ADJUSTABLE ARTICULATED SUPPORT ARM

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ABSTRACT
An adjustable, articulated support for supporting a load, such as a lamp or dentist's tray, has a base and at least two arms. One arm is pivoted on the base and the second arm is pivoted to the first. A cable drum is secured to the first arm and a tensioned cable anchored at one end to the base extends at least once round the drum and passes over an arcuate guide on the second arm. To release the support for adjustment the tension is released in the cable.

16 Claims, 9 Drawing Figures
ADJUSTABLE ARTICULATED SUPPORT ARM

The present invention relates to an adjustable, articulated support for carrying a load such as a lamp or a dentist’s tray and having a base member and two or more arms pivoted to one another and to the base member.

It is common in known supports of this kind to rely on friction-loading of the joints between the arms and between the lowermost arm and the base member in order to support the load. To adjust the support, the user manipulates the arms by applying enough force to overcome the friction in the joints.

Thus there is a conflict between the requirement for sufficient friction to support the load but not so much friction that the user is unable readily to adjust the support.

In some applications this conflict results in an unsatisfactory support. For example, where a lamp is carried by such a support on a machine in which there is vibration, if the support is such that it meets the requirement of being readily adjustable the vibration can cause the support to droop progressively.

According to the present invention in one aspect there is provided an adjustable, articulated support comprising an arm transversely pivoted at one end to a base member and an elongated flexible member anchored at one end to the base member and extending at least once round a drum secured to the arm and gripping the drum when tensioned to render the arm rigid against the applied load yet can readily be released for easy adjustment by release of the tension in the cable.

The invention will now be described, by way of example, with reference to the drawings accompanying the provisional specification in which

FIG. 1 is a partially cut-away elevation of an adjustable, articulated support according to the invention,
FIG. 2 is a plan of a first arm of the support,
FIG. 3 shows the arrangement of a cable in the support,
FIG. 4 shows an arrangement to facilitate release of tension in the cable, and
FIG. 5 shows manually releasable clamping means for the cable,
FIG. 6 is a partially cut-away elevation of a second embodiment of the invention,
FIG. 7 shows the arrangement of a cable in the support of FIG. 6,
FIG. 8 is a partially cut-away elevation of a third embodiment, and
FIG. 9 shows the arrangement of a cable in the support of FIG. 8.

The adjustable articulated support arm shown in FIGS. 1, 2 and 3 comprises first, second and third arms 10, 11 and 12. Each of the arms 10, 11 and 12 comprises a hollow tubular portion and the arms have cylindrical drums 13, 14 or 15 respectively attached to their inner ends. The cylindrical drums 13, 14 and 15 have the same diameter.

The inner end of the first arm 10 is transversely pivoted on an outer end of a tubular base member 16 for pivotal movement about a horizontal axis coaxial with the axis of the drum 13. A pivot pin 17 extends through plates 18 attached to the sides of the first arm and the base member 16. The base member 16 is mounted on a base plate 19 for rotation about a vertical axis 20.

The inner ends of the second and third arms, 11 and 12 respectively, are similarly transversely pivoted on the outer ends of the preceding arms 10 and 11 respectively, for pivotal movement about axes coaxial with the respective drums 14 and 15. Pivot pins 21 and 22 respectively extending through plates 23 attached to the sides of the arms connect the first and second, and second and third arms together.

A flexible multi-strand wire cable 24 is anchored at an inner end to the inside of the base member 16 by means of a nut and bolt 25. The cable 24 extends through the hollow base member 16 and twice clockwise (as viewed in FIG. 1) around the first drum 13 attached to the first arm 10. The cable 24 then extends successively through the first arm section 10, twice clockwise around the second drum 14, through the second arm 11 and two and a half times around the third drum 15. The cable 24 is then guided back into the second arm 11 by a small pulley 26 attached to the second arm adjacent its outer end.

The outer end of the cable 24 is then connected to resilient tensioning means comprising a pair of springs 27 in parallel mounted within the second arm 11. Two springs are used as a safety measure against failure of a spring by breakage. One end of the springs 27 is attached to the cable 24 and the other end to the second arm 11 adjacent the second drum 14 in such a manner as to tension the cable and make it bite on the drums.

The arrangement of the cable run is shown in FIG. 3.

Means for manually reducing or releasing the tension can be as shown in FIG. 4. A release cable 28 attached at one end to the outer end of the cable 24 at the point
where the cable 24 is connected to the springs 27 is passed back around the pulley 26 and then forwards on the outside of the second arm 11 towards the first arm 10. The other end of the release cable 28 is attached to a thumb-piece 28 slidably mounted on the second arm 11. A fixed finger-piece 30 is mounted on the second arm 11 between the thumb-piece 29 and the second drum 14. Thus moving the thumb-piece 29 towards the finger-piece 30 stretches the springs 27 and releases the tension in the cable 24 beyond the third drum 15.

Normally the tension exerted by the springs 27 cause the cable 24 to grip or bite on the three drums frictionally. When the third arm section 12 is loaded at its outer end, by for example, a load 31, the moment of the load 31 and the arm section 12 about the pivot 22 causes the cable 28 to bite even more on the third drum 15, increasing the tension in the cable between the second and third drum 14 and 15, until the moment of the tension balances that of the load 31. Similarly, the tension between the first and second drums 12 and 13 and between the anchor nut and bolt 25 and the first drum 13 is successively increased as the cable 24 bites on the drums. The arms 10, 11 and 12 are thus maintained in position.

When the angular positions of the arms are to be adjusted, the tension in the cable 24 must be at least somewhat released so that the cable 24 can slide over the drums 13, 14 and 15. Thus, by supporting the load 31, and releasing the tension due to the springs 27, the arms may be adjusted in position. When in the new desired positions, the cable 24 can be tensioned by the springs 27, which will permit changes in the length of cable 24 between the anchor nut and bolt 25 and the third drum 15 produced by the adjustment, and the load released. The cable tension will maintain the new position of the arms.

It is possible to make use of constant angularity of the arm 12 relative to the base member whereby for example a lamp attached to the third arm 12 can be made to shine in a constant direction or a tray remain level despite variations in the height of the lamp or tray.

In order to ensure positively this constant angularity, the third arm 12 can be equipped with clamping means for releasably clamping the cable 24 to the third drum 15 as shown in FIG. 5. The clamping means comprise a thumb screw 32 on the third arm 12 for urging a friction pad 33 against the drum 15 to clamp the cable. The friction pad is attached to one end of a lever 34. The other end of the lever 34 is pivotally mounted on the third arm 12.

Referring now to FIGS. 6 and 7, these show a second embodiment of simpler form. In this embodiment and the first like parts are given the same reference. It will be seen that there are only two arms 10 and 11, the arm 10 being transversely pivoted as before to the base member 16 by means of the pivot pin 17 extending through the base member 16 and plates 18.

The arm 11 is again pivoted to the outer end of the arm 10 by a pivot pin 21 extending through the arm 11 and plates 23 on the arm 10.

A dentist's tray 35 is secured to the arm 11 as shown and in this embodiment the multi-steel cable 24 is anchored by the bolt 25 to the base, extends twice around the drum 13 on the darm 10, partially around an arcuate guide member also in the form of a drum or pulley-like member 14 fixed to the arm 11, and is finally anchored at 36 on the tray 35. FIG. 7 shows more clearly the arrangement of the cable 24.

In addition there is provided a rigid link 37 pivoted at one end to the member 14 by means of a pivot pin 38, and at the other end to the base member 16 by means of a pivot pin 39. The hole in at least one and preferably both of the members 14 and 16 through which the pivot pins extend is somewhat oversized to permit some degree of lost motion.

When in use, the arm 11 and tray 35 tend to rotate clockwise (in FIG. 6) whereby the cable 24 is tensioned and grips the drum 13. The support is then rigid against the load. The length of the cable is made such that the tray 35 is horizontal as shown and the link 37 is not supporting any of the load.

In order to adjust the support the tray 35 is merely tilted slightly anti-clockwise, the lost motion in the pivots of the link permitting this through a small angle sufficient to release tension in the cable whereby the arm 10 can be pivoted up or down on the pivot pin 17. At the same time the arm 11 pivots on the pivot pin 21 correspondingly and maintains the tray 35 in a horizontal attitude.

FIGS. 8 and 9 show a modification of the embodiment of FIGS. 6 and 7 in which the link 37 of FIG. 6 is removed and in its place the cable 24 is taken around half the drum 14, partially around the drum 13 and is anchored to the base member 16 through a strong spring 40. The tension in the spring adds to the pull of gravity provided by the tray and tensions the cable even further. A clamp 41 is provided at the drum 14 to clamp the cable firmly to this drum.

In order to release the tension in the cable for enabling the support to be adjusted, the tray 35 is merely lifted against the tension in the spring 40 whereby the grip on the drum 13 is then released and articulation of the support can then be effected.

I claim:

1. An adjustable, articulated support, comprising a base member, a first arm transversely pivoted to the base member, a drum secured to the first arm, a second arm pivoted to the first arm, an arcuate guide member secured to the second arm, and an elongated flexible member anchored at one end to the base member and extending at least once around said drum and passing over said arcuate guide member to hold said support rigid against an applied load by tension in the elongated member and grip thereof on said drum, adjustment on the support being permitted by releasing the tension in said elongated flexible member, the end of said elongated flexible member remote from said anchorage on the base member being anchored to said second arm or to a further member secured to said second arm and the tensioning of the elongated flexible member being achieved by the action of gravity on the second arm plus any load carried thereby.

2. A support according to claim 1, and including a rigid link pivoted at one end to said second arm and at the other end to said base member, at least one of the pivots providing for a degree of lost motion permitting the tension in said elongated member to be released when adjustment of the support is required.

3. A support according to claim 1, wherein the radii of curvature of the guide member and the drum are substantially equal.

4. A support according to claim 3, wherein the axes of curvature of the drum and the guide member respec-
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tively substantially coincide with the axes of the pivots of the first arm on the base member and the second arm on the first arm.

5. A support according to claim 1 wherein the arcuate guide is of pulley-like form.

6. A support according to claim 1, and including a third arm transversely pivoted to the end of said second arm remote from said first arm, said arcuate guide member being constituted by a second drum around which said elongated member extends at least once, and said third arm having a second arcuate guide member secured thereto over which the elongated member passes.

7. A support according to claim 6, wherein the radii of curvature of the first and second drums and the arcuate guide member on the third arm are substantially equal.

8. A support according to claim 7, wherein the axes of the first and second drums and the arcuate guide member on the third arm substantially coincide respectively with the axes of the pivots between the first arm and the base member, the second arm and the first arm and the third arm and the second arm.

9. A support according to claim 6, wherein the end of the elongated flexible member remote from the base member is anchored to the second arm through a tensioning spring.

10. A support according to claim 6, wherein means are provided for clamping the elongated flexible member to the base member.

11. A support according to claim 6, wherein the second arcuate guide member is in the form of a drum and the elongated flexible member passes at least once around the last said drum.

12. A support according to claim 9, wherein means are provided to facilitate the release of tension in the elongated flexible member.

13. A support according to claim 1, wherein the elongated flexible member is a multi-strand steel cable.

14. An adjustable, articulated support, comprising a base member, a first arm transversely pivoted to the base member, a drum secured to the first arm, a second arm pivotated to the first arm, an arcuate guide member secured to the second arm, and an elongated flexible member anchored at one end to the base member and extending at least once around said drum and passing over said arcuate guide member to hold said support rigid against an applied load by tension in the elongated member and grip thereof on said drum, adjustment of the support being permitted by releasing the tension in said elongated flexible member, the end of said elongated flexible member remote from the anchorage on the base being itself anchored to the base through a tensioning spring which assists gravity in tensioning the elongated flexible member, and means for clamping said elongated flexible member to the arcuate guide member whereby tension in that part of the elongated flexible member which extends back from the guide member and around said drum to the first said anchorage can be released by rotation of the second arm about its pivot to permit adjustment of the support.

15. An adjustable, articulated support, comprising a base member, a first arm transversely pivoted to the base member, a drum secured to the first arm, a second arm pivotated to the first arm, an arcuate guide member secured to the second arm, and an elongated flexible member anchored at one end to the base member and extending at least once around said drum and passing over said arcuate guide member to hold said support rigid against an applied load by tension in the elongated member and grip thereof on said drum, adjustment of the support being permitted by releasing the tension in said elongated flexible member, the tensioning of the elongated member between the anchorage and the drum and between the drum and the arcuate guide member being effected at least in part by gravity acting on the arms.

16. A support according to claim 15, wherein the tensioning of the elongated member beyond the arcuate guide member is effected by means of a spring.

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