

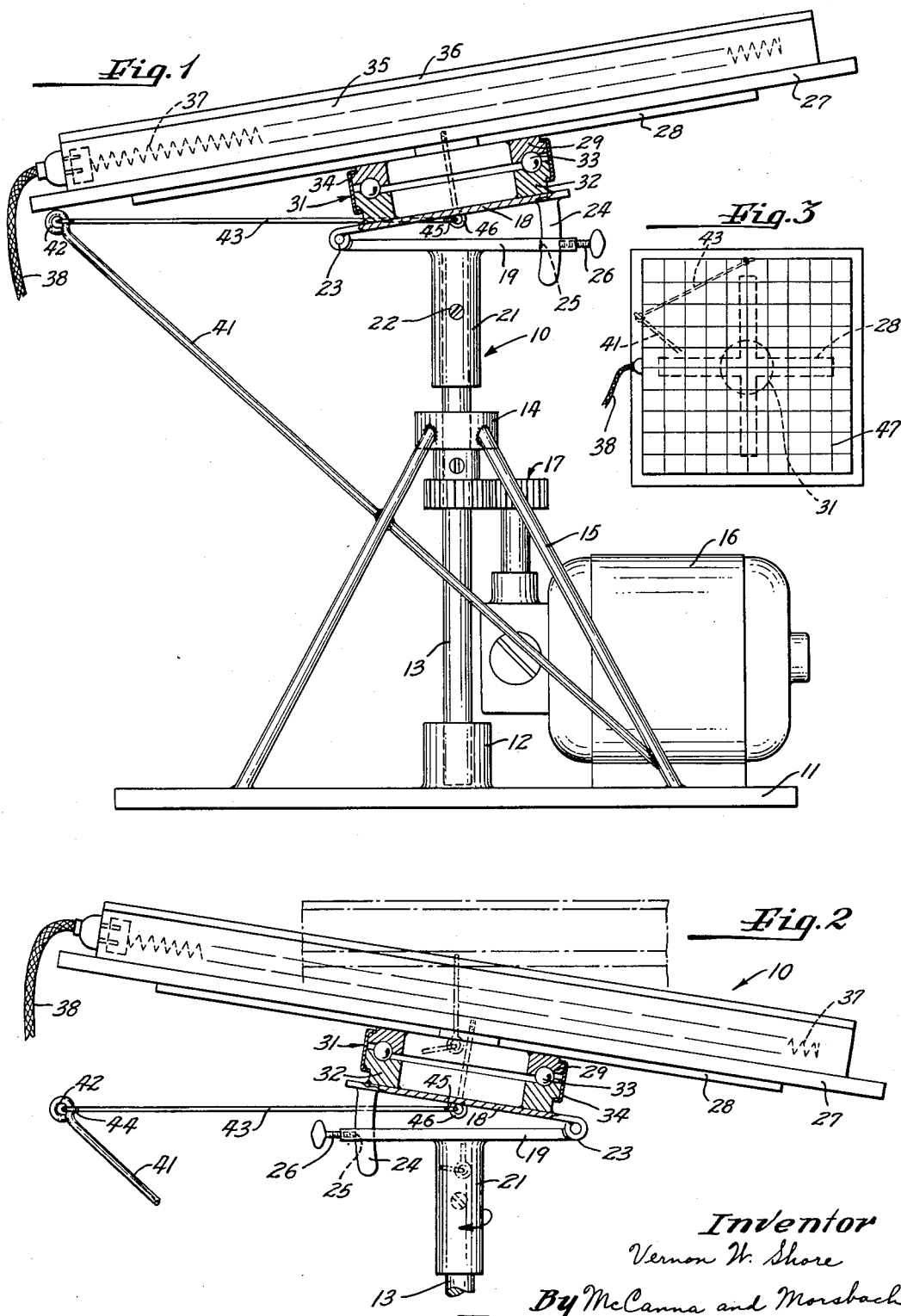
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APPARATUS FOR EFFECTING TESTS FOR PULLORUM AND THE LIKE

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APPARATUS FOR EFFECTING TESTS FOR PULLORUM AND THE LIKE

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6 Claims. (Cl. 23—253)

The present invention relates to an apparatus for effecting tests for pullorum and similar bacteria.

Chickens in general, and baby chicks in particular, are susceptible to a contagious disease known as pullorum disease. In modern hatcheries, very large numbers of chicks are disposed in a common hatching chamber in the incubators and if any one of the eggs in the hatching chamber is from a chicken infected with the disease, the chick that hatches from that egg can spread the disease to all other chicks exposed thereto. It is therefore essential that extreme care be taken in selecting the chickens from which the eggs are taken for hatching purposes, to prevent spreading of the disease to other chickens in the incubator.

In testing the chickens to ascertain whether they are infected with the disease, a drop of a pullorum antigen is mixed with a sample of the chicken's blood and this produces an observable reaction indicative of the presence or absence of the disease in the chicken. One method of mixing which has been found to produce very accurate results comprises placing a drop of antigen on a flat support and adding thereto a sample of the chicken's blood obtained by pricking the chicken and gathering a droplet of the blood on a small wire loop, the wire loop then being used to stir the blood into the antigen. Immediately thereafter, the flat support for the pool of blood and antigen is inclined so as to cause the mass of the pool to flow toward the low side of the support. The direction of inclination of the support is continuously changed in such a manner that the mass of the pool will flow in a circular path about the periphery of the pool. The slant or inclination of the support must be sufficient to cause the mass of the pool to flow to the low side of the pool, but low enough so that the surface tension of the pool prevents the latter from flowing outside the wetted area of the pool. This changing of the direction of inclination of the support is continued for twenty seconds to two minutes, depending upon the type of antigen used and then the pool observed to ascertain if a reaction indicative of the presence or absence of the disease has taken place. If the chicken tested has been infected with either pullorum disease or fowl typhoid, the antibodies in the blood will react with the antigen and produce a visible reaction.

At present, changing of the inclination of the tray is effected manually by picking up the tray after the test specimen has been applied thereto and thereafter tilting the plate by hand. Thus, a drop of the blood from one chicken is added to a drop of blood on the test plate and the plate is then manually tilted for twenty seconds to two minutes before starting the next test. Therefore, the tests can only be conducted one at a time and since the entire flock from which the eggs are obtained for hatching purposes must be periodically checked for this disease, the testing is very time consuming. Additionally, the rate at which the direction of slant of the plate is changed as well as the magnitude of the slant are not accurately

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controllable and the results of the tests thus conducted are not entirely accurate. Manual tilting of the plate is also very fatiguing so that the number of such tests which can be conducted by a single operator each day is limited.

The apparatus of the present invention is arranged to support the test plate and continuously change the slant of the plate without causing rotation thereof whereby one test specimen may be applied to the plate while the preceding test specimen is undergoing the rotational mixing on the plate previously described. The magnitude of the slant of the plate as well as the rate at which the direction of slant thereof is changed can be accurately adjusted to assure consistent and accurate tests.

An important object of this invention is the provision of an apparatus for more rapidly effecting a plurality of tests for pullorum or the like.

Another object of this invention is the provision of an apparatus for effecting tests for pullorum or the like which will cause the mass of the test specimen positioned thereon to flow in a circular path to effect mixing thereof in an improved manner.

A further object of this invention is the provision of an apparatus for effecting tests for pullorum which will permit the application of one test specimen to the test tray while the tray is in motion and a previously applied test specimen is undergoing mixing thereby expediting the sequential mixing of a plurality of test specimens.

Yet another object of this invention is the provision of an apparatus for rotatively changing the slant of the tray for supporting a test specimen without causing the tray to rotate to thereby produce a rotary mixing of the test specimen on the test tray and permit the observance of the reaction of a test specimen previously applied to the tray and also permit application of another test specimen to the tray while the previously applied test specimens are undergoing mixing.

Still another object of this invention is the provision of an apparatus for effecting tests for pullorum or the like having an improved means for rotatively changing the slant of the tray without imparting rotation thereto.

An additional object of this invention is the provision of an apparatus for effecting tests for pullorum or the like in which the amount of slant rotatively imparted to the test plate can be varied to adapt the apparatus for use with plates having different surface characteristics to the end that the mass of the pool of test material will flow to the low side of the pool and thereby flow in a circular path as the slant of the tray is rotatively changed.

Figure 1 is a side elevational view of the testing apparatus with the test plate shown in one position, parts being broken away and shown in section to illustrate details of construction;

Figure 2 is a fragmentary side elevational view of the test apparatus showing the test plate in a different position; and

Figure 3 is a top plan view of the test apparatus having the test plate mounted thereon.

Reference is now made more specifically to the accompanying drawings wherein the apparatus for effecting tests for pullorum or the like is indicated generally by the numeral 10.

The apparatus comprises a base 11 having an upstanding socket 12 disposed centrally thereon and forming a bearing for the lower end of the shaft 13. A bearing 14 is disposed intermediate the ends of the shaft 13 and secured to the base by means of legs 15 whereby the shaft 13 is rotatably supported on the base in an upright position. A motor 16 is also mounted on the base and operatively connected to the shaft 13 by means of a gear train 17, the motor and gear train being arranged

so as to rotate the shaft 13 at a predetermined speed such as 10-15 R. P. M.

In accordance with the present invention, a wobble or swash plate 18 is mounted on the shaft in a manner to permit adjustment of the angle of the wobble plate. For this purpose, a plate 19 is rigidly secured to one end of a collar 21 and extends perpendicular thereto, which collar is non-rotatably attached to the upper end of the shaft 13 by means of a set screw 22. The wobble plate is angularly adjustably mounted on the plate 19 in any desired manner, as by the hinged connection 23 and the wobble plate angle is adjusted as by the arcuate finger 24 which is secured to the wobble plate 18 and depends therefrom, which finger extends through an opening 25 in the plate 19. A set screw 26 is threadably mounted on the plate 19 and intersects the opening 25 to thereby lock the wobble plate in any preselected position.

The platform 27 for supporting the test plate is rotatably mounted on the wobble plate 18 whereby rotation of the wobble plate will rotatively change the direction of slant of the platform without imparting rotation to the platform. Conveniently, the platform 27 may be mounted on a cruciform frame 28, which frame is secured as by brazing to one race 29 of an anti-friction bearing assembly 31. The other race 32 of the bearing assembly is secured by brazing or the like to the upper surface of the wobble plate, the anti-friction bearing elements 33 being disposed between the races. The latter are rotatably connected together by means of a retainer ring 34 as is conventional. As is apparent, the anti-friction bearing assembly 31 retains the platform 27 centered on the wobble plate 18 and also drivingly interconnects the wobble plate and the platform whereby the direction of slant of the platform is rotatively changed as the wobble plate is rotated.

The box 35 which is mounted on the platform 27 for supporting the test plate 36 is of conventional construction and has the upper surface thereof heated by electrical resistance elements 37 disposed therein, power being applied to the resistance elements by means of a cord 38. A thermostat (not shown) is mounted within the box 35 and is arranged to control the temperature of the upper surface thereof so that the latter is maintained at a temperature of 100-105° F. The test plate 36 which is mounted on the upper surface of the box is heated thereby and maintains the test specimens positioned thereon at the required temperature for effecting the tests.

The platform 27 is constrained against rotation so that a test specimen may be applied to the test plate, and the reaction of a previously applied test specimen may be observed while the testing apparatus is in operation. For this purpose, an arm 41 is rigidly secured to the base 11, as by welding to the legs 15, the upper end of which arm terminates in an eye 42 disposed adjacent the periphery of the platform 27 and which is just below the plane described by the lower edge of the platform as the direction of slant thereof is rotatively changed. The arm 41 is connected to the platform by means of a link 43 having an eye 44 on one end disposed through the eye 42 on the arm and an eye 45 on the other end disposed through the eyebolt 46 attached to the platform 27. The eyebolt 46 is preferably arranged so that the eye thereon is disposed below the underside of the plate a distance equal to one-half the maximum distance of vertical oscillation that the eyebolt 46 goes through during each cycle. In this manner the link 43 will pivot through substantially equal arcs above and below the horizontal position thereof so that the amount of oscillatory motion about the axis of shaft 13 that is imparted to the platform 27 is minimized. Thus, as the shaft 13 rotates, the platform 27 and the test plate 36 mounted thereon do not rotate through an appreciable arc, but only have the direction of slant thereof changed.

The test plate 36 is provided with cross-hatched lines

47 which divide the surface thereof into a plurality of separate areas on which the separate test specimens are applied to be mixed by the apparatus. The test plate may be formed of different materials such as glass, porcelain or paper. However, the different materials used in forming the test plates provide different surface characteristics which affect flowing of the pool of blood and antigen thereon. As previously set forth, it is necessary to provide a slant sufficient to cause the mass of the pool to flow to the low side thereof, but insufficient to overcome the surface tension of the pool and cause the latter to flow freely on the surface. For this reason, the wobble plate angle is made adjustable, by means of the arcuate finger 24 and the set screw 26, to obtain the aforementioned operating conditions.

In operating the apparatus, a drop of antigen is first placed on one of the marked areas on the test plate, and thereafter a drop of blood from the chicken to be tested is obtained from the chicken on a wire loop and the blood added to the antigen by stirring the antigen with the wire loop. The test specimen is then permitted to undergo the mixing produced by rotatively changing the slant of the test tray for twenty seconds to two minutes, depending upon the type of antigen used. During this time, and while the apparatus is in operation, a second or further test specimen may be applied to the test plate, in the manner hereinbefore described. Thereafter, the reaction produced in the previously applied test specimen may be observed without stopping rotation of the apparatus. In this manner, the testing of large numbers of chickens for the disease is greatly expedited since it is not necessary to successively test the different chickens, but instead some tests or portions thereof can be carried out concurrently.

I claim:

1. An apparatus for conducting biological tests requiring thorough mixing of a small liquid test sample consisting of a drop of serum and a drop of blood to be tested comprising, a base, a test plate divided into a plurality of separate areas for receiving separate test samples, a platform for supporting said plate, an upright shaft rotatably mounted on said base, means mounting said platform on said shaft and for rotatively changing the direction of slant thereof as the shaft rotates, means for rotating said shaft at a preselected speed, said platform mounting means supporting said platform at a preselected angle to the horizontal at which the mass of a test sample thereon will flow in a circular path adjacent the low side of the wetted area of the test sample without breaking the surface tension of the test sample when said shaft is rotated at said preselected speed, and means attached to said platform for preventing substantially all rotary motion of said platform relative to said base whereby one test sample may be applied to said test plate while the shaft is rotating and the test sample previously applied thereto is undergoing mixing.

2. In an apparatus for conducting biological tests requiring thorough mixing of a small liquid test sample consisting of a drop of serum and a drop of the blood to be tested, comprising a base, a platform, a test plate removably mounted on said platform and divided into a plurality of separate areas for receiving separate test samples to be mixed, an upright shaft mounted on said base, a wobble plate, means mounting said wobble plate on said shaft for rotation therewith, means rotatably connecting said platform and said wobble plate for relative rotary movement therebetween about an axis perpendicular to said wobble plate to support said platform in a plane parallel to said wobble plate, means for rotating said shaft at a preselected speed to rotatively change the direction of slant of said platform, said wobble plate being inclined at a preselected angle to the horizontal at which the mass of a test sample on the test plate will flow in a circular path adjacent the low side of the wetted area of the test sample without breaking the

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surface tension of said test sample when said shaft is rotated at said preselected speed, and means attached to said platform for preventing substantially all rotary motion thereof relative to said base whereby a test sample may be applied to one area on the test plate while the shaft is rotating and the test sample previously applied to a different area on the test plate is undergoing mixing thereon.

3. In an apparatus for conducting biological tests requiring thorough mixing of a small liquid test sample consisting of a drop of serum and a drop of the blood to be tested, comprising a base, a platform, a test plate removably mounted on said platform and divided into a plurality of separate areas for receiving separate test samples to be mixed, an upright shaft mounted on said base, a wobble plate, means mounting said wobble plate on said shaft for rotation therewith, means rotatably connecting said platform and said wobble plate for relative rotary movement therebetween about an axis perpendicular to said wobble plate to support said platform in a plane parallel to said wobble plate, means for rotating said shaft at a preselected speed to rotatively change the direction of slant of said platform, said wobble plate mounting means including means for supporting said wobble plate on said shaft for angular adjustment of the inclination of the wobble plate relative to a plane perpendicular to said shaft, means for selectively locking said wobble plate at a preselected angle to the horizontal at which the mass of a test sample on the test plate will flow in a circular path adjacent the low side of the wetted area of the test sample without breaking the surface tension of said test sample when said shaft is rotated at said preselected speed, and means attached to said platform for preventing substantially all rotary motion of said platform relative to said base whereby a test sample may be applied to one area on the test plate while the shaft is rotating and the test sample previously applied to a different area on the test plate is undergoing mixing thereon.

4. In an apparatus for conducting biological tests requiring a thorough mixing of a small liquid test sample consisting of a drop of serum and a drop of the blood to be tested, comprising a base, a platform, a test plate removably mounted on said platform and divided into a plurality of separate areas for receiving separate test samples to be mixed, an upright shaft mounted on said base, a wobble plate, means mounting said wobble plate on said shaft for rotation therewith, means rotatably connecting said platform and said wobble plate for relative rotary movement therebetween about an axis perpendicular to said wobble plate to support said platform in a plane parallel to said wobble plate, means for rotating said shaft at a preselected speed to rotatively change the direction of slant of said platform, said wobble plate mounting means including means for supporting said wobble plate on said shaft for angular adjustment of the inclination of the wobble plate relative to a plane perpendicular to said shaft, means for selectively locking said wobble plate at a preselected angle to the horizontal at which the mass of a test sample on the test plate will flow in a circular path adjacent the low side of the wetted area of the test sample without breaking the surface tension of said test sample when said shaft is rotated at said preselected speed, an arm extending upwardly from said base and having the upper end thereof radially spaced from said shaft and disposed just below the plane defined by the lower edge of said platform as the direc-

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tion of slant thereof is rotatively changed, an elongated connector swivelly attached to the upper end of said arm, means attaching the other end of said connector to said platform at a point spaced radially from said shaft, said connector extending below said platform and having a length which is long as compared to the amplitude of vertical oscillation of said platform at the point at which said connector is attached thereto whereby to prevent substantially all rotary motion of said platform relative to said base.

5. In an apparatus for conducting biological tests requiring a thorough mixing of a small liquid test sample consisting of a drop of serum and a drop of the blood to be tested, comprising a base, a platform, a test plate removably mounted on said platform and divided into a plurality of separate areas for receiving separate test samples to be mixed, an upright shaft mounted on said base, a wobble plate, means mounting said wobble plate on said shaft for rotation therewith, means rotatably connecting said platform and said wobble plate for relative rotary movement therebetween about an axis perpendicular to said wobble plate to support said platform in a plane parallel to said wobble plate, means for rotating said shaft at a preselected speed to rotatively change the direction of slant of said platform, said wobble plate mounting means including means for supporting said wobble plate on said shaft for angular adjustment of the inclination of the wobble plate relative to a plane perpendicular to said shaft, means for selectively locking said wobble plate at a preselected angle to the horizontal at which the mass of a test sample on the test plate will flow in a circular path adjacent the low side of the wetted area of the test sample without breaking the surface tension of said test sample when said shaft is rotated at said preselected speed, an arm extending upwardly from said base and having the upper end thereof radially spaced from said shaft and disposed just below the plane defined by the lower edge of said platform as the direction of slant thereof is rotatively changed, an elongated connector swivelly attached to the upper end of said arm, means swivelly attaching the other end of said connector to said platform at a point spaced radially from said shaft and spaced below the platform a distance such that the connector moves in substantially equal arcs above and below a horizontal position as the slant of the platform changes, said connector extending below said platform and having a length which is long as compared to the amplitude of vertical oscillation of said platform at the point at which said connector is attached thereto whereby to prevent substantially all rotary motion of said platform relative to said base.

6. The combination of claim 2 wherein said means connecting said wobble plate and said platform includes an antifriction bearing assembly having one bearing race attached to the upper surface of the wobble plate and a second bearing race attached to the underside of said platform, and antifriction bearing elements disposed between said races to support the platform on the wobble plate for relative rotary movement therebetween.

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