Jan. 26, 1965 D. S. HARRIS 3,167,111

FOLDING DOOR

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FIG. 1

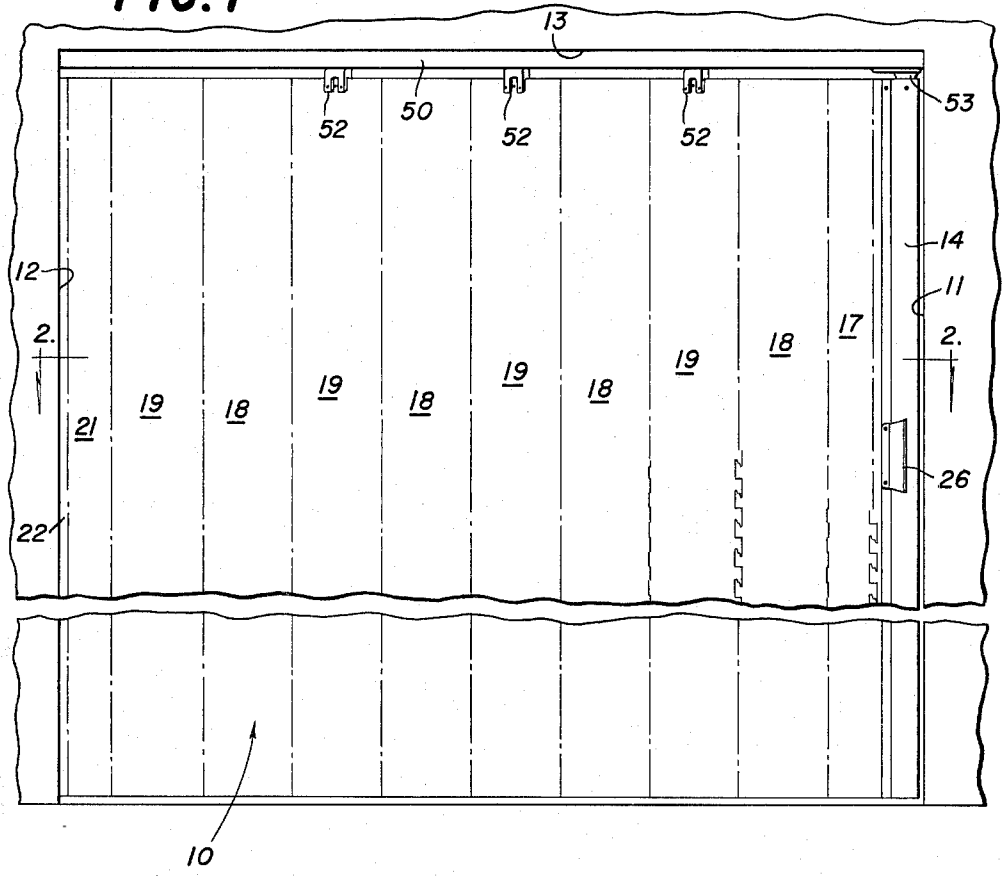
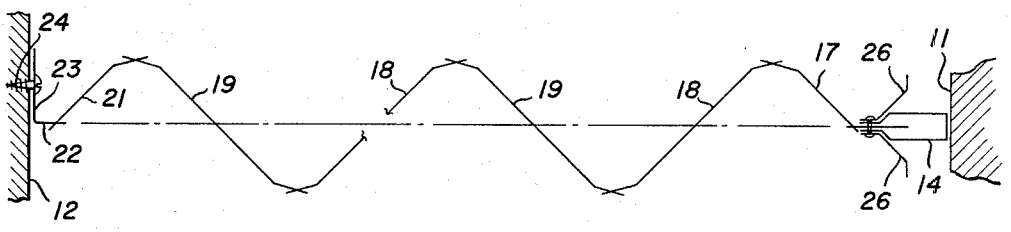


FIG. 2



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FIG. 3

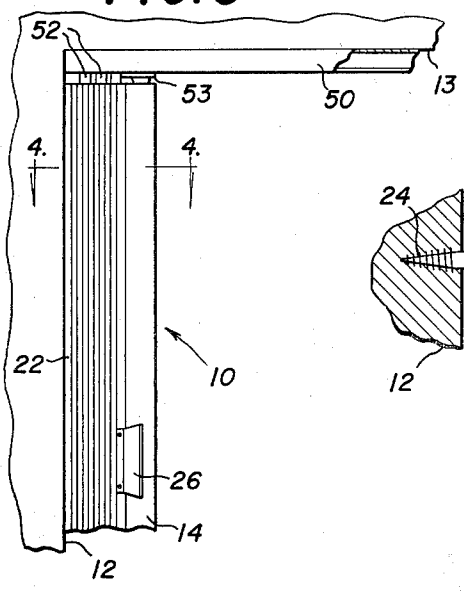


FIG. 4

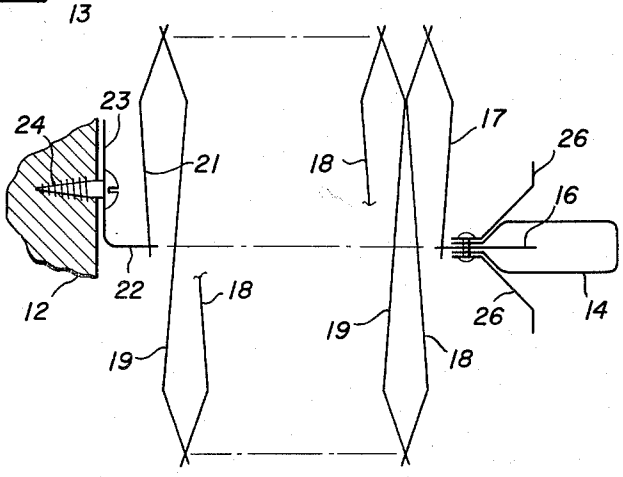


FIG. 5

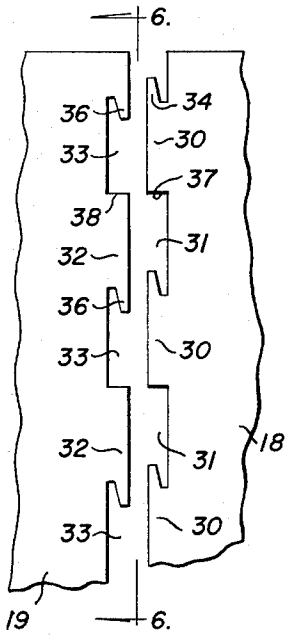


FIG. 6

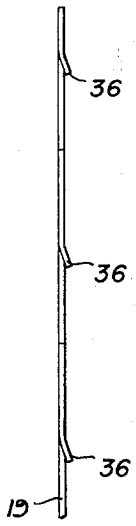


FIG. 7

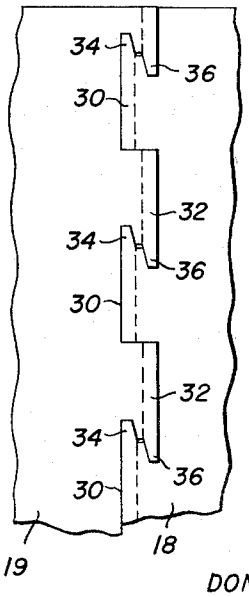
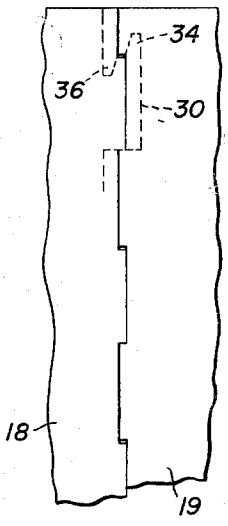


FIG. 8



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FIG. 9

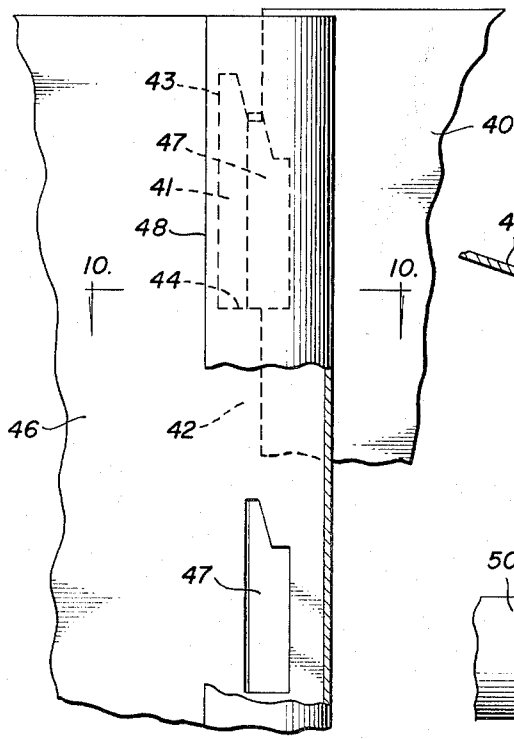


FIG. 10

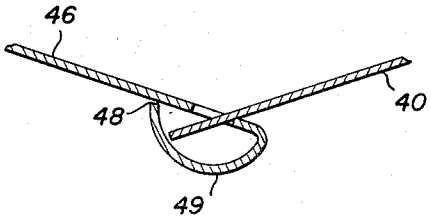


FIG. 11

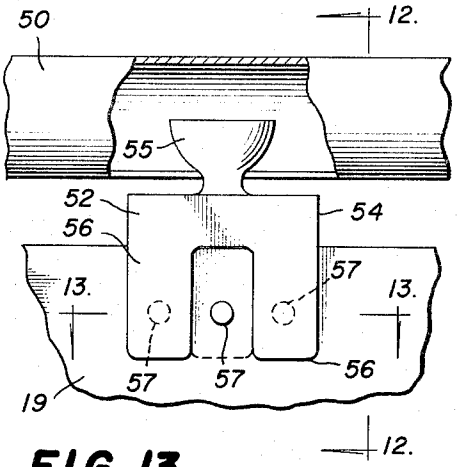


FIG. 12

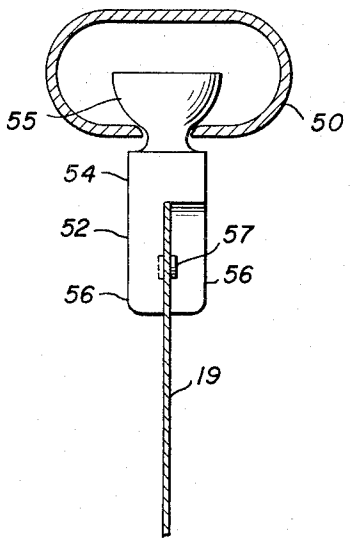
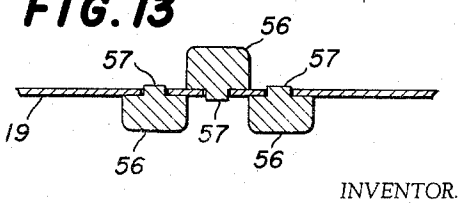


FIG. 13



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United States Patent Office 3,167,111 Patented Jan. 26, 1965

3,167,111

FOLDING DOOR

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Filed Dec. 11, 1962, Ser. No. 243,800
5 Claims. (Cl. 160—183)

This invention relates to a folding door of the type characterized by a plurality of vertically elongated slats disposed in parallel relation and hingedly interconnected at the side edges thereof for accordian-like opening and closing, and more particularly to new and improved means for hingedly interconnecting and suspending the slats of such a door.

It is a primary object of the invention to provide new and improved slats for a folding door of the type described, which slats are adapted to be hingedly interconnected at the side edges thereof without the use of separate hinge members, thereby permitting a folding door to be made at a minimum cost.

It is a further object of the invention to provide new and improved slats for a folding door of the type described, which slats are adapted to be quickly and easily hingedly interconnected and interlocked.

It is a still further object of the invention to provide new and improved slats for a folding door of the type described, which slats permit the economical manufacture of a folding door which is efficient and durable in operation.

It is an even further object of the invention to provide new and improved hanger members for suspending the slats of a folding door of the type described.

These and other objects and advantages of the invention will become apparent from the following specification wherein like numerals refer to similar parts throughout.

In the drawings:

FIG. 1 is an elevation of a folding door embodying the present invention, which door is shown in the unfolded or closed position;

FIG. 2 is a section taken along the line 2—2 of FIG. 1;

FIG. 3 is a fragmentary elevation of the folding door of FIG. 1, which door is shown in the folded or open position;

FIG. 4 is a section taken along the line 4—4 of FIG. 3;

FIG. 5 is an enlarged fragmentary plan view showinng the construction of adjoining side edges of an adjacent pair of slats of the folding door of FIG. 1;

FIG. 6 is an end view taken along the line 6—6 of FIG. 5;

FIG. 7 is an enlarged fragmentary view of the slats of FIG. 6 from one side thereof showing the side edges of these slats hingedly interconnected and interlocked;

FIG. 8 is an enlarged fragmentary view of the slats of FIG. 7 as seen from the other side thereof;

FIG. 9 is an enlarged fragmentary partially broken away view showing a modification of one side edge of one of the slats;

FIG. 10 is a section taken along the line 10—10 of FIG. 9;

FIG. 11 is an enlarged side view of one of the hanger members for suspending certain of the slats of the folding door of FIG. 1;

FIG. 12 is a section taken along the line 12—12 of FIG. 11; and

FIG. 13 is a section taken along the line 13—13 of FIG. 11.

FIG. 1 illustrates a folding door, generally designated

10, embodying the present invention, which door is shown closing a door opening defined by a pair of door jambs 11 and 12 and a door head 13. Proceeding from right to left in FIGS. 1–4, the folding door 10 will be seen to include a lead post 14, which lead post has a vertically elongated plate 16 extending along the inner edge thereof. A half slat 17 is hingedly secured at one side edge thereof to the plate 16. A plurality of full slats 18 and 19 are hingedly secured to each other at the side edges thereof. The full slat 18 nearest the lead post of the door is hingedly interconnected at one side edge thereof to a side edge of the half slat 17, and the full slat 19 farthest from the lead post is hingedly interconnected at the one side edge thereof to a side edge of a half slat 21, which half slat 21 is hingedly interconnected at the other side edge thereof to a leg 22 of a jamb post member 23. The jamb post 23 is fixedly attached, as by a plurality of screws 24, in parallel and flush relation to the door jamb 12. A pair of door pulls 26 are provided one on each side of the lead post 14 adapting the door to be easily grasped for accordion-like opening or closing of the same from either side thereof. Preferably, all of the slats as well as the plate 16 and jamb post 23 are made of lightweight, spring-like, sheet metal material, such as hard tempered aluminum sheet-type 5052. However, the mentioning of this specific material is not to be taken as limiting in that any suitable thin sheet material may be employed in the folding door embodying this invention. The unique construction of the slats adapting them to be hingedly connected at the side edges thereof to each other and to the plate 16 and jamb post 23 will now be described.

FIG. 5 illustrates fragmentary portions of adjoining side edges of adjacent slats 18 and 19. It should be realized that the construction shown in FIG. 5 is typical, i.e., the construction shown for hingedly interconnecting adjoining side edges of adjacent slats 18 and 19 is identical to the construction for hingedly connecting all of the slats to each other as well as the half slats 17 and 21 with the plate 16 and leg 22, respectively. Referring again to FIG. 5, the side edge of the slat 18 will be seen to include a plurality of aligned alternating lugs and recesses or cut-out portions 30 and 31, respectively, spaced therealong. In like manner, the side edge of the slat 19 is provided with aligned alternating lugs and recesses or cut-out portions 32 and 33, respectively, spaced therealong.

The lugs 30 are the same size and shape as the lugs 32 and the recesses 31 are the same size and shape as the recesses 33. Preferably, the recesses, although having the same peripheral configuration as the lugs, are slightly greater in length than the lugs, thereby facilitating interconnection of the slats and permitting free hinging action after the slats have been interconnected. The lugs 30, which are co-planar with an adjacent marginal portion of the slat 18, each include a projection 34, which projection extends from one end of the lug generally longitudinally of the slat. Similarly, the lugs 32 are co-planar with an adjacent marginal portion of the slat 19, and each of the lugs 32 is provided with a projection 36 at one end thereof, which projection extends generally longitudinally of the slat. The end of each of the lugs 30 remote from the projection 34 is defined by a straight edge 37 extending transversely of the lug at a right angle from the side edge of the slat 18. In like manner, each of the lugs 32 is provided at the end thereof opposite the projection 36 with a straight edge 38 extending transversely of the lugs 32. It should be realized that the construction of the side edge of the slat 18 is identical with the construction of the side edge of the slat 19, i.e., rotation of the slat 18 in the plane thereof through 180°

would result in its side edge shown in FIG. 5 appearing as identical with the side edge of the slat 19 illustrated in FIG. 5.

As best viewed in FIGS. 7 and 8, adjacent slats 18 and 19 are hingedly interconnected at adjoining side edges thereof by a reception of the lugs 30 in corresponding recesses 33 and reception of the lugs 32 in corresponding recesses 31. With the lugs and recesses so disposed to each other as illustrated in FIGS. 7 and 8, the straight edges 37 of the lugs 30 are adapted to abut the straight edges 38 of the lugs 32, respectively, while the projections 34 of the lugs 30 interengage the projections 36 of the lugs 32, respectively. This construction prevents relative longitudinal movement between the slats 18 and 19 while permitting hinging action of the slats with respect to each other. Since the recesses are slightly greater in length than the length of the lugs, the lugs are permitted to swing freely within the recesses thereby permitting smooth and easy hinging action of the slats 18 and 19.

As the slats are preferably made of thin, spring-like sheet metal material, they may be hingedly interconnected at the side edges thereof by bending or deforming the lugs to permit their entry into the corresponding recesses. In the preferred form of the invention, the projections of the lugs at one of the adjoining side edges of an adjacent pair of slats are inclined slightly from the plane of the lugs as illustrated in FIG. 6. It will be realized that either the projections 34 or 36 may be so inclined, or all of the projections 34 and 36 may be slightly inclined as shown in FIG. 6. Also, in the preferred form of the invention, marginal portions of the slats 18 and 19 adjacent the lugs and recesses are inclined from the body of the slats as best seen in FIG. 4. With a slat 18 and 19 superimposed with respect to each other in the relationship shown in FIG. 4, inclined marginal portions of the slats adjacent the lugs and recesses at adjoining side edges of slats are pressed into substantial co-extensive contact, i.e., the slats are flattened, with the projections 34 being aligned with the approximate midpoint of the recesses 33 and the projections 36 being aligned with the approximate midpoint of the recesses 31. When the slats are in this relationship, the inclined projections 36 will extend into the planes of the recesses 31. Now, relative longitudinal movement of the slats 18 and 19, e.g., upward movement of the slat 18 and downward movement of the slat 19 as seen in FIG. 5, results in interengagement of the projections 36 with the projections 34, respectively, as the former projections slide along one side of the latter projections. After relative longitudinal movement of the slats is stopped by interengagement of the projections of the lugs as described, opening or spreading of the slats 18 and 19 results in the lugs 30 entering corresponding recesses 33 and the lugs 32 entering corresponding recesses 31. As the slats 18 and 19 are opened, the straight edges 37 of the lugs 30 will be brought into abutting relation with respective straight edges 38 of the lugs 32, thereby effecting an interlock between the slats 18 and 19 at the adjoining side edges thereof.

Interengagement of the projections of the lugs and the abutting relationship of the straight edges of the lugs prevents relative longitudinal movement of the slats and separation of the slats by lateral movement. The slats can be separated only by placing of the marginal portions of the slats adjacent the lugs and recesses into substantial co-extensive contact followed by relative longitudinal movement of the slats. Since these marginal portions are inclined with respect to the body of the slats, flattening of the slats 18 and 19 along substantially the entire length thereof at these marginal portions is necessary before separation of the slats can be accomplished, thereby making inadvertent separation of the slats unlikely.

FIGS. 9 and 10 illustrate a modified form of construction for hingedly interconnecting and interlocking adjoining side edges of adjacent slats, which slats may be used in making the folding door shown in FIGS. 1–4. FIG. 9 shows a fragmentary portion of a slat 40, which slat is provided along a side edge thereof with aligned alternating lugs and recesses 41 and 42, respectively. The lug 41 is provided with a projection 43 at one end thereof and a straight edge 44 at the opposite end thereof. It should be realized that the configuration of the side edge of the slat 40 is identical to the side edge of the slat 18 shown in FIG. 5. A slat 46 adapted to be hingedly interconnected with the slat 40 is provided with aligned openings or cut-out portion 47, which openings are spaced inwardly from the side edge 48 of the slat 46 for defining a vertically elongated lip 49 between the aligned row of openings 47 and the side edge 48. It will be noted that the openings 47 are similar in shape to the recesses 33 shown in FIG. 5. In other words, the slat 46 is the same as the slat 19 except that in the slat 46 the side edge 48 has been extended beyond a vertical line running through the outer edges of the lugs, thereby forming in the slat 46 spaced openings rather than alternating lugs and recesses.

The slats 40 and 46 may be hingedly interconnected and interlocked in the same manner as the slats shown in FIGS. 1 through 8. As noted in FIG. 10, the vertically elongated lip 49 is generally arcuate in cross-section, and the lip forms with one side of the slat 46 a vertically extending enclosed space for reception of the lugs 43 of the slat 40 when the slat 40 and slat 46 are hingedly interconnected. The rounded lip 49 makes the hinged connection at adjoining side edges of adjacent slats 40 and 46 more attractive in appearance by enclosing the lugs 43 extending through the corresponding openings 47.

The invention also relates to a new and improved hanger for suspending the door illustrated in FIGS. 1 through 4 from an overhead track for accordion-like folding and unfolding. In FIGS. 1 and 3 the door 10 is shown suspended from a track 50 by a plurality of hangers 52 and by a lead hanger 53, which lead hanger may be of conventional design. Preferably, the hangers 52 of this invention are provided at every other slat of the door 10, although of course any suitable number of hangers 52 may be provided. As best seen in FIGS. 11 and 12, the track 50 includes a generally tubular member having a slot in the bottom wall thereof, which slot extends for the entire length of the track. The hanger 52 includes a body portion 54 having a rounded head 55 extending from the top thereof, which head is adapted for sliding movement within the track 50. A plurality of staggered fingers 56 depend from the body portion 54. Preferably, three fingers are provided with one of the fingers being adapted for flush engagement with one side of one of the slats and with the other fingers being adapted for flush engagement with the other side of the same slat. The number of fingers illustrated is not to be taken as limiting the invention, as any number of fingers can be provided so long as at least one finger is provided for engagement with each side of the slat to be suspended from the hanger. A stud 57 is provided on each finger 56, which stud projects from the side of the finger in flush engagement with a side of the slat for a distance substantially the same as the thickness of the slat. The slat to be gripped by the hanger 52 is provided with complementarily spaced apertures for receiving the studs 57. The hangers 52 are formed of a material permitting the fingers 56 to be flexed to allow a slat to be received between the fingers. Alignment of the apertures in the slat with the corresponding studs in the fingers will allow the fingers to snap or return to their normal position, thereby resulting in the gripping of a slat in the hanger by engagement of the studs and apertures as best seen in FIG. 13.

It should be apparent that the hangers 52 are simple to construct as they are a one-piece structure. The hangers of this invention permit the rapid and easy suspension of slats of a folding door.

Thus it will be seen that by this invention new and improved slats have been provided, which slats are of unique construction adapting them to be hingedly interconnected at the side edges thereof without the use of separate hinge members, thereby permitting a folding door employing such slats to be manufactured at a minimum cost. Each of the slats may be inexpensively made, and all of the slats making up a folding door may be of identical construction. For example, the slats **19** may be identical with the slats **18**, i.e., inverting of the slats **18** will result in the slats **19**. Further, the new and improved hangers of this invention provides inexpensive but effective means for suspending the slats of a folding door.

While the invention has been shown in but one form it will be obvious to those skilled in the art that it is not to be so limited, but on the contrary it is susceptible of various changes and modifications without departing from the spirit and scope of the appended claims. For example, the construction shown for hingedly interconnecting adjacent slats at the side edges thereof will have utilization in the field of hinges generally, as this construction will have application for forming an articulated joint between two hinge members each of which has a side edge wherein the lugs and recesses may be formed or connected.

I claim:

1. In a folding door of the type characterized by a plurality of vertically elongated slats disposed in parallel relation and hingedly interconnected at the side edges thereof, which slats are formed of sheet material, the construction comprising, adjoining side edges of adjacent first and second of said slats each having aligned alternating lugs and recesses spaced therealong, the lugs of the first slat and the lugs of the second slat being co-planar with adjacent marginal portions of said first and second slats, respectively, each of said lugs being vertically elongated and having a projection at one end thereof and a transversely extending straight edge at the opposite end thereof, all of said projections on said first slat extending in one direction longitudinally of the slats and all of said projections on said second slat extending in an opposite direction longitudinally of the slats, the lugs of said first slat being received in the corresponding recesses in said second slat and the lugs of said second slat being received in the corresponding recesses of said first slat with the straight edges of the lugs of the first slat respectively abutting the straight edges of the lugs of the second slat and with the projections of the lugs of the first slat respectively interengaging the projections of the lugs of the second slat for forming a hinged interlock between said first and second slats to permit folding of the same, and the projections on one of said slats being slightly deflected from the plane of the associated marginal portion to facilitate entry of said lugs into said recesses.

2. In a folding door of the type characterized by a plurality of vertically elongated slats disposed in parallel relation and hingedly interconnected at the side edges thereof for accordion-like folding and unfolding, which slats are formed of sheet material, the construction comprising, adjoining side edges of adjacent first and second of said slats each having aligned alternating lugs and recesses spaced therealong, the lugs of the first slat and the lugs of the second slat being co-planar with adjacent marginal portions of said first and second slats, respectively, said adjacent marginal portions being respectively inclined with respect to the body of said first and second slats for preventing substantial co-extensive contact of said adjacent marginal portions when said first and second slats are in folded relation, each of said lugs having a projection at one end thereof and a transversely extending straight edge at the opposite end thereof, all of said projections on said first slat extending in one direction longitudinally of the slats and all of said projections on said second slat extending in an opposite direction longitudinally of the slats, the slugs of said first slat being received in the corresponding recesses in said second slat and the lugs of said second slat being received in the corresponding recesses in said first slat with the straight edges of the lugs of the first slat respectively abutting the straight edges of the lugs of the second slat and with the projections of the lugs of the first slat respectively interengaging the projections of the lugs of the second slat for forming a hinge interlock between said first and second slats to permit folding of the same, said first and second slats being adapted to be flattened for placing said adjacent marginal portions into substantial co-extensive contact with each other.

3. In a plurality of hingedly interconnected elongated sheet members, the construction comprising, adjoining longitudinal edges of adjacent first and second of said sheet members each having aligned alternating lugs and recesses spaced therealong, each of said lugs having a projection at one end thereof and a straight edge at the opposite end thereof, all of said projections on said first sheet member extending in one direction longitudinally of the members and all of said projections on said second sheet member extending in an opposite direction longitudinally of the members, the lugs of said first sheet member being received in the corresponding recesses in said second sheet member and the lugs of said second sheet member being received in the corresponding recesses in said first sheet member with the straight edges of the lugs of the first sheet member respectively abutting the straight edges of the lugs of the second sheet member and with the projections of the lugs of the first sheet member respectively interengaging the projections of the lugs of the second sheet member for forming a hinged interlock between said first and second sheet members to permit folding of the same.

4. In a folding structure of the type characterized by a plurality of elongated slats disposed in parallel relation and hingedly interconnected at the longitudinal edges thereof, the construction comprising, adjacent first and second of said slats having contiguous longitudinal edges, said edge of the first slat having aligned alternating lugs and recesses spaced therealong and the second slat having aligned openings spaced inwardly of said side edge thereof, each of said lugs having a projection at one end thereof and a straight edge at the opposite end thereof, all of said projections extending in the same direction longitudinally of the slats, the lugs of said first slat being received in the corresponding openings in said second slat with the straight edges of the lugs respectively abutting one end of the openings and with said projections respectively interengaging the other ends of the openings for forming a hinged interlock between said first and second slats to permit folding of the same, the marginal portion of said second slat between said openings and said edge thereof being bent over for enclosing said lugs when said first and second slats are interlocked.

5. In a folding structure of the type characterized by a plurality of elongated slats disposed in parallel relation and hingedly interconnected at the longitudinal edges thereof, the construction comprising, adjacent first and second of said slats having contiguous longitudinal edges, said edge of the first slat having aligned alternating lugs and recesses spaced therealong, substantial portions of said lugs being coplanar with the marginal portion of said first slat which includes said edge thereof, said edge of the second slat having aligned cut-out portions spaced therealong, each of said lugs having a substantially coplanar projection at one end thereof extending generally longitudinally of the slats and a straight edge at the opposite end thereof extending generally transversely of the slats, all of which projections extend in a common direction, each of said cut-out portions having opposite ends aligned longitudinally of the slats, the lugs of said first slat being received in the corresponding cut-out portions in said second slat with the straight edges of the lugs respectively abutting one end of the cut-out portions and with the projections of the lugs respectively engaging the

other end of the cut-out portions for forming a hinged interlock between said first and second slats to permit folding of the same.

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