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- (72) Inventor GENSHI TANIWAKI



(54) IMPROVED STORAGE SYSTEM HAVING WHEELED STORAGE RACKS OR THE LIKE

(71) We, KONGO CO. LIMITED, a Corporation organized under the laws of Japan, of 875, Ikeda-machi, Kumamoto-shi, Kumamoto-ken, Japan, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to wheeled storage racks, wheeled bookshelves and the like, capable of being moved along guide rails by an operator by manually operated means.

There has been devised and demonstrated a storage rack system in which, in order to make full use of a limited storage space, a number of wheeled storage racks or the like are arrayed on rails laid on the floor thereby enabling any one of them to be moved with respect to an adjacent rack or racks to open up a passage for a worker or librarian to gain access to a selected storage rack or bookshelf. Each storage rack or bookshelf is provided with a handle through which it can be pushed or propelled to a desired position. However the manual displacement of a large-sized storage rack or the like becomes difficult because of its weight so that the size of such storage racks is limited. As a result, it is impossible to make the fullest possible use of the available storage space. To overcome this problem, it has been proposed to use an electric motor to shift heavy storage racks, but the installation costs are heavy due to some parts of the drive mechanism being disposed in the floor. The installation cost would also become prohibitive if each storage rack, is equipped with an individual motor.

Another problem encountered in the storage rack system of the type described is that an operator or librarian can be sandwiched between adjacent storage racks should someone move the rack without noticing that his or her colleague is in the

passage between the racks. Moreover in cases where the rails are on an incline, there is a danger of a storage rack starting to roll of its own accord and colliding with the adjacent rack causing damage to articles stored thereon.

According to the present invention, there is provided a storage system comprising a series of storage racks, bookshelves or the like mounted on pairs of driving wheels, a pair of ground rails with which said driving wheels are in frictional engagement and along which the racks or bookshelves can be traversed in either direction to open up a space or passage way between any two adjacent racks or bookshelves, a manually operated drive transmission on each rack or bookshelf, said drive transmission including a handwheel, a driving sprocket fast with a shaft mounting the handwheel and coupled through an endless drive member to a driven sprockets fast with an axle having a pair of said driving wheels, and a locking device which is capable of positively locking each rack or bookshelf against movement along the ground rails by engagement thereof with the drive transmission, or with one of the ground rails, whereby the rack or bookshelf can be held stationary in any desired position.

A safety locking device may also be provided so that if any one who may be trapped in the passage between the storage racks hits or touches a swingable buffer plate extending transversely across the whole opening of the storage rack, the storage rack is instantly locked in position, thereby always ensuring a safe working space between the adjacent storage racks.

The invention is illustrated in the accompanying drawings, in which

Figure 1 is a side view of a number of wheeled storage racks or bookshelves arrayed on rails laid on the floor for operation in accordance with the present invention;

Figure 2 is a perspective view thereof;
Figure 3 is a perspective view of a driving mechanism of a storage rack as shown in Figure 1 and 2;

Figure 4 is a sectional plan view of a locking device used in the storage rack of this invention, Figure 5 being a sectional view on the line V—V of Figure 4;

Figure 6 is a sectional plan view of another embodiment of a locking device used in the storage rack of the present invention, Figure 7 being a sectional view on the line VII—VII of Figure 6;

Figure 8 is a side view of a storage rack or bookcase in accordance with the present invention incorporating a safety device;

Figure 9 is a side view, on an enlarged scale, of the safety device of Figure 8, Figure 10 being a perspective view thereof;

Figure 11 is a safety locking device used in the storage rack of the present invention. Figure 12 being a plan view thereof and Figure 13 a sectional view on the line XIII—XIII of Figure 12;

Figure 14 is a side view of another form of safety locking device used in the storage rack of the present invention; Figure 15 being a side view thereof; and

Figure 16 is a side view, partly broken, of another form of safety locking device used in the storage rack of the present invention.

Referring to Figures 1 to 3, there is provided a plurality of wheeled storage racks or bookshelves, of which there are five in the embodiment of Figures 1 and 2, indicated respectively at 1A to 1E, riding on rails 12 laid on the floor. The storage racks or bookshelves 1D and 1E are shown spaced apart from each other to provide access to them. An operating handwheel 14 is carried at a suitable height from the floor at the outer end of a rotatable shaft extending through one side wall of each storage rack or bookshelf, a driving sprocket 16 (Figure 3) being fast on the inner end of the shaft. A driven sprocket 18 the diameter of which is greater than that of the driving sprocket 16, is fast on the axle 10' of one of the pairs of driving wheels 10 outwardly and coaxially thereof. The driving and driven sprockets 16 and 18 are coupled to each other by an endless chain 20, or an endless belt or a rope. It is preferable from the standpoint of appearance to have the chain drive mechanism (consisting of the driving and driven sprockets 16 and 18 and the endless chain 20) disposed in the space defined by the double side wall of the storage rack or bookshelf. This arrangement also permits easier attachment of the shelves to the side wall.

When one manually rotates the handwheel 14, the amplified movement is transmitted to the driving wheels 10 through the chain drive so that even a heavy storage

rack or bookshelf may be easily moved along the rails 12. Instead of the chain drive consisting of one pair of sprockets 16 and 18, two pairs of sprockets may be used if so desired. In this case, two intermediate sprockets are coaxially disposed between the sprockets 16 and 18. The reduction ratio may be increased so that the storage rack or bookshelf may be transported with less effort.

27 indicates an operating knob for actuating a locking device for preventing unintentional movement of each storage rack or bookshelf, one form of the locking device being shown in detail in Figures 4 and 5. Referring to Figures 4 and 5 the locking device serves to hold the storage rack or bookshelf stationary in any position, e.g. should the rails 12 be inclined downward to the right in Figure 1, the storage racks or bookshelves 1B to 1D would tend to roll down to the right so that an operator could be sandwiched between the storage racks or bookshelves 1D and 1E. In order to prevent such accident, a locking device is attached to each of the storage racks or bookshelves 1B to 1D, the leftmost storage rack or bookshelf 1A being held stationary or immovable.

The locking device comprises a toothed wheel 24a carried by the shaft of the handwheel 14 and formed integral and coaxial with the driving sprocket 16a, and a detent member 26, H-shaped when viewed from above as shown in Figure 4 and consisting of an engaging rod 26a and a push and pull rod 26b firmly connected to and in parallel to each other by a crossbar. The shaft rod 26b is so journaled as to be displaceable in an axial direction between the inner and outer walls of the double side wall and has its outer portion extended beyond the outer wall and attached to an operating knob 27 as shown in Figure 4.

In operation, gripping the knob 27 and pulling the detent member 26 outwardly, that is towards the operator, the engaging rod 26a will engage with the teeth of the toothed wheel 24a, thereby locking the driving mechanism, that is the handwheel 14 and hence the driving wheel 10. Thus, the storage rack or bookshelf may be securely held in stationary position. To release the locking device, one pushes the knob inwardly so that the engaging rod 26a disengages from the toothed wheel 24a. Thereafter, one rotates the handwheel 14 to move the storage rack or bookshelf to a desired position.

Referring to Figures 6 and 7 there is shown a locking device substantially similar in construction to that of Figures 4 and 5 except that the arrangement of the H-shaped detent member 26 is modified in its operation. The rod 28b of the detent

member 28 is mounted for angular displacement between an inner wall 30 and an outer wall of the double side wall through an intermediate panel or wall 32, and the engaging rod 28a extends through coaxial arcuate slots formed in the inner wall 30 and the panel 32. An operating knob 36 is attached to the outer end of the shaft rod 28b, and a tension spring 34 has its one end anchored to a stud on the inner wall 30 located below and in vertical alignment with the inner end of the shaft rod 28b and its other end to the inner end of engaging rod 28a.

By gripping the operating knob 36 and turning it in a counterclockwise direction it releases the engaging rod 28a from the toothed wheel 24b; thus the locking device is released so that the operator may rotate the handwheel 14 to move the storage rack or bookshelf to any desired position. To lock the handwheel 14 and hence the driving wheels 10, one turns the operating knob 36 in the clockwise direction to engage the engaging rod 28a with the toothed wheel 24b as shown in Figure 7. Thus, the handwheel 14 and hence the wheel 10 are locked so that the storage rack or bookshelf may be securely held stationary in position. As the operating knob 36 is turned in the clockwise or counterclockwise direction, the tension spring 34 is extended and then passes beyond its dead centre point so that the engaging rod 28a may be securely held in the locking position shown in Figure 7 or in the released position. Even when the engaging rod 28a is pressed against the crest of a tooth of the toothed wheel 24b, the toothed wheel 24b will rotate as the storage rack or bookshelf is moved so that the engaging rod 28a will automatically be forced to fall into the space between the teeth of the toothed wheel 24b under the force of the tension spring 34.

In the arrangement shown in Figures 8, 9 and 10, there is provided a safety device capable of preventing an operator or worker from being sandwiched between adjacent storage racks or bookshelves by accidental rolling thereof. The safety device comprises a spacer arm or member 42, whose inner end is hinged or otherwise attached to one column member 40 of the storage rack or bookshelf and whose outer and free end is provided with an impact receiving head 44, and a brace rod 48 whose one end is pivoted to the supporting member 42 and whose other end projects through a slot 46 in the column member 40 (see Figure 10) and is provided with a stop 50 for limiting its outward movement by engagement with column 40 thereby holding member 42 in its horizontal operative position.

When one enters the passage between adjacent storage racks or bookshelves, an

operator pulls out the member 42 into the horizontal operative position shown in Figure 9. Therefore, even should one of the adjacent storage racks or bookshelves be accidentally moved by another operator, the member 42 will act as a stop to prevent its further movement so that a safe space for an operator is provided between the adjacent storage racks or bookshelves. Having picked up the desired parts or put the parts upon the shelf or shelves, he or she comes out of the passage between the adjacent storage racks or bookshelves and folds back the safety device into its retracted position, that is the position where the supporting member 42 rests upright along the column member 40. In the retracted position, the brace member 48 serves as a weight that keeps the supporting member 42 in the retracted position and prevents it from swinging back to the horizontal operative position by accident. To ensure that the safety device is securely held in the retracted position, any suitable locking device may be provided.

The embodiment of the locking device described with reference to Figures 11, 12 and 13 is substantially similar to the locking device shown in Figures 6 and 7 except that it further comprises a safety locking device operatively coupled to the locking device which is shown as comprising a toothed wheel 24c, a detent member 60 (Figure 12) consisting of an engaging rod 60a, a shaft rod 60b with an operating knob 66 and a connecting bar 60c, and a tension control spring 62.

A lateral shaft 70 is rotatably journaled between a pair of opposed channel-shaped column members 68 at opposite corners of the storage rack or bookshelf, and has its one end portion close to the handwheel 14 bent at a right angle to form an L-shaped crank. After extending through one side wall of the channel-shaped column member 68, it is bent at a right angle within the channel-shaped column member 68, and bent again at a right angle to form a crank section 72 extending outwardly through the opening of the channel-shaped member 68 and in parallel with the section of the lateral shaft 70, the latter extending horizontally and transversely across the opening of the storage rack or bookshelf. The crank section 72 engages with the bifurcated end 84 of a connecting lever 82 whose other end is pivoted to one end of an actuating lever 80.

A buffer plate 86 has its one side fixed along its length to the lateral shaft 70 and a tension spring 74 has its ends anchored respectively to the crank section 72 and the channel-shaped column 68 so that the buffer plate 86 is normally held in the extended position indicated by the broken lines in Figure 11. The angular displacement of the

buffer plate 86 is limited because the angle of movement of the downwardly extended section of the lateral shaft 70 is limited by the side walls of the channel-shaped column member 68.

The actuating lever 80 is also pivoted to a stationary pivot member 88 at a point close to the end which is pivoted to the connecting lever 82. Locking of the handwheel 14 is effected through the toothed wheel 24c into and out of engagement with which is brought a cross pin 96 attached to the lower end of a plunger 92 in the form of an elongated rod, which rod is slidably mounted in a two part stationary guide member 94, its upper part 94' being tubular to receive rod 92, while its lower part consists of an inverted U-piece 98 having outturned flanges for engagement with the wall part 30' by which the guide member is held stationary. Vertically extending guide slots 100 in the two limbs of the U-piece 98 receive the cross pin 96.

Plunger rod 92 is attached to the inner end of the actuating lever 80 by a lost motion connection in the form of a chain or other flexible member 90 e.g. a length of cable, the purpose of which is to enable the rod 92, should it encounter the crest of one of the teeth of toothed wheel 24c, to remain suspended and thus free to drop into its operative (locking) position between two teeth on further angular movement of wheel 24c.

In the normal or nonoperative position, the crank section 72 of the lateral shaft 70 pushes the connecting lever 82 under the force of spring 74 so that the actuating lever 80 is caused to pivot (Figure 11) in the counterclockwise direction about the pivot member 88. Thus the plunger rod 92 and hence the cross pin constitutes the engaging member 96 is lifted from its position in engagement with the toothed wheel 24c. The buffer plate 86 is placed between the side walls of the storage rack or bookshelf and at such height from the floor that it may be actuated by an operator or worker when his body touches or bumps against the buffer plate 86.

When the buffer plate 86 is in the normal or inoperative position indicated by the broken lines in Figure 11, the handwheel 14, by which the racks are shifted, is not locked by the cross pin 96 as described above so that the storage rack or bookshelf may be freely moved along the rails 12. When one of the adjacent spaced apart storage racks or bookshelves is moved by accident which can occur when an operator or worker is in the passage or space between them, the buffer plate 86 is struck by the body of an operator or worker so that it swings to the position indicated by the solid line in Figure 11. As a result the connecting lever 82 and the ac-

tuating lever 80 are displaced to the positions indicated by the solid lines in Figure 11 so that the engaging member i.e. pin 96 is lowered into a position in which it makes engagement with the toothed wheel 24c. Thus the handwheel 14 and hence the driving wheel 10 are locked so that the storage rack or the bookshelf is immediately stopped and held stationary. When the operator or worker moves away from the buffer plate 86, it is returned to its normal or inoperative position under the force of the spring 74.

As set out above the rod member 92 is suspended from the actuating lever 80 through a flexible member 90 so as to provide a lost motion connection by reason of the flexible member 90 taking up the slack that occurs when the engaging member 96 strikes a crest of the tooth of the toothed wheel 24c so that its further downward movement (as permitted by the slack) is prevented. When the toothed wheel 24c rotates through a very small angle, the engaging member 96 immediately drops into the space between the teeth of the toothed wheel 24c, thereby locking the driving mechanism.

In the embodiment of the locking device shown in Figures 14 and 15, the buffer plate 86 and the lateral shaft 70 are arranged in a manner substantially similar to that described in Figures 11 to 13. An L-shaped crank member 106 has its one end fixed to one end of the lateral shaft 70 close to the handwheel (not shown), and has its horizontal limb provided with a stud 110' slidably mounted in an elongated slot formed at one end portion of a bell crank 110 having a fixed fulcrum 108. A rod member 112 is suspended through the flexible member 90 from the horizontal limb of the bell crank 110. A tension spring 74 connected at one end to the inner wall of the channel-shaped column member 68 and at its other end to the crank member 106 so that the buffer plate 86 is normally held in the extended position shown in Figure 15. As a result the rod 112 is held in the raised position.

The lower portion of the rod 112 extends through the top plate of a carriage box or casing 114 carrying the driving wheels 120, and a stud 112' fixed to the lower end of the rod member 112 is a sliding fit in an elongated slot formed in one arm of a bell crank 118. A transversely displaceable engaging member 116 is supported for sliding movement by a pair of guide lugs 115 struck out of the wall plate of carriage box 114 as shown in Figure 14. The engaging member 116 has a projecting stud 116' which engages with an elongated slot formed in the other arm of the bell crank 118. One end of the engaging member 116 is

adapted to engage with one of a plurality of engaging holes 122 formed equiangularly in the face of the driving wheel 120 along a circle coaxial with the wheel.

5 In normal or inoperative position, the engaging member 116 is retracted to the left (Figure 14) and is out of engagement with the engaging hole 122 as shown in Figure 14 so that the wheel 120 is free to rotate. 10 However, should the storage rack or bookshelf be accidentally moved so that the buffer plate 86 is hit by or bumps against an operator or worker, the buffer plate 86 is turned in the counter clockwise direction (Figure 15). The member 106 also pivots in the counterclockwise direction so that the bell crank 110 is caused to pivot in the clockwise direction. This causes rod member 112 to be lowered so that the bell crank 118 is caused to pivot in the counter-clockwise direction (Figure 14). The engaging member 116 is now advanced to the right into engagement with one of the holes 122 of wheel 120. As a result the wheel 122 is locked so that the storage rack or bookshelf is immediately stopped and held stationary.

Referring to Figure 16, there is shown a further form of locking device in which a rail supporting member 134 supporting a rail 130 is provided with a plurality of holes 156 arrayed lengthwise direction of the rail. An upright channel-shaped column 140 is attached to one of the corners of the carriage box 138 carrying the driving wheels 132. A lateral shaft 142 is formed integral with buffer plate 158 and is rotatably journaled by a pair of channel-shaped column members 140 attached to the carriage box 138 at the opposite corners thereof, respectively. One end of the shaft 142 is securely attached to the upper end of a crank member 166 whose vertical limb is disposed within the channel-shaped column member 140 and which normally assumes a vertical position. The horizontal limb 144 of the crank member normally assumes a horizontal position. The end portion of the connecting limb 144 projects out of the channel-shaped column member 140, and has a headed stud 146 which is a sliding fit within a guide slot 152 formed in one arm of a bell crank 150 whose fulcrum is on a support arm 148 fixed to the column member 140. The lower end of an engaging member 154 which is suspended through a flexible member 168 (similar to that as described previously) from the other arm of the bell crank 150 is normally suspended in a position slightly above one of the holes 156 of the rail supporting member 134. A tension spring 160 is connected at one end to the stud 146 at its other end to column member 140 so that the buffer plate 158 is held in the extended position indicated by

the solid lines in Figure 16. The angular displacement of the bell crank 150 is limited by engagement of a collar 162 fast on the engaging member 154 with a guide plate 164 for the engaging member 154. The buffer plate 158 is extended across the opening of the storage rack or bookshelf at such a height that it may be actuated by an operator or worker when it hits his body.

The mode of operation of the embodiment just described will be readily understood from the previous description.

WHAT WE CLAIM IS:—

1. A storage system comprising a series of storage racks, bookshelves or the like mounted on pairs of driving wheels, a pair of ground rails with which said driving wheels are in frictional engagement and along which the racks or bookshelves can be traversed in either direction to open up a space or passage way between any two adjacent racks or bookshelves, a manually operated drive transmission on each rack or bookshelf, said drive transmission including a handwheel, a driving sprocket fast with a shaft mounting the handwheel and coupled through an endless drive member to a driven sprocket fast with an axle having a pair of said driving wheels, and a locking device which is capable of positively locking each rack or bookshelf against movement along the ground rails by engagement thereof with the transmission, or with one of the ground rails, whereby the rack or bookshelf can be held stationary in any desired position.
2. A storage system as claimed in claim 1, in which the drive transmission driving and driven sprockets are coupled through an endless chain.
3. A storage system as claimed in claim 2 wherein the number of teeth of said driving sprocket is less than that of said driven sprocket.
4. A storage system as claimed in any one of claims 1 to 3, wherein the locking device comprises a toothed wheel fast on the shaft of the driving sprocket and a detent movable into and out of engagement therewith and operable from the exterior of the rack or bookshelf.
5. A storage system as claimed in claim 4, in which the detent is H-shaped and comprises an engaging member and a shaft member in parallel with each other and in spaced apart relation interconnected firmly by a connecting member, said shaft member being axially slidably supported by a side wall of the rack or bookshelf in such a way that when said shaft member is axially pulled or pushed said engaging member may come into or out of engagement with said toothed wheel, thereby locking or releasing said drive transmission, said shaft member having one end projecting beyond the side

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adapted to engage with one of a plurality of engaging holes 122 formed equiangularly in the face of the driving wheel 120 along a circle coaxial with the wheel.

5 In normal or inoperative position, the engaging member 116 is retracted to the left (Figure 14) and is out of engagement with the engaging hole 122 as shown in Figure 14 so that the wheel 120 is free to rotate. 10 However, should the storage rack or bookshelf be accidentally moved so that the buffer plate 86 is hit by or bumps against an operator or worker, the buffer plate 86 is turned in the counter clockwise direction 15 (Figure 15). The member 106 also pivots in the counterclockwise direction so that the bell crank 110 is caused to pivot in the clockwise direction. This causes rod member 112 to be lowered so that the bell 20 crank 118 is caused to pivot in the counterclockwise direction (Figure 14). The engaging member 116 is now advanced to the right into engagement with one of the holes 122 of wheel 120. As a result the wheel 25 122 is locked so that the storage rack or bookshelf is immediately stopped and held stationary.

30 Referring to Figure 16, there is shown a further form of locking device in which a rail supporting member 134 supporting a rail 130 is provided with a plurality of holes 156 arrayed lengthwise direction of the rail. An upright channel-shaped column 140 is attached to one of the corners of the carriage box 138 carrying the driving wheels 132. 35 A lateral shaft 142 is formed integral with buffer plate 158 and is rotatably journaled by a pair of channel-shaped column members 140 attached to the carriage box 40 138 at the opposite corners thereof, respectively. One end of the shaft 142 is securely attached to the upper end of a crank member 166 whose vertical limb is disposed within the channel-shaped column 45 member 140 and which normally assumes a vertical position. The horizontal limb 144 of the crank member normally assumes a horizontal position. The end portion of the connecting limb 144 projects out of the 50 channel-shaped column member 140, and has a headed stud 146 which is a sliding fit within a guide slot 152 formed in one arm of a bell crank 150 whose fulcrum is on a support arm 148 fixed to the column 55 member 140. The lower end of an engaging member 154 which is suspended through a flexible member 168 (similar to that as described previously) from the other arm of the bell crank 150 is normally suspended in a 60 position slightly above one of the holes 156 of the rail supporting member 134. A tension spring 160 is connected at one end to the stud 146 at its other end to column member 140 so that the buffer plate 158 is 65 held in the extended position indicated by

the solid lines in Figure 16. The angular displacement of the bell crank 150 is limited by engagement of a collar 162 fast on the engaging member 154 with a guide plate 164 for the engaging member 154. The buffer plate 158 is extended across the opening of the storage rack or bookshelf at such a height that it may be actuated by an operator or worker when it hits his body.

The mode of operation of the embodiment just described will be readily understood from the previous description.

WHAT WE CLAIM IS:—

1. A storage system comprising a series of storage racks, bookshelves or the like 80 mounted on pairs of driving wheels, a pair of ground rails with which said driven wheels are in frictional engagement and along which the racks or bookshelves can be traversed in either direction to open up a 85 space or passage way between any two adjacent racks or bookshelves, a manually operated drive transmission on each rack or bookshelf, said drive transmission including a handwheel, a driving sprocket fast with a 90 shaft mounting the handwheel and coupled through an endless drive member to a driven sprocket fast with an axle having a pair of said driving wheels, and a locking device 95 which is capable of positively locking each rack or bookshelf against movement along the ground rails by engagement thereof with the transmission, or with one of the ground rails, whereby the rack or bookshelf can be held stationary in any desired position. 100

2. A storage system as claimed in claim 1, in which the drive transmission driving and driven sprockets are coupled through an endless chain.

3. A storage system as claimed in claim 2 105 wherein the number of teeth of said driving sprocket is less than that of said driven sprocket.

4. A storage system as claimed in any one of claims 1 to 3, wherein the locking device 110 comprises a toothed wheel fast on the shaft of the driving sprocket and a detent movable into and out of engagement therewith and operable from the exterior of the rack or bookshelf. 115

5. A storage system as claimed in claim 4, in which the detent is H-shaped and comprises an engaging member and a shaft member in parallel with each other and in spaced apart relation interconnected firmly 120 by a connecting member, said shaft member being axially slidably supported by a side wall of the rack or bookshelf in such a way that when said shaft member is axially pulled or pushed said engaging member may come into or out of engagement with said 125 toothed wheel, thereby locking or releasing said drive transmission, said shaft member having one end projecting beyond the side

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wall so as to be operable from the exterior of said storage rack or the like.

6. A storage system as claimed in claim 4 wherein the detent is H-shaped and comprises an engaging member and a shaft member in parallel with each other and in spaced apart relation interconnected firmly by a connecting member, said shaft member being rotatably supported by a side wall of the rack or bookshelf in such a way that when said shaft member is rotated through a predetermined angle in one direction or the opposite, said engaging member is brought into or out of engagement with said toothed wheel, said engaging member being loaded with a spring in such a way that it is retained in either an operative position where it engages with said toothed wheel or in an inoperative position where it is disengaged from said toothed wheel, said engaging member being displaceably mounted in coaxial arcuate guide slots formed in an inner wall disposed inwardly of the side wall and an auxiliary wall disposed between said inner wall and said side wall, respectively, said shaft member having one end projecting through the side wall so as to be operable from the exterior of said rack or bookshelf.

7. A storage system as claimed in any one of claims 1 to 6, further comprising, for each rack, a safety device capable, when brought into an operative position, of maintaining a predetermined distance or passage between the rack and an adjacent rack or bookshelf.

8. A storage system as claimed in claim 7, wherein said safety device comprises a spacer member which can be moved into a horizontal extended position for engagement by the adjacent rack or bookshelf.

9. A storage system as claimed in claim 8, in which the spacer member comprises an arm pivotally mounted on a column member of said rack or bookshelf to permit said arm to be moved into its operative horizontal position in which it is held by a brace member for engagement with the adjacent rack or bookshelf or into an inoperative upright position in which the arm is held upright against said column member.

10. A storage system as claimed in claim 9 in which the free end of said arm is provided with an impact receiving stop member.

11. A storage system as claimed in either one of claims 9 and 10 in which the brace member is pivoted at its lower end to the spacer arm at a point between the ends thereof and whose upper end portion projects through a slot formed in said column member and is attached to an engaging member which is adapted to engage with said column member when the spacer arm is brought into its operative

horizontal position, thereby retaining it in its operative horizontal position.

12. A storage system as claimed in claim 4, further comprising, for each rack, a safety locking device operatively coupled to the toothed wheel of the locking device, wherein the safety locking device comprises a lateral shaft rotatably supported in said storage rack or bookshelf and extending transversely thereof across an access opening thereof, one end portion of said lateral shaft being bent downwardly and again bent to form a crank section which extends in parallel with said lateral shaft; a buffer plate whose one side is secured to said lateral shaft in the axial direction thereof, the height of said buffer plate being such that it may engage with a person in a passage or space between the rack or bookshelf and an adjacent rack or bookshelf; a connecting lever whose upper end is bifurcated and engages with the free end of the crank section of said lateral shaft; an actuating lever pivoted to a stationary pivot member, one end of said actuating lever being pivoted to the lower end of said connecting lever; a rod member whose upper end is coupled through an intermediate member to the other end of said actuating lever, said rod member being slidable within a guide member for vertical movement; and an engaging member attached at a right angle to the lower end of said rod member and extending through vertically elongated slots formed in a side wall of said guide member for engagement with the toothed wheel of said locking device so as to lock said drive transmission on actuation of said buffer plate should the latter strike a person.

13. A storage system as claimed in any one of claims 1 to 3, comprising, for each rack, a safety locking device for locking said drive transmission, wherein said safety locking device comprises a lateral shaft rotatably supported in said rack or bookshelf and extending transversely thereof across an access opening thereof; a buffer plate whose one side is fixed to said lateral shaft in the axial direction thereof, the height of said buffer plate being such that it may engage with the body of a man in a passage or space between the rack or bookshelf and an adjacent spaced apart rack or bookshelf; an L-shaped crank member whose upper end is fixed to one end of said lateral shaft; a bell crank pivoted to a fixed fulcrum; a stud projecting from the lower end of said L-shaped crank member which is slidably engaged in a vertical elongated guide slot formed in one upright arm of said bell crank; a rod member suspended from the horizontal arm of said bell crank by means of a flexible member,



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and a first engaging member coupled through a bell crank to the lower end of said rod member and adapted to engage with one of a plurality of engaging holes formed in a
5 second engaging member forming part of the drive transmission, whereby an actuation of the buffer plate, should the latter strike the body of a man, the rack or bookshelf is locked in position.

10 14. A storage system as claimed in claim 13 wherein said second engaging member comprises one of the driving wheels, the engaging holes being formed and located equiangularly in the face of one wheel along
15 a circle coaxial with the wheel.

20 15. A storage system as claimed in claim 13, modified by an arrangement in which the safety locking device does not lock the drive transmission and the second engaging member does not form part of the drive transmission but is provided by a rail supporting member for supporting one of said pair of rails, the rail supporting member having a plurality of engaging holes extending lengthwise thereof and in parallel

with said one rail, and in which the rod member is provided directly, without a first engaging member, to engage any one of the engaging holes in the rail supporting member.

30 16. A wheeled storage rack or the like, substantially as hereinbefore described with reference to Figures 1 to 5 with or without the device of Figures 8 to 10; or Figures 1 to 3 modified by Figures 6 and 7 with or
35 without the device of Figures 8 to 10; or Figures 1 to 3 modified by Figures 11 to 13 with or without the device of Figures 8 to 10; or Figures 1 to 3 modified by Figures 14 and 15 with or without the device of Figures 8 to 10; or Figures 1 to 3 modified by Figure 16
40 with or without the device of Figures 8 to 10, of the accompanying drawings.

For the Applicants,
CARPMAELS & RANSFORD,
Chartered Patent Agents,
43 Bloomsbury Square,
London, WC1A 2RA.