Oct. 30, 1945. M. BRANN 2,387,875

NAVIGATION TRAINER

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Fig. 1.

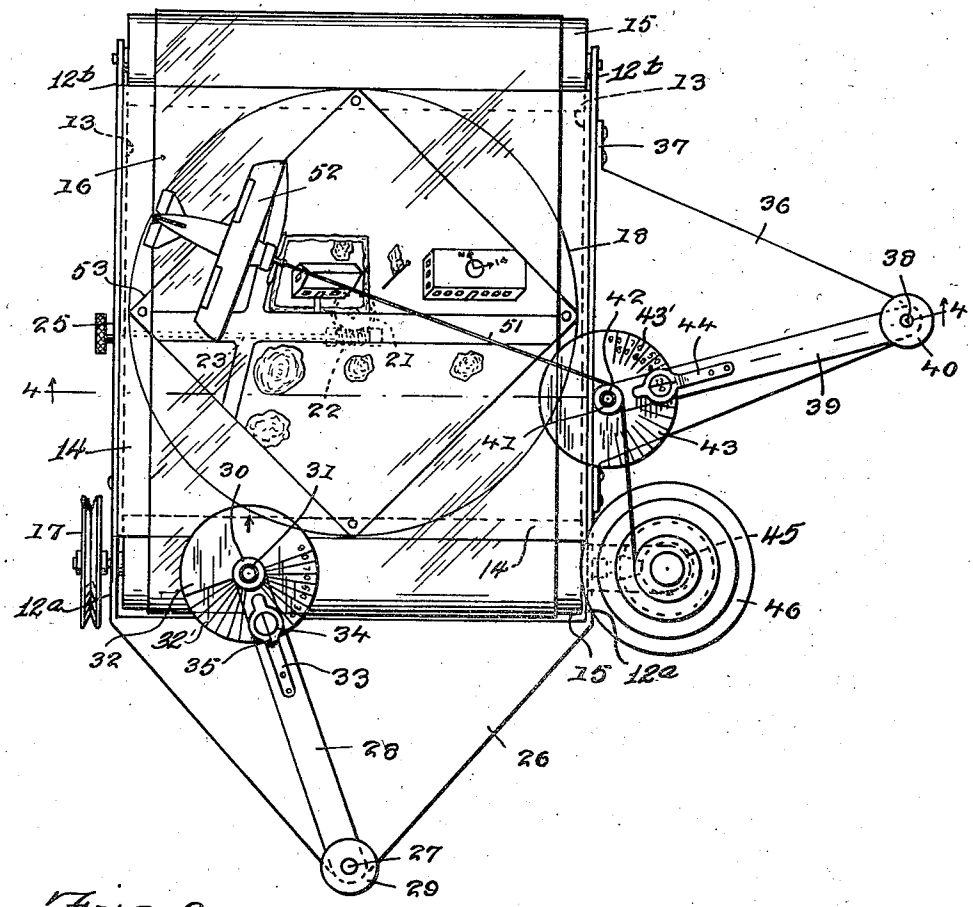
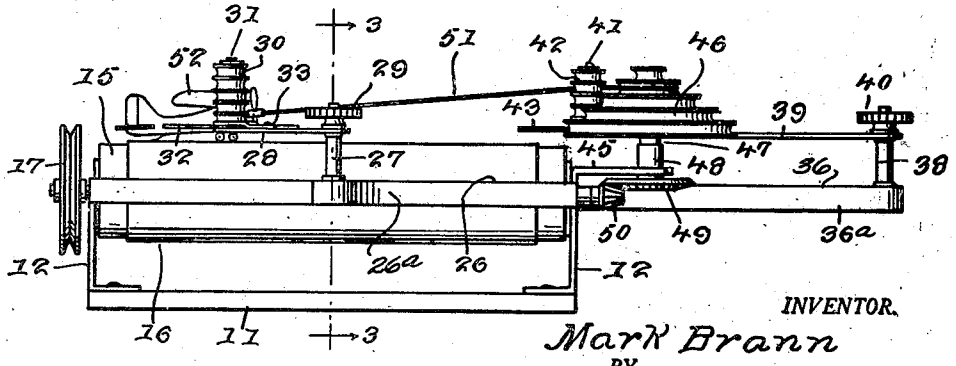


Fig. 2.



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Fig. 3.

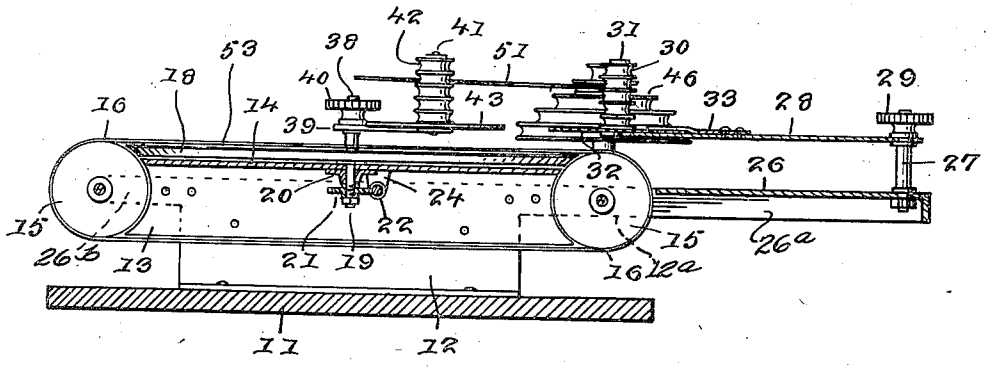
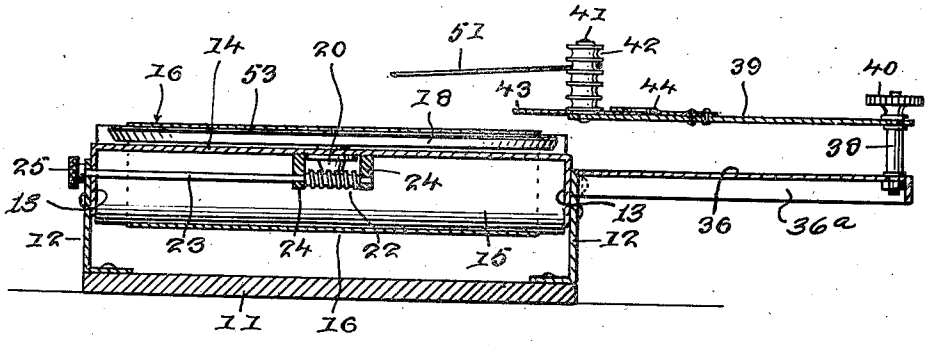


Fig. 4.



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NAVIGATION TRAINER

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Application January 17, 1944, Serial No. 518,600

3 Claims. (Cl. 35—11)

This invention appertains to an improved navigation training apparatus and has for one of its several objects to provide a novel and compact arrangement of instrumentalities and mechanisms for graphically illustrating to students in navigation the effect of wind and water movement in the navigation of a model of a craft.

Another object of the invention has to do with the provision of an apparatus of this character, which permits students to practice air and water navigation, without the aid of a full scale craft and actual atmospheric and water movement.

With these and other objects and advantages in view, the invention resides in the certain new and useful combination, construction and arrangement of parts, as will be hereinafter more fully described, set forth in the appended claims, and illustrated in the accompanying drawings, in which:

Figure 1 is a top plan view of the apparatus, in accordance with the invention;

Figure 2 is a front elevation thereof;

Figure 3 is a vertical longitudinal section taken on the line 3—3 of Figure 2; and

Figure 4 is a vertical transverse section taken on the line 4—4 of Figure 1.

Referring to the drawings, wherein like characters of reference denote corresponding parts in the several views, the embodiment of the apparatus, as it is exemplified therein, is comprised in a substantially box-like frame that is made up of a flat rectangular base 11 which has upstanding brackets 12 secured on the opposite side edges of its upper surface. Secured along the inner sides of the brackets 12 are flanges 13 depending from the opposite side edges of a horizontally disposed metal wall 14. The opposite ends of the brackets 12 are extended beyond the complemental ends of the wall 14 to provide front arms 12^a and rear arms 12^b for the journaling therein of rollers 15, about which an endless belt 16, of a flexible transparent material, such as Cellophane or the like, is trained. A drive element, such as the pulley 17, is mounted on an end of the roller 15 at the front end of the wall 14.

Immediately overlying the wall 14 is a turntable 18 that is supported on a spindle 19 which is projected downwardly through the center of the wall 14 and through a bearing 20 secured on the lower side of the latter. A worm wheel 21 is keyed on the spindle 19, below the bearing 20, and is meshed with a worm gear 22 that is keyed on the inner end of an actuating rod or shaft 23 which extends laterally to one side of the frame, the inner end of the rod or shaft 23, at opposite sides of the worm gear 22, being supported in bearings 24 depending from the lower side of the wall 14 and its outer end in one of the brackets 12. The outer end of the rod or shaft 23 is projected through and beyond the bracket and is provided with a knurled handwheel or knob 25 for its manipulation. The plate 14 is located slightly below the horizontal plane in which the top sides of the rollers 15 are located, and the turntable 18 is located between the plate 14 and the upper stretch of the belt 16, as clearly shown in Figure 3 and 4.

Extending horizontally from the front end of the arms 12^a is a bracket plate 26, that may take the form of an isosceles triangle, in which case, its apex is disposed in the plane of the longitudinal center of the frame. The bracket plate 26 is reinforced by flanges 26^a which extend downwardly from the side edges of the plate, which are connected at their front ends, and which form continuations of the front arms 12^a, as shown in Figure 3. Mounted on the bracket 26, in proximity to the apex, is an upstanding post 27 which has its upper end engaged by the outer end of an adjustable arm 28 and a knurled clamp nut 29 to secure the arm against unintended displacement from a set position. An upstanding, multi-grooved, pulley 30 is rotatably mounted on a vertical shaft 31 that has bearing at its lower end in the inner end of the arm 28, the shaft also acting as a pivot for an adjustable protractor 32 positioned on the arm beneath the pulley. The protractor 32 is preferably in the form of a circular disc of a transparent material and engaged at its center on the shaft 31 and having a scale 32' thereon. A flat spring 33 is secured on the arm 28 at one end and has its other end bearing on the protractor 32 to retain it in a set position of adjustment. A sight opening 34 is formed in that portion of the spring 33 which overlies the scaled edge of the protractor 32 and has an index 35 associated therewith for cooperation with the scale graduations.

A bracket 36, that may also take the form of an isosceles triangle, is extended horizontally outward from the side of the frame, from points of securement, as at 37, to the adjacent one of the brackets 12, and has an upstanding post 38 mounted on it in proximity to the apex of the angle which is disposed in the plane of the transverse center of the frame. The outer end of an adjustable arm 39 is engaged on the upper end of the post 38 and is secured in a set position thereon by a knurled clamp nut 40. A vertical shaft 41 has bearing at its lower end in the inner

end of the arm 39 and supports a multi-grooved pulley 42 for free rotation thereon. Engaged at its center on the shaft 41, beneath the pulley 42, is a protractor 43, which also may take the form of a circular disc of a transparent material having a degree scale 43' extending along its edge. Secured at one end to the upper side of the arm 39 is a flat spring 44 which has its other end bearing on the protractor 43 to retain it in a set position of adjustment. This spring 44 is also provided with a sight opening and an associated index for co-operation with the scale on the protractor 43.

Offset from the frame, at a point adjacent its front end and on the same side from which the bracket 36 is supported, is an angled bracket 45 having a stepped pulley 46 mounted on its upper side. The pulley 46 is keyed on a vertical shaft 47 that has its lower end projecting downwardly through a bearing 48 secured in the bracket for the application of power thereto. As shown, the shaft 47 may be driven by a beveled gear 49, keyed on its lower end below the bearing 48, arranged in mesh with a mating gear 50 that is keyed on the shaft of the roller 15 at the front end of the frame, by which arrangement, power from a single source applied to the drive element 17, at the opposite end of the roller, will be sufficient for the operation of the belt 16 and the stepped pulley 46.

In use, the apparatus, as thus provided, will be set up in a manner that access may be readily had to the several mechanisms and instrumentalities and its top will be in full view of students under instruction. If an air flight is to be simulated, a map of the territory selected for the demonstration will be superimposed on the turntable 18, or for the practice of air maneuvers, an air view, showing evidences of wind movement, will be substituted, the evidences taking the form of apparent movement of trees, tall grass, flags and smoke, and also waves, foam, streaks, calm and ruffled areas of bodies of water. If the navigation of surface craft is to be practiced, then a representation of a water area will be placed on the turntable 18 and this will graphically illustrate surface effects for a given condition of the weather. The endless belt 16 has a width equal to, or slightly greater than, the diameter of the turntable 18, so that maps, charts or the like, positioned on the latter will be clearly visible through its upper run. A model 52, of an air or a water craft, will be placed on the upper run of the belt 16, well to the rear end thereof and will be connected to a cord 51 that is passed about one or the other of the idler pulleys 30 and 42 and trained about the stepped pulley 46, upon which it is to be wound in order to impart forward movement to the model.

In operation, with power from a suitable source (not shown), applied to the drive pulley 17, the front roller 15 will drive the belt 16, while the rear roller will idle. The traveling movement of the upper run of the belt 16 simulates the motion of the atmosphere, or of a water surface. With the operation of the belt 16, the stepped pulley 46 is driven through the beveled gears 49 and 50 and, as a consequence, the model 52 is subjected to the pull of the cord 51, in simulation of its own propulsive effort and direction and, at the same time, to the movement of the belt 16, in simulation of the movement and direction of the atmosphere, or of a water surface, depending upon the type of craft in use at the moment. The final movement of the model 52, in its approach to the stepped pulley 46, will be the resultant of the two forces thus acting upon it. By adjusting the arms 28 or 39, in co-operation with the protractors 32 or 43, courses may be set for model movement in any and all directions and the heading of the model can be measured at the point of crossing of the cord 51 over the protractor scales. Also, by manipulating the knurled handwheel or knob 25, the turntable 18 can be rotated through the intermeshing worm gears 21 and 22 so as to vary the position of a chart or map, designated 53, placed thereon in relation to the variations in the motion of a model positioned on the upper run of the belt 16.

Having thus fully described my invention, it is to be understood that various changes in design and construction of the apparatus, and substitutions of equivalent mechanisms and instrumentalities, may be resorted to, without departing from the spirit of the invention, or its scope as claimed.

What I claim is:

1. A training device for simulating navigational conditions and their effect on a moving object, comprising a turntable device mounted for manual rotational adjustment to alter the visual disposition of indicia placed thereon, an endless transparent belt movable above said turntable, and through which the indicia may be seen, a pair of pivotally movable arms related to the belt and turntable and each carrying a protractor and an idler pulley mounted on the pivots thereof, an object movably supported on the belt, and a cord attached to the object and passing one or the other of the idlers of the respective arms, and power means operatively connected with the cord and belt for actuating the same.

2. A training device for simulating navigational conditions and their effect on a moving object, comprising a manually rotatable member disposed in a horizontal plane and adapted to carry indicia, a transparent, horizontally and linearly movable support device above the rotatable member and through which the indicia may be seen, pivoted arms each carrying an idler pulley and a protractor on their pivots and related to the linearly movable support at its end and side, a movable object carried by the movable support, and means trained over one or the other of the pulleys and attached to the object for moving the object with reference to the support.

3. A training device for simulating navigational conditions and their effect on a moving object, comprising a frame, brackets carried by the frame and extending outwardly from one side and one end thereof respectively, arms pivoted respectively to the ends of the brackets, a protractor carried by each arm, an idler pulley carried by each arm at its point of pivotal attachment, a manually operable turntable carried by the frame and adapted to carry indicia thereon, a transparent belt carried by the frame and movable over the turntable and through which the indicia may be seen, an object movably supported on the belt, and means attached to the object and extending about one or the other idler pulley for moving said object with respect to the belt.

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