

ASCENDABLE BLACKBOARD

5 Field of the Invention

The present invention relates to a blackboard for use in school class rooms, lecture rooms and the like. More particularly, the present invention relates to an ascendable blackboard which can be adjusted as to its height up and down, so that the user of
10 the blackboard can easily lift and lower the movable part of the blackboard with a slight force, and that the movable part can be stopped at the desired level in a sure manner.

Background of the Invention

15 A conventional blackboard which is installed in a school class room or a lecture room is fixed on the front wall of it, and therefore, the height of the blackboard cannot be adjusted. However, it is a matter of fact that the blackboard can be conveniently used by adjusting its height in accordance with the
20 stature of the user. In order to meet such a need, some ascendable blackboards have been developed.

In case that a user of a blackboard is very tall, it is inconvenient for the user to use the entire surface of the blackboard. In this case, the user can use the upper part of the
25 blackboard. However, in case that a user of a blackboard is very short, it is inconvenient for the user to use the entire surface of the blackboard. In this case, the user can use the lower part of the blackboard. As all the conventional blackboards are fixed against the front walls of school class rooms, lecture rooms and
30 the like, they are not movable upward or downward.

The present invention relates to a blackboard assembly which are movable upward or downward so as to adjust the height of the blackboard. Also, the present invention relates to an

ascendable blackboard which can be adjusted as to its height up and down, so that the user of the blackboard can easily lift and lower the movable part of the blackboard with a slight force, and that the movable part can be stopped at the desired level in a
5 sure manner.

Objects of the Invention

Therefore, the present inventor developed an ascendable blackboard using no separate balancer, so that a blackboard can
10 be installed in a simple manner. In the present invention, a weight balancer in the form of a spring means is used, so that a blackboard assembly (a movable middle portion of the blackboard) can be moved up and down to a desired height. Further, in the present invention, the initial force for lifting the blackboard is
15 reduced very much.

It is an object of the present invention to provide an ascendable blackboard in which the ascendable blackboard can be installed in a simple manner.

It is another object of the present invention to provide an
20 ascendable blackboard in which a blackboard assembly (a movable middle portion of the blackboard) is moved up and down and fixedly stopped at the desired height by utilizing the elastic force of a spring means.

It is still another object of the present invention to provide
25 an ascendable blackboard in which the initial lifting force for the blackboard can be reduced.

It is still another object of the present invention to provide an ascendable blackboard in which, owing to the lack of a balancer, the weight of the blackboard assembly (the movable
30 middle portion of the blackboard) is reduced, and its installation and actuation can be carried out in a simple manner.

It is still another object of the present invention to provide an ascendable blackboard in which, in the case where the

blackboard is fixedly installed or where an auxiliary blackboard is used, the blackboard can be fixedly installed.

Summary of the Invention

5 In achieving the above objects, the ascendable blackboard according to the present invention comprises left and right slidable vertically moving means 11 coupled with a main blackboard assembly 1 so as to make the main blackboard assembly 1 supported during its upward and downward movements; a pair of
10 supporting rods 10 passing through the slidable vertically moving means 11 and fixed to an outside of the main blackboard assembly and to insides of side auxiliary blackboard assemblies 2 and 2'; a pair of weight balancers 12 fixed to upper portions of the supporting rods 10 and to insides of the side auxiliary
15 blackboard assemblies 2 and 2'; and a pair of strings 14 for connecting the slidable vertically moving means to the weight balancers so as to move the main blackboard assembly 1 up and down.

 In order to facilitate the transmission of force between the
20 slidable vertically moving means and the weight balancers, idler rollers 13 are installed between the slidable vertically moving means and the weight balancers, for guiding the strings 14.

 The weight balancer 12 comprises a flat spring means 21 having an elastic force for supporting the main blackboard
25 assembly 1; a revolving member 22 for revolving forward or backward so as to wind or unwind the string in accordance with the upward or downward movements of the main blackboard assembly 1; and a pin shaft 23 for fixing one end of the flat spring means 21 so as to establish an elastic force on the flat
30 spring means.

 A stopper 5 is installed at a lower middle position of the main blackboard assembly 1. The stopper 5 comprises a manually manipulated lever 51 and a pair of rods 52 for being moved to the

left and right by the manipulation of the lever 51. The pair of the rods 52 are inserted into holes 53 inside the side auxiliary blackboard assemblies 2 and 2', for securing the main blackboard assembly 1.

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Brief Description of the Drawings

The above objects and other advantages of the present invention will become more apparent by describing in detail the preferred embodiment of the present invention with reference to the attached drawings in which:

FIG. 1 is a schematically perspective view of the ascendable blackboard of the present invention, showing that the main blackboard assembly 1 has been moved up;

FIG. 2 is a schematically perspective view of the ascendable blackboard of the present invention, showing that the main blackboard assembly 1 has been moved down;

FIG. 3 is a schematically frontal view of the ascendable blackboard of the present invention, showing that the main blackboard assembly 1 lies evenly with the side auxiliary blackboard assemblies 2 and 2';

FIG. 4 is a schematically perspective view showing the supporting rods 10, the slidable vertically moving means 11, the idler rollers 13, the weight balancers 12, and the strings 14;

FIG. 5A is a plan view schematically showing the internal constitution of the ascendable blackboard according to the present invention and FIG. 5B is a front view of FIG. 5A;

FIG. 6 is an exploded perspective view of the weight balancer 12;

FIG. 7 is a schematically perspective view of the weight balancer 12;

FIG. 8 is a schematic view of the flat spring means 21 of the weight balancer 12, in a state with the main blackboard assembly

1 moved up;

FIG. 9 is a schematic view of the flat spring means 21 of the weight balancer 12, in a state with the main blackboard assembly 1 moved down;

5 FIG. 10 is a schematic plan view showing another embodiment of the slidable vertically moving means;

FIG. 11 is a schematic perspective view of the stopper 5 which is installed at the lower middle position of the main blackboard assembly 1; and

10 FIG. 12A is a schematic view showing the actuation principle of the stopper 5, FIG. 12B illustrates that the rod 52 is inserted into the hole 53 by manipulating the lever 51, and FIG. 12C illustrates that the rod 52 is taken out of the hole 53 by manipulating the lever 51.

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Detailed Description of the Preferred Embodiment

Generally, the blackboard which is installed in a school class room or in a lecture room is constituted such that auxiliary blackboard assemblies 2 and 2' are disposed at the left and right, and a main blackboard assembly 1 is disposed between the two auxiliary blackboard assemblies 2 and 2'. In the conventional blackboard, the main blackboard assembly 1 and the auxiliary blackboard assemblies 2 and 2' are integrally formed.

25 In the present invention, the left and right auxiliary blackboard assemblies 2 and 2' are fixed on the wall, while the main blackboard assembly 1 disposed at the center is movably installed. Therefore, the height of the main blackboard assembly can be arbitrarily adjusted in accordance with the convenience of the user.

30 FIG. 1 is a schematically perspective view of the ascendable blackboard of the present invention, showing that the main blackboard assembly 1 has been moved up. FIG. 2 is a schematically perspective view of the ascendable blackboard of the

present invention, showing that the main blackboard assembly 1 has been moved down. FIG. 3 is a schematic front view of the ascendable blackboard of the present invention, showing that the main blackboard assembly 1 lies evenly with the side auxiliary
5 blackboard assemblies 2 and 2'.

FIG. 4 is a schematically perspective view showing the supporting rods 10, the slidable vertically moving means 11, the idler rollers 13, the weight balancers 12, and the strings 14. In FIG. 4, the string 14 connects the slidable vertically moving
10 means to the weight balancer 12. FIG. 5A is a plan view schematically showing the internal constitution of the ascendable blackboard according to the present invention.

As can be seen in FIGs. 4 and 5A, within the side auxiliary blackboard assemblies 2 and 2', there are two auxiliary
15 blackboards 3 respectively inserted. The auxiliary blackboards 3 can be used by pulling them out, in a state with the main blackboard assembly 1 lying evenly with the side auxiliary blackboard assemblies 2 and 2' as shown in FIG. 3. The auxiliary blackboards 3 move along rails (not shown in the
20 drawings) and rollers (not shown in the drawings). This can be easily devised by those ordinarily skilled in the art.

The vertically moving devices such as supporting rods 10, slidable vertically moving means 11, idler rollers 13 and weight balancers 12 are installed between the auxiliary blackboards 3 and
25 the wall.

As shown in FIG. 5A, a main blackboard 4 has a radius of curvature of about 18,000 mm, and this curved contour is for preventing random radiations.

At the middle of the left and right sides of the main
30 blackboard assembly 1, there are formed the slidable vertically moving means 11 integrally with the main blackboard assembly 1. The slidable vertically moving means 11 of FIGs. 4 and 5 has a cylindrical contour, and accommodates a supporting rod 10 in such

a manner that the supporting rod 10 can be moved up and down. Inside it, there is installed a linear bearing, so that the slidable vertically moving means 11 can smoothly move up and down along the supporting rod 10. The structure of the linear bearing
5 can be easily devised by those ordinarily skilled in the art.

The supporting rods 10 pass through the slidable vertically moving means 11, and are fixed to the insides of the side auxiliary blackboards 2 and 2', and to the outside of the main blackboard assembly 1.

10 In FIG. 4, the slidable vertically moving means 11 are provided in the form of linear bearings. The supporting rods 10 pass through the linear bearings in such a manner that the slidable vertically moving means would move up and down along the fixed supporting rods 10, and that the main blackboard
15 assembly 1 would move up and down together. Unlike in FIG. 4, the slidable vertically moving means may be provided in a form other than the linear bearings.

FIG. 10 illustrates another embodiment of the slidable vertically moving means. Here, a pair of rollers 11' are provided,
20 and by the help of the rollers 11', the main blackboard assembly 1 moves up and down along the fixed supporting rods 10.

As shown in FIG. 5, the weight balancer 12 according to the present invention is connected through the idler roller 13 to the slidable vertically moving means 11 by means of the string
25 14. That is, the idler roller 13 is installed above the slidable vertically moving means 11, while the weight balancer 12 is installed at almost the same height as the idler roller 13. In this manner, the transmission of force can be facilitated.

The string 14 is fixed to a middle point on the slidable
30 vertically moving means 11, and is connected through the idler roller 13 to the weight balancer 12. The string 14 may consist of a steel rope or an ordinary rope, and should have enough strength to support the weight of the main blackboard assembly 1. The

string 14 which is connected to the weight balancer 12 is wound on spiral grooves 223 of a revolving member 22, and the source of the winding force is the elastic force of the flat spring means 21 of the weight balancer 12.

5 In FIG. 5, the idler roller 13 is adopted, but this idler roller 13 may be omitted. In other words, the slidable vertically moving means 11 may be directly connected to the weight balancer. In this case, in order to achieve an efficient transmission of force, the weight balancer 12 should be preferably disposed above the
10 slidable vertically moving means 11.

 The weight balancer 12 includes a flat spring means 21 having a sufficient elastic force for supporting the main blackboard assembly 1, a revolving member 22 for revolving forward or reverse so as to wind or unwind the string in accordance with
15 the upward or downward movements of the main blackboard assembly 1, and a pin shaft 23 for fixing one end of the flat spring means 21 so as to establish an elasticity on the flat spring.

 FIG. 6 is an exploded perspective view of the weight balancer 12. A fixing member 211 of the flat spring 21 is
20 inserted into an insertion slot 221 of the revolving member 22. An insertion part 212 receives a pin shaft 23 so as to be engaged with an insertion slit 231 of the pine shaft 23. At the lower end of the pin shaft 23, there is formed a worm gear 232. If this
25 worm gear 232 is rotated, the flat spring is wound starting from the central portion of it, thereby furnishing an elastic force to the revolving member 22. Spiral grooves 223 are formed on the outside of the revolving member 22, so that the string 14 can be wound or unwound around the spiral grooves 223. One end of the string 14 is fixed to a hole 222, while the other end of the
30 string 14 is fixed to the central portion of the slidable vertically moving means 11. The revolving member 22 having the spiral grooves 223 for winding the string 14 should preferably have a conical form, but a cylindrical form may be acceptable.

FIG. 7 is a partly cut-out view of the weight balancer 12. When the blackboard is installed on a wall, the worm gear 232 is rotated until the elastic force of the flat spring 21 would be equivalent to the weight of the main blackboard assembly 1.

5 FIG. 8 is a schematic view of the flat spring 21 of the weight balancer 12, in a state with the main blackboard assembly 1 moved up. If the main blackboard assembly 1 is moved up, the flat spring 21 is wound around the pin shaft 23. On the other hand, if the main blackboard assembly 1 is moved down, the flat
10 spring 21 is unwound around the pin shaft 23. FIG. 9 is a schematic view of the flat spring 21 of the weight balancer 12, in a state with the main blackboard assembly 1 moved down.

In the present invention, the weight balancer 12 may be installed either in a number of two at the left and right in a
15 symmetric form, or a single weight balancer 12 may be installed. In this case, the strings 14 which are connected to the slidable vertically moving means 11 are connected to a single weight balancer 12, so that the two slidable vertically moving means 11 would be actuated by the single weight balancer 12.

20 A stopper 5 is installed at the middle of the bottom of the main blackboard assembly 1. FIG. 12A is a schematic view showing the actuation principle of the stopper 5. FIG. 12B illustrates that the rod 52 is inserted into the hole 53 by manipulating the lever 51. FIG. 12C illustrates that the rod 52 is
25 taken out of the hole 53 by manipulating the lever 51. The stopper 5 is used when the main blackboard assembly 1 is to be fixedly stopped at a certain height.

In the case where the auxiliary blackboards 3 which are installed within the side auxiliary blackboard assemblies 2 and 2'
30 are moved toward the main blackboard assembly 1, the main blackboard assembly 1 moves down due to the weights of the auxiliary blackboards 3. The reason is that the weight of the main blackboard assembly 1 exceeds the elastic force of the flat

spring 21 which has been initially adjusted. In this case, the main blackboard assembly 1 is fixedly stopped at a particular height by using the stopper 5.

5 The stopper 5 comprises a lever 51 for being manually manipulated and a pair of rods 52 for being moved to the left and right by the manipulation of the lever 51. FIG. 11 is a schematic perspective view of the stopper 5 which is installed at the lower middle position of the main blackboard assembly 1. As shown in FIG. 12B, if the lever 51 is moved to the right, then the rod 52
10 moves outward to be inserted into the hole 53, with the result that the main blackboard assembly 1 is fixedly stopped. As shown in FIG. 12C, if the lever 51 is moved to left, then the rod moves inward to be taken out of the hole 53, with the result that the main blackboard assembly 1 is placed at a movable position.
15 The hole 53 for receiving the rod 52 is formed in a plurality on the sides of the side auxiliary blackboard assemblies 2 and 2'.

It should be apparent to those ordinarily skilled in the art that various changes and modifications can be added to the specific embodiment of the present invention, but these changes
20 and modifications should come within the scope of the present invention which is defined in the appended claims.

What is claimed is:



1. An ascendable blackboard comprising:

left and right slidable vertically moving means 11 coupled with a main blackboard assembly 1 so as to make said main blackboard assembly 1 supported during its upward and downward movements;

a pair of supporting rods 10 passing through said slidable vertically moving means 11 and fixed to an outside of said main blackboard assembly and to insides of side auxiliary blackboard assemblies 2 and 2';

a pair of weight balancers 12 fixed to upper portions of said supporting rods 10 and to insides of said side auxiliary blackboard assemblies 2 and 2'; and

a pair of strings 14 for connecting said slidable vertically moving means to said weight balancers so as to move said main blackboard assembly 1 up and down.

2. The ascendable blackboard as claimed in claim 1, further comprising an idler roller 13 for allowing a string 14 to be passed around, and disposed between said slidable vertically moving means 11 and said weight balancer 12, said idler roller 13 being installed above said slidable vertically moving means and at a same horizontal level as that of said weight balancer 12.

3. The ascendable blackboard as claimed in claim 1, wherein said weight balancer 12 comprises a flat spring means 21 having a sufficient elastic force for supporting said main blackboard assembly 1, a revolving member 22 for revolving forward or reverse so as to wind or unwind said string 14 in accordance with upward or downward movements of said main blackboard assembly 1, and a pin shaft 23 for fixing one end of said flat spring 21 so as to establish an elasticity on the flat spring means.

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4. The ascendable blackboard as claimed in claim 3, wherein said revolving member 22 is provided with spiral grooves 223 for winding said string 14.
5. The ascendable blackboard as claimed in claim 3, wherein said revolving member 22 has a conical contour or a cylindrical contour.
6. The ascendable blackboard as claimed in claim 1, further comprising a stopper 5 for fixedly stopping said main blackboard assembly.
7. The ascendable blackboard as claimed in claim 6, wherein said stopper 5 comprises a manually manipulated lever 51 and a pair of rods 52 for being moved to left and right by manipulations of said lever 51.
8. The ascendable blackboard as claimed in claim 7, wherein said rods 52 are installed on inner sides of said side auxiliary blackboard assemblies 2 and 2'.
9. The ascendable blackboard as claimed in claim 3, wherein said pin shaft 21 comprises an insertion slit 231 for engaging with an insertion part 212 of said flat spring 21 and a worm gear 232 for winding the flat spring means 21.
10. The ascendable blackboard as claimed in claim 1, wherein said slidable vertically moving means 11 is provided in a form of linear bearings.
11. The ascendable blackboard as claimed in claim 1, wherein said slidable vertically moving means 11 is provided in a form of rollers 11'.

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