

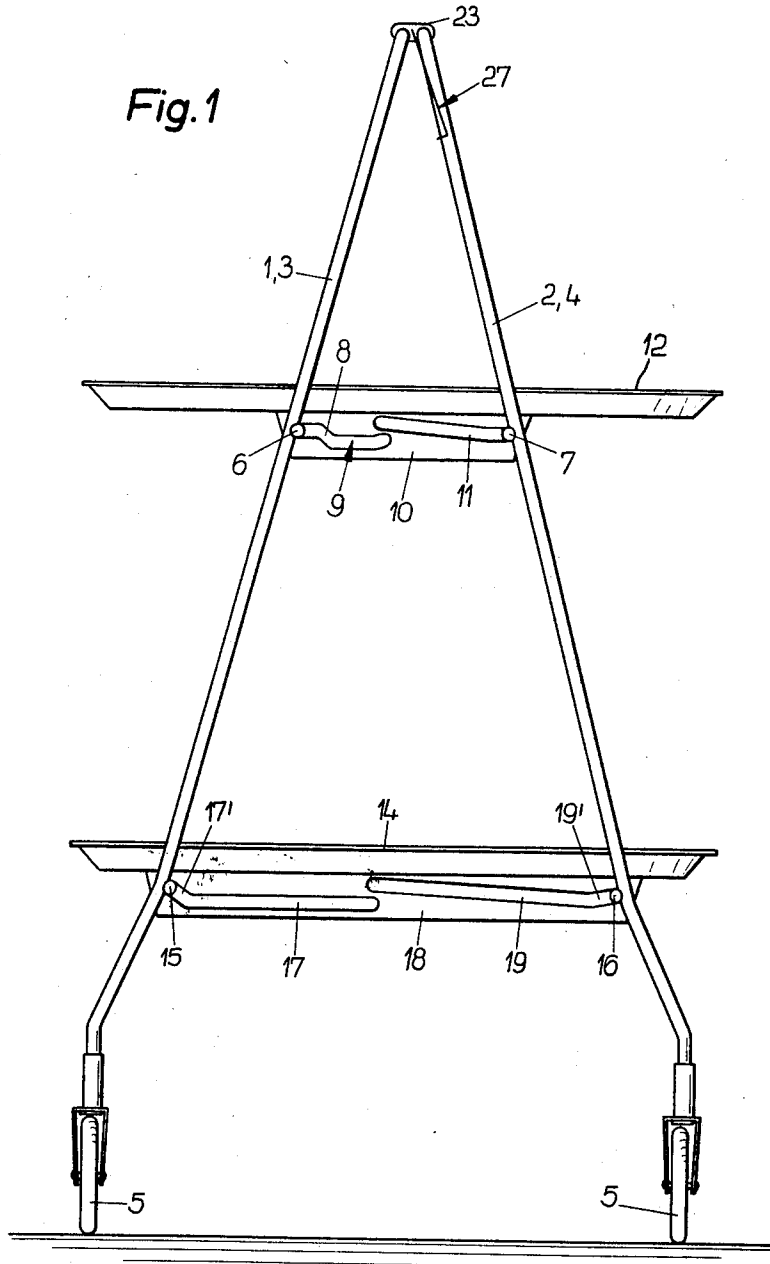
Feb. 3, 1970

F. BUSSE ET AL
COLLAPSIBLE AND EXPANDABLE TRAY ASSEMBLIES
FOR TRANSPORTING AND SERVING ARTICLES

3,492,953

Filed June 4, 1968

5 Sheets-Sheet 1



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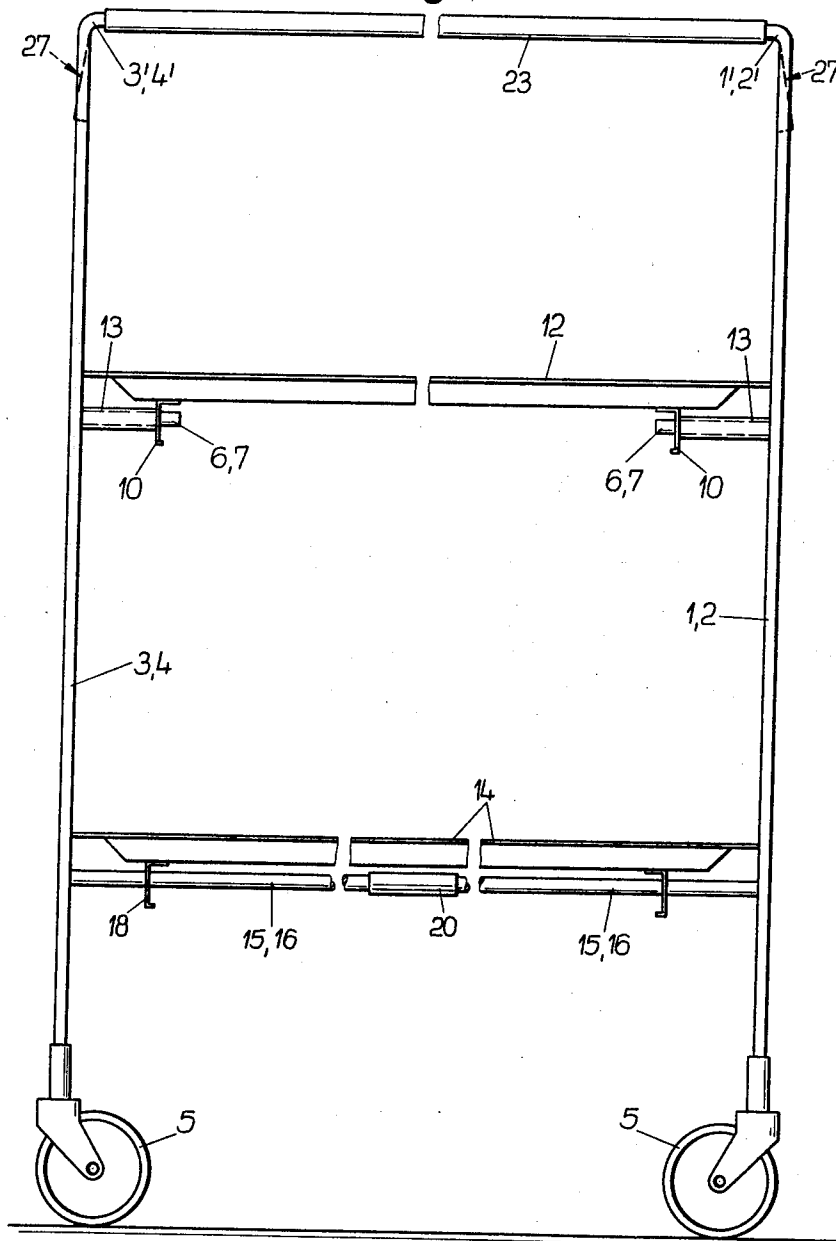
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Fig. 2



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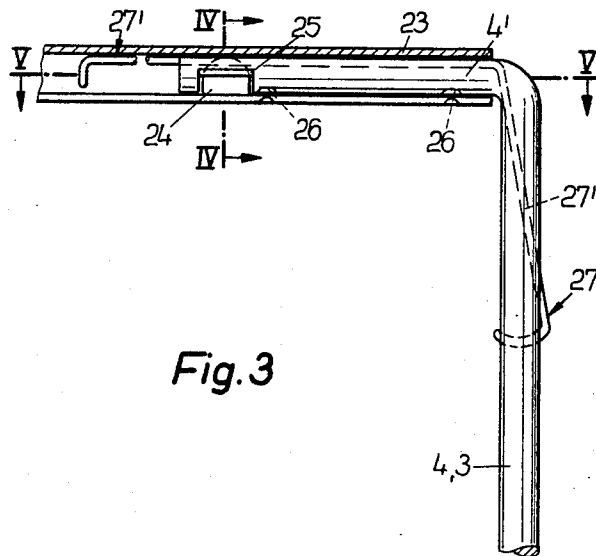


Fig. 3

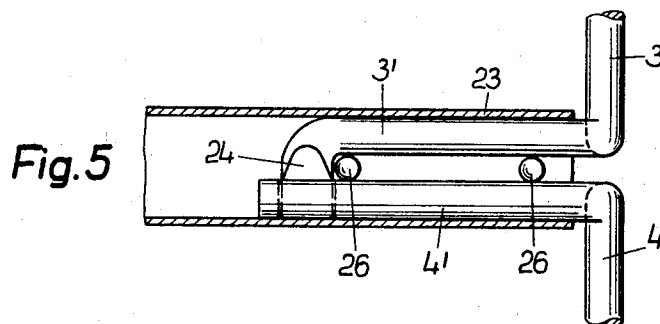


Fig. 5

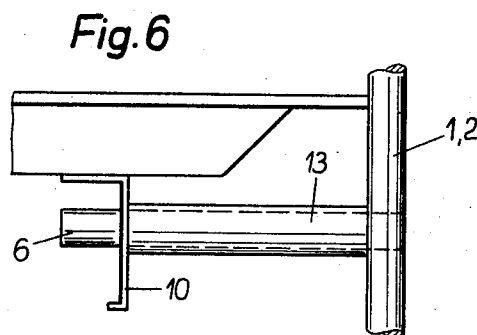


Fig. 6

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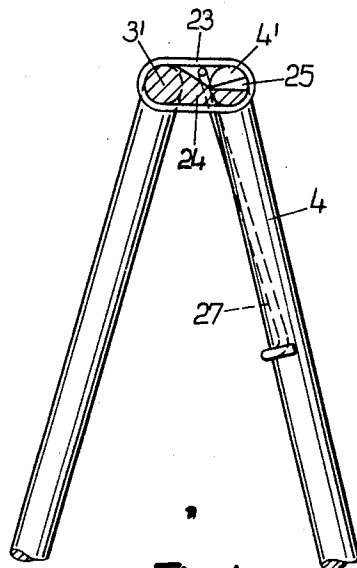


Fig. 4

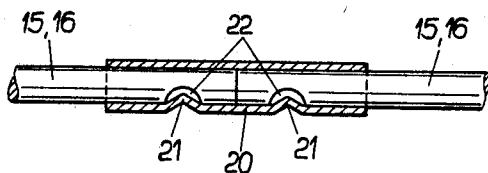


Fig. 7

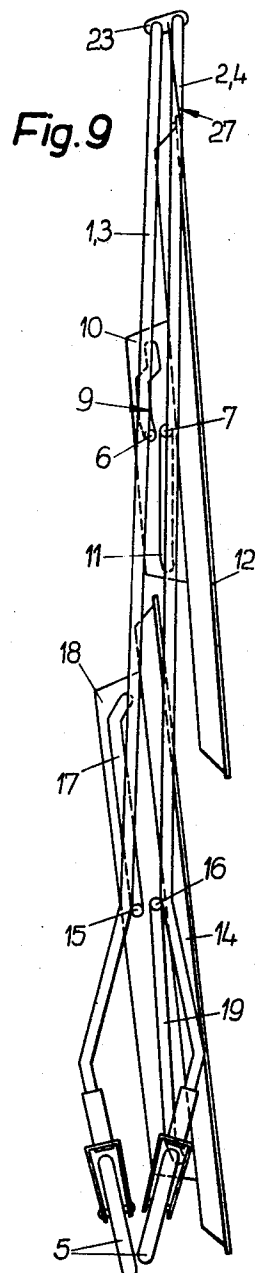


Fig. 9

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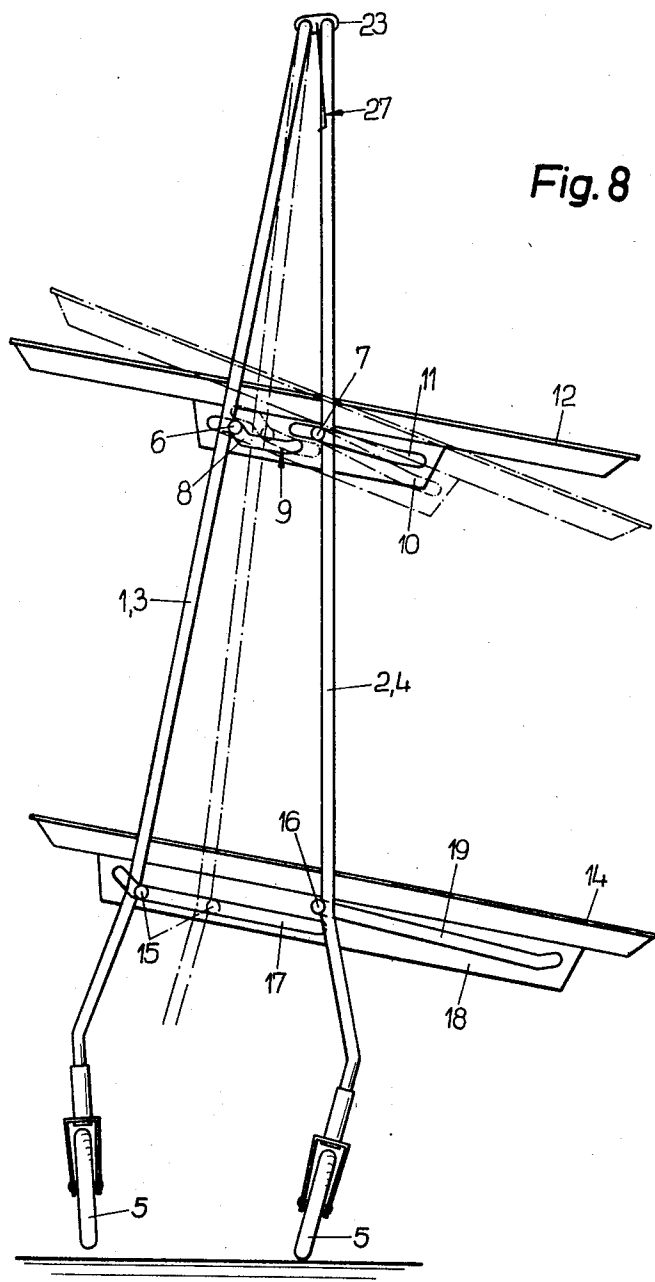


Fig. 8

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**COLLAPSIBLE AND EXPANDABLE TRAY
ASSEMBLIES FOR TRANSPORTING AND
SERVING ARTICLES**

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Filed June 4, 1968, Ser. No. 734,460

Claims priority, application Germany, Dec. 9, 1967,

B 95,774

Int. Cl. A47b 3/08

U.S. Cl. 108—111

10 Claims

ABSTRACT OF THE DISCLOSURE

A collapsible and expandable tray assembly for supporting articles. The assembly includes a tray means which has a horizontal operative position and which has in the region of its ends vertical wall portions formed with slots. At each of the opposed ends of the tray means are a pair of legs which have top ends located next to each other and which in their expanded position diverge downwardly from their top ends across the tray means. These pairs of downwardly diverging legs are pivotally interconnected at their top ends so that they can be swung between their downwardly diverging expanded positions to collapsed positions where they are located next to and are substantially parallel to each other. The pairs of legs respectively carry camming rods which respectively extend through the slots of the vertical wall portions of the tray means for camming the tray means between its horizontal operative position and a collapsed position extending substantially parallel to the legs when the latter are in their collapsed position.

BACKGROUND OF THE INVENTION

The present invention relates to tray assemblies for serving and transporting articles.

In particular, the present invention relates to that type of tray assembly which can be collapsed into a position of non-use where it will occupy a relatively small volume and which can be expanded into an operative position when the assembly is used.

Preferably the tray assembly of the invention includes a pair of upper and lower trays which are horizontal in their operative positions, and which are located between pairs of supporting legs pivotally connected at their top ends and diverging downwardly from their top ends across the ends of the trays, these legs being operatively connected at their bottom ends to freely swingable rollers which enable the entire assembly to be rolled for transporting the articles on the trays. When the assembly is collapsed the legs of each pair are located next to and extend substantially parallel to each other while the trays also assume positions extending substantially parallel to the legs.

There are known assemblies of the above general type where pairs of legs are respectively situated at the ends of the assembly and are pivotally connected at their top ends, these legs being collapsible and forming with a tray a substantially triangular end structure when expanded into their operative position. The trays which are carried by these legs are swingable with respect hereto while moving longitudinally along these legs so that the elevations of the connections between the trays and legs changes during displacement of the assembly between its collapsed and expanded positions.

One of the primary disadvantages of constructions of this latter type is that it requires a relatively high degree of skill in the manipulations performed in order to displace the assembly between its collapsed and expanded

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positions. In order to collapse the assembly it is first necessary to displace the trays manually, one after the other, from their operative positions where they are held by detent structures, and it is only after these trays are thus manually displaced at least part of the way from their operative positions that it becomes possible to swing the legs at each end of the trays toward each other. Moreover, when the assembly is expanded, it is necessary to manually snap the trays into their final positions where the detent structures maintain the trays in their operative positions with the legs expanded. When the trays are swung to their inoperative positions it is essential that the trays be spaced from the floor by a distance greater than the width of the trays, so that it will be possible to conveniently engage the trays for the purpose of again expanding the structure.

SUMMARY OF THE INVENTION

It is accordingly a primary object of the present invention to provide a construction of the above general type which will avoid the drawbacks of the known structures.

Thus, it is an object of the invention to provide a tray assembly of the above general type which can be operated in an extremely simple manner.

Also, it is the object of the invention to provide a structure of the above type which occupies only a small amount of space while at the same time making it possible to displace trays between operative and inoperative positions in response to and simultaneously with a displacement of the legs of the assembly between their expanded and collapsed positions.

Thus, it is a more particular object of the invention to provide a tray assembly of the above general type which may have upper and lower trays having operative horizontal positions and interconnected with end leg assemblies which can be expanded for reliably holding the trays in their operative positions while at any time the leg assemblies can be collapsed with resulting displacement of the trays also to their collapsed or inoperative positions where they extend substantially parallel to the collapsed legs and occupy with the latter an extremely small amount of space.

Thus, in accordance with the invention the assembly includes a tray means having a pair of opposed ends and a centerline extending perpendicularly across these opposed ends with the tray means having in the region of its opposed ends wall portions which extend substantially vertically when the tray means is in its horizontal operative position, these wall portions respectively being formed with control slots. At each end of the tray means there are a pair of legs pivotally interconnected with each other over the tray means and diverging downwardly from their top pivotal connections across each end of the tray means, these legs carrying rollers at their bottom ends. The legs are respectively fixedly connected with camming rods which respectively extend through slots parallel to the centerline of the tray means, these slots terminate at each wall portion in inner ends situated in the region of the centerline of the tray means. With this construction the slots are given a configuration which will result in swinging of the tray means between its horizontal operative position when the legs diverge downwardly from their top pivotal connection and a collapsed position. The camming rods coact with the slots to displace the tray means from its horizontal operative position to a location where it is substantially parallel to the legs.

BRIEF DESCRIPTION OF DRAWINGS

This invention is illustrated by way of example in the

accompanying drawings which form part of this application and in which:

FIG. 1 is an end elevation of an assembly according to the invention shown in its expanded position;

FIG. 2 is a fragmentary front elevation of the assembly of FIG. 1 as seen from the left side of FIG. 1;

FIG. 3 is a fragmentary longitudinal partly sectional elevation taken at the region of the top end of the assembly in a vertical plane extending centrally through an elongated tube which interconnects the pairs of end legs;

FIG. 4 is a transverse of fragmentary sectional elevation taken along line IV—IV of FIG. 3 in the direction of the arrows;

FIG. 5 is a fragmentary sectional plane view taken along line V—V of FIG. 3 in the direction of the arrows;

FIG. 6 is a fragmentary front elevation showing the manner in which a leg is interconnected with a wall portion of a tray means;

FIG. 7 is a fragmentary longitudinal partly sectional elevation showing the manner in which lower camming rods are interconnected with each other;

FIG. 8 is an end elevation corresponding to FIG. 1 showing the structure between its collapsed and expanded positions;

FIG. 9 is also an end elevation corresponding to FIGS. 1 and 8 but showing the structure in its fully collapsed condition.

DESCRIPTION OF A PREFERRED EMBODIMENT

Referring now to the drawings, an assembly according to the invention is illustrated in FIG. 1 in its expanded position as it appears when looking toward one end of the assembly. FIG. 1 illustrates a pair of elongated legs 1 and 2, and it is to be understood that at the opposite end of the assembly which is not visible in FIG. 1 there are a corresponding pair of legs 3 and 4 situated behind the legs 1 and 2. Thus, the legs 1 and 2 form one pair of legs situated at one end of the assembly, and legs 3 and 4 form a second pair of legs situated at the opposite end of the assembly. At their lower ends these respectively carry freely swingable rollers 5 in a well known manner. It will be noted that at the region of their bottom ends all of the legs are respectively provided with angled portions which extend vertically, in the expanded position of the assembly, down to the location where these bottom vertical leg portions are connected to the roller units 5.

Each pair of legs fixedly carries an upper pair of camming rods 6 and 7, respectively, so that a pair of the rods 6 are affixed to the legs 1 and 3 and extend therefrom horizontally toward each other, these rods being coaxial, while a pair of the rods 7 are respectively fixed to and extend toward each other from the legs 2 and 4, with these camming rods 7 also having a common horizontal axis and being parallel to and situated at the same elevation as the rods 6, as is apparent from FIGS. 1 and 2.

The assembly includes an upper tray means 12 having a tray provided with a bottom flat wall having an upwardly directed surface and a lower surface in the operative horizontal position of the tray means 12 shown in FIGS. 1 and 2. Fixed to the lower surface of the tray means 12 are a pair of vertical wall portions 10 forming part of angled members extending transversely across a longitudinal centerline of the tray means 12 which extends perpendicularly across the opposed ends of the tray means 12 midway between its front and rear side edges, and of course, also midway between the legs 1 and 2, as well as the legs 3 and 4, when these legs are in their expanded positions. The pair of vertical wall portions 10 are respectively formed with a pair of slots 9 which are aligned with each other and which are of identical configuration, each of these slots 9 are being formed intermediate its ends with a stepped portion 8. The pair of camming rods 6 respectively extend through the slots 9. In addition, these vertical wall portions 10 are respectively formed with identical and aligned slots 11 through which

the camming rods 7 respectively extend. It will be noted that with this construction it is these camming rods 6 and 7 which serve to support the tray means 12 on the legs 1-4. At each wall portion 10 the slots 9 and 11 have inner end regions situated at the region of the centerline of the tray means 12 and overlapping each other in the manner indicated most clearly in FIG. 1. As is apparent from FIG. 2, the vertical wall portions 10 are situated inwardly of the opposed ends of the tray means 12 in the general region of these opposed ends.

In order to avoid longitudinal shifting of the tray means 12 along the camming rods 6, 7, the latter rods carry spacer sleeves 13 which extend between the legs and the wall portions 10 in the manner shown in FIGS. 2 and 6. These spacer sleeves 13 may, for example, be in the form of hose sections through which the camming rods 6, 7 respectively extend in the manner shown in FIGS. 2 and 6.

A lower tray means 14 is situated beneath the tray means 12, and the legs 1 and 3 respectively fixedly carrying camming rods 15 which extends toward each other along a common horizontal axis and pass through a pair of slots 17 formed in vertical wall portions 18 of the lower tray means 14. These wall portions 18 have with respect to the tray means 14 the same relative locations that the wall portions 10 have with respect to the tray means 12, and the pair of slots 17 are of an identical construction and are aligned with each other. The vertical wall portions 18 are also formed with elongated slots 19 which are identical and aligned with each other, and the legs 2 and 4 respectively fixedly carry coaxial camming rods 16 which extend horizontally through the slots 19. Thus, these rods 15 and 16 also serve to support the tray means 14 on the legs 1-4. It is to be noted that the slots 17 and 19 also overlap each other in the region of the centerline of the tray means 14. This longitudinal centerline of the tray means 14 extends perpendicularly across the opposed ends thereof and perpendicularly across the vertical wall portions 18 of the tray means centrally between the pairs of legs when the latter are in their expanded positions shown in FIG. 1. The pair of slots 17 and 19 of each wall portion 18 which overlap each other in the region of the tray centerline at the inner ends of the slots have outer ends which are inclined upwardly at different angles, FIG. 1 indicating the outer end regions 17' and 19' of the slots 17 and 19 which are inclined upwardly at different angles.

As is apparent particularly from FIG. 7, the pair of coaxial camming rods 15 extend all the way along the tray means 14 and abut directly against each other, and in the same way the pair of camming rods 16 extend into abutting relation. A sleeve 20 surrounds the abutting end regions of the coaxial rods 15 and an identical sleeve 20 surrounds the abutting end regions of the coaxial rods 16. The pair of rods 15 are formed in the region of their abutting ends with recesses 22 which receive dimples 21 formed in the sleeve 20 surrounding the ends of the rods 16. Thus, with this construction the pair of rods 15 are fixedly connected to each other to form in effect a single elongated rod extending between and fixed to the legs 1 and 3, and the pair of rods 16 form in effect a single elongated rod extending between and fixed to the legs 2 and 4, so that in this way the rigidity of the structure is enhanced.

Referring now to FIGS. 3-5, it will be seen that the several legs 1-4 are respectively provided at their top ends with angled portions extending horizontally and forming horizontal free end portions for the several legs, these portions being parallel to the centerline of the tray means. Thus, FIG. 5 indicates the horizontal angled portions 3' and 4' of the legs 3 and 4, and the legs 1 and 2 are provided with similar horizontal angled portions respectively extending toward the angled portions 3' and 4'.

For the purpose of pivotally interconnecting each pair of legs at the region of their top ends, the angled horizontal top free end portions of each pair of legs are received in a tube 23 which in cross section has a substan-

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tial elliptical or oval configuration, as shown most clearly in FIG. 4. One of the horizontal free end portions of each pair of legs is provided with an extension which extends across and substantially fills the interior of the tube 23. In the example illustrated in FIGS. 3-5, it is the horizontal end portion 3' of the leg 3 which is provided with the extension 24 which substantially fills out the interior of the tube 23 in the manner shown most clearly in FIG. 4. The extension 24 may form an integral part of the end portion 3' extending angularly from the inner end thereof across the interior of the tube 23 in the manner shown most clearly in FIG. 5. It is to be understood that at the other end of the tube 23 the leg 1 will have a horizontal free end portion received in the tube 23 and having a transverse extension identical with the extension 24.

The horizontal portion 4 of the leg 4 is formed with a notch 25 through which the free end of the extension 24 extends, so that the horizontal portion 4' of the leg 4 has in effect a substantially hook-shaped free end straddling the extension 24 in the manner shown most clearly in FIG. 3. As is shown in FIG. 4, the downwardly directed surface of the notch 25 which is formed in the end portion 4' of the leg 4 is inclined with respect to the upwardly directed surface of the extension 24 which is received in the notch 25 to provide clearance sufficient to enable the pair of legs 3 and 4 to be swung with respect to each other between their collapsed and expanded positions. In the same way, at the other end of the tube 23 the horizontal end portion of the leg 2 is formed with a notch corresponding to the notch 25 and receiving the extension of the leg 1 which corresponds to the extension 24.

In order to fix the horizontal upper free end portions of the several legs in the elongated interconnecting tube 23 which forms a means pivotally interconnecting these legs, so that the elongated free end portions of the legs cannot be axially displaced out of the ends of the tube 23, the lower wall portion of the latter is formed at each of its end regions with a pair of inwardly extending dimples 26 received between the free end portions of the legs in the manner shown in FIG. 5, and these dimples will reliably retain the upper horizontal end portions of the legs within the tube 23 while at the same time the legs are turnable with respect to the tube 23. These dimples 26 are formed only after the parts are assembled. However, it is also possible to interconnect the components by other means. Thus, for example, the extension 24 may be welded or soldered to the tube 23, and this will also result in retaining of the legs operatively connected with respect to each other and with the tube 23 while the legs are still turnable with respect to each other since the extension 24 does not move with respect to the tube 23.

At each end of the tube 23 there is an elongated springy wire 27 having an upper horizontally extending portion 27' extending along the interior of the tube 23 of each and of its end regions and having an exterior downwardly directed portion. These downwardly directed portions of the springs 27 respectively coact with the legs 2 and 4 so as to urge them away from the legs 1 and 3, respectively. Thus, the downwardly directed parts 27' of the springs 27 extend respectively along the inner surfaces of the upper portions of the legs 2 and 4 and in part around the latter at the lower ends of the springs 27. These springs 27 serve to urge the structure towards its expanded condition and thus facilitate expanding of the structure from its collapsed toward its expanded condition.

The above-described structure operates as follows:

Assuming that it is desired to collapse the structure from the expanded position thereof shown in FIG. 1, then the parallel legs 2 and 4 are simultaneously swung inwardly toward the centerline of the pair of tray means 12 and 14 and toward the other parallel legs 1 and 3.

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As a result the coaxial rods 16 move longitudinally along the slots 19 because the outer end portions 19' of the slots 19 are upwardly inclined to a lesser extent than the outer end portions 17' of the slots 17, so that there is less resistance to longitudinal displacement of the rods 16 along the slots 19 than of the rods 15 along the slots 17. Thus, the rods 16 will approach the central region of the vertical wall portions 18. After rods 16 move beyond the centerline of the tray means 14, the latter swings downwardly as a result of its own weight, and simultaneously with this action the rods 7 move toward the inner ends of the slots 11 to the central region of the vertical wall portions 10 so as to bring about, at the same time, a downward tilting of the tray means 12.

During the continued inward swinging of the parallel legs 2 and 4, the inner ends of the slots 11 and 19 form stops which engage and turn about the camming rods 7 and 16, and the upper tray means 12 is shown in this position in dot-dash lines in FIG. 8. Thus, because of the engagement of the rods 7 and 16 with the inner ends of the slots 11 and 19 the trays 12 and 14 will be displaced with respect to the rods 6 and 15 with the inner ends of the slots 9 and 17 approaching the rods 6 and 15.

Because of the intermediate step region 8 of the slots 9, the upper tray means 12 swings ahead of the lower tray means 14 so that the upwardly swinging end of the latter will not strike against the tray means 12. Thus, the stepped portions of the slots 9 coact with the rods 6 to accelerate the swinging of the tray means 12 with respect to the swinging of the tray means 14. In this way the swinging of the trays continues until the structure has the collapsed condition indicated in FIG. 9 where the legs are located next to and extend substantially parallel to each other while the tray means 12 and 14 extend substantially parallel to the legs and overlap each other in the manner shown in FIG. 9.

The expanding of the structure from the position of FIG. 9 back to the position of FIG. 1 is aided by the force of the springs 27. The movement of the tray means 12 and 14 is controlled by the configuration of the slots and their camming action with the camming rods so that simply in response to movement of the legs between their collapsed and expanded positions the tray means 12 and 14 will assume their horizontal operative positions. In some cases it may be desirable, at least initially, to provide a manual starting movement for the tray means 12 and 14, preferably after the pair of tray means has the central region of the ends thereof engaged by the legs 2 and 4 and is situated in a horizontal position when the structure is collapsed.

Thus, as a result of the above-described structure of the invention, the entire assembly is extremely simple and convenient to operate. Because of the camming action provided by the camming rods in coaction with the slots of the tray means the movement of the tray means between their operative and collapsed conditions is controlled solely in response to swinging of the legs between their collapsed and expanded positions. Therefore, the manipulations are extremely simple to carry out, and no special dexterity is required. The distance of the lower tray means from the floor and also the distance between the pair of tray means can be maintained very small. The control of the movement of the trays is determined in part by the different inclinations of the outer ends 17' and 19' of the slots 17 and 19.

By providing the upper slots 9 with the intermediate steps 8, both of the trays will move in substantially the same way during collapsing of the structure at the initial part of the collapsing movement while as a result of the intermediate step 8 of each slot 9 the upper tray means 12 is accelerated in advance of the lower tray means so that the pair of tray means cannot strike against each other.

The situation of the angled members 10 and 18 as shown in FIG. 2 and described above provides advan-

tages with respect to the assembly and the manufacture thereof.

The extension of the pairs of camming rods 15 and 16 into abutting engagement as described above makes it possible to provide the assembly with a sufficiently great stability without requiring additional stiffening members for this purpose.

Also, the above-described structure in connection with the coupling of the pairs of rods to each other in the end portions of the interconnecting tube 23 provides a simple and effective means to achieve the pivotal interconnection of the pairs of rods so that they can be displaced from expanded positions where they diverge downwardly from their top ends to their collapsed positions where they extend substantially parallel to each other as shown in FIG. 9.

What is claimed is:

1. A collapsible and expandable assembly for transporting and serving articles, comprising at least one tray means having a substantially horizontal operative position and having a pair of opposed ends and a centerline extending longitudinally of said tray means substantially perpendicularly across said opposed ends thereof substantially midway between side edges each of which extends between said opposed ends of said tray means, said tray means having in the regions of the said opposed ends wall portions respectively extending vertically when said tray means is in said substantially horizontal operative position thereof, said wall portions extending perpendicularly with respect to said centerline and each being formed with a pair of longitudinal guide slots respectively having inner ends located adjacent to each other in the region of said centerline, a pair of substantially upright supporting legs situated at each end of said tray means and extending above and below the latter, each pair of supporting legs having top ends adjacent to each other substantially over said centerline of said tray means and, when the latter is in said operative position thereof, each pair of legs diverging downwardly from their top ends to an elevation below said tray means where each pair of legs terminate in bottom ends spaced from each other by a distance greater than at any other part of each pair of legs, means interconnecting each pair of legs at said top ends thereof for swinging movement with respect to each other about an axis parallel to said centerline to a collapsed position where said legs of each pair are substantially parallel to and located next to each other, and a pair of camming rods respectively fixed to the legs of each pair extending parallel to said centerline, and respectively extending through the pair of slots of each vertical wall portion, the camming rods fixed to one of said pair of legs extending through the slots of the wall portion of the tray means adjacent to said one pair of legs and the camming rods of the other pair of legs extending through the slots of the wall portion of the tray means adjacent to the other of said pair of legs, and said camming rods coacting with said slots for tilting said tray means from said operative substantially horizontal position thereof to a position where said tray means extends substantially parallel to said legs when the latter are in their collapsed position located next to and extending substantially parallel to each other.

2. The combination of claim 1, and wherein said legs at the ends of said tray means respectively carry rollers at their bottom ends.

3. The combination of claim 1 and wherein inner ends of said slots of each vertical wall portion of said tray means overlap each other.

4. The combination of claim 1 and wherein there are a pair of tray means spaced one above the other when in their substantially horizontal operative positions, both of said tray means having said vertical wall portions each of which is formed with said pair of slots and said legs fixedly carrying camming rods respectively extending through all of said slots for displacing said tray means between said operative positions when said legs are expanded and diverged downwardly with respect to each other from their top ends to collapsed positions where said pair of tray means are substantially parallel to said legs with the latter situated next to and extending substantially parallel to each other.

5. The combination of claim 4 and wherein said tray means overlap each other when in their collapsed positions.

6. The combination of claim 1 and wherein said slots of each wall portion respectively terminate in outer end regions which are upwardly inclined at different angles.

7. The combination of claim 4 and wherein said upper tray means has one of said slots of each wall portion thereof formed with an intermediate step.

8. The combination of claim 1 and wherein said tray means includes a tray having a flat supporting wall having upper and lower surfaces, and a pair of angle members fixed to said lower surface of said wall and extending therealong transversely to said centerline and respectively having said vertically extending wall portions extending downwardly from said lower surface of said wall and formed with said slots, said angled members being situated inwardly of said opposed ends of said tray means in the region of said opposed ends.

9. The combination of claim 4 and wherein the camming rods which extends through said slots of said wall portions of the lower one of said tray means extend all the way across the space between the pairs of legs, abut against each other, and are fixedly connected together.

10. The combination of claim 1 and wherein each pair of legs is provided at its top end with inwardly extending portions extending angularly from said legs parallel to said centerline, said means pivotally interconnecting said pairs of legs at said top ends thereof including an elongated tube of substantially oval cross section extending between said pairs of legs and receiving said inwardly extending end portions thereof, one of said legs having at its inwardly extending portion a transverse extension extending across the interior of said tube and the other of said inwardly extending portions of the other one of each pair of legs being formed with a notch receiving said extension of said one inwardly extending portion so that said legs are pivotally interconnected by the location of said extension in said notch with said legs each being turnable with respect to said tube.

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