May 6, 1969 R. D. GUTTING 3,442,564

POWER OPERATED FILE CABINET

Filed Dec. 23, 1966 Sheet 1 of 4

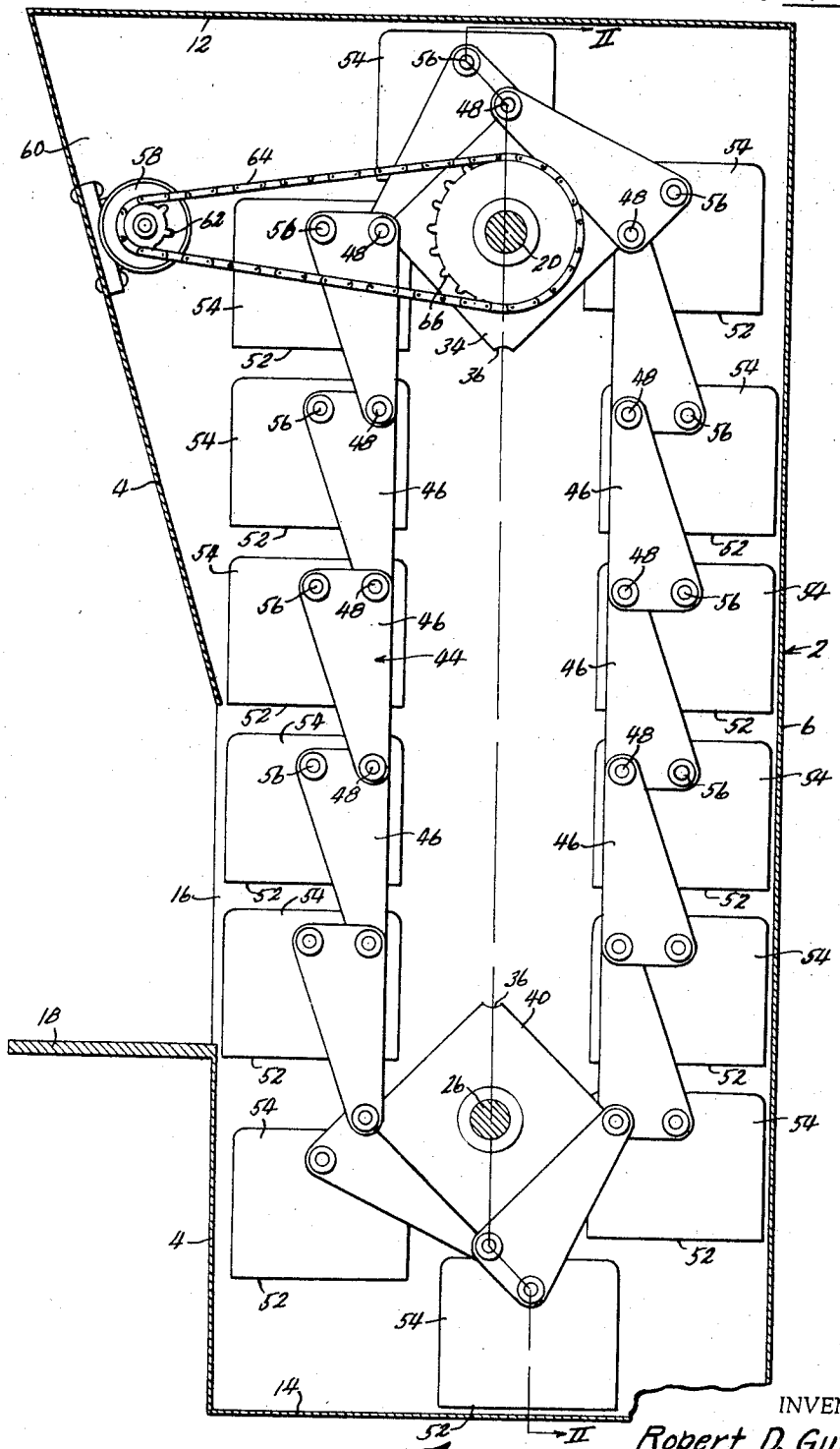


Fig. 1

INVENTOR.
Robert D. Gutting
BY PENDLETON, NEUMAN
SEIBOLD & WILLIAMS
Attorney.

May 6, 1969 R. D. GUTTING 3,442,564

POWER OPERATED FILE CABINET

Filed Dec. 23, 1966 Sheet 2 of 4

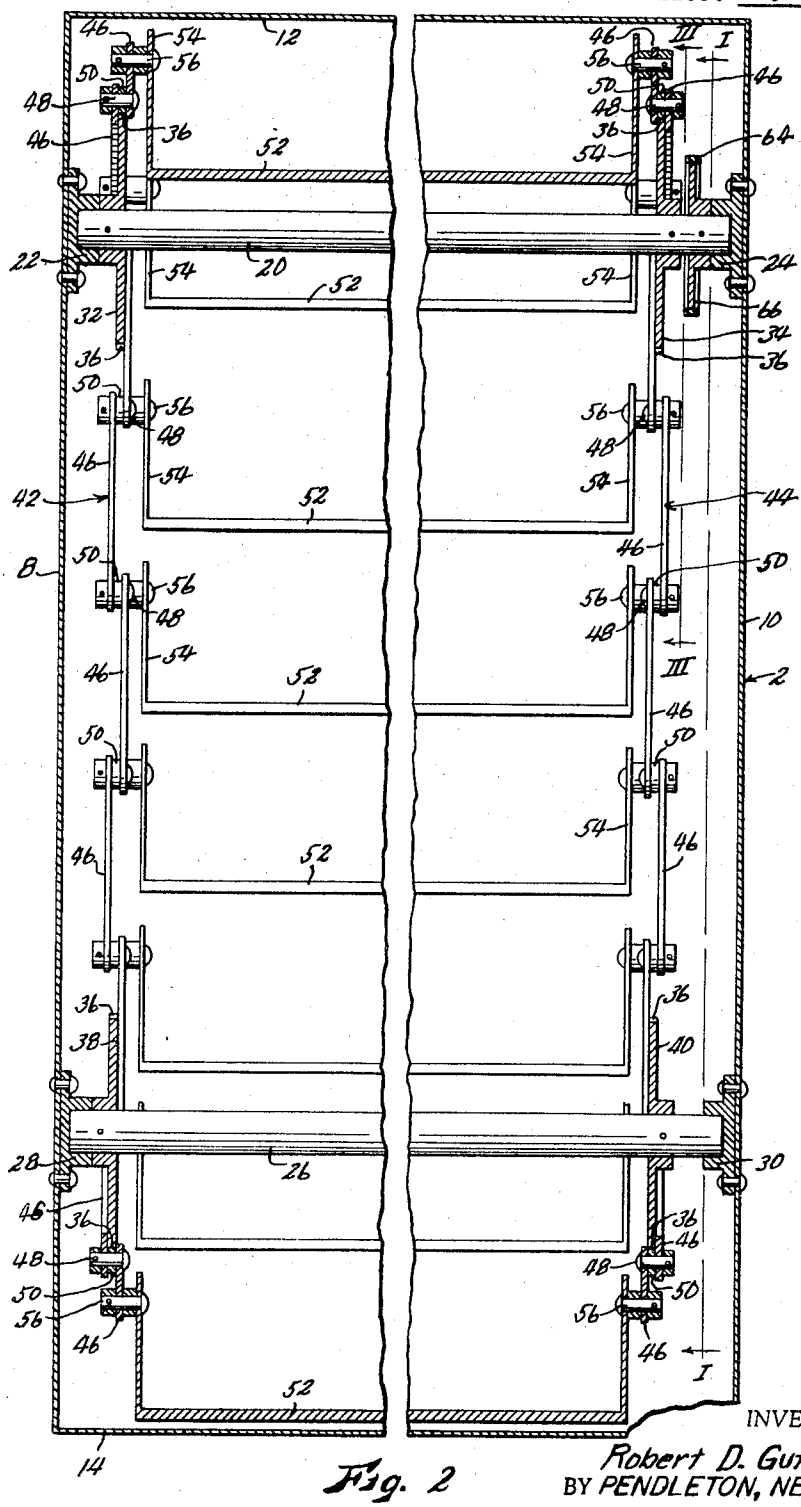


Fig. 2

INVENTOR.
Robert D. Gutting
BY PENDLETON, NEUMAN
SEIBOLD & WILLIAMS
Attorney.

May 6, 1969 R. D. GUTTING 3,442,564

POWER OPERATED FILE CABINET

Filed Dec. 23, 1966 Sheet 3 of 4

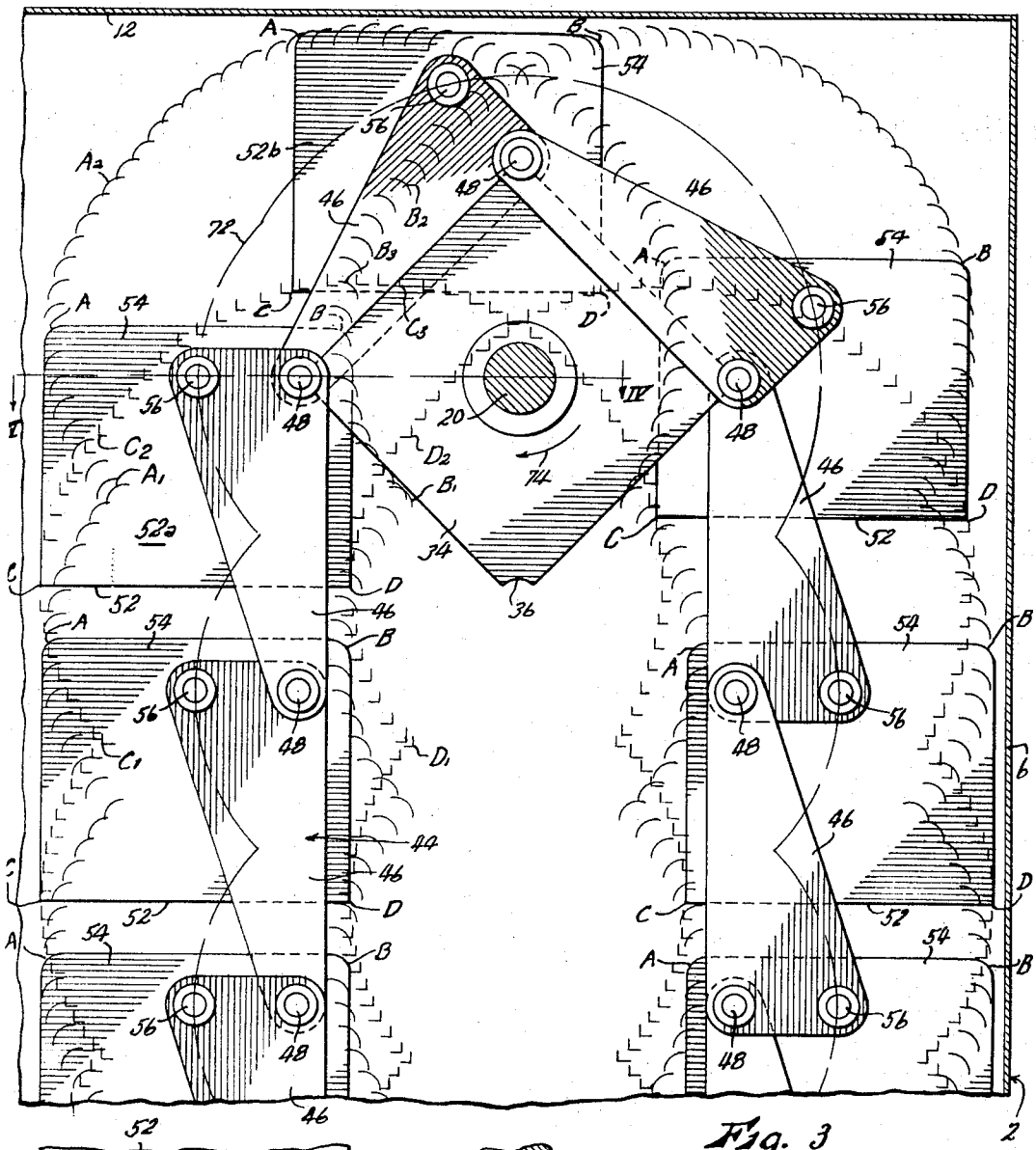


Fig. 3

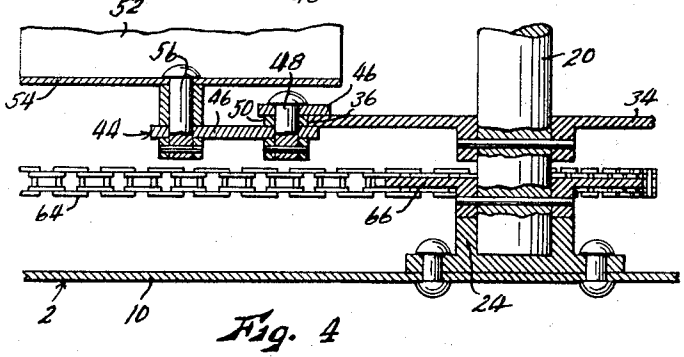


Fig. 4

INVENTOR.
Robert D. Gutting
BY PENDLETON, NEUMAN
SEIBOLD & WILLIAMS
Attorney.

May 6, 1969 R. D. GUTTING 3,442,564

POWER OPERATED FILE CABINET

Filed Dec. 23, 1966 Sheet 4 of 4

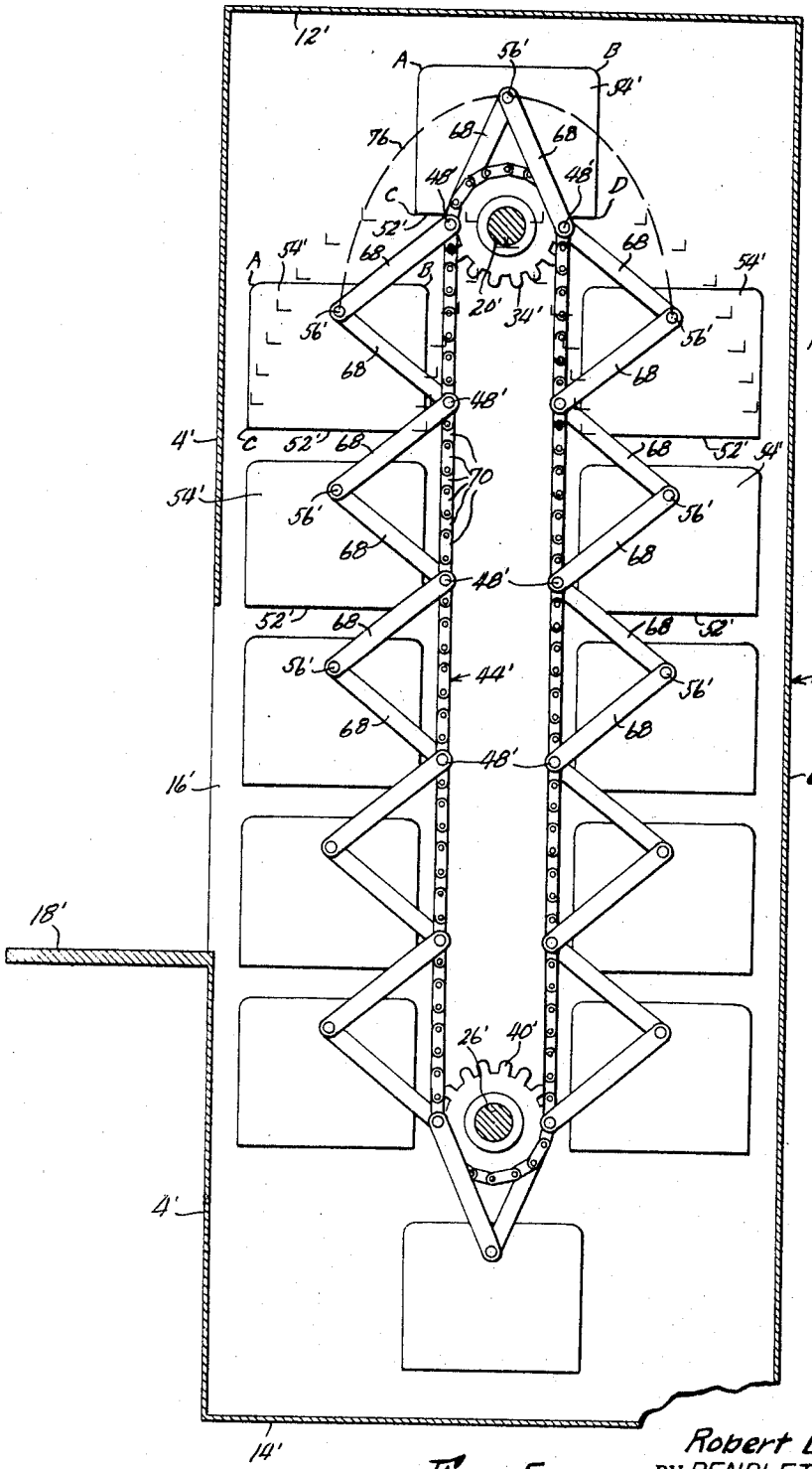


Fig. 5

INVENTOR.
Robert D. Gutting
BY PENDLETON, NEUMAN
SEIBOLD & WILLIAMS
Attorney.

United States Patent Office

3,442,564
Patented May 6, 1969

3,442,564

POWER OPERATED FILE CABINET

Robert D. Gutting, Topeka, Kans., assignor to Hon Industries, Inc., Muscatine, Iowa, a corporation of Iowa

Filed Dec. 23, 1966, Ser. No. 604,467
Int. Cl. A47f 3/08, 5/00; A47b 77/16
U.S. Cl. 312—268 10 Claims

ABSTRACT OF THE DISCLOSURE

A power driven file cabinet having square sprocket wheels, carrier support chains consisting of rigid links each of an effective length corresponding to the length of the sides of the sprocket wheels, and a series of shelves pivotally suspended on successive links of the chains at pivots directly outward from the pivotal connections of the respective links to adjacent links.

This invention relates to new and useful improvements in power driven file cabinets, and has particular reference to that class of file cabinet in which a series of file shelves are carried by a pair of generally vertically extending endless sprocket chains which are trained about sprocket wheels mounted on vertically spaced apart horizontal shafts, at least one of said shafts being power operated to drive said sprockets and sprocket chains, whereby any one of said shelves may be presented selectively at a window of said cabinet for use. The advantages of this type of file cabinet in permitting use of the space in a file room all the way from floor to ceiling are well known. Filing space is very expensive, representing a major cost in many businesses, and any cabinet which provides more complete and thorough use of the available space is accordingly a valuable contribution.

The principal object of the present invention is the provision in a file cabinet of the character described, of means which, within the limitations of size in a cabinet carrying standard letter-size shelves and constructed to fit in a room with eight-foot ceilings, will increase the file capacity by one-sixth without appreciably increasing the size of the cabinet. That is, in a cabinet no more than eight feet in elevation and carrying standard letter-size file shelves, twelve shelves have heretofore been considered to be the maximum possible number, while according to my invention, an eight-foot cabinet may contain fourteen shelves. Generally, this object is accomplished by means of sprockets and sprocket chains of a new and novel design, as will be described.

Other objects are simplicity and economy of construction, efficiency and dependability of operation, and adaptability for use in various applications.

In general, the foregoing objects are achieved in the illustrated embodiment of the invention by providing a power driven file structure including a first pair of spaced, square, angularly aligned sprocket wheels mounted for rotation about a first horizontal axis, a second pair of spaced, square, angularly aligned sprocket wheels mounted for rotation about a second horizontal axis vertically spaced from the axis of the first pair, with the sprocket wheels of the second pair vertically aligned with the sprocket wheels of the first pair, each side of the sprocket wheels being of the same predetermined length, a pair of sprocket chains trained about corresponding sprocket wheels of said pairs, each of the chains comprising an endless series of pivotally interconnected rigid links each of a length corresponding to the length of the sides of said sprocket wheels and having means at the pivotal connections between each successive pair of links for engaging the corners of the associated sprocket wheels, and a horizontal shelf extending between each pair of corresponding links of the sprocket chains with means pivoting each end wall of each shelf to the associated chain links at points spaced above the related shelf no more than about two-thirds of the length of a chain link, on the vertical midlines of the end walls, with the pivot points offset outwardly a distance at least one-third of such length from the loops formed by lines connecting the pivotal connections between the links of the chains.

With these objects in view, as well as other objects which will appear in the course of the specification, reference will be had to the accompanying drawing, wherein:

FIG. 1 is a vertical sectional view through a power driven file cabinet embodying the present invention, taken on line I—I of FIG. 2,

FIG. 2 is a vertical sectional view taken on line II—II of FIG. 1, partially broken away and foreshortened,

FIG. 3 is an enlarged fragmentary sectional view taken on line III—III of FIG. 2, with the paths of various portions of the file shelves being indicated in multiple fragmentary showings,

FIG. 4 is a fragmentary sectional view taken on line IV—IV of FIG. 3, and

FIG. 5 is a view similar to FIG. 1, but showing a standard shelf suspension representative of those commonly employed at the present time.

Like reference numerals apply to similar parts throughout the several views, and the numeral **2** applies generally to a generally rectilinear file cabinet having a front wall **4**, rear wall **6**, side walls **8** and **10**, top wall **12** and bottom wall **14**. The front wall has a window **16** formed therein extending between side walls **8** and **10**, and a horizontal counter **18** extending outwardly from the lower edge of the window. Ordinarily, such cabinets are constructed slightly less than eight feet in total height, in order to be accommodated in file rooms having standard eight-foot ceilings, and counter **18** is at desk height above the floor, in order to provide a convenient working table for file clerks seated thereat.

An upper shaft **20** extends horizontally between side walls **8** and **10** in the upper portion of the cabinet, said shaft being journalled rotatably at its ends in bearings **22** and **24** affixed respectively to said side walls. Similarly, a lower shaft **26** extends between side walls **8** and **10** in the lower portion of the cabinet, is journalled in bearings **28** and **30** affixed to said side walls, and is parallel to and disposed in the same vertical plane as shaft **20**. Affixed on shaft **20**, respectively adjacent side walls **8** and **10**, are a pair of sprockets wheels **32** and **34**, said sprockets being of square configuration with an arcuate notch **36** at each corner thereof for engaging the sprocket chain rollers as will be described. Similarly, another pair of square sprocket wheels **38** and **40** are affixed on lower shaft **26**, sprockets **32** and **38** lying in the same vertical plane, and sprockets **34** and **40** lying in another vertical plane. The sprockets on each shaft are angularly aligned with each other, that is, the corners of each are disposed at the same angle from the shaft.

An endless sprocket chain **42** is trained around sprockets **32** and **38**, and an identical sprocket chain **44** is trained around sprockets **34** and **40**. Each of said chains constitutes a series of links **46**, each successive pair of links being pivotably joined together at their contiguous ends, as by a pivot pin **48**. Mounted on each or said pivot pins between the adjacent links is a roller **50**. Since the distance between the centers of successive pivot pins **48** is equal to the length of each side of each of the sprockets, or more accurately between the centers of curvature of the arcuate notches **36** at successive corners of each sprocket, and since the distance between centers of the shafts **20** and **26** is an even multiple of the length of each link, it will be seen that as shaft **20** is turned to

drive sprockets 32 and 34, notches 36 of the sprockets engage rollers 50 to drive the chains.

Each link 46 of chain 42 and the corresponding link of chain 44 supports a horizontal file shelf 52 therebetween, each shelf being provided at each end, respectively, adjacent the two chains, with an upstanding end wall each of said end walls being pivotally connected, as by pivot pin 56, to the adjacent chain link 46, Pivot pin 56 is disposed in the vertical midline of the end wall, and well above the shelf, so that the shelf always hangs downwardly from its pivots by gravity. Each pivot pin 56 is engaged in its associated chain link 46 at one end of said link, directly outwardly from one of the chain pivots 48. Thus the two pivots 48 and one pivot 56 associated with each link define a right triangle with one of pivots 48 at the right angle. For this reason, it is convenient to form the links in a triangular shape as shown.

Upper shaft 20 is rotatably driven by an electric motor 58, geared to a sufficiently low speed, which is mounted in a chamber 60 formed in the cabinet forwardly of the shelves by sloping the upper portion of front cabinet wall 4 upwardly and forwardly as shown in FIG. 1. A sprocket 62 driven by said motor is operably connected by a sprocket chain 64 to a sprocket 66 affixed on upper shaft 20. By suitable control means, not shown, the motor may be operated to turn shaft 20 in either direction to bring any one of shelves 52 to rest in a position level with counter 18, for the convenience of the clerk. Also, any suitable means can be provided for stabilizing the shelves against rocking or swaying on their pivots 56, but is not shown since it is not pertinent to the present invention.

By way of comparison, FIG. 5 shows a file cabinet similar in many respects to that contemplated by my invention, but utilizing a conventional suspension for the shelves. Corresponding primed numerals indicate corresponding parts therein. The cabnet 2' shown in FIG. 5 is of exactly the same size as that shown in FIG. 1, except for the forward chamber 60 shown in FIG. 1, which does not affect the space required for the shelves. Also, the shelves 52' and their end walls 54' of FIG. 5 are of the same size as shown in FIG. 1, and the shelf pivots 56' bear the same relationship to the shelf end walls. However, in FIG. 5 each shelf pivot 56' is connected coaxially to the outer ends of a pair of relatively pivotal links 68, the inner ends of said links being pivoted to a chain 44', which corresponds to chain 44 of FIGS. 1–4, at spaced apart points 48', whereby each pair of links forms an isosceles triangle with the chain. Moreover, chain 44' includes a series of links 70 between each successive pair of pivots 48, rather than being unitary as in FIG. 1, and chain sprockets 34' and 40', corresponding to sprockets 34 and 40, are essentially circular rather than square as in FIG. 1.

A comparison of FIGS. 1 and 3 on the one hand, and FIG. 5 on the other hand, will readily reveal the advantages of my invention. Most important, as shown in FIG. 1 my structure permits the inclusion of fourteen shelves in the same cabinet required for twelve shelves with the suspension shown in FIG. 5. This is of course an extremely valuable feature in view of the extent and high cost of the filing space required in many business. True, there is greater clearance in FIG. 5 between the shelves and the front, rear, top and bottom cabinet walls than in FIG. 1, but the difference is slight, and certainly would not permit the addition of even a single shelf in FIG. 5 with the conventional suspension shown therein. The primary reason for this added capacity is that in FIG. 1 the distance around the operative half of either sprocket engaged by a sprocket chain is equal to the spacing between two successive pairs of shelves, while in FIG. 5 the distance around the operative half of either sprocket, measured along the chain, is equal only to the spacing between a single successive pair of shelves. Stated in another manner, in FIG. 1 there will always be one more shelf pivot 56 at or above the level of shaft 20 (or below the level of shaft 26) than there will be shelf pivots 56' at or above the level of shaft 20' in FIG. 5, at corresponding positions in the rotation of the shafts.

Moreover, the square sprockets, and links equal in length to the spacing between shelves, as shown in FIG. 1, provides for clearance between the shelves as they pass around the shafts, and for clearance between the shelves and the shafts. Referring to FIG. 3, the upper front and rear corners of each shelf end wall are designated A and B respectively, and successive closely spaced positions in their paths of travel are indicated by short arcs. Similarly the lower front and rear corners of each shelf are designated C and D respectively, with successive closely spaced positions in their paths of travel indicated by angled lines. The path of travel of the axis of shelf pivots 56 is indicated by the broken line 72. Assuming next that shaft 20 is being turned in the direction of arrow 74, it will be seen that in the eighth-revolution thereof preceding the position shown in FIG. 3, one of the shelves, further designated by the numeral 52*a*, moves from a position wherein its corners are positioned at A1, B1, C1, and D1, to the position shown in the drawing, or forwardly away from the vertical plane of shafts 20 and 26, while the next preceding shelf, further designated as 52*b*, moves from a position in which its corners are positioned at A2, B2, C2 and D2 to the position shown in the drawing, or rearwardly toward the plane of shafts 20 and 26. This rearward movement of shelf 52*b*, with the simultaneous forward movement of shelf 52*a*, is the action providing for clearance between the shelves. As movement continues from the position shown in FIG. 3, shelf 52*a* is elevated to a position in which its upper rear corner B is disposed at B3. However, by that time the lower front corner C of shelf 52*b* has moved rearwardly to position C3, so that there is no interference between the shelves, this being the critical point of closest approach therebetween. There is no particular problem as the shelves enter and begin descent in the rearward rank of shelves, as clearance is greater at that point of travel. This type of action is completely impossible with the conventional suspension shown in FIG. 5. As indicated in FIG. 3, the entire front and rear ranks of shelves move alternately toward and apart from each other in a "pulsing" action as the sprockets rotate, due to the square form of said sprockets. This action, while not useful except in providing clearance between the shelves as they round the shafts, is not large and is not considered objectionable. It does, however, render it desirable that counter 18 be disposed at such a level that each shelf is disposed at the outer limit of its "pulse" (i.e. with the sprockets turned so that their diagonals are horizontal and vertical) as it passes the counter level.

An examination of the indicated paths of the lower corners C and D of the shelves in FIG. 3 shows that they also clear shaft 20. This permits shaft 20 to be solid from side to side of the cabinet, so that sprockets 32 and 34 can both be driven by a single power connection to the shaft. This is not possible with the FIG. 5 structure. In that view, wherein the path of the shelf pivots 56 is indicated by broken line 76, and wherein the paths of the lower corners C and D of the shelves are indicated by angled lines, it will be seen that the shelves drop below and intersect shaft 20'. This necessitates interruption of the shaft, the two sprockets on that axis being carried on separate coaxial stub shafts, with no shaft between the sprockets. This necessitates separate drives for the two sprockets, which while possible is expensive, and usually results in the fact that structures such as shown in FIG. 5 are driven by turning lower shaft 26', which can be solid since there is no shaft clearance problem. The present structure permits driving of the loaded upper shaft rather than the unloaded lower shaft, which is considered to be better from an engineering point of view. It also permits drive motor 58 to be installed between the end limits of the shelves, in overhead space which is normally wasted.

In the FIG. 5 structure with a drive unit connected to the lower shaft, said drive unit normally must be disposed outside the end limits of the shelves, and hence increases the necessary overall width of the cabinet. The present structure permits upper shaft **20** to be as much as three inches in diameter without interference, and this is more than adequate.

Besides the features already generally discussed, it will be seen that clearance between the shelves and the shaft is assisted by limiting the extension of each shelf below its pivot **56**, and by the fact that each pivot **56** is disposed at the extreme end of its associated link **46**. The latter provides a greater clearance between the shelves and shaft **20** than would be the case if pivot **56** were disposed at any point intermediate the ends of its associated link.

The proportions of the various parts are so important to the functions described, and are so limited by standard file dimension requirements, that a general statement thereof is believed to be in order. For example, in a standard letter file, it is generally accepted that the space available must be 9 x 12 inches. That is, the extension of each end wall **54** above its shelf **52** must be 9 inches high and 12 inches from front to rear, in order that standard letter file folders may be arranged therein with their rear folds resting on the shelf. Allowing a one inch shelf thickness to permit reinforcement of the shelf to remain rigid under the heavy loads it must support, the total vertical height of each shelf and its end walls will be 10 inches. From this starting point, and assuming 12 inches or one foot as a unit, it will be seen the effective length of each edge of the square sprockets **32**, **34**, **36** and **38** should be 12 inches (or unitary), that the effective length of each link **46** should be unitary, that the transverse offset of pivot **56** of each link from the link of its pivots **48** should be no less than one-third of a unit (or 4 inches) and should be in a line at right angles to the line of pivots **48** and intersecting one of pivots **48**, that the total vertical height of each shelf should be no more than 5/6 unitary, and that the spacing of pivots **56** of each shelf above the bottom of shelf should be no more than 2/3 unitary. Exact adherence to these proportions is not required, but any substantial variation therefrom will result either in interference between parts, or in the wastage of valuable space.

While I have shown and described a specific embodiment of my invention, it will be readily apparent that many minor changes of structure and operation could be made without departing from the spirit of the invention.

What I claim as new and desire to protect by Letters Patent is:

1. Power driven file apparatus comprising a first pair of spaced, essentially square angularly aligned sprocket wheels mounted for rotation about a first horizontal axis, a second pair of spaced, essentially square, angularly aligned sprocket wheels mounted for rotation about a second horizontal axis vertically spaced from said first axis, each side of each of said sprocket wheels being of the same effective length, said sprocket wheels of said second pair being disposed in vertical alignment with said sprocket wheels of said first pair, a pair of sprocket chains each extending about and engaging corresponding aligned sprocket wheels of said pairs, each of said chains comprising an endless series of pivotally interconnected rigid links each of an effective length equal to the effective length of the sides of said sprocket wheels, means at the pivotal connection between each successive pair of links for engaging the corners of the associated sprocket wheels, and a series of shelves each pivotally suspended on said pair of chains, with successive shelves being pivotally supported on successive links of said chains.

2. Apparatus as recited in claim **1** wherein each of said shelves is pivotally suspended on the respective links with its pivot axis offset outwardly from the loops defined by lines connecting said pivotal connections between said links of said chains.

3. Power driven file apparatus comprising a first pair of sprocket wheels mounted for rotation about a first horizontal axis, a second pair of sprocket wheels mounted for rotation about a second horizontal axis vertically spaced from said first axis, said sprocket wheels of said second pair being aligned with said sprocket wheels of said first pair, a pair of sprocket chains trained about said sprocket wheels and each comprising a plurality of pivotally interconnected rigid links, and a pluraltiy of shelves suspended on said chain at uniform predetermined intervals and each having an upstanding end wall at each end thereof, pivot means pivotally joining each of said end walls to one of said links to pivotally suspend said shelves on said chains, each of said pivot means being disposed on a line normal to the length of the respective link and intersecting one of the pivotal connections of such link to another link in the respective chain and spaced outwardly from such pivotal connection a distance equal to at least one-third of said interval, the maximum extension of each shelf below the pivot axis thereof being no more than approximately two-thirds of said predetermined interval.

4. Apparatus as recited in claim **2** wherein each of said shelves is of a width from front to rear corresponding to said effective length, and wherein each chain link includes a shelf pivot support providing a shelf pivot axis spaced outwardly from a line connecting the chain pivots of said link by a distance at least one-third of said effective length.

5. Apparatus as recited in claim **4** wherein said shelf pivot support of each link is disposed on a line at right angles to a line connecting the chain pivots of said link, and intersecting one of said chain pivots of said link.

6. Apparatus as recited in claim **4** wherein the maximum extension of each shelf below the pivotal axis thereof is no more than approximately two-thirds of said effective length.

7. Apparatus as recited in claim **4** wherein the shelf pivot support of each link is disposed on a line at right angles to a line connecting the chain pivots of said link, and intersecting one of said chain pivots of said link, and wherein the maximum extension of each shelf below the pivotal axis thereof is no more than approximately two-thirds of said effective length.

8. Power driven file apparatus as in claim **3** wherein each of said sprockets is of a circumference equal to four times said interval.

9. Power driven file appartaus as in claim **3** wherein each of said sprockets comprises a regular polygon with each edge thereof being of a length equal to said interval.

10. Power driven file apparatus as in claim **9** wherein each of said links is of a length equal to said interval.

References Cited

UNITED STATES PATENTS

581,803	5/1897	Armstrong	198—137
1,691,186	11/1928	Greth	312—268
2,900,214	8/1959	Johnson	312—97
3,033,390	5/1962	Gronvold	198—158
3,202,265	8/1965	Anders	312—268
3,303,922	2/1967	Gore	312—97

OTHER REFERENCES

A.P.C. application of Marchand, Ser. No. 469, 106, published July 13, 1943.

JAMES T. McCALL, *Primary Examiner.*

U.S. Cl. X.R.

198—158; 312—97

U.S. DEPARTMENT OF COMMERCE

PATENT OFFICE

Washington, D.C. 20231

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,442,564 May 6, 1969

Robert D. Gutting

It is certified that error appears in the above identified patent and that said Letters Patent are hereby corrected as shown below:

Column 3, line 6, after "end wall" insert -- 54, --; line 8, "46," should read -- 46. --; line 61, "business" should read -- businesses --. Column 5, line 35, "link", second occurrence, should read -- line --; line 53, "square" should read -- square, --. Column 6, line 50, "appartaus" should read -- apparatus --.

Signed and sealed this 14th day of April 1970.

(SEAL)
Attest:

Edward M. Fletcher, Jr.
Attesting Officer

WILLIAM E. SCHUYLER, JR.
Commissioner of Patents