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# PNEUMATIC DRIVE MECHANISM FOR CHARTS

Filed March 10, 1945

FIG. 1

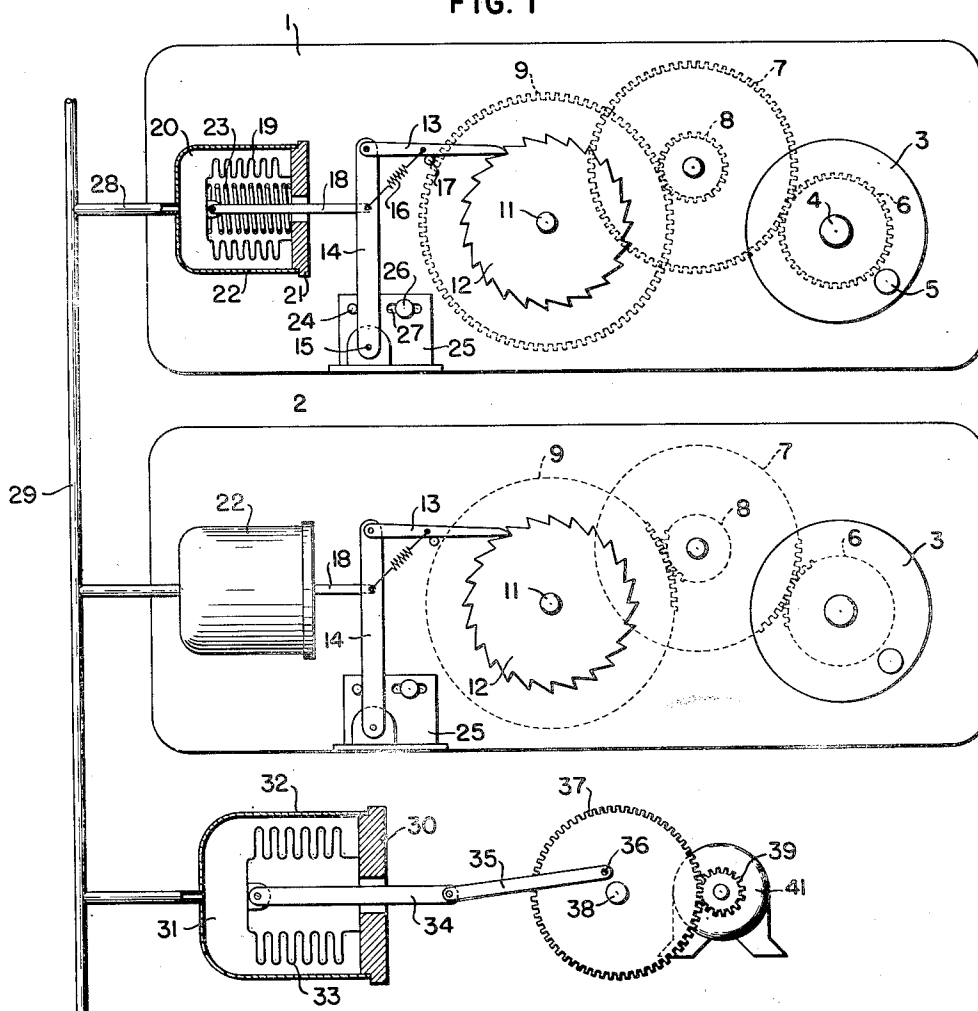
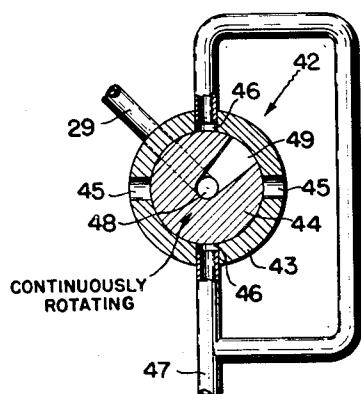


**FIG. 2**



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## UNITED STATES PATENT OFFICE

2,491,361

## PNEUMATIC DRIVE MECHANISM FOR CHARTS

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Application March 10, 1945, Serial No. 582,147

## 1 Claim. (Cl. 58—42)

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The present invention relates to clock mechanisms for recording instruments and more particularly to a clock mechanism that is pneumatic in operation, and one that is driven from a pulsating air supply.

The majority of recording and controlling instruments that are in use today have their recording charts driven by a clock mechanism that is powered from an electric motor. Such clocks maintain accurate time and are satisfactory for most applications. It frequently happens, however, that recording instruments must be placed in locations that have a hazardous or explosive atmosphere such as is likely to occur in an oil refinery or in a natural gas pumping station. The ordinary type of electric clock motor cannot then be used because of the danger of sparks and a consequent fire or explosion. In such locations an explosionproof motor is required. Motors of this type are considerably larger and more expensive than the standard type of clock drive motor, mainly because of the special housing and wiring that must be used. Also in some control instruments the control mechanism that must be placed in the instrument case takes up so much room that an explosionproof motor cannot be placed therein. This means that more instruments must be used, each having fewer control parts, or that the chart driving motor must be placed outside of the instrument case, with its consequent complications.

It is an object of the present invention to overcome the above mentioned difficulties by providing a pneumatically operated clock for recording instruments. This clock is small and compact so that it may be placed in any recording instrument. It is a further object of the invention to provide a pneumatic clock for use in recording instruments that is operated by a pulsating supply of air. The air may be supplied from any suitable source, but preferably from a suitable apparatus that can be located outside of the explosive atmosphere in which the instrument itself is located. The power supply for creating the pulsating pressure may be obtained from an electric motor separate from the instrument. This motor may readily be of the explosionproof type if necessary.

It is also an object of the invention to provide a pneumatic system of driving the charts on all of the instruments that may be mounted on a single panel board. The motors for driving the charts are driven from a single pulsating air supply. Since all of the motors are of the same type and are driven from the same pulsating air sup-

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ply, the clocks will be perfectly synchronized. This means that the charts from various instruments may be compared with the assurance that variations in the records on the several charts occurred at the same time.

The various features of novelty which characterize this invention are pointed out with particularity in the claim annexed to and forming a part of this specification. For a better understanding of the invention, however, its advantages and specific objects obtained with its use, reference should be had to the accompanying drawings and descriptive matter in which is illustrated and described a preferred embodiment of the invention.

In the drawings:

Figure 1 is a view showing the chart driving system, and

Figure 2 is a view showing an alternate means to set up pulsating pressures.

Referring to the drawings there are shown a pair of clock mechanisms 1 and 2 that are used to rotate the chart of any suitable type of recording instrument. Since the clocks are identical in construction, a description of one will suffice. Each of these clocks is provided with a chart hub 3 having a centering pin 4 and a driving pin 5. In the operation of these hubs a chart, which is provided with a concentric opening, is placed over the projection 4 while an eccentric opening therein is placed over the pin 5 to be driven thereby. The pin 4 is the extension of a shaft upon which the hub is mounted and also has attached to it a gear 6 by means of which the hub is rotated. This gear is driven by additional gears 7, 8, and 9, the latter of which is mounted upon a suitable journaled shaft 11. Also fastened to the shaft 11 is a ratchet 12 that is rotated periodically by means of a pawl 13 cooperating therewith. Supporting the pawl for movement is a lever 14 that is journaled to be oscillated about a pivot 15. The pawl is normally biased in a clockwise direction about its pivot on the lever 14 by a spring 16, one end of which is fastened to the pawl and the other end of which is fastened to the lever. Clockwise movement of pawl 13 is limited by a stop pin 17 which extends from the supporting plate for the clock mechanism.

Oscillating movement is imparted to lever 14 by means of a link 18 which has one end attached to the lever and has its other end attached to the head of a bellows 19. This bellows, along with a cup-shaped member 22, is fastened to a suitable support 21 forming between the bellows, the support and cup member, an expansible chamber 20. As a pulsating pressure is applied to the chamber,

the bellows will be contracted and expanded to oscillate supporting member 14 and pawl 13, thereby rotating the ratchet 12. Normally the bellows is expanded by a spring 23 to move support 14 in a counter-clockwise direction to a position limited by a stop pin 24 that is mounted on a suitable plate 25. The amount of clockwise rotation that can be imparted to the lever 14 is limited by a stop pin 26 which is adjustably located in a slot 27 formed in plate 25. Thus the amount of movement that can be imparted to the pawl 13 and therefore the number of the teeth of the ratchet that can be engaged by the pawl on each stroke thereof is limited.

Pressure pulses are supplied to the expansible chamber 20 and the bellows 19 through a closed system consisting of a pipe 28 leading from each clock to a main pipe 29. The latter pipe is connected with a device that serves to set up pressure pulses in the line. This device consists of an expansible chamber 31 formed between a cup-shaped member 32 and a bellows 33 that are attached to a support 30. As the bellows 33 is expanded and contracted, pulsations of pressure will be set up in the line 29 and connecting pipes 28 to operate the clock motors. Movement is imparted to the bellows 33 by means of a link 34 that is connected at one end to the bellows end wall and at its other end to a connecting rod 35 which is driven by a crank pin 36 projecting from a gear 37. This gear is mounted on a shaft 38 and is rotated by a pinion 39 on the shaft of a motor 41. A piston in a cylinder could be used instead of the bellows to set up the pulsating pressure if desired.

As has been mentioned above it is often desirable to have recording instruments located in an atmosphere which is hazardous. Therefore it is desirable to have the clocks of these recording instruments driven by some means which is explosionproof. For this reason the motor of the mechanism which supplies the pressure pulses to the line 29 can be located remotely from the recording instruments in some safe atmosphere. If it is found that the distances are too great to be practical to do this, the single electric motor which serves to expand and contract bellows 33, thus setting up the pulsating pressure, may be a standard explosionproof, constant speed type of motor. Thus all of the clocks in the recording instruments are driven by a single electric motor which can be located in a safe place or which can be of an explosionproof type. This means that the clock mechanism which is located in each of the recording instruments may be small and may be operated in a safe manner.

There is no chance of a spark occurring which could cause a fire or an explosion. Another advantage of the system disclosed herein is that each of the recording charts is driven at exactly the same speed. Since all of the motors for the clock mechanisms are simultaneously operated by pressure pulses that are set up in a single pipe, the clocks will be driven in synchronism. This means that whenever records made by various of the instruments are compared, the person comparing them will know that a record made on a given portion of each chart occurred at exactly the same time.

In Figure 2 there is disclosed another means for producing the pulsating pressures in the main pipe 29. In this figure there is disclosed a valve 42 having a casing 43 and a valve plug 44 that is rotated at a constant speed by any suitable means. The casing 43 is provided with a pair of ports 45 which are connected with the atmos-

phere and a pair of ports 46 which are connected by means of pipe 47 with a suitable source of air under pressure. Valve plug 44 is provided with a centrally located port 48 that connects to the main pipe 29. Extending between port 48 and the surface of the plug 44, is a passage 49. As plug 44 is rotated, the pipe 29 will alternately be connected by passage 49 and port 48 with one of the ports 46 and one of the ports 45. In this manner the pressure in pipe 29 is raised to the value of the pressure in pipe 47 and is then exhausted to the atmosphere. As plug 44 is rotated at a constant speed, pressure pulsations will be set up in pipe 29 that can be applied to the expansible chambers of clock motors thereby operating these motors at the proper rate of speed.

From the above description it will be seen that I have provided a system for operating clocks in recording instruments which will insure that each of the clocks is driven at exactly the same speed and a system which removes from the recording instrument, any element which could make a spark and thereby create an explosion hazard.

While in accordance with the provisions of the statutes, I have illustrated and described the best forms of the invention now known to me, it will be apparent to those skilled in the art that changes may be made in the form of the apparatus disclosed without departing from the spirit of the invention as set forth in the appended claim, and that in some cases certain features of the invention may sometimes be used to advantage without a corresponding use of other features.

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

A clock device for recorders comprising a chart driving member, pawl and ratchet means to drive said member, pneumatic motor means to move said pawl relative to said ratchet to rotate the latter, said motor means including parts forming an expansible chamber one wall of which is a bellows adapted to expand and contract in response to pressure pulsations applied to said chamber, valve means including a casing having a first port connected to a source of fluid under pressure and a second port connecting with the atmosphere, a constantly rotating valve plug having a port therein and a passage extending from said last mentioned port to a position in which it may communicate with the ports in said casing as said plug rotates, and a connection extending between said port in said plug and said chamber whereby said chamber may alternately be connected with the supply of fluid under pressure and the atmosphere to set up pressure pulsations in said chamber.

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