March 20, 1962 E. ÖSTRÖM 3,025,970

COLLAPSIBLE SHELF ARRANGEMENT

Filed May 16, 1958 2 Sheets-Sheet 1

Fig. 1.

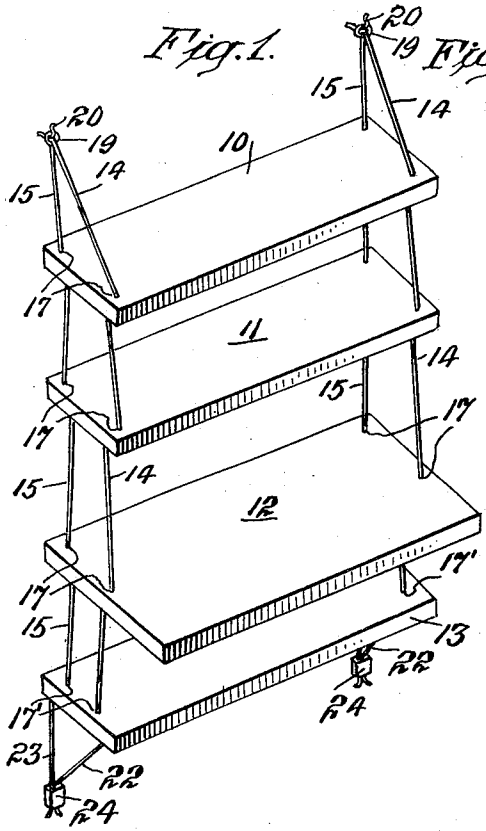


Fig. 2.

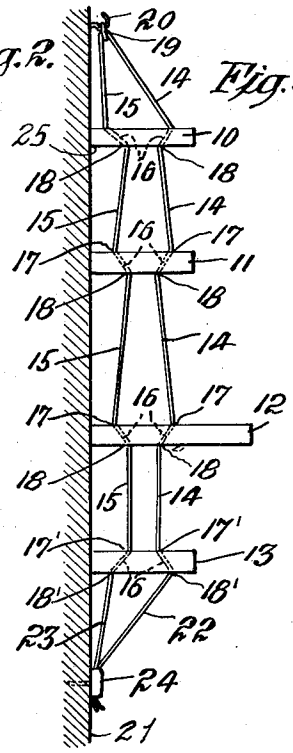


Fig. 3.

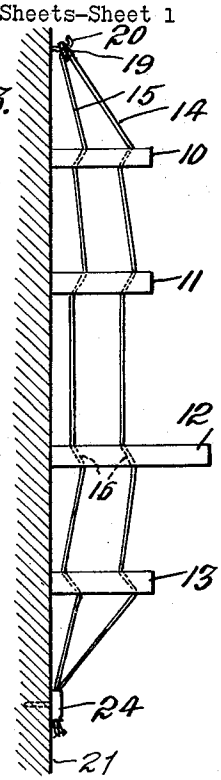


Fig. 4.

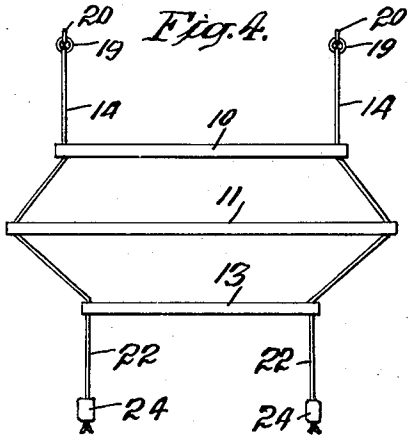
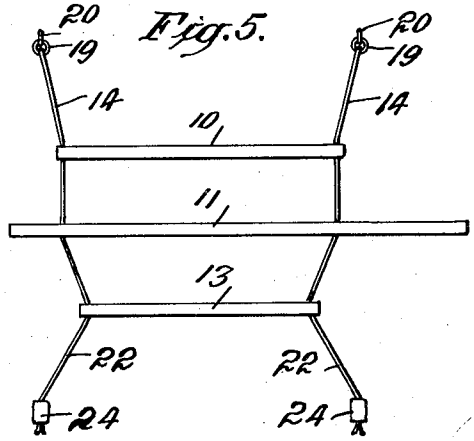


Fig. 5.



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Filed May 16, 1958 2 Sheets-Sheet 2

Fig. 6.

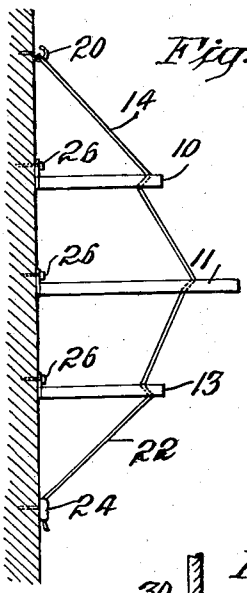


Fig. 7.

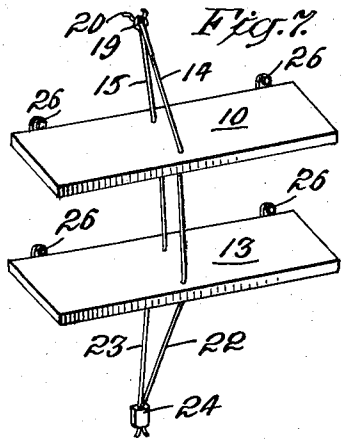


Fig. 8.

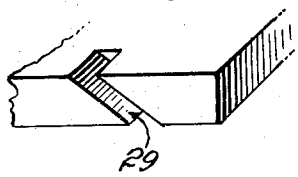


Fig. 9.

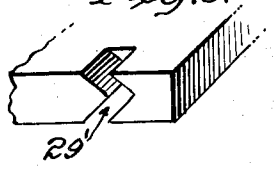


Fig. 10.

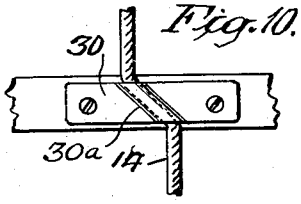


Fig. 11.

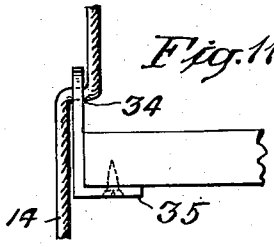


Fig. 12.

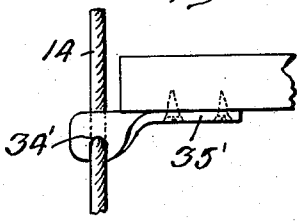
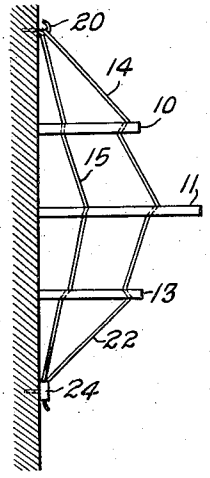


Fig. 13.



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COLLAPSIBLE SHELF ARRANGEMENT

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10 Claims. (Cl. 211—90)

The present invention refers to shelf arrangements for books and the like, comprising one or several shelves placed above each other, and is characterized mainly thereby that the individual shelves are interconnected by one or more, preferably four, bendable suspension elements, such as lines, ribbons of textile, plastic or the like, respectively wires, chains, bendable rods of metal or the like.

Similar but free-hanging, shelf arrangements are known before but have different drawbacks which are eliminated by the present invention.

Thus, some of the known shelf arrangements are suspended in chains in such a way that the relative position of the shelves becomes entirely dependent upon the length of the chain links. By other known shelf arrangements such locking elements are used for the shelves as are impossible to move from a fixed position without permanent deformation or destruction. In both cases it is difficult or impossible to adjust the horizontal position of the shelves or to choose at liberty the location of each shelf.

Further known shelf arrangements are theoretically self-locking as well as adjustable but do not show this combination of properties in practice.

However, according to the present invention it is possible to arrange by simple means a shelf arrangement to be suspended on a wall without support from the floor and firmly resting against that wall, whereby the individual shelves even of different sizes are easily put in any desired position, where the shelves are effectively locked and which can easily be adjusted or completely changed and thereafter again locked without demolishing any of the elements comprised by the arrangement.

The individual shelves are preferably easily movable along the suspension elements but easily lockable in desired position, preferably self-locking, by tightening of the suspension elements.

In suitable locations, and preferably in the vicinity of each end of the shelves, should pass suspension elements, preferably two such elements through each one guide element, possibly consisting of a hole, a slot or the like through the shelf or else arranged as a slot or similar passage in a fitting to be fastened to the shelf. The suspension elements may pass vertically through the guide elements but in shaping or placing the guide elements in such a manner that a local deviation is obtained in the normal direction of the suspension elements a self-locking is easily obtained. The guide elements in the different shelves may extend in many different ways but preferably in such a manner that each two adjacent shelves and the interlying portions of the suspension elements form symmetrical figures if viewed from the front and possibly also from the side. The guide element closest to the wall and furthest away from the wall respectively of each shelf should preferably be placed on the same or approximately the same distance from the rear edge of the shelf as the corresponding guide element of the other shelves regardless of the width of the shelves. In cases when it is desired that each shelf should rest particularly securely against the wall, it is, however, suitable to choose said distance from the wall to the guide element to a maximum for the middle shelf and successively smaller for each shelf above or below the middle shelf or both.

Each adjacent pair of suspension elements, the two at each end of the shelves are suitably arranged to be hung on a hook or similar support, on a wall or the like, whether directly or in a ring or the like.

The lower end of each suspension element is suitably fixed to a wall or the like, preferably detachably fixed, with a lock element working with wedge or pinch action, whereby the entire shelf arrangement will automatically be kept tight against the wall.

The invention will now be further described with reference to the figures shown in the attached drawings and in that connection some further characteristic properties of the invention will also be mentioned.

In FIGURE 1 is shown in perspective a self-locking variety of a shelf arrangement according to the invention and in FIGURE 2 the same arrangement is shown in end view.

FIGURE 3 shows a modification of the example shown in FIGURE 2.

FIGURES 4 and 5 show in front view different examples of stretching the suspension elements.

FIGURES 6 and 7 show in end view and perspective view respectively shelf arrangements with only one and two suspension elements respectively.

FIGURES 8–12 show in larger scale different details for self-locking of the suspension elements. FIGURES 8 and 9 show perspective views of guide elements in the shape of one straight and one angular slot respectively in the shelf. FIGURE 10 shows in end view a slot-shaped guide element arranged in a fitting to be secured to a shelf. FIGURES 11 and 12 show in front view further varieties of fittings with one single guide hole for the suspension element. FIGURE 13 shows an end view of a shelf arrangement like that illustrated in FIGURE 5.

In the example shown in FIGURES 1 and 2 the shelf arrangement consists of four individual shelves **10**, **11**, **12** and **13**, which are connected by four bendable suspension elements, **14** and **15**, two at each end of the shelves. Of the four shelves shown in the example the two upper ones, **10** and **11**, and the lowest one, **13**, have the same width, whereas the next to the lowest one, **12**, is somewhat wider than the rest. All shelves shown in FIGURES 1 and 2 are equally long but not only the width but also the length of the shelves can be varied according to wish as shown in the FIGURES 4 and 5, where only three individual shelves are contained in each shelf arrangement but, otherwise, the arrangement is similar to the ones shown in FIGURES 1–3.

The shelves in this example (as well as in the examples according to FIGURES 3–7) have been provided with guide elements for the suspension elements **14** and **15** in the form of guide holes **16** extending obliquely through the shelves **10–13**, two such guide holes **16** at each end of each shelf. The guide holes in the three upper shelves **10**, **11** and **12** converge downwards, whereas the holes in the lowest shelf **13** diverge downwards. All guide holes close to the wall are placed straight above each other on two vertical lines as are also all guide holes furthest away from the wall as shown in FIGURE 2. The upper hole openings **17** of the holes in the three upper shelves **10**, **11** and **12** are thus straight over each other as are the lower hole openings **18**. On the lowest shelves **12** and **13** the hole openings **18** and **17'** facing each other are also located straight above each other as are the upper hole openings **17** on the next lowest shelf, **12**, and the lower hole opening **18'** on the lowest shelf, **13**.

The bendable suspension elements **14** and **15** extend through the guide holes **16** with a rather loose fit, so that the shelves may be pushed up and down on the suspen-

sion elements as long as these are not taut. When the suspension elements **14** and **15** are being stretched by their lower ends or by the load from a lower shelf, the shelves will automatically become locked in the chosen position on the suspension elements, since they pass through the shelves in a zigzag manner as illustrated in FIGURE 2.

The outer suspension element **14** and the inner suspension element **15** at each end of the shelf can well be one continuous element or joined by a ring or a loop, **19**, which is hung on a hook, **20**, on a wall, **21**. The lower ends **22** and **23** of the suspension elements are in the shown example carried to the wall **21** and attached thereto by means of a suitable lock element, **24**. The locking element **24** may be of any suitable conventional type. For example, the element **24** may be of a type having a base which is U-shaped in horizontal section and a manually operable lever or tab pivoted to the spaced arms of the base for movement about a horizontal axis at a region adjacent to its closed end. The lever is in the form of a cam at the region it is pivoted so that, after the suspension elements are drawn through the gap between the closed end of the base and the tab and pulled taut, the tab can be angularly moved about its horizontal axis to bring the periphery of the cam portion nearer to the closed end of the base and anchor the lower ends of the suspension elements. The lock element can be fixed to the wall **21** either straight below the hook **20** (FIGURE 4) or else moved sideways (FIGURE 5) in order to achieve improved stability.

Since all guide holes **16** are lined up vertically above each other as previously described and as shown in FIGURE 2, the inner edge **25** of each individual shelf will rest against the wall **21**. If it is required that the intermediary shelves **11** and **12** should press particularly well against the wall, the guide holes of the shelves should instead be so arranged that the outer suspension elements will pull these shelves against the wall with greater force than exerted by the other, inner, suspension elements in the direction from the wall or, as shown in FIGURE 13, so that the outer as well as the inner suspension elements will tend to pull the shelves against the wall.

In the example shown in FIGURES 1 and 2 guide holes have been shown only at the ends of the shelves but it is well feasible to provide for additional suspension elements between the ends of the shelves, in the middle of the shelves which may be of advantage by long shelves.

In FIGURES 6 and 7 are shown alternatives for light loads, where the shelves are suspended by only one (FIGURE 6) or two (FIGURE 7) suspension elements **14** and **15** which in that case are suitably carried through the approximate plane of gravity of the shelves. In these examples the shelves are kept straight to the wall by means of tacks, **26**. In FIGURES 6 and 13 the distance from the wall to the guide element **14** is a maximum for the middle shelf **11** and successively smaller for the shelves **10** and **13** above and below the middle shelf **11**. Further, in FIGURE 13 the distance from the wall to the guide element **15** is a maximum for the middle shelf **11** and successively smaller for the shelves **10** and **13** above and below the middle shelf **11**. It will be understood that in FIGURES 1, 2, 3 and 4 the distance from the wall to the guide elements **14** and **15** may be a maximum for a shelf intermediate the top and bottom shelves and successively smaller for each shelf above and below such intermediate shelf.

Instead of fixing the lower ends **22** and **23** of the suspension elements to the wall **21** as shown in FIGURES 1–7 the element ends can be fixed to the lowest shelf, **13**, either by joining the ends with a knot or in any other manner. The two portions **22** and **23** of the elements extending below the lowest shelf, **13**, may also be made in one continuous piece extending through the hole **16** underneath the shelf **13**, in which case the upper ends of the suspension elements **14** and **15** are suitably joined in a ring, **19**.

The guide holes **16** shown in FIGURES 1–7 may suitably be so shaped or provided with such fittings as to obtain a supplementary pinch action when stretching the suspension elements.

Instead of making the guide elements as holes through the shelves the guide elements can also be made as slots **29** and **29'** in the ends of the shelves, such as shown in perspective view in FIGURES 8 and 9, whereby the same alternative arrangements are possible as described above with reference to FIGURES 1–3.

It is also possible to obtain self-locking action by guide elements contained in separate fittings intended to be fixed to the shelves.

In the fitting **30**, shown in FIGURE 10, the guiding is effected by a slot or chute **30***a* in the fitting which is screwed onto the end of the shelves.

The alternatives shown in FIGURES 11 and 12 differ from the alternative in FIGURE 10, preferably in so far as the length of the guide chute has been shortened to holes **34** and **34'** through the fittings **35** and **35'**, respectively, which are fixed to the bottoms of the shelves.

The shown and described alternatives are intended only to exemplify the invention and should not limit the scope of the invention. A great number of additional modifications are thus obviously possible.

I claim:

1. In combination, an upright support, a plurality of horizontally disposed elongated shelves having front and rear longitudinal edges, means for supporting the shelves one above another in spaced relation with their rear longitudinal edges against the support, said supporting means comprising at least one vertically extending elongated flexible element, means for attaching the upper end of the element to the support at a level higher than the top shelf, means for attaching the lower end of the element to the support at a level lower than the bottom shelf to maintain the element taut on the support, and holding means for each shelf including at least one passageway adjacent to its front longitudinal edge and securing structure adjacent to its rear longitudinal edge, the element extending through the passageway of each shelf and projecting upward and downward from the shelf with the passageway constituting the only region at which the element is connected to the shelf, the longitudinal axis of each passageway being at an angle to the vertical to hold the element therein in non-slip relationship with the shelf when the element is taut, and the passageways being so constructed and formed that when the tautness of the vertically extending flexible element is relieved, the element is movable in either direction through the passageway of a shelf to adjust the latter to another position on the element by the single operation of grasping and pulling that part of the relieved element at the vicinity of the passageway.

2. Apparatus as set forth in claim 1 in which the passageway of a shelf intermediate the top and bottom shelves is horizontally removed from the support a first distance and the passageway of each successive shelf above and below the intermediate shelf is progressively nearer to the support.

3. In combination, an upright support, a plurality of horizontally disposed elongated shelves having front and rear longitudinal edges, means for supporting the shelves one above another in spaced relation with their rear longitudinal edges against the support, said supporting means comprising at least first and second vertically extending elongated flexible elements, means for attaching the upper ends of the elements to the support at a level higher than the top shelf, means for attaching the lower ends of the elements to the support at a level lower than the bottom shelf to maintain the elements taut on the support, and holding means for each shelf including at

least a first passageway adjacent to its front longitudinal edge and a second passageway adjacent to its rear longitudinal edge, the first and second elements extending through the first and second passageways, respectively, of the shelves, each element extending through a single passageway of each shelf and projecting upward and downward from the shelf with the single passageway constituting the only region at which the element is connected to the shelf, the longitudinal axis of each passageway being at an angle to the vertical to hold the element therein in non-slip relationship with the shelf when the element is taut, and the passageways being so constructed and formed that when the tautness of the vertically extending flexible element is relieved, the element is movable in either direction through the passageway of a shelf to adjust the latter to another position on the element by the single operation of grasping and pulling that part of the relieved element at the vicinity of the passageway.

4. Apparatus as set forth in claim 3 in which the first passageway of a shelf intermediate the top and bottom shelves is horizontally removed from the support a first distance and the first passageway of each successive shelf above and below the intermediate shelf is progressively nearer to the support.

5. Apparatus as set forth in claim 3 in which the second passageway of a shelf intermediate the top and bottom shelves is horizontally removed from the support a first distance and the second passageway of each successive shelf above and below the intermediate shelf is progressively nearer to the support.

6. In combination, an upright support, a plurality of horizontally disposed elongated shelves having front and rear longitudinal edges, means for supporting the shelves one above another in spaced relationship with their rear longitudinal edges against the support, said supporting means comprising first and second groups of vertically extending elongated flexible elements, means for attaching the upper ends of the first and second groups of elements, respectively, to the support at first and second regions which are spaced from one another and at a level higher than the top shelf, means for attaching the lower ends of the first and second groups of elements, respectively, to the support at third and fourth regions which are spaced from one another and at a level lower than the bottom shelf, and holding means for each shelf including first and second passageways at one shelf end which are adjacent to the front and rear longitudinal edges, respectively, of the shelf and first and second passageways at the opposite shelf end which are adjacent to the front and rear longitudinal edges, respectively, of the shelf, first and second elements in the first group extending through first and second passageways, respectively, at the one shelf ends and first and second elements in the second group extending through first and second passageways, respectively, at the opposite shelf ends, each element extending through a similarly located single passageway of each shelf and projecting upward and downward from the shelf with the single passageway constituting the only region at which the element is connected to the shelf, the longitudinal axis of each passageway being at an angle to the vertical to hold the element therein in non-slip relationship with the shelf when the element is taut, and said passageways being so constructed and formed that when the tautness of the vertically extending flexible elements is relieved, each element is movable in either direction through the passageway of a shelf to adjust the latter to another position on the element by the single operation of grasping and pulling that part of the relieved element at the vicinity of the passageway.

7. Structure as set forth in claim 6 in which the first and second groups of elements on the top shelf are spaced apart a distance which is less than the distance between the first and second regions of the support at which the upper ends of the first and second groups of elements are attached.

8. Structure as set forth in claim 6 in which the first and second groups of elements on the bottom shelf are spaced apart a distance which is less than the distance between the third and fourth regions of the support at which the lower ends of the first and second groups of elements are attached.

9. Apparatus as set forth in claim 6 in which each of the first passageways at the one and opposite ends of a shelf intermediate the top and bottom shelves is horizontally removed from the support a first distance and each of the first passageways at the one and opposite ends of each successive shelf above and below the intermediate shelf is progressively nearer to the support.

10. Apparatus as set forth in claim 6 in which each of the second passageways at the one and opposite ends of a shelf intermediate the top and bottom shelves is horizontally removed from the support a first distance and each of the second passageways at the one and opposite ends of each successive shelf above and below the intermediate shelf is progressively nearer to the support.

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