United States Patent [19]

Staller

[11] **3,829,189**

[45] **Aug. 13, 1974**

[54] **MOTORIZED MOBILE SHELVING APPARATUS**

[75] Inventor: **Marvin A. Staller**, Fort Atkinson, Wis.

[73] Assignee: **Spacesaver Corp.**, Ft. Atkinson, Wis.

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[52] U.S. Cl. ..... **312/198**, 104/147, 214/16 B, 312/200

[51] **Int. Cl...A47b 53/00**, A47b 77/00, A47b 87/00

[58] **Field of Search** ..... 312/198, 199, 201, 223; 214/16 B, 6 T; 104/147, 162, 154, 235, 27 P; 200/16 R, 153 T, 168 K, 47

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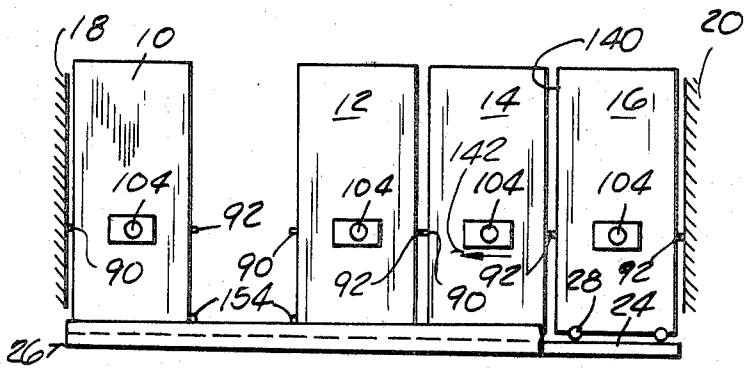
Primary Examiner—Paul R. Gilliam

Attorney, Agent, or Firm—Henry C. Fuller

[57] **ABSTRACT**

Mobile storage apparatus includes a plurality of mobile units guided for movement in a direction normal to the storage faces with each mobile unit having a separate motor. Switch actuator rods shiftable horizontally in each unit have a control arm projecting through the end panels of the units for manipulation. Manual movement of each actuator rod to the right or left causes actuation of right or left directional control switches to energize the motor for movement of the unit to the right or left. The actuator rods project beyond the side margins of each of the units to engage projecting parts of actuators on the adjacent units so that manual movement of the actuator rod in one unit causes movement of the actuator rods in adjacent units to energize the motors in all units for which the rod is shifted to open the selected aisle space.

6 Claims, 5 Drawing Figures



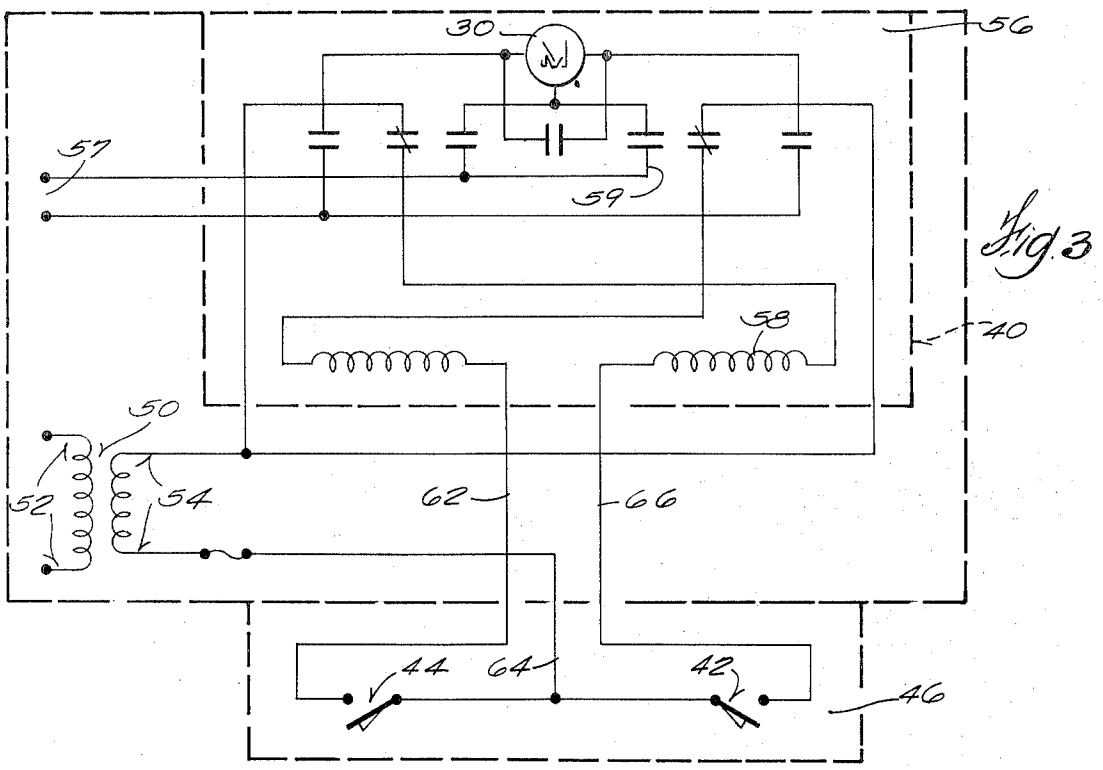


Fig. 3

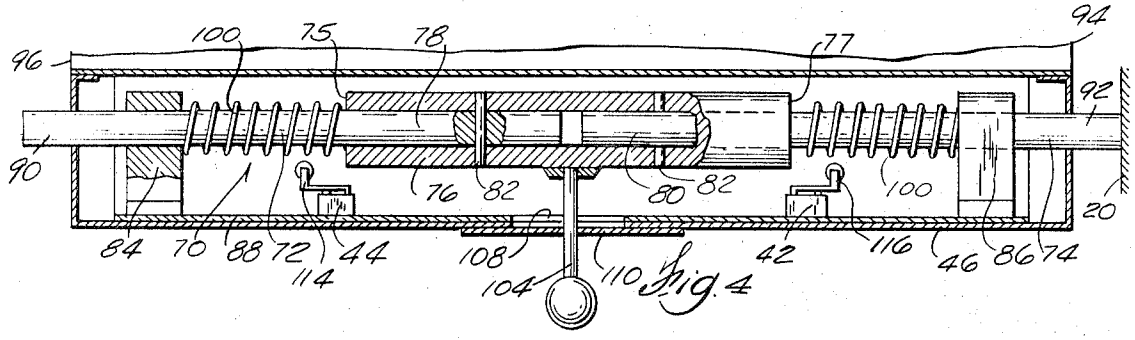


Fig. 4

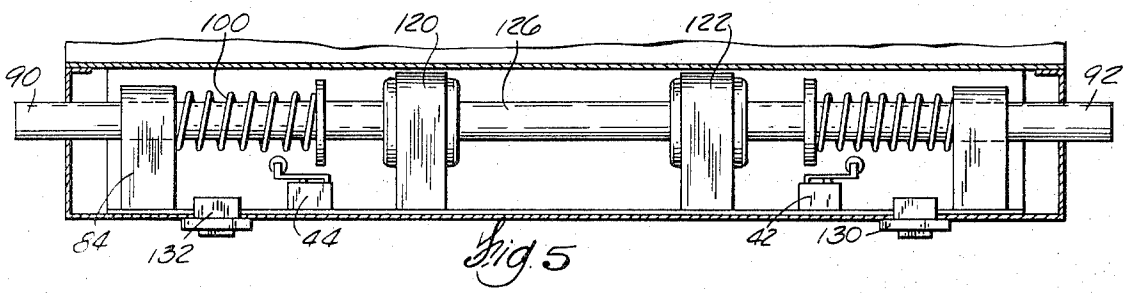


Fig. 5

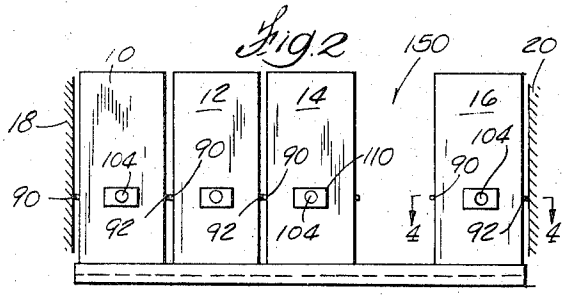


Fig. 2

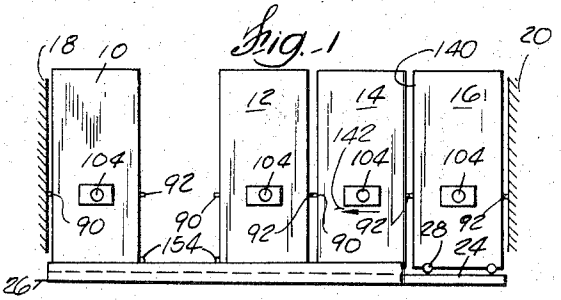


Fig. 1

MOTORIZED MOBILE SHELVING APPARATUS

BACKGROUND OF THE INVENTION

The mobile storage apparatus of the invention is a further development of the subject matter in U.S. Pat. No. 3,640,595. Mobile storage systems of the type disclosed in this patent require a number of electrical components and complex circuitry to accomplish the required movement of the mobile units to open an aisle. In addition, electrical cables are required between the adjacent units.

SUMMARY OF THE INVENTION

The invention provides mobile storage units using a minimum of components and circuitry to accomplish the desired shifting of mobile units without any electrical circuitry connecting adjacent units. Each of the mobile units has an individual motor for driving it to the right or left, as desired. The motor is energized to move the unit to the right or left by two directional switches located in the end panel of the unit. An axially and horizontally shiftable switch actuator rod is supported in the panel and has shoulders for actuating the right or left switches depending upon the direction of movement of the actuator rod. In one embodiment, the rod is provided with a control handle or arm which projects through a slot in the end panel for access by the operator.

The actuating rods in all units are aligned for engagement and shifting movement of the actuator rods in adjacent units. To accomplish engagement with the ends of rods in adjacent units, the switch actuating rods project beyond the side margins of the unit in a direction normal to the storage faces of the units. When it is desired to open a particular aisle, the handle for the switch actuator rod on the unit to which access is desired is shifted in the appropriate direction thus energizing the motor in the mobile unit to which the rod is manipulated and the projecting end on the switch actuator rod will engage and shift the switch actuator rods in one or more adjacent units and energize the motors in the adjacent units. When the aisle is open to the desired extent, the control handle is released and spring biasing returns the rod to a centered neutral position opening the switches and stopping the units.

The control circuit for each unit is independent of the other units and in addition to the right and left directional switches includes a conventional motor control to accomplish the energization of the motor for rotation in the appropriate direction.

Further objects, advantages and features of the invention will become apparent from the following disclosure.

DRAWINGS

FIG. 1 is a diagrammatic front elevational view of mobile storage apparatus in accordance with the invention.

FIG. 2 is a view similar to FIG. 1 with two of the mobile storage units shifted to the left.

FIG. 3 is a schematic diagram of the control electrical circuit for each of the mobile units.

FIG. 4 is an enlarged sectional view of the switch actuator along line 4—4 of FIG. 2.

FIG. 5 is a view similar to FIG. 4 of a modified embodiment showing the switch actuator rod with electrical controls.

DETAILED DESCRIPTION

Although the disclosure hereof is detailed and exact to enable those skilled in the art to practice the invention, the physical embodiments herein disclosed merely exemplify the invention which may be embodied in other specific structure. The scope of the invention is defined in the claims appended hereto.

In the drawings, FIG. 1 shows storage apparatus in accordance with the invention which optionally includes a plurality of mobile storage units **10, 12, 14** and **16** located between stationary storage units **18** and **20.**

Guide means are provided for guiding movement of the mobile storage units in a direction normal to the storage faces of the mobile units. The guide means can include tracks or guide rails **24** anchored to the floor **26.** The mobile units are supported on the guide rails by wheel means **28.** The wheel means **28** and guide rails **24** can be constructed in accordance with the disclosure in U.S. Pat. No. 3,640,595, and more specifically, FIGS. **5, 6, 7, 8** and 9 in said patent. The units can be driven by individual electric motors **30** (FIG. 3). The drive train can include a line shaft such as that shown in FIG. 11 of U.S. Pat. No. 3,640,595, with the line shaft connected to one or more track engaging drive wheels.

Each mobile storage unit **10, 12, 14** and **16** includes control circuit means **40** as shown in FIG. **3.** The control circuit means includes a right directional switch **42** and a left directional switch **44** which are located within the end panel **46** of each of the mobile units. The control circuit also includes a relay control transformer **50** with terminals **52** for connection to line current and output terminals **54** to provide a relay control voltage such as 24 volts. The switches **42** and **44** energize a conventional motor control **56** with input terminals **57,** relay coils **58** and a set of contacts **59** to provide forward and reverse motor operation. Leads **62, 64** and **66** connect the right and left directional switches 42 and **44** to the motor control **40.**

In accordance with the invention each of the mobile units includes an axially shiftable switch actuator **70.** In the disclosed construction the switch actuator comprises two rod sections **72** and **74** which are commonly connected by a pipe or tube **76.** Ends **78** and **80** of rods **72** and **74** extend into the tube **76** and are pinned to the tube by pins **82.** The rods **72** and **74** are supported for axial movement by bushings **84** and **86** which are connected to a frame portion **88** which is connected to the front panel **46.** The switch actuator rods **72** and **74** are provided with axial extending projections **90** and **92** which project beyond the storage faces **94** and **96** of the storage units for engagement with the rods of adjacent units as subsequently described.

Means are provided for biasing the switch actuator to the centered neutral position shown in FIG. **4.** In the disclosed construction the biasing means comprises springs **100** arranged around the rods **72** and **74** located between the bushings **84** and **86** and the ends of tube **76.**

Means are provided for selectively shifting the switch actuators to actuate each of the switches **42** and **44.** As dislosed in FIG. 4, the means to selectively shift said

switch actuators comprises a control arm or handle **104** which extends through and is fixed to tube **76** and which projects through a horizontally extending slot **108** in end panel **46.** A cover plate **110** fixed to the arm **104** can be employed to cover the slot. Axial shifting of the switch actuator rod **70** by moving arm **104** to the left as viewed in FIG. **4** will cause the shoulder or end **75** of tube **76** to engage the switch lever **114** of switch **44** and cause energization of the motor **30** to move the storage unit to the left. Movement of the arm **104** to the right as viewed in FIG. **4** will cause the end **77** of tube **76** to engage the switch lever **116** on switch **42** and energize the motor in a reverse direction to move the unit to the right.

FIG. **5** shows a modified embodiment in which the means for selectively shifting the switch actuator includes solenoid coils **120** and **122.** The rod **126** is coaxially received in the coils **120** and **122** and thus forms the armature for the coils. Right and left electrical switches **130** and **132** are electrically connected to the coils **120** and **122** to energize the coils and cause the desired movement of the switch actuator rod **126** to engage switch **44** or **42.** For example, closing of switch **132** will energize coil **120** to cause the actuator rod **126** to move to the left and switch **130** will energize coil **122** to move the actuator rod **126** to the right. Other solenoid arrangements can be employed with mechanical connections between the armature and the rod **126.**

In operation of the mobile storage units of the invention, and with the use of the control arms **104,** if it is desired to shift mobile unit **14** from the FIG. **1** position to the FIG. **2** position to gain access to face **140** of storage unit **16,** the switch actuator arm **104** for unit **14** is shifted to the left as shown by the arrow **142** which will cause the end of tube **76** to actuate switch **44** and energize the motor to move the unit **14** to the left. The manual shifting of the switch actuator rod **70** to the left as thus described, will also cause engagement of the switch actuator rod end **90** with the end or projection **92** of the adjacent mobile unit **12.** If the unit **12** is closely adjacent to the unit **14** as shown in FIG. **1,** the initial shift of control rod **70** to the left will cause the control rod in unit **12** to also shift to the left and thus simultaneously energize the motors **30** in both units **12** and **14.**

Inasmuch as the control actuator rods are biased to the neutral position, manual pressure must be maintained until the desired aisle space is opened. Once the space **150** (FIG. **2**) is open, manual pressure can be released and the units **12** and **14** will cease movement. If the units **12** and **14** are moved a distance such that the switch actuator projection **90** of unit **12** engages the actuator rod projection **92** on unit **10,** the control rod **70** in unit **10** will shift the actuator rods **70** of units **12** and **14** to the right and into a neutral position and thus de-energize the motors in the units **12** and **14.**

In other movement operations, the end mobile units **10** and **12** can respectively move to the left and right until the actuator rods **70** and **72** of these units are shifted by engagement with the stationary units **18** and **20.** Bumpers **154** (FIG. **1**) between units will maintain adjacent units at a slight spacing so that actuator rods can be maintained in a neutral position when the units are at rest.

What is claimed is:

1. Storage apparatus comprising a plurality of mobile storage units, including first and second mobile units, each unit having at least one storage face, guide means cooperating with said mobile units to guide movement of said storage units in a direction normal to said faces of said storage units, a separate reversible motor individual to each of said mobile units for individually driving said unit along said guide means, and control-circuit means for selectively energizing and de-energizing said motors on said units and to move said units in opposite directions including right and left directional switches with switch levers, and means for actuating said switches including an axially shiftable common switch actuator in each of said units for operating both directional switches in each unit, said switch actuators spanning the width of each unit, each switch actuator having projections at each end extending beyond the faces of said units, with said switch actuators on said units aligned for engagement by said switch actuator projections of adjacent units, and each of said mobile units including means to selectively shift said switch actuators axially in opposed directions to shift said switch actuators in a first unit and adjacent second units to actuate said directional switches in said first unit and adjacent second units to energize said motors of said first unit and adjacent second units to move the mobile units to afford the desired access.

2. storage apparatus in accordance with claim **1** wherein said units have an end panel and said shift actuator is a horizontally extending rod, means supporting the rod in said panel and means on the rod cooperating with said right and left directional switches to actuate one of said switches when said rod is moved in one direction and the other of the switches when the rod is shifted in the other direction.

3. Storage apparatus in accordance with claim **2** wherein said means for selectively shifting said switch actuators comprises an arm connected to said shift actuator rod and wherein said rod is located on the inside of said end panels of said units and slots in said end panel with said arms projecting through said slots and accessible on the outside of said panel for manual manipulation.

4. Storage apparatus in accordance with claim **2** including means for biasing said rod to a neutral position with said switches in an open condition.

5. Storage apparatus in accordance with claim **2** wherein said means for selectively shifting said switch actuators comprises solenoid coils arranged around said rod and wherein said rod comprises the armature of said solenoid coils and switch means on said units for selectively energizing said coils to shift said rod in the desired direction.

6. Storage apparatus in accordance with claim **1** including a stationary storage unit defining the end of travel of said mobile units, said stationary unit including a surface engageable with a switch actuator projection to shift said switch actuator to open said switch which causes movement of the engaging mobile unit.

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