

Sept. 16, 1969

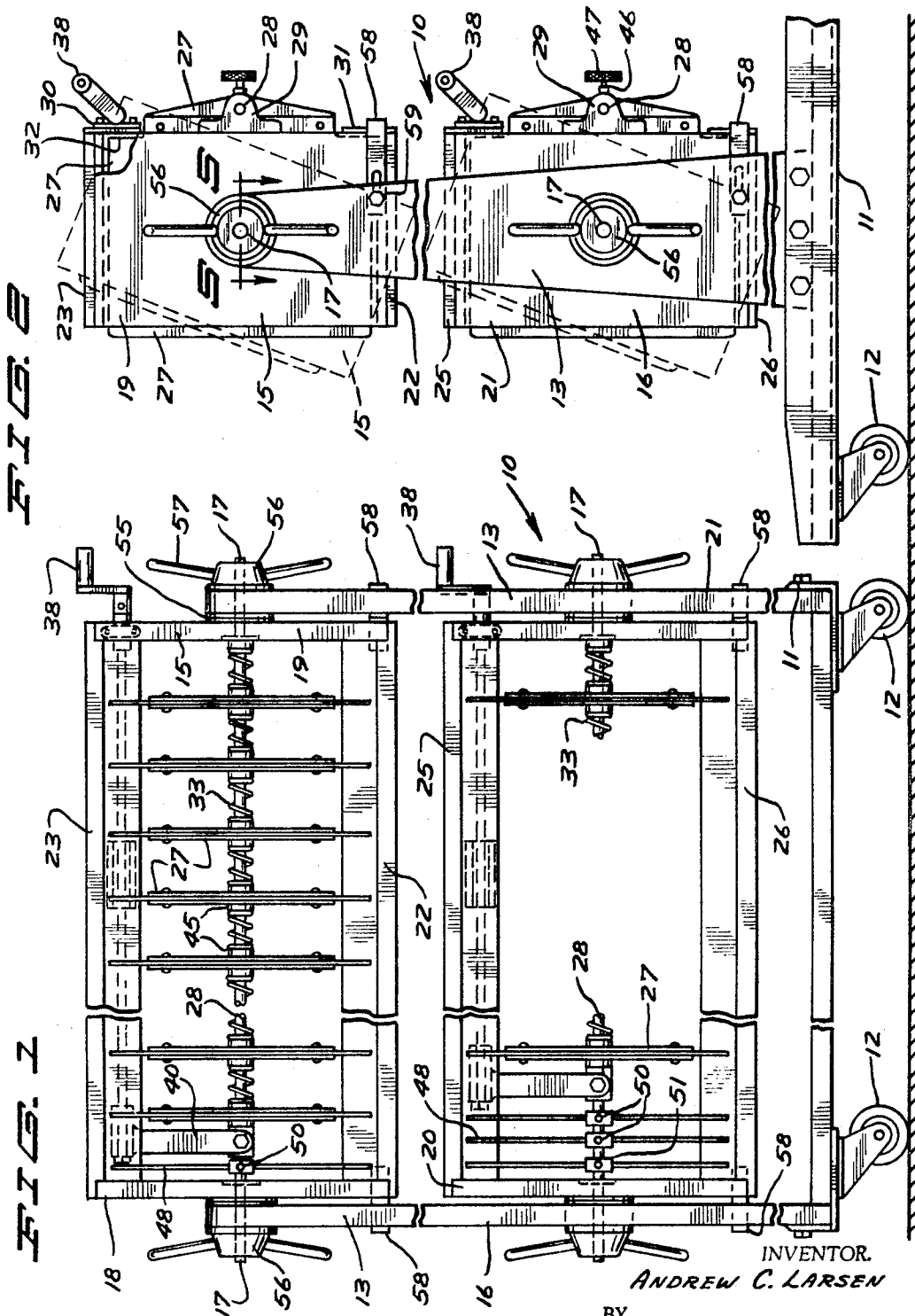
A. C. LARSEN

3,467,258

LIBRARY BOOK CART

Filed June 19, 1967

3 Sheets-Sheet 1



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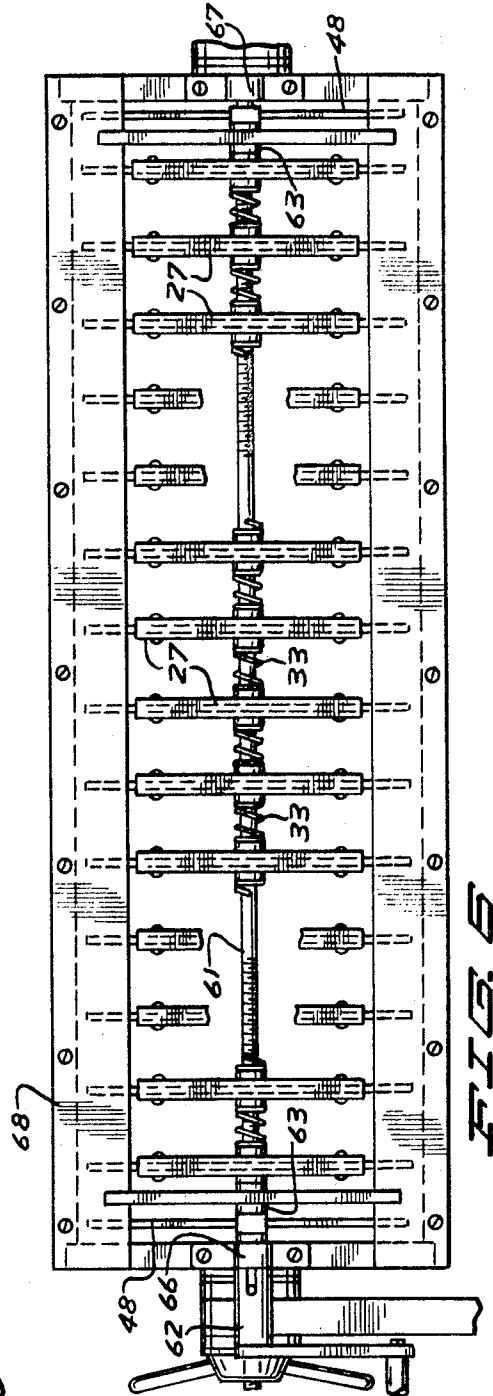
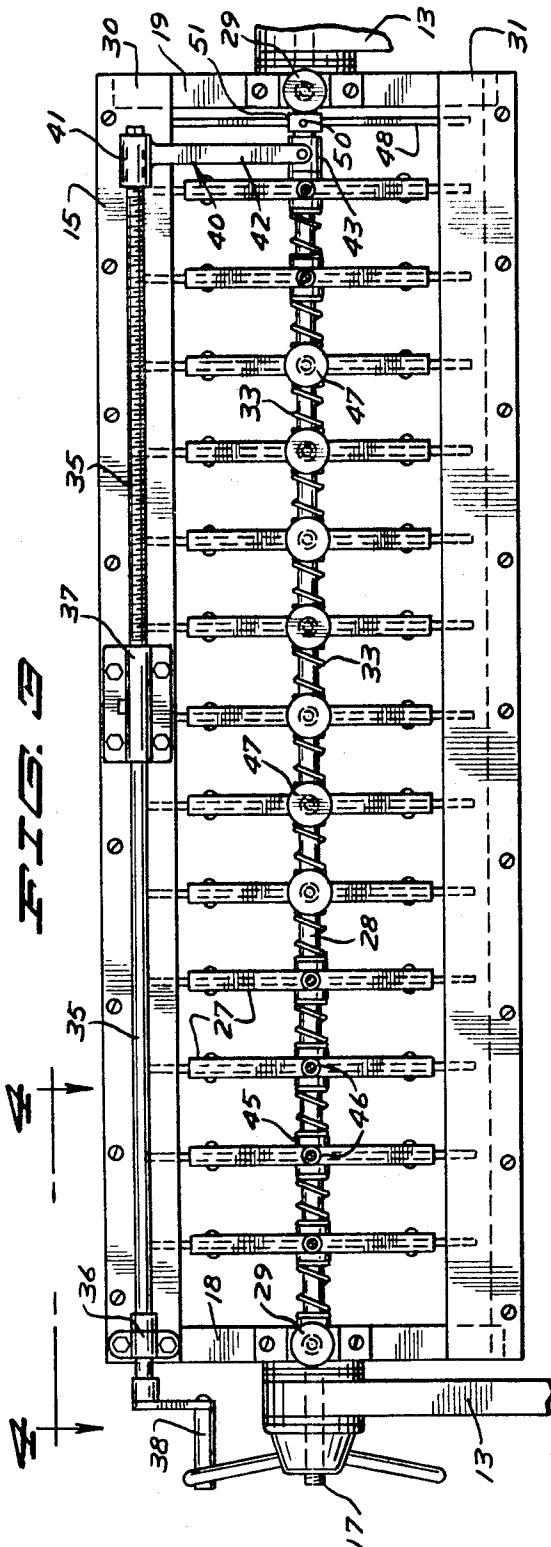
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3 Sheets-Sheet 2



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3 Sheets-Sheet 3

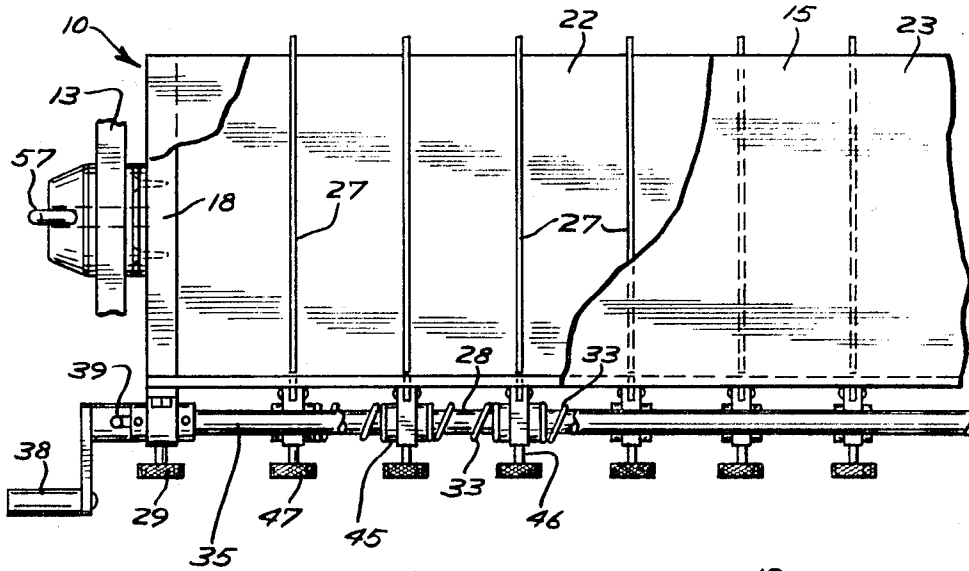


FIG. 4

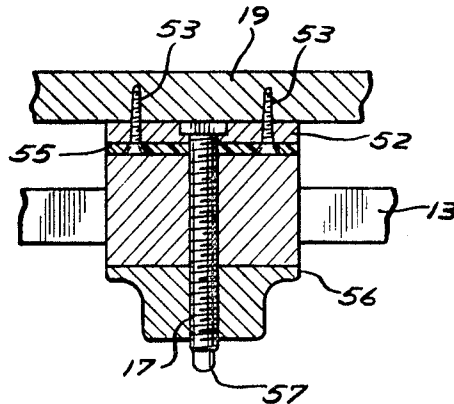


FIG. 5

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LIBRARY BOOK CART

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10 Claims

ABSTRACT OF THE DISCLOSURE

A portable book cart includes a shelf which has a plurality of book dividers slidably mounted thereon. The spacing of these book dividers is affected by independent springs each operating between two adjacent dividers. The outermost dividers are compressed or released, and this causes all of the dividers to be forced closer together or spaced farther apart to the end that the space between the dividers will be automatically adjusted uniformly throughout the shelf. Thus the shelf can be adjusted to accommodate a set of uniform thickness, relatively thin books; and can be readjusted to accommodate another set of books of approximately uniform relatively greater thickness.

Background of the invention

In schools multiple volume sets of books such as encyclopedias are mounted on book shelves on wheels and are moved from one class room to another as the need for books arises. The same set of portable shelves must be used at different times for different sets of books. Normally each book of each set will have substantially the same thickness as other books of the same set, but this book thickness will vary from set to set. When the students use such books, and there is no divider placed between the adjacent books in the set, the books rapidly become worn and finally unusable because of abuse.

Portable book shelves presently in use incorporate fixed dividers spaced at widths at least slightly wider than the thickness of the thickest books to be used. This does not provide proper support for the narrower books, and they will tend to lie at an angle between dividers, thus distorting the shape of the books and putting a strain on the bindings. This problem is made more serious because the shelves are portable and are rolled around with great force and enthusiasm particularly by students in the lower grades.

Portable book shelves without any dividers have also been used, but, as pointed out above, when all or many of the books are removed from the set, the remaining books fall over and the books are mistreated in putting them back into place.

Summary of invention

A portable book cart made according to the present invention will include one or more shelves on which a plurality of book dividers are mounted for sliding movement longitudinally of the shelf. Independent means acting between each pair of adjacent dividers is provided to tend to bias each pair of dividers to move in direction away from each other. Means is provided to selectively:

- (1) Force the two outermost dividers on a shelf toward each other, and
- (2) To allow the dividers to move away from each other under the influence of the biasing means.

This will permit the dividers along the entire shelf to move in accordance with the amount of biasing force existing between adjacent dividers along the shelf. In the case of biasing means constituted as identical springs having identical rates of deflection, the dividers will move together and move apart at uniform rates to the end that

the spacing between the dividers along the shelf will be substantially uniform at all times regardless of whether the spacing is relatively close or relatively farther apart.

When a set of books, the individual books of which have relatively narrow approximately uniform thickness, is to be used on the shelf, the compressing means will be operated until the dividers are moved uniformly toward each other to provide book receiving openings of such width as to furnish proper support for the books, leaving enough space between the dividers so that the books will easily slide into place, but not permitting sufficient spacing so that the books can be damaged by lying diagonally between the dividers. Each book will then be in contact only with the adjacent vertical facing walls of one pair of dividers, and no damage can come to the book because of the placing of other books onto the shelf or removing other books therefrom, or because of rapid operation of the portable shelves over the floor.

When a book set having books of uniform greater thickness is to be put into the portable book shelf, the set having the thinner books will first be removed, the mechanical means constricting the dividers will be operated to allow the spring biasing means, for example, to push each and every divider outwardly a uniform distance from its adjacent dividers, and the new set will be installed on the shelves.

In order to prevent accidental damage to the books during transit or use, the entire shelf can be mounted for rotation on a longitudinal axis to cause the books to "lie back" against the back of the shelf. This also makes the back of the book binding more easily readable for taller students.

In order to discourage students from tampering with the adjustment of the book shelves, the mechanical compressing means can include a threaded shaft operated by rotation of a removable handle, sufficient friction being needed to operate the threaded shaft so that, with the handle removed, students will not be able to perform the adjustments.

Description of drawings

In the drawings:

FIG. 1 is a front elevational view of a book case made according to the present invention and showing two book shelves mounted thereon;

FIG. 2 is an end elevational view of the book case of FIG. 1;

FIG. 3 is an enlarged back elevational view of the top shelf of FIGS. 1 and 2;

FIG. 4 is an enlarged fragmentary top plan view taken on line 4-4 in FIG. 3;

FIG. 5 is an enlarged sectional view taken on the line 5-5 in FIG. 2; and

FIG. 6 is a top plan view of a book shelf made according to a modified form of the invention.

Description of preferred embodiments

In FIGS. 1 through 5, a book cart 10 includes a platform 11 supported on universally mounted wheels or castors 12. A pair of upright stanchions 13 are mounted on this platform, and support upper and lower book shelves 15 and 16 through the instrumentality of threaded stub shafts 17 which are fixedly mounted in end walls 18, 19, 20 and 21 of the book shelves, respectively, and extend integrally outwardly therefrom. This structure is best seen in FIG. 5 as to the book shelf end wall 19. The end walls 18 and 19 of the upper book shelf 15 are integrally joined with bottom wall 22 and top wall 23, these four walls forming the frame of the book shelf. Similarly, end walls 20 and 21 of the lower book case 16 are integrally joined with bottom wall 25 and top wall 26 to form lower book shelf 16.

Between the end walls 18 and 19 of the upper book case, book dividers 27 are slidably mounted on a divider shaft 28, said shaft itself being mounted on these end walls as at 29. An upper back plate 30 and a lower back plate 31 extend across the back of the upper book shelf 15 in spaced relationship to each other from end wall 18 to end wall 19; and notches 32 provided in the dividers 27 receive these back plates, thus preventing rotation of the dividers around the shaft 28. A plurality of compression coil springs 33 are situated on the shaft 28, each such spring lying between a pair of adjacent dividers 27. These springs are of a length so that when all of the dividers are spaced at maximum dimension from each other, each of the springs are still in bearing loading relationship with its associated dividers. Where equal spacing is desired between each of the pairs of dividers, the springs will be identical in length and will have identical loading characteristics in terms of deflection per inch of applied load.

To provide means for moving the dividers 27 toward each other, in the form of the invention as shown in FIGS. 1 through 5, threaded shaft 35 is mounted for rotational movement with respect to the top edge of the book shelf 15 through the instrumentality of bearings 36 and 37. The removable crank or handle 38 is provided at one end thereof to rotate the threaded shaft 35 through the instrumentality of a pin 39 extending from said threaded shaft. An operating arm 40 of threaded shaft 35 includes a collar 41 threadably mounted on the shaft, an integral finger 42 extending from said collar 41, and a collar 43 slidably mounted on the divider shaft 28 and connected to the finger 42.

When it is desired that the dividers 27 have maximum spacing to handle a set of relatively thick books, the crank 38 will be rotated in a counter-clockwise direction to cause the righthand screwthreads of the shaft 35 to move the threaded collar 41 and hence the entire operating arm 40 to the position as seen in FIG. 3, for example. Each of the springs 33 will exert the same force as every such spring between adjacent book dividers 27, and the spacing between each of the dividers will, therefore, be uniform as seen in the drawings.

When it is desired to accommodate a set of relatively thin books, the crank 38 will be rotated in clockwise direction to cause the threaded shaft 35 to propel the threaded collar 41 to the left as seen in FIG. 3 so that the book dividers 27 are compressed toward the left end of the book shelf as seen in that figure. Because the force between each of the sets of book dividers occasioned by the presence of the springs will be the same, the book dividers will slide along the shaft 28 to position where the spaces between the dividers are all the same.

The friction between the parts and the very nature of the threaded shaft are such that when the crank or handle 38 is removed from the shaft 35, it will be impossible to manually rotate the threaded shaft 35 using the hands.

Should several volumes of a particular set be of substantially greater or lesser thickness than the rest of the books in the set, means have been provided to lock certain of the dividers to accommodate such books while leaving the other dividers free to adjust themselves to provide other spacings. For example, as seen in FIGS. 3 and 4, each of the dividers 27 is provided with a hub portion 45 slidably mounted on the shaft 28, a portion of this hub being tapped to receive a set screw 46 having a knurled head 47. In order to fix the position of any of the book dividers 27, the corresponding knurled heads 47 will be rotated to tighten the set screws in the hub 45 onto the shaft 28 thus preventing further longitudinal movement of the divider 27 with respect to the shelf until its set screw is loosened.

Another provision for a permanently fixed shelf opening is provided by one or more independent or loose book dividers 48 which is also slidably mounted on the

shaft 28, but outside of the reach of the operating arm 40. Thus when the book dividers 27 are compressed toward the left in FIG. 3, the independent dividers 48 can be slid to provide the desired spacings between the end wall 19 and this divider 48, and a set screw 50 in a spacer hub 51 can be tightened to permanently fix a positioning of the independent dividers.

The lower book shelf 16 of FIGS. 1 through 4 is substantially identical with the upper book shelf 15 just described with the exception that three or more independent loose dividers such as 48 are provided for added books and each may be adjusted to provide any desired spacing through the instrumentality of set screws 50 mounted in loose spacer hub 51.

The means by which the book shelves are pivotally mounted to stanchion 13 is disclosed in detail in FIG. 5, each of the mounting means being identical with that as shown for the end wall 19 of upper book shelf 15 in that figure. As shown in FIG. 5, the threaded stub shaft 17 is fixedly mounted on end wall 19 through the instrumentality of a mounting plate 52 held against the wall by screws 53. A fiber washer 55 is also held in place by the screws 53, and the stub shaft 17 extends through an opening provided in the stanchion and far enough outwardly therefrom to receive a threaded hub 56 having operating handles 57.

When it is desired that the book shelves be rotated to position, for example, as seen in dotted lines in FIG. 2, the operating handles 57 and hub 56 will be moved in counterclockwise direction as seen in FIG. 2, thus reducing the friction between the fiber washer 55 and the stanchion 13, allowing the book shelf to be manually rotatable to the desired position. The handles and hub will then be turned up tight again to tightly clamp the book shelf in its desired position.

To prevent rotation of the book shelves past the horizontal so that the books cannot be accidentally dumped on the floor, stop brackets 58 are provided, these brackets being mounted to the stanchion as at 59. If desired, these brackets can be adjusted so that the bottom walls 22 of the book shelves never quite reach horizontal, thus assuring that there is never any tendency for the books to move forward and out of the shelves until they are lifted and taken out of the shelves by the users thereof.

The modification of the invention as seen in FIG. 6 is substantially identical with the form of the invention previously described with the exception of the fact that the means for compressing the book spacers 27 is constituted as an Acme thread screw shaft 61 having left hand threads at one end and right hand threads at the other. A removable operating handle or crank 62 is associated with the Acme thread screw shaft 61, and Acme thread wing nuts 63 are threadably mounted on the screw type shaft 61 at either end thereof to bear upon the outermost dividers 27 so that when the crank 62 is rotated in a clockwise direction as seen from the left in FIG. 6, these wing nuts will force the outermost divider plates toward each other, and under the influence of compression coil springs 33, the dividers will all position themselves so that these spaces to receive books are equal. The wing nuts are held from rotating when the shaft 61 is rotated, but will slide in direction along the axis of the shaft to compress the dividers together.

It is to be noted that in the modified form of the invention as seen in FIG. 6, the double threaded shaft 61 mounted as at 66 and 67 to the back of the book shelf 68 performs the function of both the shaft 28 and the screw type shaft 35 in the first form of the invention inasmuch as the dividers and springs are slidably mounted on it.

With the single threaded screw shown in the first form of the invention, if a number of books are to be spaced that are of various thicknesses, the spacing is accomplished as follows: Open up the spacings to full open. As an example, the first four books on the left are $2\frac{1}{2}$ " thickness. The hand crank is turned to accommodate the four $2\frac{1}{2}$ " books and the fourth spacer from the left is locked with

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the spacer set screw. (This is best seen in FIG. 3). Thus the four spacers on the left end of the shelf each remain at a $2\frac{1}{2}$ " spacing. The next set of six books are $1\frac{1}{8}$ " in thickness. The hand crank is turned until the rest of the dividers are $1\frac{1}{8}$ " apart. The tenth divider from the left is locked with its set screw. The shelf then has four spaces at $2\frac{1}{2}$ " and six spaces at $1\frac{1}{8}$ ". If the rest of the books are $1\frac{1}{4}$ " thick, the crank is again turned until the rest of the spaces reach $1\frac{1}{4}$ " and the last divider is locked. Because of the springs, only three dividers have to be locked to get the desired results. Note that because the arm 40 moves from right to left, once a set screw on one of the dividers is locked, further movement of the arm 40 in either direction will not change the spacing of the dividers to the left of the locked divider.

The loose dividers 48 can be positioned in the area to the right of arm 40 after the automatic positioning has been done.

With the double threaded screw, the automatic spacing is done by turning the crank to rotate screw 61. The nuts 63 move in or out from both ends and the spacing is made in this manner. There are no set screws on the double threaded screw. However one or more loose spacers 48 can be positioned at each end of the book shelf having the double threaded screw. These loose spacers can be set to make the desired spacings at either end of the book shelf after the wing nuts 63 have been moved to adjust the dividers.

In order to have reliable automatic spacing, the divider hubs have to be machined accurately and the springs also have to be accurate in length. The springs are wound special to allow dividers to make contact with each other to give a minimum $\frac{3}{8}$ " book spacing.

A combination of two book shelves will be used in each cart, one with the single right hand threaded shaft, dividers, and springs which provides book spacing for books of various thicknesses. The other shelf will have a double right and left hand threaded shaft, dividers and springs to provide book spacings for books of same thickness, such as encyclopedias or multiple volume book sets.

In the claims:

1. A book shelf including a rectilinear frame having spaced apart upright end walls wherein the improvement comprises:

- a plurality of book dividers,
- means for supporting said dividers for sliding movement between said end walls,
- independent biasing means operative between each pair of adjacent dividers to tend to cause said dividers to slide away from each other, and
- means for alternately compressing the outermost of said dividers toward each other against the action of said biasing means, and releasing said dividers to the spreading action of said biasing means.

2. The combination as specified in claim 1 wherein said support means includes a shaft extending between said end walls, said dividers each include a hub slidable on said shaft, and said biasing means includes a plurality of independently operating compression coil springs situated on said shaft and operative on said dividers.

3. The combination as specified in claim 1 wherein said compressing means includes a threaded shaft mounted in longitudinal alignment with said shelf and at least one operating arm threadably mounted on said threaded shaft and in compressing relationship to an endmost divider.

4. The combination as specified in claim 2 wherein said compressing means includes a threaded shaft mounted in longitudinal alignment with said shelf and at least one operating arm threadably mounted on said threaded shaft and in compressing relationship to an endmost divider.

5. The combination as specified in claim 2 wherein said shaft has threads at opposite ends thereof, said threads at opposite ends being of opposite lead, and separate means threadably mounted onto each end of said shaft and engaging said dividers at opposite ends of said book shelf so that upon rotation of said shaft, said means move said dividers toward or away from each other.

6. The combination as specified in claim 2 and releasable set screw means threadably mounted through said hub to engage said shaft to hold said dividers with respect to said shaft independently of movement of said compressing means.

7. The combination as specified in claim 6 wherein said bias means comprise separate compression coil springs positioned between adjacent dividers and bearing against the hubs of the dividers.

8. A portable cart for transporting books including: a frame having a base and a pair of spaced apart upright end support members, wheel means on the frame for permitting said cart to be moved over a surface, a book shelf mounted on said cart, said book shelf comprising a rectangular frame having spaced apart upright end walls and a support member for holding books, said book shelf being positioned between said frame upright end support members, means for mounting said shelf to said upright supports for pivotal movement about an axis extending in direction along the length of said book shelf, releasable means for adjustably fixing the position of said book shelf about said axis, a plurality of book dividers, means for supporting said dividers for sliding movement between said end walls, independent biasing means operative between each pair of adjacent dividers to tend to cause said dividers to slide away from each other, and means for alternately compressing the outermost of said dividers toward each other against the action of said biasing means, and releasing said dividers to the spreading action of said biasing means.

9. The combination as specified in claim 8 and separate adjustable stop means between said book shelf and said frame to limit pivotal movement of said shelf in at least one direction of pivoting independently of said releasable means.

10. The combination as specified in claim 8 wherein said support means includes a shaft extending between said end walls, said dividers each include a hub slidable on said shaft, and separate releasable set screw means threadably mounted through each of said hubs and operative to engage said shaft and hold the hub through which it is mounted with respect to said shaft.

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U.S. Cl. X.R.

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