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UNITED STATES PATENT OFFICE

AUTOMATIC SHIRT FOLDER

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10 Claims. (Cl. 223—37)

1 The invention relates to novel and improved means for automatically folding garments such as shirts and the like. The invention constitutes an improvement over that disclosed in my copending application, Serial No. 188,876, filed September 26, 1950, for Shirt Folder, now Patent No. 2,629,519, dated February 24, 1953. Said copending application discloses novel means for folding a shirt whereby the folding operation begins substantially simultaneously from two opposed locations, usually near the sleeve ends or cuffs. The operation then progresses inwardly, being executed by cooperating pairs of opposed, hinged members swinging inwardly so as to carry progressively folded portions inwardly therewith, and fold such portions along fold lines established by such hinged members. This characteristic of the operation of the means disclosed in my aforesaid copending application is necessarily quite brief, but the operation of the novel means herein to be described is associated with the same general scheme and will be described in detail below.

An object of the present invention is to provide means insuring a more smooth and uniform motion of the folding members than heretofore obtainable.

A further object of the present invention is to substantially reduce certain components of the swinging movement of the folding members, which were heretofore effective in a generally vertical direction on the garment part being folded, and to cause said swinging movement to become effective mainly in a horizontal direction during folding contact with the garment so as to guide the garment portion being folded instead of throwing it, as heretofore.

A further object of the invention is to control and synchronize the folding movements of the opposed folding members so that a smoother and neater folded assembly is achieved.

A further object of the invention is to provide novel and improved collar supporting and retaining means whereby a shirt collar portion is maintained in desired positional relationship to the rest of the shirt during folding thereof.

Other objects and advantages will be apparent from a study of the following specification, in conjunction with the accompanying drawings, wherein:

Fig. 1 is a side elevational view of a folding machine embodying my invention, the operator’s position being at the left, and the front, rear and sides of the machine being shielded by a conventional sheet metal housing. A shirt is draped with body portion on the inclined top, and with sleeves hanging downwardly over opposed right and left sides of the machine.

Fig. 2 is a schematic showing of the two pairs of swingable folding members indicating the relative lateral and vertical spacing of their pivotal axes.

Fig. 3 is a rear view, somewhat enlarged and with the housing removed, showing mainly the operating mechanism for the folding members.

Fig. 4 is a detail view of part of the mechanism shown in Fig. 3.

Fig. 5 is a top plan view of the machine showing mainly the initial disposition of the folding members, with a shirt in place prior to starting of the folding operation.

Fig. 6 is a vertical sectional view taken on the line 6—6 of Fig. 5.

Fig. 7 is a top plan view of the collar supporting and retaining means, hereinafter generally referred to as a collar block, which is indicated in broken line in Fig. 5, just above center.

Fig. 8 is a bottom view, looking upward from beneath the collar block, to show the operating mechanism for said collar block.

Fig. 9 is an enlarged vertical sectional view taken on the line 9—9 of Fig. 7.

Fig. 10 is a view in side elevation, of a portion of the shirt tail folding means, and associated control devices.

Figs. 11 and 12 show sequential positions in the folding cycle of a plain cuff shirt.

Fig. 13 shows an intermediate position in the folding cycle of a French cuff shirt.

Fig. 14 shows the fluid power circuits, control elements, and fluid motor means for the operation of the various moving parts of the folding machine.

Referring first to Fig. 1 for a general characterization of the folding machine, there is shown a front housing and guard wall 10 having integral wing portions 10a extending along the sides part way towards the rear. The top 12 of the machine is slightly inclined downwardly towards the operator’s position, at the left, and a shirt 13 is draped on the top with its right sleeve 14 hanging downwardly along the side wall 11. A rear housing 15 may conveniently be provided with an upper, forwardly extending part 15a for any suitable purpose, such as to hold a stack of folded shirts, and/or a pile of cardboard stiffeners, etc.

Beneath housing 15 there is a tail folding blade 16 (Figs. 1 and 5) carried on a pair of opposed arms 17 (Figs. 1 and 10) as will hereinafter
be more particularly described. This blade is adapted to execute a transverse fold of the shirt tail portion.

A pair of folding arms 20 and 21 (Figs. 2, 5, 11, 12, and 13) are mounted for swinging movement along respectively opposed sides of the machine, on axes generally parallel to the sides of the machine, and substantially below the plane of the lay-out position of the shirt body. A pair of folding wings 22 and 23 are mounted for rotation on spaced axes above and within the axes of rotation of the arms. As will be apparent from Fig. 5, the shirt body 13 is arranged on the lay-out table with its sleeves 14 and 15 over the arms 20 and 21 above mentioned, but with its body portion beneath the wings 22 and 23. The arms and wings will occasionally be referred to as the folding assembly, since the several longitudinal folds are achieved by inward swinging movement of the arms and wings in a predetermined sequence.

To permit initial disposal of the shirt in the position shown in Fig. 5 the arms 20 and 21 are below the level of the lay-out position, but the wings 22 and 23 are upwardly tilted as shown in Fig. 2. When folding 22 being driven directly behind wing 23 in said figure. Lowering the wing assembly to contact with the shirt body initiates the various folding operations, beginning with swinging movement of the tail folder, and following with folding movement of the folding assembly comprising the arms and wings.

For simplicity, and ready reference as a logical foundation for the detailed explanation of the mounting and structure of the various operating elements the succession of events in the folding operation is as follows.

The operator places the shirt, button strip, scissors, and collar in a normally contracted collar block, and then manually permits release of biasing means so as to expand the collar block to grip the collar. The operator then presses down the folding wings from the position of Fig. 1 to that of Fig. 5 which movement actuates mechanism effective to initiate the various folding movements in the following order: the tail folder swings forward; tail holding means retains the folded tail while the tail folder swings back; the arms swing in proper sequence to the position of Fig. 11; the wings swing in proper sequence to the position of Fig. 12; the operator may here apply a binding strip around the shirt; the operator steps on a foot treadle 24 (Figs. 1 and 10) and the folding assembly comprising the arms and wings, with the shirt folded, thereof, swings to an angularly uplifted position; the shirt is slipped forwardly off the folding assembly; the operator removes her foot from the treadle, and the wings and arms unfold; the arms swing down to their original idle position; it completes the cycle.

The various folding elements including the tail folder, the tail holder, the arm-and-wing folding assembly, and the collar block, will now be described in detail.

The tail folder comprises a transverse blade 15 (Figs. 2, 5, and 8) extending all the way across the width of the table, but when idle occupying the retracted position of Fig. 1. It is carried by tubular legs 17 on each side, which may be connected near the bottom by a transverse stiffener. The assembly is pivoted at 26 (Fig. 10) on the bottom frame member 27. The tail folder is operated by a double acting air motor 28 which has a piston rod 23 pivoted to the assembly. A description of the operation of motor 28 will be given later.

The tail holder cooperates with the tail folder by retaining the folded tail when the tail folder swings back to idle position. It comprises an upper plate 32 secured to legs 32a, which legs are pivotally mounted at 32b on a lower plate 33 (Figs. 1, 4, 5, 6). Small coil springs 34 maintain the upper plate in contact with the lower plate. At the lower end a rocker member 35 freely mounted on a main supporting shaft 36 which in turn is supported at its ends in main bearings 37 fixed on the frame. Operating means for the tail holder includes a depending arm 36 (Fig. 6) having at its lower end a pin 33. The arm is biased downwardly by a tension spring 40. The pin 39 rests on the top end of a leg 41a of a camming lever 41, said member having another leg 41b the legs defining therebetween a slot 41c into which pin 33 may drop under certain operating conditions. The lever 41 is pivoted at 44 on a shaft 45, and is operable by means of a pivotal connection at 46 with the end of a piston rod 47 of a fluid motor 48.

In idle position the tail holder is elevated, as shown in Fig. 5, the pivot of motor 49 being in retracted position under the bias of a spring 53 (Fig. 14). As will appear, movement of the tail folding blade actuates motor 49 so as to rock camming lever 41 clockwise, whereupon pin 33 drops into slot 41c, and camming action of the leg 41b effective on lever arm 50 swings the tail holder down on the shirt tail above the folder blade which has just effected its folding stroke. When the blade 16 retracts, the spring pressed upper tail holding plate 33 cooperates with the lower plate 35 to hold the shirt tail.

A cardboard 42 may be removably disposed in slips 80 on a member 51 which has forwardly extending legs 51a, 51b. When the tail folding blade swings to its forward position, the tail is tucked to a fold with one fold at a line established by the terminal edges of the cardboard 52 and the wings 22 and 23. The second fold tucked beneath the tail holder 31. The cardboard need not be used, but if used serves as a stiffener after the shirt is removed from the folding assembly.

As heretofore stated, the longitudinal folds are executed by a folding assembly comprising the arms 20 and 21 and the wings 22 and 23. The wings are similarly mounted, and a description of one will suffice for both. Wing 23 has fixed thereto a short shaft 54 journaled in bearings 55 on a carrier rod 56 which is freely tiltable around the main shaft 56 heretofore described. Attached to the shaft 54 is a gear segment 57 in mesh with another segment 58. Driving of segment 58 will later be described, it being sufficient here to state that driving of segment 57 produces swinging movement of the wing. As shown in Fig. 3, corresponding operating elements for the other wing are identified by the numbers 54a, 57a and 58a.

Wing carrier 56 has an arm 58c depending therefrom, and pivotally connected to a pivot block 52 on rod 53. Rod 53 has a pivot block 59 mounted on a pin 60 on the frame. A compression spring 61 on rod 53 bears against both pivot blocks, giving the toggle an over center action to hold the wing assembly either tilted upwardly, or down to the lay-out level. Swingably carried on pin 60 is a yoke member 74 having its respective legs 64a and 64b provided with adjustable abutment screws 65 as limit stops. The legs 64a and 64b function to operate the
plunger 82 of a slide type air valve 65 to either of two positions, corresponding respectively to the up and down position of the wing assembly, as will appear. The wing assembly is therefore freely rockable around main shaft 36.

The arm supporting means will now be described. The arms 20 and 21 are carried on a rearwardly disposed arm supporting member 67 (Figs. 3 and 6) which has a pair of mounting brackets 68 having bearings 69 thereon for rotation of member 67 around shaft 36. Control of such rotation is effected by a piston rod 70 of a hydraulic type pump 71 which, when the piston is energized, tends to swing member 67 counterclockwise (Fig. 6), this tendency being resisted by a spring 74 attached to member 67 and to the front of the frame, so as to bias the said member 67 counterclockwise when motor 71 is open to exhaust. Arm-carrying member 67 is located in the position shown in Fig. 6 by means of a latch lever 75 pivoted to member 67, which lever has a notch 76 in its lower surface fitting over a pin 77 or other member fixed to the frame. Obvi-ously the spring 74 opposes movement of member 67 when latched as shown. Disengagement of the latch lever is effected by a plunger 78 movable upwardly upon energization of fluid power motor 71.

Arms 20 and 21 are swingably carried on member 67. The arms are constructed and mounted similarly, and description of one will suffice. Arm 21 is fixed to a short shaft 50 journaled in member 67, and shaft 45 has fixed at its end a pinion 51 which is in mesh with a gear segment 52 pivoted at 53. It will be apparent that rotation of segment 52 produces swinging movement of arm 21, the segment being driven by means soon to be described. The other arm 20 is likewise driven through pinion 51a and segment 52a.

Motive power for the arms and wings is supplied from a main drive double acting fluid motor 85 carried on member 67 and effective, through a piston rod 87, to raise and lower a carriage 53 which has thereon two pairs of driving rollers on respectively opposed faces of the carriage. The carriage 53 has two rods 88 and 89a elastically guided in bearings 91 and 91a in member 67. The outermost pair of driving rollers 89 and 89a (Fig. 3) are effective, when the carriage is moved upwardly, to engage cut-out portions 90 and 90a of respective internal gears 82 and 82a so as to cause inward swinging of respective arms 20 and 21.

The operation, of course, is reversible upon downward movement of the carriage. It will be noted that rollers 89 and 89a are at different levels on the carriage, so that 89 will engage and operate first and 89a slightly ahead of the former, for the purpose of disengagement of roller 89a and segment 82a. A pair of rollers 92 and 92a on the inner side of the carriage are similarly disposed, upon movement of the carriage, to engage and rotate gear segments 85a and 86a so as to swing arms 20 and 21 at slightly spaced moments of time, and subsequent to the swing of arms 21 and 20, the actual sequence being arm 21, arm 20, wing 23 and wing 22, as will be evident from Figs. 5, 11 and 12.

When the latch lever 15 is disengaged, as hereinafter described, and spring 74 swings arm carry-
in the supporting plate 106. Two additional carriers 107 and 108 are movable transversely in respective slots 109 and 110 and have secured thereto two block bands 111 and 112. The carriers 107 and 108 are suitably grooved to receive the ends of band 111 and 112 in alignment relationship, while bands 111 and 112 slide respectively in front and back of a thin fixed wall 113, while an upturned portion of a fixed bracket 114 lies in front of band 111. Wall 113 has a turned-over lip 115a along its top edge which effectively retains the collar on the block.

Referring to Fig. 8, the piston rod 115 is connected to a slide bar 117 which moves carrier 104 directly secured thereto, and has a loose linkage connection with bell crank 118 and 119 which respectively operate carriers 105 and 107.

Certain additional operating elements will be described in connection with the following description of the fluid power circuits, the preferred fluid in the present embodiment being compressed air.

Air entering at A (Fig. 14) proceeds by way of pipe 120, valve 121 and pipe 122 to motor 100 which maintains the collar block in contracted condition. The air also flows through pipe 123 to the inlet of valve 66, and through this valve by pipe 124 to a normally open valve 125 and thence through pipe 126 to the top of main folding motor 96, and also through pipe 127 to a servomotor 128 (in Fig. 10 servomotor 128 is shown with its air cut off) which has tripped a device to allow normally closed combination valve 145 to close. Pipe 130 is supplying air to the inlet of a slide valve 131 and through this by pipe 132 to air motor 71 which holds the arm-carrying frame 67, in the arms-down position.

The operator now lays out a shirt, as indicated in Fig. 1, and presses manual button 135, best seen in Fig. 6, moving bell crank leverage 136 which is pivoted on a bracket 137 and has a forked end engaging a pin in the stem of valve 121. This moves the stem to the left, cutting off air to motor 106, so as to allow spring 101 to expand the collar block.

The operator next swings wings 22 and 23 down on the shirt, the over-center device 56a, 53 holding them in the down position. The tail holder 32, 33 does not lower all the way, but is held elevated by rocker lever pin 59 resting on leg 44a. Lowering of the folding wings has caused valve 85 to shift the stem of valve 66 to the left initiating the folding operation.

Air is now cut off to the top of folding motor 56, trip servomotor 128, and motor 71, but latch 75 (Fig. 6) continues to hold frame 57 when motor 71 is cut off. Air goes by pipes 130 and 135 to inlet of slide valve 140, and thence by pipe 141 to the bottom of motor 28. Air also proceeds by pipe 142 to combination valve 143 (usually kept open) and by pipe 144 to the inlet of a normally closed combination valve 145 where it is temporarily stopped. Motor 28 has operated; however, swinging the tail folder forward, and as the latter approaches its limit of forward travel an abutment 146 contacts a pivoted operating member 147 (Fig. 10) which shifts slide valves 131 and 140 to the right. Air has already been cut off to valve 131. Valve 140 now cuts off air to the bottom of tail folder motor 26 and introduces it to the top thereof by pipes 148 and 149. At the same time air goes through pipe 150 to motor 48 which acts to press down the tail holder as previously described (Fig. 6).

When the tail folder moved forward another abutment screw 156 (Fig. 10) moved out from under an abutment member 157 pivoted at 158 on another piece 159 which in turn is pivoted at 160 on a bracket 161 on the frame. A spring 162 pulled block 157 down, leg 163 resting on member 159 and 160 and the line in alignment relationship, while bands 111 and 112 slide respectively in front and back of a thin fixed wall 113, while an upturned portion of a fixed bracket 114 lies in front of band 111. Wall 113 has a turned-over lip 115a along its top edge which effectively retains the collar on the block.

Referring to Fig. 8, the piston rod 115 is connected to a slide bar 117 which moves carrier 104 directly secured thereto, and has a loose linkage connection with bell crank 118 and 119 which respectively operate carriers 105 and 107.

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The operator now lays out a shirt, as indicated in Fig. 1, and presses manual button 135, best seen in Fig. 6, moving bell crank leverage 136 which is pivoted on a bracket 137 and has a forked end engaging a pin in the stem of valve 121. This moves the stem to the left, cutting off air to motor 106, so as to allow spring 101 to expand the collar block.

The operator next swings wings 22 and 23 down on the shirt, the over-center device 56a, 53 holding them in the down position. The tail holder 32, 33 does not lower all the way, but is held elevated by rocker lever pin 59 resting on leg 44a. Lowering of the folding wings has caused valve 85 to shift the stem of valve 66 to the left initiating the folding operation.

Air is now cut off to the top of folding motor 56, trip servomotor 128, and motor 71, but latch 75 (Fig. 6) continues to hold frame 57 when motor 71 is cut off. Air goes by pipes 130 and 135 to inlet of slide valve 140, and thence by pipe 141 to the bottom of motor 28. Air also proceeds by pipe 142 to combination valve 143 (usually kept open) and by pipe 144 to the inlet of a normally closed combination valve 145 where it is temporarily stopped. Motor 28 has operated; however, swinging the tail folder forward, and as the latter approaches its limit of forward travel an abutment 146 contacts a pivoted operating member 147 (Fig. 10) which shifts slide valves 131 and 140 to the right. Air has already been cut off to valve 131. Valve 140 now cuts off air to the bottom of tail folder motor 26 and introduces it to the top thereof by pipes 148 and 149. At the same time air goes through pipe 150 to motor 48 which acts to press down the tail holder as previously described (Fig. 6).

When the tail folder moved forward another abutment screw 156 (Fig. 10) moved out from under an abutment member 157 pivoted at 158 on another piece 159 which in turn is pivoted at 160 on a bracket 161 on the frame. A spring 162 pulled block 157 down, leg 163 resting on member 159 and 160 and the line in alignment relationship, while bands 111 and 112 slide respectively in front and back of a thin fixed wall 113, while an upturned portion of a fixed bracket 114 lies in front of band 111. Wall 113 has a turned-over lip 115a along its top edge which effectively retains the collar on the block.
extend up, with clearance, through holes in the wings, so that the wings will strip the cuffs from their sleeve. The operator folds and arranges the cuffs, and then valve 143 is shifted by the operator, whereupon the regular folding sequence resumes.

What I claim is:
1. Folding means of the character described comprising a frame, a folding table carried by said frame, a wing support and an arm support carried by said frame, a pair of folding wings having respective axes of swing on said wing support, said axes of swing of said wings being approximately at the level of said table, a pair of folding arms having respective axes of swing on said arm support, the axes of swing of said arms being substantially below the level of said table, the wing axes being spaced to permit the wings to swingably converge inwardly to superposed folded registry and to diverge outwardly to unfolded position, the arm axes being spaced to permit the arms to be swung inwardly to folded position between the wing axes, and outwardly to an unfolded position beyond said wings, whereby, when said wings and arms are in unfolded position with the body portion of a shirt beneath said wings and with said arms beneath the skirt sleeves, sequential folding movement first of said arms and then of said wings folds the skirt longitudinally.
2. Folding means of the character described comprising a frame, a folding table carried by said frame, a wing support and an arm support carried by said frame, a pair of folding wings having respective axes of swing on said wing support, said axes of swing of said wings being approximately at the level of said table, a pair of folding arms having respective axes of swing on said arm support, the axes of swing of said arms being substantially below the level of said table, the wing axes being spaced to permit the wings to swingably converge inwardly to superposed folded registry and to diverge outwardly to unfolded position, the arm axes being spaced to permit the arms to be swung inwardly to folded position between the wing axes, and outwardly to an unfolded position beyond said wings, whereby, when said wings and arms are in unfolded position with the body portion of a shirt beneath said wings and with said arms beneath the skirt sleeves, sequential folding movement first of said arms and then of said wings folds the skirt longitudinally, the arc of swing of each said arm having the arcuate portion thereof above the table level, said arcuate portion being disposed in a direction substantially at right angles to the afore said axes of tilt, means for tilting said wing support independently of said arm support, the axes of swing of said wings being spaced to permit said wings to swingably converge to superposed folded registry, and to diverge outwardly to unfolded position, the axes of swing of said arms being spaced to permit said arms to be swung inwardly to folded position within the axes of swing of said wings, said axes of swing of said wings being approximately at the level of said table, said axes of swing of said arm being substantially below the level of said table.
3. Folding means of the character described comprising a folding table, an arm support tiltable on an axis fixed with respect to said table, a wing support also tiltable on an axis fixed with respect to said table, a right and a left folding arm having respective axes of swing carried by said arm support, a right and a left folding wing having respective axes of swing carried by said wing support, both the wing axes of swing and the arm axes of swing being disposed in a direction substantially at right angles to the afore said axes of tilt, means for tilting said wing support independently of said arm support, the axes of swing of said wings being spaced to permit said wings to swingably converge inwardly to superposed folded registry, and to diverge outwardly to unfolded position, the axes of swing of said arms being spaced to permit said arms to be swung inwardly to folded position within the axes of swing of said wings, said axes of swing of said wings being approximately at the level of said table, said axes of swing of said arm being substantially below the level of said table.
4. Folding means of the character described comprising a folding table, an arm support tiltable on an axis fixed with respect to said table, a wing support also tiltable on an axis fixed with respect to said table, a right and a left folding arm having respective axes of swing carried by said arm support, a right and a left folding wing having respective axes of swing carried by said wing support, both the wing axes of swing and the arm axes of swing being disposed in a direction substantially at right angles to the afore said axes of tilt, means for tilting said wing support independently of said arm support, the axes of swing of said wings being spaced to permit said wings to swingably converge inwardly to superposed folded registry, and to diverge outwardly to unfolded position, the axes of swing of said arms being spaced to permit said arms to be swung inwardly to folded position within the axes of swing of said wings, said axes of swing of said wings being approximately at the level of said table, said axes of swing of said arm being substantially below the level of said table.
5. Folding means of the character described comprising a folding table, an arm support tiltable on an axis fixed with respect to said table, a wing support also tiltable on an axis fixed with respect to said table, a right and a left folding arm having respective axes of swing carried by said arm support, a right and a left folding wing having respective axes of swing carried by said wing support, both the wing axes of swing and the arm axes of swing being disposed in a direction substantially at right angles to the afore said axes of tilt, means for tilting said wing support independently of said arm support, the axes of swing of said wings being spaced to permit said wings to swingably converge inwardly to superposed folded registry, and to diverge outwardly to unfolded position, the axes of swing of said arms being spaced to permit said arms to be swung inwardly to folded position within the axes of swing of said wings, said axes of swing of said wings being approximately at the level of said table, said axes of swing of said arm being substantially below the level of said table.
6. Folding means of the character described comprising a folding table, an arm support tiltable on an axis fixed with respect to said table, a wing support also tiltable on an axis fixed with respect to said table, a right and a left folding arm having respective axes of swing carried by said arm support, a right and a left folding wing having respective axes of swing carried by said wing support, both the wing axes of swing and the arm axes of swing being disposed in a direction substantially at right angles to the afore said axes of tilt, means for tilting said wing support independently of said arm support, the axes of swing of said wings being spaced to permit said wings to swingably converge inwardly to superposed folded registry, and to diverge outwardly to unfolded position, the axes of swing of said arms being spaced to permit said arms to be swung inwardly to folded position within the axes of swing of said wings, said axes of swing of said wings being approximately at the level of said table, said axes of swing of said arm being substantially below the level of said table.
axes of tilt, means for tilting said wing support independently of said arm support, the axes of swing of said wings being spaced to permit said wings to swingably converge inwardly to superposed folded registry, and to diverge outwardly to unfolded position, the axes of swing of said arms being spaced to permit said arms to be swung inwardly to folded position within the axes of swing of said wings, said arm support and said wing support having a common axis of tilt, said axes of swing of said wings being approximately at the level of said table, said axes of swing of said arms being substantially below the level of said table, the arc of swing of each said arm having the arcuate portion thereof above table level defining arm movement mainly in a horizontal direction toward folded position.

7. Folding means of the character described comprising a frame, a folding table carried on said frame, a pair of spaced bearings fixed with respect to said table, a shaft rotatably carried in said bearings, a wing support on said shaft for free rotation thereon, an arm support journaled for free rotation on said shaft, a pair of folding wings having respective axes of swing on said wing support, a pair of folding arms having respective axes of swing on said arm support, the wings and arms being spaced to permit the wings to swingably converge inwardly to superposed folded registry, and to diverge outwardly to unfolded position, the arm axes being spaced to permit the arms to be swung inwardly to folded position between the wing axes, and outwardly to an unfolded position beyond said wings, the wing axes being approximately at the level of said table, the arm axes being substantially below the level of said table, each said arm and wing having a respective shaft fixed thereto for rotation in said respective axis of swing, and each such shaft having a pinion thereon, a mounting plate carried on said arm support, and power driven means carried on said mounting plate for generally up-and-down movement, said power driven means being adapted to operatively engage and rotate each said pinion in chronological sequence whereby to cause folding motion of said arms and wings in like sequence, the arc of swing of each said arm having the arcuate portion thereof above table level defining arm movement mainly in a horizontal direction toward folded position.

8. Folding means of the character described comprising a frame, a folding table carried on said frame, a pair of spaced bearings fixed with respect to said table, a shaft rotatably carried in said bearings, a wing support on said shaft for free rotation thereon, an arm support journaled for free rotation on said shaft, a pair of folding wings having respective axes of swing on said wing support, a pair of folding arms having respective axes of swing on said arm support, the wing axes being spaced to permit the wings to swingably converge inwardly to superposed folded registry, and to diverge outwardly to unfolded position, the arm axes being spaced to permit the arms to be swung inwardly to folded position between the wing axes, and outwardly to an unfolded position beyond said wings, the wing axes being approximately at the level of said table, each said arm and wing having a respective shaft fixed thereto for rotation in said respective axis of swing, and each such shaft having a pinion thereon, a mounting plate carried on said arm support, and power driven means carried on said mounting plate for generally up-and-down movement, said power driven means being adapted to operatively engage and rotate each said pinion in chronological sequence whereby to cause folding motion of said arms and wings in like sequence.

EDMUND N. NECKEL.

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