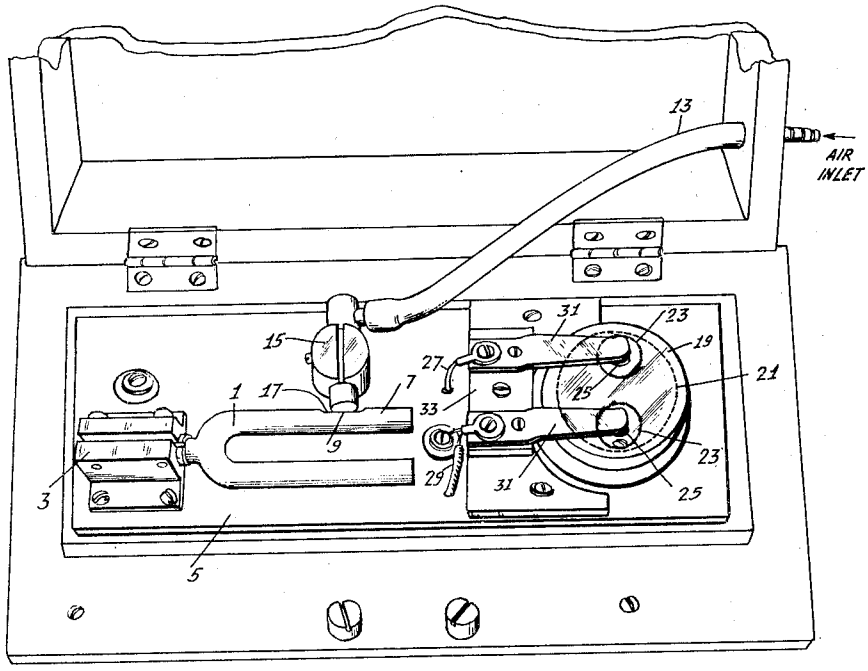
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QUARTZ TUNING FORK DRIVE

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## QUARTZ TUNING FORK DRIVE

Application filed May 3, 1929. Serial No. 360,061.

The present invention relates to a method and means for driving tuning forks, and is particularly directed to a method and means for driving quartz tuning forks.

It has heretofore been known that tuning forks formed of quartz may be molded, but, so far as I am aware, no efficient means for driving such a type fork has heretofore been found, and it is, therefore, a primary object of my invention to provide a method and means by which quartz tuning forks may be easily maintained in a continuous vibration.

In connection with the use of quartz tuning forks, the principal advantage to be gained therefrom is due to the fact that quartz has a very low coefficient of rate of vibration change with temperature change, and, therefore, there is little need for compensating for temperature changes produced upon the fork by external temperature conditions.

While the present invention has been directed primarily to quartz tuning forks, the method and means disclosed is, however, applicable to steel tuning forks or other known types of forks and also for driving other forms of vibrational elements.

As a further object of my invention, I have sought to develop a method and means by which an air blast under a predetermined pressure may be conveniently arranged to vibrate a quartz tuning fork or other type of fork where desired.

Still a further object of my invention is to provide a method and means by which the vibrations imparted to the quartz or other type of tuning fork may be readily picked up and used for applying constant frequency impulses to drive any desired form of vibrator, impulse wheel, La Cour wheel, synchronous motor, or any other desired and appropriate type of synchronizing element where a constant frequency must be applied so as to maintain the period of vibration or rotation constant irrespective of external temperature and other known changes.

Still other and further objects of my invention are to provide, in a method to be hereinafter described in further detail, a system for vibrating tuning forks and the like which is relatively simple in its construction and arrangement of parts, a system which is easy and convenient to install, a system which is readily applicable to use in connection with known types of vibrational elements, a system which is efficient in its use, readily and cheaply set up and substantially fool-proof in its operation.

Still other and ancillary objects of my invention will become apparent and at once suggest themselves to those skilled in the art to which the invention relates by reading the following specification in connection with the accompanying drawing forming a part of my disclosure, wherein the single figure thereof diagrammatically illustrates a preferred arrangement for vibrating tuning forks, and a means by which the constant frequency vibrational pulses may be picked up.

Now referring to the drawing, I have mounted a tuning fork 1, preferably of the quartz type, in a support bracket 3 so as to rigidly hold the same therein by means of bolts or in any other desired manner so that the bracket may then be rigidly secured to a base member 5. Toward one end of the tine 7 of the fork 1, I have provided a flattened portion 9, preferably formed when the fork is cast to form an integral part thereof. As a preferred drive means for the fork, I have provided an air drive of the general type claimed and described in my copending application filed jointly with Carl Eric Nelson, Serial No. 360,062, filed May 3, 1929.

In such an arrangement, air, under a predetermined pressure, is supplied through an inlet tube 13, in the direction shown by the arrow, from which it passes through a resonant air chamber 15 and is directed against the flattened portion 9 on one tine of the fork. As has been disclosed in my copending application above referred to, as air is applied to the resonant air chamber 15, the pulses of air produced therein periodically cause the fork 1 to vibrate and provide an efficient drive means therefor. The flattened portion 9 on the tine 7 of the fork

1 should preferably have the side 17 adjacent the resonant air chamber 15 ground accurately flat so as to oppose the lip of the resonant air chamber and provide a convenient and flat area so that as air is projected from the chamber 15, it will force the tine 7 of the fork away from the air chamber and cause it to vibrate back and forth in the general direction parallel to the axis of the air-chamber 15.

When the fork is set into vibration by the air means above described, it communicates a small amount of vibration to the base member 5, which should be preferably formed of metal, and, in fact, I have found steel or cast iron to be quite suitable, although aluminum and other metals may also be used where desired. The vibrations set up in the base member 5 due to vibrations of the tuning fork 1 are found to be quite sufficient to actuate a telephone receiver 19, or other pick-up means, placed upon the base member 5 and will, therefore, impart vibrations to the diaphragm 21 of the receiver 19. In this case, the vibrations imparted to the telephone diaphragm correspond to the fork vibrations. As the diaphragm is then vibrated, at a rate corresponding to the period of the fork, impulses are transferred through the coils 23 of the receiver, and through means of the contacts 25 on the upper surface thereof may be imparted to conductors 27 and 29 connected thereto through the means of contact elements 31, mounted so as to hold the receiver in place on the base member 5 and also so as to contact with the contact elements 25 of the receiver.

The contact elements 31 may be so bent as to rigidly hold the receiver upon the base member 5 and, if desired, may be mounted upon a standard 33 carried from the base member and secured thereto in any desired manner, as shown.

Where other types of tuning forks than the quartz tuning forks illustrated are used, the principle of invention is identical and the quartz fork has merely been illustrated as a specific example of the arrangement shown and described, and for reason of the fact that the invention is primarily directed to the driving of quartz forks which has heretofore been most difficult and, in fact, quite impossible to attain, and, so far as I am aware, the problem has been heretofore without solution.

While I have described my invention as including a flattened surface 9 as an integral part of one of the tines of the tuning fork, it is also fully within the scope of my invention to place a small metallic ring portion, having one surface thereof flattened, on the tine 7 of the fork 1. Thus, air leaving the resonant air chamber 15 may be projected upon the flat surface of the metallic ring, which for the purpose of avoiding considerable weight may be formed from aluminum, and cause the quartz fork to vibrate in the manner above described. Also, where the fork is found to be slightly out of balance by the addition of the metallic ring to one tine, a similar ring may be added to the other tine.

Other modifications of the arrangement hereinabove suggested will at once suggest themselves to those skilled in the art to which the invention relates, and I, therefore, only desire to be limited in what modifications I may make to the system disclosed in so far as the spirit and scope of the hereinafter appended claims necessitates.

Having now described my invention, what I claim and desire to secure by Letters Patent is the following:

1. A system for driving vibratory elements which includes a quartz tuning fork and means rigidly mounting the same, an air supply, and means for projecting the air from said supply against said fork and producing vibrations therein.

2. A system for driving vibratory elements which includes a quartz tuning fork, a base member for rigidly supporting said fork, an air supply, and means for projecting the air from said supply against said fork for producing mechanical vibrations in both said fork and said base member.

3. A system for maintaining constant vibration of tuning forks and the like which includes a quartz tuning fork, a base member and means for rigidly mounting said fork from said base member, and air supply and means for projecting the air from said supply to a relatively small area on one tine of the said quartz tuning fork and thereby producing constant vibration throughout said tuning fork.

4. A system for maintaining constant vibration of tuning forks and the like which includes a quartz tuning fork, a base member and means for rigidly mounting said fork from said base member, an air supply, and means for projecting the air from said supply to a relatively small area on one tine of the said quartz tuning fork and thereby producing vibrations in both said tuning fork and said base member, said vibrations corresponding in frequency to the natural frequency of said vibrated fork.

5. A drive system for tuning forks and the like which includes a quartz tuning fork, means for rigidly mounting said fork, and an air drive means for maintaining said fork in vibration.

6. A system for maintaining quartz tuning forks in vibration which includes a means for supporting said quartz tuning fork in a rigid manner, said fork having a flattened surface formed on one of the tines thereof, an air supply, and means for pro-

jecting the air from said supply against the flattened portion of said tuning fork and thereby vibrating the said fork.

7. A system for maintaining quartz tuning forks in vibration which includes a means for supporting said quartz tuning fork in a rigid manner, a flattened surface supported on one tine of said tuning fork, an air supply, and means for projecting the air from said supply against the flattened portion of said tuning fork for periodically forcing said tine away from said air projecting means so as to induce vibrations in said fork.

8. A system for producing electric currents of a constant frequency which includes a quartz tuning fork, means for rigidly mounting said tuning fork, air means for driving said tuning fork so as to produce constant frequency mechanical vibrations therein, and means for picking up said mechanical vibrational pulses transferred from said tuning fork to said rigid mounting and converting said mechanical vibrations into constant frequency electrical energy pulses.

9. A system for producing vibrations of a constant period which includes a quartz tuning fork, means for rigidly mounting said tuning fork, air means for driving said tuning fork, and microphonic means for picking up vibrational pulses from said tuning fork.

10. A system for producing vibrational pulses of a constant period which includes a quartz tuning fork, a base member, means for rigidly mounting said fork from said base member, an air supply, means for projecting the air from said supply against one tine of the said tuning fork and thereby producing constant vibration thereof, means provided by said rigid mounting to said fork to said base member for producing vibrations in said base member corresponding to the vibrations of said fork, and a magnetic pick-up supported from said base member for receiving the impulses imparted to said base member from said fork and converting said impulses into electric currents.

11. A system for producing electrical currents of a constant frequency which includes a quartz tuning fork, a base member, means for rigidly mounting said fork from said base member, an air supply, means for projecting the air from said supply against one tine of the said tuning fork and thereby producing a constant period mechanical vibration thereof, means provided by said rigid mounting of said fork from said base member for producing mechanical vibrations in said base member corresponding in periodicity to the vibrations of said fork, and an electromagnetic pick-up supported from said base member for receiving the mechanical impulses imparted to said base member from said fork and converting said mechanical impulses into constant frequency electric currents.

12. The method of vibrating quartz tuning forks and the like which includes rigidly mounting a quartz tuning fork upon a support member, projecting air against one tine of the tuning fork, and causing the projected air to vibrate the tuning fork at its natural period.

13. The method of producing constant frequency electric impulses from quartz tuning forks rigidly mounted upon a suitable supporting base which comprises projecting air against one tine of the tuning fork, continuously vibrating the fork from said projected air at the natural period of vibration of said fork, transferring the vibrational pulses from the fork to the base member, electromagnetically picking up the vibrational pulses imparted to the base member, and converting the picked up vibrational pulses into electric currents of a frequency corresponding to the fork frequency.

14. The method of producing constant frequency electric impulses from quartz tuning forks rigidly mounted upon a suitable supporting base which comprises projecting air against one tine of the tuning fork, continuously vibrating the fork from said projected air at the natural period of mechanical vibration of said fork, transferring the produced mechanical vibrational pulses from the fork to the base member, electromagnetically picking up the mechanical vibrational pulses imparted to the base member, and converting the mechanical picked up vibrational pulses into electric currents of a frequency corresponding to the fork frequency.

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