Feb. 5, 1952 R. A. BRENNER ET AL 2,584,111

FOLDABLE CLOSURE

Filed Aug. 27, 1945 3 Sheets-Sheet 1

FIG. 1

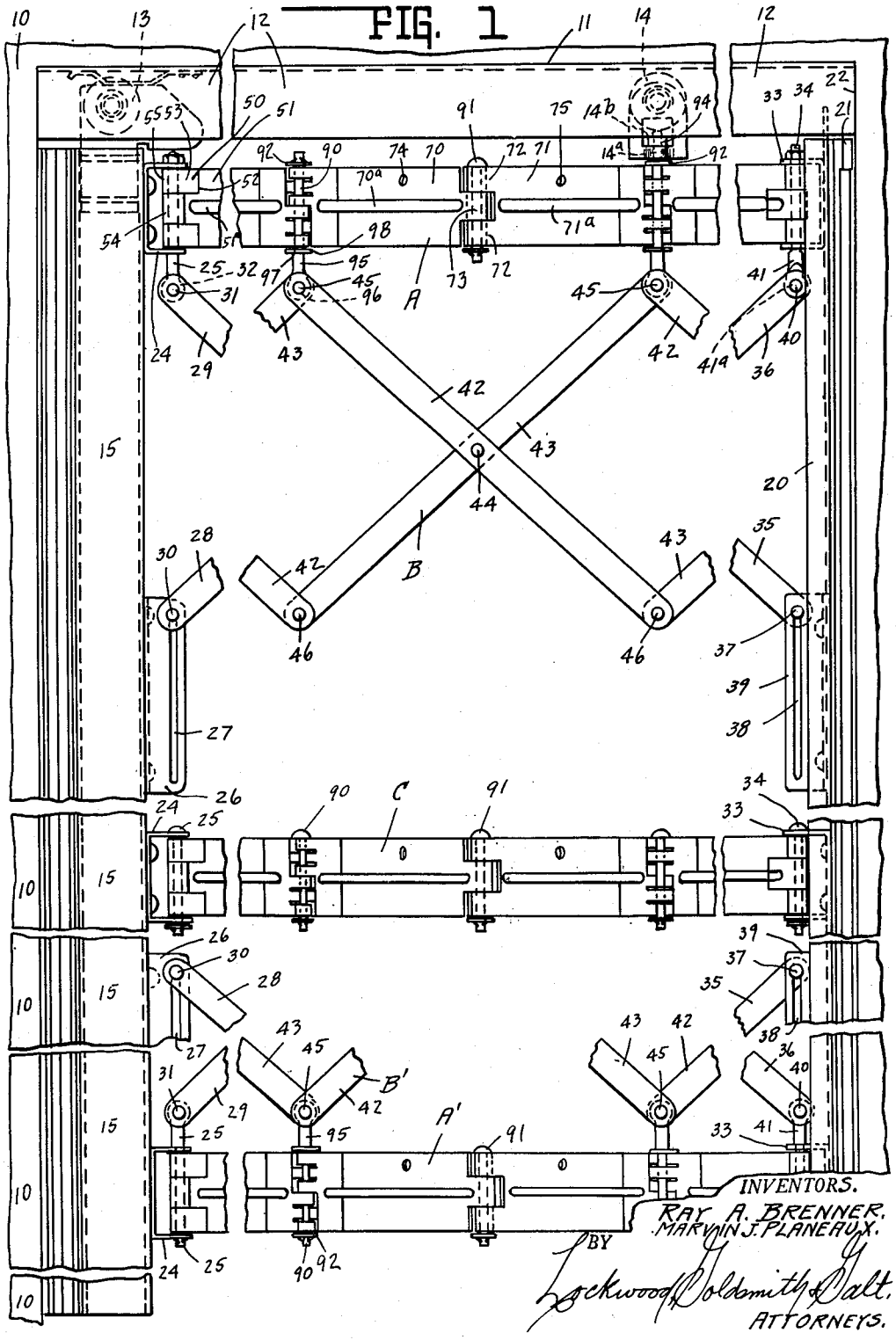

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FIG. 2

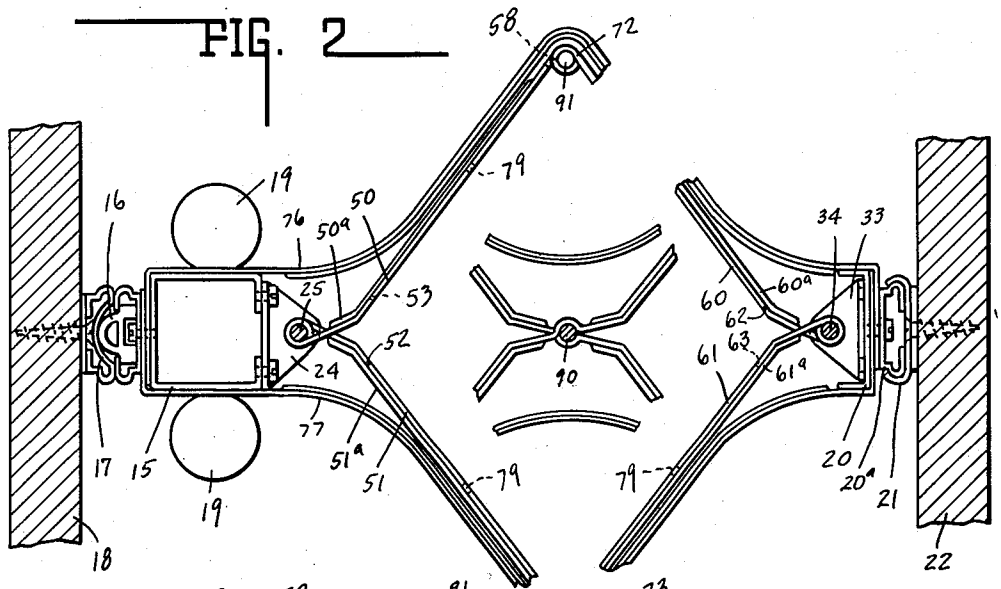

FIG. 3

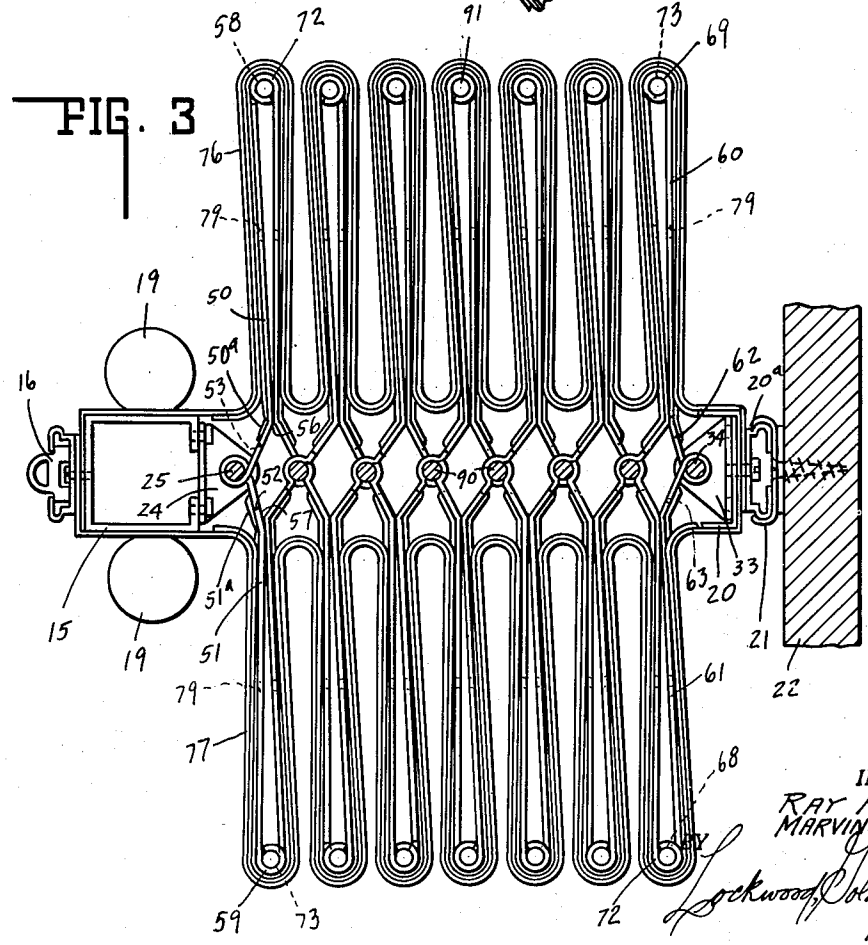

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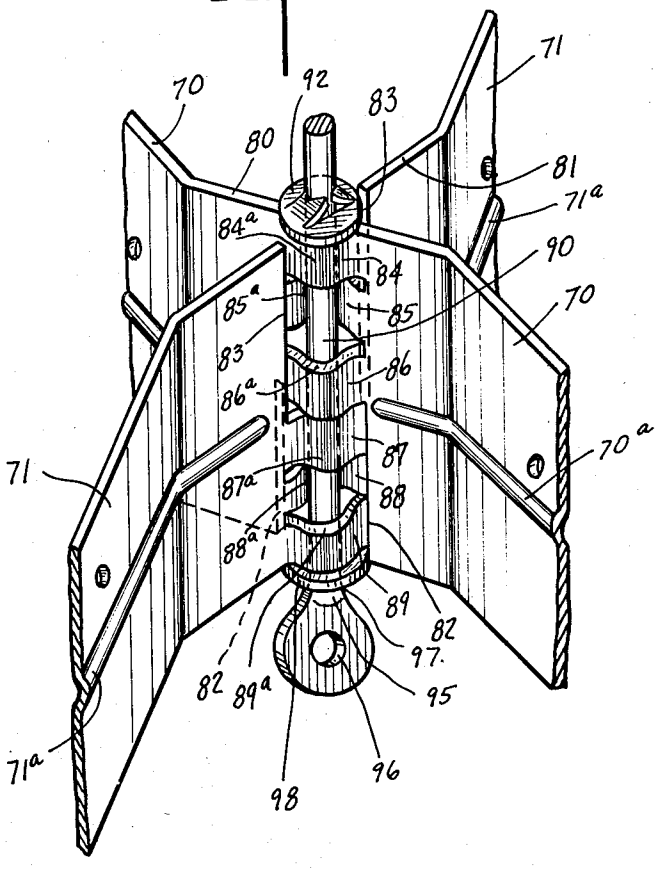
FIG. 4



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UNITED STATES PATENT OFFICE

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FOLDABLE CLOSURE

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Application August 27, 1945, Serial No. 612,816

15 Claims. (Cl. 160—84)

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This invention relates to a foldable closure suitable for closing an opening thus serving as a door, and extensible into opening closing position and collapsible for exposing the opening.

Heretofore closures of this general type have been provided with suitable curtain or covering material, and usually have expanded laterally from the plane of the closure to one side or both sides of said plane. Such closures have a tendency to sag vertically and curve in long lengths. Other closures have mechanism which has collapsed vertically or in the plane of the opening and such closures also sag due to weight and also curve in long lengths.

The chief object of the present invention is to provide a collapsible and extensible closure that is substantially without sag when extended and similarly without appreciable curvature if of long length and not track confined.

The chief feature of the present invention resides in providing a closure of the last mentioned character with at least one horizontally collapsible and extensible linkage, preferably of hinge or strap plate stock type in combination with at least one vertically collapsible and extensible linkage, preferably of bar stock type, the latter linkage being extensible away from, although connected to the former, and collapsible toward the first mentioned linkage.

Another feature of the invention resides in connecting adjacent pivotal connections together whereby sag and lateral curvature are substantially eliminated or conversely the collapsible and extensible structure is inherently mutually braced transversely.

Other objects and features of the invention will be set forth more fully hereinafter.

The full nature of the invention will be understood from the accompanying drawings and the following description and claims.

In the drawings Fig. 1 is an elevational view of the end portions and an intermediate portion of a closure in extended position, the covering or curtain being omitted for clearness, and the embodiment illustrated herein includes upper and lower composite interconnected transverse collapsing units and an intermediate semi-independent horizontally collapsing unit.

Fig. 2 is a top plan view thereof in extended position and with the covering or curtain included.

Fig. 3 is a similar view of a complete closure in the collapsed position.

Fig. 4 is a perspective view of a central connection, being a pair of full length leaves or straps as shown in the central portion of Fig. 2.

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In Fig. 1 of the drawings 10 indicates a wall or the like having opening 11 therein provided with an overhead bottom slotted tubular track 12 extending across the same and within which are suitable trolley structures 13 and 14, the former being connected to the lead post 15, and one or more of the latter and intermediate trolleys 14 being provided and connected to the closure in the plane of the opening.

The lead post 15, such as illustrated in Figs. 2 and 3 most clearly, may have cushion strip 16 secured thereto and same may engage bumper socket strip 17 carried by wall 18 of opening 11 and in the plane thereof. The lead post may be provided at opposite sides with suitable handles 19, catch or latch means, and/or key actuated lock means, all not shown, since same form no part of the present disclosure.

The rear post 20 may be of channel section type and detachably mounted as at 21 to the opposite wall 22 of opening 11. When desired it may be permanently mounted. Also if desired, whenever over head track and/or a bottom track is not employed, the entire closure may be hingedly mounted by hinge means between the wall 22 and rear post 20. In certain areas fire regulations require closures to swing. Thus the present invention can readily be extended to that field from which it heretofore has been excluded and this is possible because the closure is of non-sagging as well as noncurving type, as stated initially herein.

As also stated hereinbefore, the present invention is illustrated as including a pair of opposed composite units, see Fig. 1. The upper unit comprises a horizontally collapsible series A and a vertically collapsible series B interconnected as hereinafter described.

This constitutes the simplest form of the invention. Another and inverted composite unit comprises lowermost horizontally collapsible series A' and thereabove and interconnected thereto is the vertically collapsible series B'. Therebetween, if desired, may be included one or more horizontally collapsible series C, similar, if not substantially identical to series A or A' but not connected to either series B or B' although connectible to series A and A' as hereinafter described.

Since series A, A' and C are substantially identical, a description of series A will suffice for all. Since series B and B' are substantially identical, although reversed, a description of series B will suffice for both.

In Fig. 1 the lead post 15 has secured to it a suitable bearing member, such as a U-shaped

bracket 24 that straddles the pivotally connected straps 50 and 51 of half hinge length and associated therewith is the pintle 25 suitably connected at its upper end to lead trolley 13. The bracket 24 or post 15 may be connected thereto, as desired.

In any event, pintle 25 provides a hinge axis parallel and in close proximity to the lead post 15. Therebeneath and suitably secured to the lead post is the inwardly directed vertically elongated plate 26 having a vertical, elongated slot 27 therein, which is in vertical alignment with the axis of pintle 25.

A pair of crossed bars 28 and 29 of equal length are pivotally connected together at their center portions (not shown). The lower end of bar 28, adjacent lead post 15, mounts a headed pin 30 that rides in the slot 27. The upper end of bar 29 adjacent lead post 15 is apertured and mounts pivot pin 31 (a rivet-like member) which is carried by the lower end 32 of pintle 25 upon an axis transverse to the pintle axis.

In a similar but reverse manner the rear post 20 mounts a U-shaped bracket 33 in turn mounting pintle 34 having a pivotal axis parallel and in close proximity to the rear post. This bracket straddles the adjacent pivotally connected ends of the half length strap or hinge plates 60 and 61.

Beneath the aforesaid is a pair of elongated, equal length bars 35 and 36, pivotally connected together at their mid portions (not shown). The lower end of bar 35 mounts headed pin 37 riding in elongated slot 38 in inwardly directed vertically elongated plate 39 suitably secured to rear post 20. This vertically disposed slot is in vertical alignment with the axis of vertically disposed pintle 34. The upper end of bar 36 mounts pivot pin 40, in the form of a rivet or the like, that seats in the transverse aperture 41*a* in the lower end 41 of pintle 34.

Between the adjacent ends of bars 28—29 and 35—36 are interposed a suitable number of similar length crossed bars 42 and 43 pivotally connected together at their mid-points as at 44 and pivotally connected at their extremities as at 45 and 46 to adjacent bars 42 and 43, the right hand pair being pivotally connected to the ends of bars 35 and 36 and the left hand pair being pivotally connected at their ends to bars 28 and 29.

Slots 27 and 38 may be of closure limiting character, that is, herein the lower ends may limit closure collapse and/or the upper ends may limit closure extension, if desired.

As illustrated, there is at each end a pair of half length hinge plates or straps and therebetween is the required number of so-called full length hinge plates which are hinge connected together at their mid-points, all as hereinafter to be described. Therefore, there are provided as many pairs of equal length crossed bars as there are pairs of full length strap hinges plus one, or if the two pairs of half length plates be considered the equivalent of one pair of full length plates numerically and for spacing distance in the plane of the closure, then the number of pairs of crossed bars will equal the number of pairs of full length hinge plates (actual and equivalent).

The critical point to be observed is that when so arranged all bar pivots 45 lie immediately adjacent the hinge connection between all central hinge connections of the plates, and each juxtapositioned pair of vertical and horizontal pivots may be connected together if desired, as illustrated, and in the manner indicated at 32 and 41*a* and as more fully set forth hereinafter.

Reference will now be had to the strap or plate

hinge series A, which is horizontally collapsible as distinguished from bar series B which is vertically collapsible, since pins 30 and 37 lower in slots 27 and 38 respectively as the closure is collapsed and elevate therein as the closure is extended.

Beginning at the upper left hand corner of Fig. 1 and at the left end in Figs. 2 and 3 there is provided an oppositely directed pair of so-called half length strap or plate hinge members 50 and 51. These, see Figs. 2 and 3, are longitudinally ribbed as at 50*a* and 51*a* respectively for reenforcement or stiffening. The adjacent ends are notched as at 52 and 53 to form tongues 54 and 55 that interfit. Each of the tongues at its end it curled for reception of pintle 25.

Herein each half length hinge is offset as at 56 and 57 in registration with the notches aforesaid and where the tongues depart from the body portion. It will be noted that one hinge has two spaced tongues and the other an intermediate tongue and same interfit and occupy the space between the arms of bracket 24. If desired, where the cooperating notches and tongues engage, same may constitute a stop for limiting the extensible movement of the half hinges.

The single tongue half hinge 51 at its other end includes a pair of curled tongues 59 and the double tongue half hinge 50 at its other end includes intermediate curled tongue 58. The resulting pivotal sockets determine maximum horizontal movement in the collapse of series A.

The right hand pair of half hinges 60 and 61 are reversed as it were, that is, if the left half hinge on one side has a double tongue the right half hinge on that same side has the single tongue and voce versa relative to the other side. Numerals 60 to 69 inclusive indicate parts at the right end similar to parts at the left end indicated by numerals 50 to 59 inclusive.

Interposed between the pairs of half hinges 50—51 and 60—61 are the desired number of horizontally crossed full length strap or plate hinge members 70 and 71. Obviously, at opposite ends there is provided a pair of curled tongues 72 and a single intermediate tongue 73. Each hinge includes longitudinal ribbing reenforcement 70*a* and 71*a* respectively and in each the two are longitudinally aligned.

Apertures 74 and 75 are provided for cover or curtain mounting purposes, the two coverings at opposite sides being indicated at 76 and 77. These at the ends lap the end posts 15 and 20 and are covered and retained in place thereon by portions 16 and 20*a*, respectively. Each is suitably secured at the apertures to the full and half length hinges by any suitable means not shown, the cover anchoring apertures in the half hinges being indicated at 79.

Reference will now be had more particularly to Fig. 4, where the central portion of two horizontally crossed full length hinges 70 and 71 are illustrated. Herein each includes a central portion 80 and 81, respectively, constituting a bias portion preferably having the same angular relation to its contiguous half hinge portion that the post mounted tongues of the half length hinges have relative to the latter, or the former inclination may slightly differ therefrom, as illustrated more clearly in Figs. 2 and 3.

In Fig. 4 central bias portion 80 of strap hinge 70 includes an upwardly directed central notch 82 extending from the lower edge to approximately midway between the top and bottom edges. In like manner hinge 71 includes a down-

wardly directed central notch 83 extending from the top edge of bias portion 81 of hinge 71.

The upper portion of bias portion 80 includes three horizontally disposed strips 84, 85 and 86, the midportions of which are curved as at 84a, 85a and 86a respectively, the intermediate portion 85a is directed oppositely relative to like directed portions 84a and 86a to form a pintle or hinge bearing.

In like manner the lower portion of the bias portion 81 includes three horizontally disposed strips 87, 88 and 89, the midportions of which are curved as at 87a, 88a and 89a respectively, and intermediate portion 88a is directed oppositely relative to like directed portions 87a and 89a to form a pintle or hinge bearing.

The portions 84, 85 and 86 are seated in notch 83 and portions 87, 88 and 89 are seated in notch 82 so that all curved portions thereof provide a single vertically disposed bearing for pintle 90.

The remote ends of the full length hinge plates are hingedly connected together at 91. Observe in Fig. 1 that the central hinging of successive full length hinges is oppositely disposed, that is, portions 85a and 88a lie behind the pintle 90, see right disclosure, and also lie in front of pintle 90, see left disclosure.

If desired, headed pintle 91 may extend the full height of the closure and simultaneously connect the adjacent ends of all horizontally collapsible vertically superposed plates. This serves as a covering folding means, as well as additional closure reenforcement.

Each pintle 90 mounts at its outermost end, at the upper end in series A and lower end in series A', a washer 92. If a trolley 14 is not to be associated therewith, said washer may be of the friction grip type. If trolley 14 is to be connected to pintle 90, the latter extends as at 93 not only through washer 92 but through bore 14a in trolley 14 and the aperture 14b therein exposes the end of said pintle which may carry a retaining head, such as nut 94.

Each pintle 90 is vertically aligned relative to superposed pivots 45 and 46 and the pintle is extended as at 95 and flattened to wing formation and is centrally apertured at 96. This wing is interposed between the pivotally connected ends of links 42 and 43 and pivot 45 passes through aperture 96 as well. Pintle 90, adjacent wing 96, may be shouldered, as it were, at 97 and carry washer 98 upon which bears the adjacent edge of the strap hinge. Since all central pivots 90 preferably are connected to adjacent pivot 45, the result is mutual bracking, that is, the horizontal series does not sag because of the vehicle series and the vertical series does not buckle or bend because of the horizontal series. There thus results a substantially self-bracing closure which can be solely supported by the rear post mounting if, as and when desired.

Also, all mechanism is concealed within the covering. The biasing permits, see Fig. 3, the hinges to substantially abut so that when collapsed the covering folds retain folded relation, do not contact each other and do not crease.

As previously stated, a lower composite unit B' and A' may be employed but same are actually reversed relative to series A and B, although the same relationship between series A and B is maintained between series A' and B'. As many intermediate series C may be employed as desired or required and all may be interconnected by extended pintles 91 if desired.

The present invention specifically is a simplification and improvement upon the McGuire et al. Patent No. 2,220,939 of November 12, 1940, and the Oberdorfer et al. Patent No. 2,321,507 of June 8, 1943, in that the lazy tongs thereof are not required herein and upon Shearer No. 2,373,146 of April 10, 1945, wherein the lazy tongs are omitted but the hinge plates are difficult to assemble and require special operations and handling since one passes partially through the cooperating hinge and then must be turned only in a predetermined direction for interfitting registration.

The present invention is, as stated, directed to novel, inventive, commercial form of closure hinge mechanism which omits all the disadvantages of the foregoing closures and which retains all the advantages of the same.

While the invention has been illustrated and described in great detail in the drawings and foregoing description, the same is to be considered as illustrative and not restrictive in character.

The several modifications described herein, as well as others which will readily suggest themselves to persons skilled in this art, all are considered to be within the broad scope of the invention, reference being had to the appended claims.

The invention claimed is:

1. In a foldable closure having posts at opposite ends and relatively movable toward and away from each other for collapse and extension respectively, the combination of strap type hinge means of lazy tongs type and having parallel pivotal connections, alternate pivotal connections being disposed substantially in a common plane at all times, said hinge means at opposite ends having pivotal connection to the posts, crossed link means disposed in a plane normal to the plane of action of said hinge means and movable in the said common plane, the said link means including parallel pivotal connections disposed substantially transversely of the common plane, means connecting said alternate pivotal connections to certain of the link connections, other means pivotally connecting the upper extreme ends of said link means, adjacent the hinge means, to the posts and pin and slot connections between each post and the adjacent lower extreme end of said link means, the hinge and link means collapsing and extending in planes transversely to each other.

2. A foldable closure of the character defined by claim 1 wherein there is provided between the posts another pair of hinge and link means similarly connected together and similarly connected to the posts, the last mentioned hinge and link means being reversely positioned relative to the first mentioned hinge and link means.

3. A foldable closure of the character defined by claim 1 wherein there is provided between the posts another pair of hinge and link means similarly connected together and similarly connected to the posts, and an additional strap type hinge means, similar to the one first mentioned and interposed between the pairs of strap type hinge means and similarly secured to the posts.

4. A foldable closure of the character defined by claim 1 wherein there is provided between the posts another pair of hinge means similarly connected together and similarly connected to the posts, the link means being disposed between the pairs of hinge means.

5. A foldable closure of the character defined by claim 1 wherein there is provided between the posts additional hinge and link means similarly connected together and similarly connected to

the posts, the hinge and link means being in a reversed position.

6. In a foldable closure having a lead post structure and a parallel rear post structure, the combination of a horizontally collapsible series of articulated rigid members disposed in a horizontal zone, secured at opposite ends to the structures, and a horizontally collapsible series of articulated rigid members disposed in a vertical zone operatively secured to the series disposed in a horizontal zone and collapsible and extensible therewith.

7. An articulated hinge structure including in combination a plurality of pairs of crossing hinge plates sequentially connected end to end, all hinge plates having a common width and leaf portions of common length, the hinge structure having depth substantially equal to the width of a single hinge plate, each pair of hinge plates having central pivotal connection, a pair of half hinge plates at each extreme end of the sequentially connected and crossed series of plates, means pivotally connecting the remote ends of the half hinge plates to the adjacent ends of the adjacent pair of sequentially interconnected hinge plates, and means pivotally connecting together the adjacent ends of the said half hinge plates and supporting same, at least one side edge of each plate of the crossing plates at its central portion being suitably notched out from that side edge to at least the mid-position for reception of the other plate of the pair of plates.

8. A hinge structure as defined by claim 7 wherein the central pivotal connection between plates comprises semi-cylindrical portions, said portions each partially embracing and seating a hinge pin, the portions being oppositely directed for complete but longitudinally offset envelopment of the hinge pin.

9. An articulated hinge structure including in combination a plurality of pairs of crossing hinge plates sequentially connected end to end, all hinge plates having a common width and leaf portions of common length, the hinge structure having a depth substantially equal to the width of a single hinge plate, each pair of hinge plates having central pivotal connection, a pair of half hinge plates at each extreme end of the sequentially connected and crossed series of plates, means pivotally connecting the remote ends of the half hinge plates to the adjacent ends of the adjacent pair of sequentially interconnected hinge plates, and means pivotally connecting together the adjacent ends of the said half hinge plates and supporting same, each full length hinge plate central portion being notched out at one edge, and the unnotched remainder being slit longitudinally to form at least two superposed portions, each of which includes a semi-cylindrical formation and oppositely directed, the semi-cylinders of each of the two portions enveloping in longitudinally offset relation a hinge pin common to both portions, the semi-cylinders of one plate portion registering in the notching in the other plate.

10. A foldable closure of the character defined by claim 1 wherein there is provided between the posts another pair of hinge and link means similarly connected together and similarly connected

to the posts, the last mentioned hinge and link means being reversely positioned relative to the first mentioned hinge and link means, both hinge means for closure collapse extending equally and oppositely from the common plane.

11. A foldable closure of the character defined by claim 1 wherein there is provided between the posts another pair of hinge and link means similarly connected together and similarly connected to the posts as said first-mentioned hinge and link means, and an additional strap type hinge means, similar to the one first mentioned and interposed between the pairs of strap type hinge means and similarly secured to the posts, all hinge means for closure collapse extending equally and oppositely from the common plane.

12. A foldable closure of the character defined by claim 1 wherein there is provided between the posts another pair of hinge means similarly connected together and similarly connected to the posts as said first-mentioned hinge and link means, the link means being disposed between the pairs of hinge means, both hinge means for closure collapse extending equally and oppositely from the common plane.

13. A foldable closure of the character defined by claim 1 wherein there is provided between the posts additional hinge and link means similarly connected together and similarly connected to the posts as said first-mentioned hinge and link means, the hinge and link means being in reversed position, all hinge means for closure collapse extending equally and oppositely from the common plane.

14. In a foldable closure having a lead post and a parallel rear post, two series of articulated collapsible and extensible rigid members, each series attached at one of its ends to one post and at the other of its ends to the other post, the axis on which the members of one series collapse and extend being in planes normal to the planes of the axis on which the members of the other series collapse and extend, and means operatively connecting the two series together intermediate of their ends.

15. In a folding closure, a first lazy tongs structure horizontally collapsible and extensible in a horizontal plane, a second lazy tongs structure horizontally collapsible and extensible in a vertical plane, pintles for the ends of the members of said structures, some of the pintles of the first and second lazy tongs structures being connected together so that the two lazy tongs structures are caused to collapse and extend equally and simultaneously.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,749,191	Nordel	Mar. 4, 1930
1,907,021	Vansant	May 2, 1933
2,220,939	McGuire	Nov. 12, 1940
2,321,507	Oberdorfer	June 8, 1943
2,373,146	Shearer	Apr. 10, 1945