduit 11 and onto the tooth being worked upon by the burr 6 as long as the dental engine is running. The cam 22 may be varied in shape to produce any character of injection required, such as a relatively quick opening and closing of the valve or a quick closing and a slower opening or vice versa, but in any event the opening and closing of the valve is intermittent, and the frequency of opening is directly proportional to the speed of the dental engine. The provision of several pulleys of different diameters enables the frequency of opening of the valve to be changed for any predetermined engine speed. The size of the gears 25, 26 and the pitch of the threads of said gears may be changed to meet any desired condition without invention.

In Fig. 4 the main body 7 of the hand piece is fitted with an angle portion 9, in which case instead of using a rigid air conduit corresponding to conduit 11 of Fig. 2, that extends to adjacent the burr, I provide a slightly shortened conduit 11' terminating at about the juncture between portion 9 and the body 7, which conduit is secured to the portion 9 in the same manner as conduit 11 is adapted to be secured to member 7. Adjacent the chuck carrying head 10 a clamp 30

secures a short nozzle 31 to said head which nozzle has its discharge end directed toward the burr 6, while the opposite end of the nozzle connects with conduit 11' by a flexible tube 32. This enables the end portion and head 10 to be rotated relative to the portion 7.

In Fig. 5 the air conduit 33 along the hand piece and terminating adjacent the burr, is formed integrally with the hand piece, the discharge end of said conduit being directed to discharge the air toward the burr. The air line 14 connects with this conduit through a side of sleeve 34, which sleeve carries an annular groove 35 communicating between the line 14 and conduit 33, the said sleeve having a grease seal 35' permitting rotation of the hand piece relative to said sleeve without leakage of air past said sleeve.

In each instance, the air supply is regulated by the valve and the cam and cam actuating means already described.

Fig. 10 illustrates a form of the invention in which the valve may be actuated directly from a motor 36 which may be separate from the dental engine, or which may be the dental engine, but the speed of said motor, if separate from the dental engine, varies in direct proportion to the speed of the dental engine through a rheostat 37 that may control the speed of both the dental engine and the motor 36. Also, in this form of invention, the motor directly connects with drive shaft 26' instead of the drive being through a pulley connection with the dental engine, and the valve stem 18' directly engages the cam 22'. Where the motor 36 is the dental engine itself, a pulley 38 is provided for the belt 2, which pulley may be on the armature shaft of the motor.

Having described my invention, I claim:

1. In combination with a dental hand piece that includes a burr or the like, a dental engine, drive means extending between said burr and said engine, an air conduit including an end portion carried by said hand piece, said end portion having an air ejection nozzle positioned adjacent said burr and directed toward the latter, a valve in said air conduit for opening and closing said conduit to flow of air to said nozzle, means for periodically opening and closing said valve, including a power means and mechanical drive means connecting between said power means and said valve.

2. In combination with a dental hand piece that includes a burr or the like, a dental engine, drive means extending between said burr and said engine, an air conduit including an end portion carried by said hand piece, said end portion having an air ejection nozzle positioned adjacent said burr and directed toward the latter, a valve in said air conduit for opening and closing said conduit to flow of air to said nozzle, means for periodically opening and closing said valve comprising a power means and mechanical drive means connecting between said power means and said valve, and means for controlling the periodic rate at which said valve is opened and closed.

3. In combination with a dental hand piece that includes a burr or the like, a dental engine, drive means extending between said burr and said engine, an air conduit including an end portion carried by said hand piece, said end portion having an air ejection nozzle positioned adjacent said burr and directed toward said burr, a valve in said air conduit for opening and closing said conduit to flow of air to said nozzle, valve actuating means driven by said dental engine for periodically opening and closing said valve, said valve actuating

means including cam means and a belt connecting between said dental engine and said cam means, said belt also comprising a part of said drive means.

- 5 4. In dental equipment including a hand piece having a dental tool rotatably carried thereby for working on a tooth, power means connected with said tool for driving the latter, a conduit adapted to be connected with a source of compressed air under substantially constant pressure, said conduit being provided with a discharge nozzle secured on said hand piece in a position to discharge air therefrom toward said tool, a valve in said conduit for opening and closing the conduit to flow of air therethrough, rotatable valve actuating means connected with said power means for rotation by the latter in one direction upon actuation of said power means to drive said tool, said rotatable valve actuating means including an element directly connecting with said valve for periodically opening said valve at predetermined intervals upon actuation of said power means for driving said tool.
- 10 5. In combination with a dental hand piece that

includes a burr or the like rotatably carried thereby, a dental engine, a belt connecting between said burr and engine for rotating said burr, an air conduit including an end portion carried by said hand piece, said end portion having an air ejection nozzle positioned adjacent said burr and directed toward the latter, a valve in said air conduit for opening and closing said conduit to flow of air to said nozzle upon actuation of said valve, means for periodically opening and closing said valve at a rate directly proportional to the rate of speed at which said belt is driven by said motor, said means including a valve actuating device connecting with said valve and in driving engagement with said belt for being driven by the latter, and means establishing said driving engagement.

15 6. In a combination as defined in claim 5, said last mentioned means comprising a multiple pulley having different diameter peripheral surfaces for singly engaging said belt, thereby providing means for varying the rate of speed at which said valve is actuated.

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