Aug. 1, 1961 V. K. ADAMS 2,994,134

PHOTOPRINT DRIER

Filed Aug. 21, 1959 2 Sheets-Sheet 1

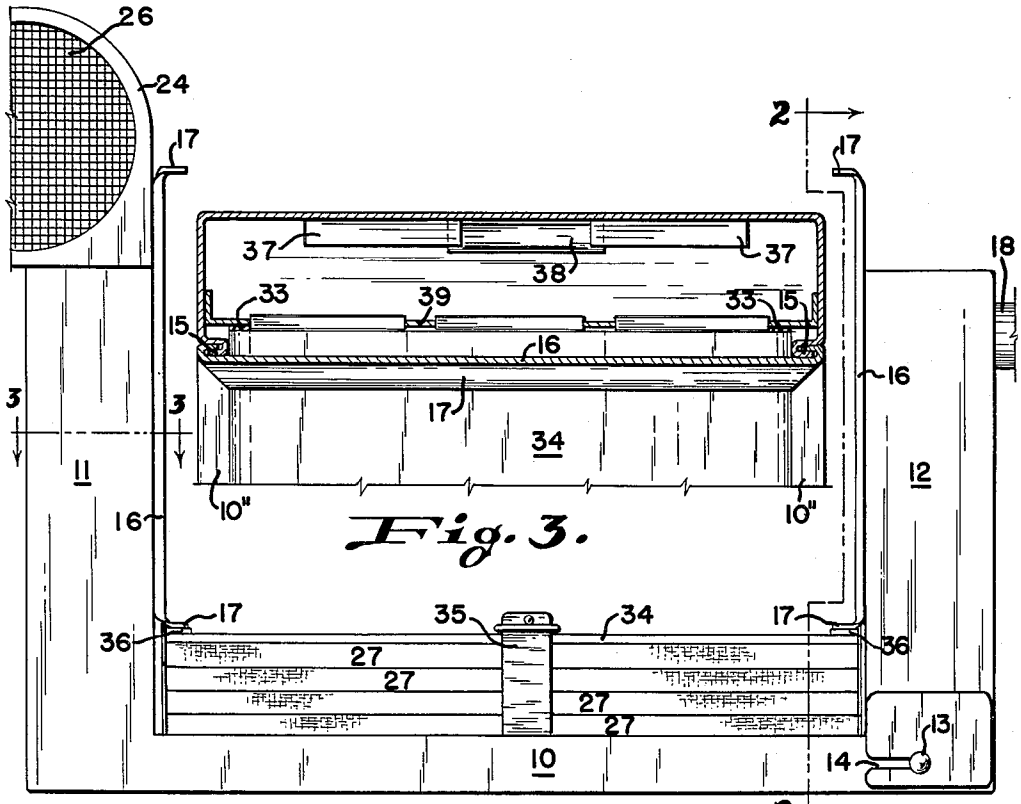


Fig. 3.

Fig. 1.

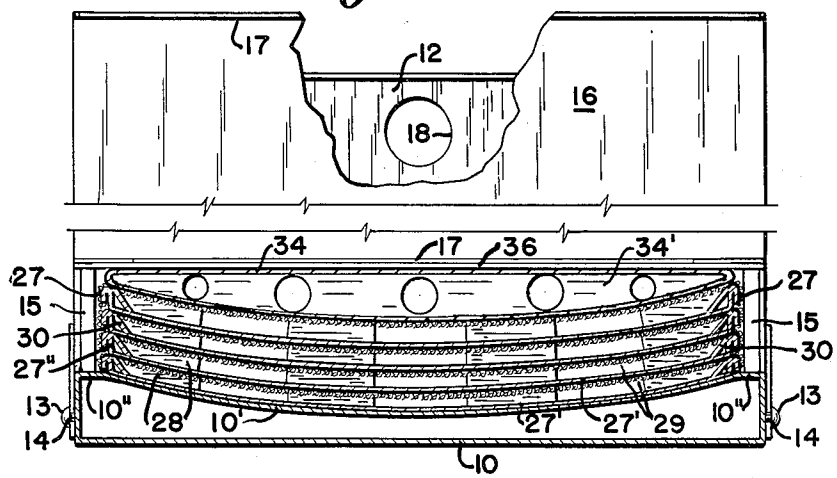


Fig. 2.

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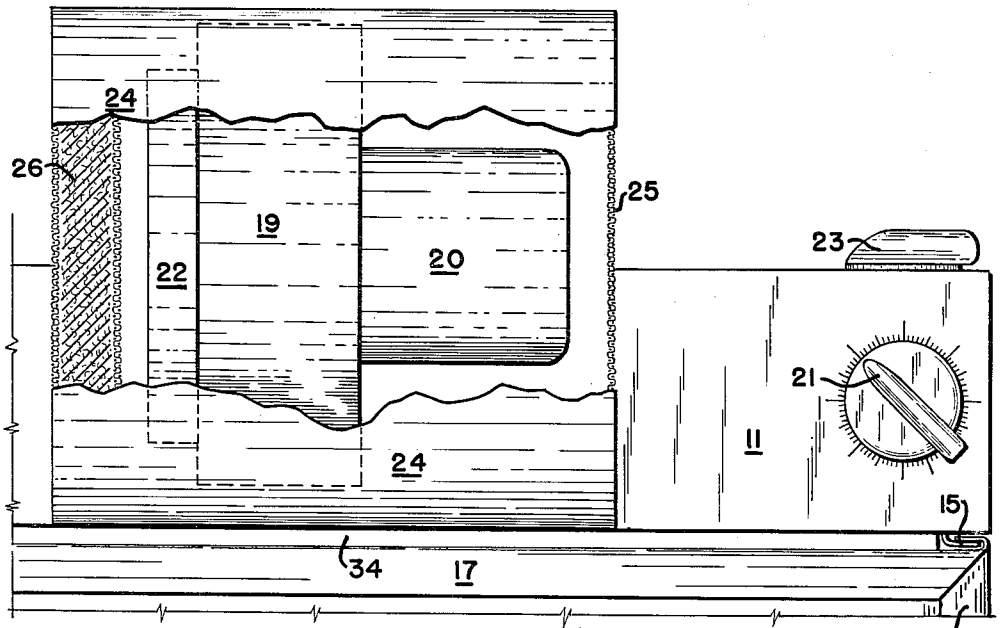


Fig. 4.

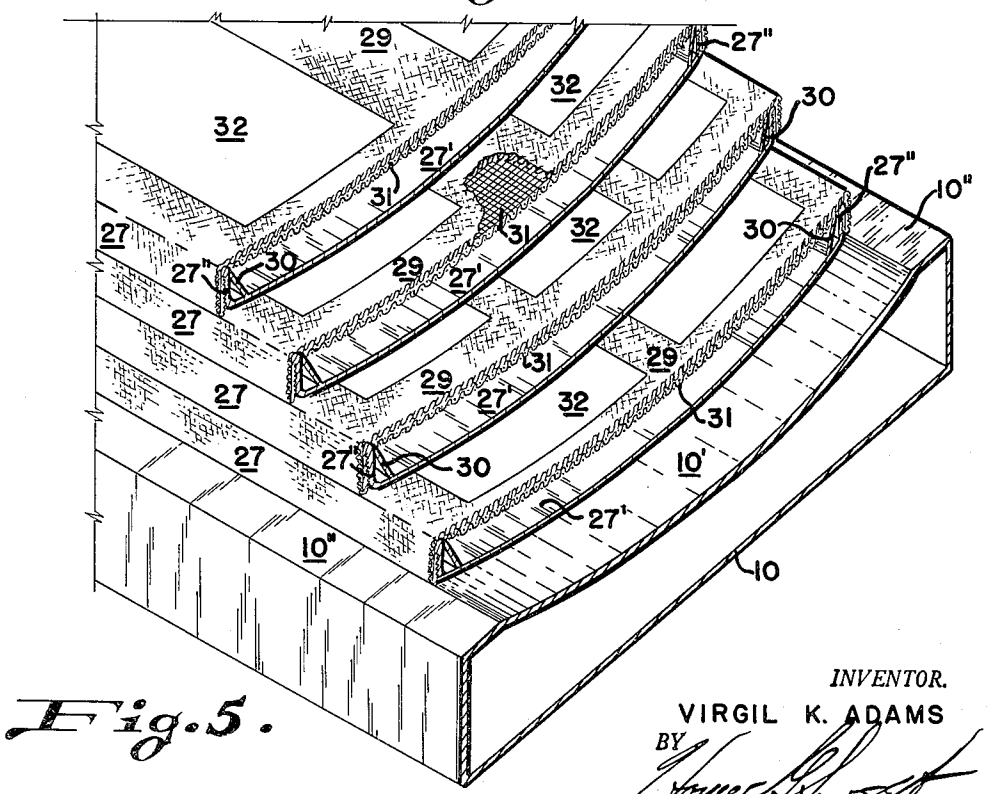


Fig. 5.

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PHOTOPRINT DRIER

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10 Claims. (Cl. 34—145)

This invention relates to photographic laboratory equipment useful in the production of photoprints, and more particularly to apparatus for the finish drying of the normally-wet prints resulting from conventional processing thereof, and has as an object to provide a novel and improved photoprint drier of enhanced practical advantage and superior use facility.

A further object of the invention is to provide a novel and improved photoprint drier of selectively-variable, high-maximum capacity.

A further object of the invention is to provide a novel and improved photoprint drier selectively determinative of ultimate surface finish of the prints conditioned thereby. A further object of the invention is to provide a novel and improved photoprint drier effective to uniformly treat prints processed in multiple therein.

A further object of the invention is to provide a novel and improved photoprint drier effective to counteract and neutralize the normal curling tendency evidenced by conventionally-processed prints.

A further object of the invention is to provide a novel and improved photoprint drier applicable to the processing of prints in a wide range of sizes, paper types and weights, and degrees of initial wetness.

A further object of the invention is to provide a novel and improved photoprint drier susceptible of precise operative regulation and control, manual, automatic, or both, in effective correlation with the conditions of its use.

A further object of the invention is to provide a novel and improved photoprint drier that is relatively inexpensive of expedient production, compact in proportion to its capacity, facile of expeditious use, effectively reactive through simple connection with conventional electrical supply circuits, and positive and efficient in attainment of the ends for which designed.

With the foregoing and other objects in view, my invention consists in the construction, arrangements, and operative combination of elements as hereinafter set forth, pointed out in my claims, and illustrated by the accompanying drawings, in which—

FIGURE 1 is a side elevation of an exemplary embodiment of the invention as organized in condition of practical use, a portion of generally-conventional adjuncts comprised in the assembly being broken away to conserve space.

FIGURE 2 is a vertical section transversely through and taken substantially on the indicated line 2—2 of FIGURE 1, an intermediate area of the view being broken away to conserve space.

FIGURE 3 is a fragmentary, detail section taken substantially on the indicated line 3—3 of FIGURE 1.

FIGURE 4 is a fragmentary, top plan view, on a relatively enlarged scale, of the major portion of the structure shown at the left of FIGURE 1, an enclosure wall appearing in the view being broken away to disclose otherwise concealed arrangements.

FIGURE 5 is a multi-plane, isometric section, on a scale similar to that of FIGURE 4, transversely through

base and associated tray elements of the improvement as organized in condition of use.

Occasion for and the problems incident to the drying of photoprints, particularly in quantity and at commercial establishments, are so familiar to those conversant with the art and practice as to obviate occasion for elaboration herein. Suffice it to say that the equipment hitherto available to effect the final drying step of photoprint processing has been less than satisfactory, and the instant invention is hence directed to the provision of a novel and improved photoprint drier operable to eliminate the deficiencies of previously known analogous equipment with practical advantage of superior degree.

In any preferred particularity of construction, the improvement of the invention as typified by the views of the drawings is characterized by a flat, hollow, substantially-rigid, generally-rectangular base **10** of a length desirably exceeding its width, a vertical depth, or thickness, representing a minor fraction of its width, whereof the top member **10'** is transversely concaved between flat, longitudinal fillets **10''**. Uniform in all transverse planes and open throughout its length, the base **10** fixedly connects at one end and communicates interiorly with a hollow, desirably-rectangular, vertical riser **11** which is formed with an open side immediately superjacent the base and is otherwise closed save as hereinafter specified. At its other end the base **10** detachably connects and interiorly communicates with a riser **12** similar to the riser **11** and correspondingly formed with an open side above the end of the associated base in spaced opposition to the open side of said riser **11**, the connection of the riser **12** to the base **10**, represented as a telescopic slide joint including headed pins **13** projecting laterally from sides of the base **10** for accommodation in slots **14** appropriately interrupting elements of the riser **12**, being such as to facilitate manual removal and replacement of the riser **12** relative to the base **10** wherewith it is designed to function in the association according to FIGURE 1. Slidably associated, as by means of vertical guides **15**, with and to close transversely across the open sides of the risers **11** and **12**, like closure panels **16**, desirably provided with outturned flanges **17** at their upper and lower margins, are individually vertically adjustable relative to the risers to vary and to determine the open areas of the riser sides closable thereby.

The upper end closure of the riser **11** is formed with an opening, not specifically shown, for the input of air to the riser interior and the riser **12** is formed with an outlet **18** adjacent its upper end, whereby, with the riser **12** connected to the base **10** as shown in FIGURE 1 and the panels **16** lowered to close the corresponding sides of the associated risers, a closed conduit effective for the translation of air is established from the input opening at the upper end of the riser **11** downwardly through said riser, through the associated base **10**, and upwardly through the riser **12** to escape via the outlet **18** of the latter.

Supply of air to and for translation through the conduit comprised from the base **10** and risers **11** and **12**, and for circulation through features of the invention subsequently to be described, is the function of a conventional blower **19** powered by an electric motor **20** regulable as to speed and operation by a control **21** in a usual manner, which powered blower is mounted on the upper end of the riser **11** to deliver therethrough in ac-

cord with conventional practice. Elevation of temperature being an expediting factor in drying operations, a conventional, air-permeable, electric heating unit **22** is associated with and to act upon the air intake to the blower **19** under the regulating influence of a control **23** adjustable to determine the operation and to vary the heat output thereof, and the powered blower and heating unit are desirably housed within an enclosure **24** carried by the riser **11** between a screen **25** and filter **26** effective to condition the air intake therethrough in an obvious manner. The blower **19** with its motor **20**, the electric heating unit **22**, and the controls **21** and **23**, being commercially-available conventional adjuncts amenable to operative association with electric power supply in diverse arrangements familiar to and within the skill of craftsmen in the related art, it is manifestly sufficient to locate and describe said elements in terms of their operative association with the pertinent features of the invention and with each other, the details of their connection in and with a supply circuit being entirely unnecessary for an understanding of the invention and its mode of operation. As to the controls **21** and **23**, these may be merely manual regulating switches of common available type, or self-regulating time switches amenable to presetting and subsequent automatic reaction in the manner common to conventional such devices.

A distinctive feature of the invention is the provision and organization of a plurality of like trays **27**, four of which are represented in the views of the drawings, arranged to stack in superposition on the concaved upper surface of the base **10** in spanning relation between the risers **11** and **12** for support of wet photoprints in exposure to the drying influence of heated air circulated therethrough and thereabout in accordance with the principles and by means of the agencies characterizing the invention.

In a preferred structural identity, each of the trays **27** is a transversely concavo-convex, shallow unit of a length slightly exceeding the open span between the risers **11** and **12**, a width approximating that of the concaved base top member **10'**, and a depth desirably less than the minimum vertical spacing interiorly of the base **10**. Preferably formed in major part from stiff, polished, sheet metal of light gauge, such as stainless steel, each tray **27** is characterized by a floor, or bed member, **27'** sized to coextensively cover and laterally contoured into conformity with the base top member **10'**, spacedly-parallel ribs **27''** determinative of tray width and depth angularly upstanding from said floor along the long sides thereof for vertical registration with corresponding elements of superposed tray units, and a coplanar series of spaced flanges **28** perpendicularly upstanding from and across each end of the floor **27'** in a uniform extension thereabove the same as the uprise of the ribs **27''**, which flanges **28** cooperate with said ribs **27''** to support the successive tray units of a superposed stack in uniformly-spaced parallelism of their floors **27'**. The otherwise open top of each tray **27** is covered by a flexible sheet **28** of air-permeable fabric, such as canvas, marginally secured to and along the ribs **27''** in any expedient manner, as by folding the fabric sheet margins within recurved edges of the ribs, effective to secure said sheets to the tray for smoothly-taut, conforming coaction with the floor **27'** of a superposed tray unit, the deforming effect of tensions applied through the sheet **29** to the ribs **27''** being resisted, if necessary, by inclined webs **30** affixed to brace upper margins of said ribs from inwardly-adjacent areas of the floor **27'**. Where the lateral span of the sheet **29** is great or the nature of said sheet is such as to warrant reinforcing support, a substantially-inextensible, reticulate or foraminous sheet **31**, such as wire mesh, may be affixed to upper margins of the ribs **27''**, or to the adjacent zones of the sheet **29**, to underlie said sheet **29** in spaced parallelism with the floor **27'** of the unit, as represented in FIGURE 5.

Constituted as shown and described, each tray **27** is a flat, elongated, laterally-extensive conduit of proportionally small depth characterized by an imperforate, polished, metallic floor spaced from an air-permeable, fabric cover between which air may circulate from one and to the other end of the unit in consequence of the access and exit openings to the conduit interior provided by the spaces between the flanges **28** partially obstructing the unit ends, it being manifest that such circulation of air to and through each of the several units of a superposed stack thereof is accommodated without impairment in consequence of the successive tray support inherent in the construction of the units as illustrated and described.

It is the function of the trays **27** to position and support wet photoprints subject to the drying influence of regulably heated and circulated air in a manner that conditions the dried prints to lie flat without the typical annoying tendency to bow or curl and in selectively-alternative engagement of their emulsion faces with surfaces distinctively determinative of print finish effect, for realization of which functions the prints to be dried, indicated at **32** in FIGURE 5, are placed flat and out of contact with each other on the exposed upper fabric surface of the tray with the emulsion faces of the prints in contact with the fabric surface when a non-gloss, or mat, finish is desired for the dry prints and with the emulsion faces of the prints directed away from the fabric surface when a gloss finish is preferred for the prints.

A first tray **27** having been charged with prints to be dried and the riser **12** being separated from the base **10**, said charged tray is placed on and in registration with the base top member **10'** and end-entered through the open side of the riser **11** under the elevated panel **16** thereof to sealing coaction of ends of its ribs **27''** with vertical strips **33** of yieldable material fixed inwardly adjacent side margins of the riser opening, in which disposition the floor **27'** of the tray conformably rests upon the base top member **10'**. A first charged tray **27** having been placed as shown and described, additional such trays similarly charged with prints to be dried are stacked in superposed relation thereon with their metal floors **27'** compressively engaging the prints **32** of the subjacent tray, any number of the trays requisite to accommodate the quantity of prints to be dried being utilized within the capacity of the base and riser assembly to receive the same. A given stack of the trays **27** having been assembled on the base **10**, a packer or follower **34** conformably coactable with the concave upper surface of the topmost tray to coextensively cover the same and to itself present a flat upper surface parallel to the bottom of the base **10** is applied as the top element of the stack and a binder **35**, such as an adjustable flexible belt, is tensed and secured over the element **34** and the stack topped thereby to compact the stack assembly into secure compressing relation with the prints leaved therein. The packer or follower **34** is a hollow, substantially-rigid unit of sheet metal having a polished lower exposed face contoured to mate with the base top member **10'** and hence to coact with the fabric cover of any one of the trays **27**, and stiffening end closures **34'** apertured and interrupted as may be preferred to accommodate circulation of air into, within, and from the unit interior. A stack of print-charged trays **27** having been developed and compacted on and above the base top member **10'** to accommodate any quantity of wet prints within the capacity of the apparatus, the closure panel of the riser **11** is lowered to closing engagement of its lower flange **17** against the upper surface of the packer or follower **34** wherewith said panel flange is desirably adapted to sealably coact through the agency of a strip **36** of compressible material affixed to the under surface of the flange, the riser **12** is applied to and for cooperation with the appropriate end

of the base 10 as shown in FIGURES 1 and 2 and above described with the panel 16 of said riser 12 elevated to permit telescopic penetration of the tray and follower stack slightly through the open side of the riser and to sealing coaction with vertical strips 33 at the sides of the riser opening, and the said elevated panel of the riser 12 is finally lowered to seal against the follower or packer 34 through the agency of a strip 36 affixed to the flange thereof as set forth in connection with the corresponding panel of the riser 11, in which association and correlation of elements the apparatus of the invention is charged and organized for realization of its intended purposes and advantages.

Unitarily assembled as shown in FIGURE 1 and charged with wet prints interleaved between coacting surfaces of the trays 27 and follower or packer 34 as above described, the blower 19 and heating unit 22 are actuated by means of their respective controls to establish an input of warmed air to the upper portion of the riser 11 for circulation therein and thence through the base 10, trays 27, and follower or packer 34 to the riser 12 and ultimate escape from the apparatus by way of the outlet 18 with consequent uniform drying effect upon the prints positioned by the trays for identical reaction to the warm air circulation alike applied over both surfaces of all thereof. The rate of air input from the blower 19 and the air temperature elevation effected by the heating unit 22 being susceptible of independent regulation through their respective controls 21 and 23, and the outlet 18, itself amenable to size-adjustment, if desired, being small in proportion to the air capacity of the apparatus, it is obvious that the circulation and retention of warm air within the drier and about the prints therein may be variously adjusted and proportioned in accordance with experience and recognized techniques to effect proper drying of prints on papers of different types, characters and weights. It being within the contemplation of the invention that direction of air input to and circulation of air within the riser 11 may contribute, under some operating conditions, to the efficiency and practicality of the apparatus, the showing of FIGURE 3 typifies the use of downwardly-convergent vanes 37 affixed interiorly of said riser in the path of air input thereto for direction of a portion of the air flow to and for reaction from an upwardly-concaved, transverse deflector 38 subjacently correlated therewith, and the provision of a louvered screen 39 inwardly and spacedly paralleling the panel 16 across the otherwise open face of the riser 11 in any particularity of arrangement determined to be effective for efficient direction of air to and through the trays 27 and follower or packer 34 of the associated stack.

Since changes, variations, and modifications in the form, construction, and arrangement of the elements shown and described may be had without departing from the spirit of my invention, I wish to be understood as being limited solely by the scope of the appended claims, rather than by any details of the illustrative showing and foregoing description.

I claim as my invention:

1. A photoprint drier comprising a hollow base, similar hollow risers upstanding from the opposite ends of said base in flow communication at their lower ends with the interior of said base, said risers being similarly formed with open sides opposed in confronting registration with each other above said base, panels selectively adjustable toward and away from said base in closing relation with the open sides of the risers, like, open-ended, hollow trays for the positioned support of wet photoprints adapted for stacked registration on and above said base in connecting relation between engagement at their ends through the opposed open sides of said risers and consequent individual flow communication with the interiors thereof, an open-ended, hollow packer adapted to conformably and coextensively cap a tray assembly stacked upon said base in coaction with lower margins of said panels, whereby to establish through said base, trays and packer air flow channels individually communicating with and between the riser interiors, and means for the regulable supply of regulably-heated air to and for circulation through said risers and the air flow channels therebetween.

2. A photoprint drier comprising a hollow base, similar hollow risers upstanding from the opposite ends of said base in flow communication at their lower ends with the interior of said base, said risers being similarly formed with open sides opposed in confronting registration with each other above said base, panels selectively adjustable toward and away from said base in closing relation with the open sides of the risers, like, open-ended, hollow trays for the positioned support of wet photoprints adapted for stacked registration on and above said base in connecting relation between engagement at their ends through the opposed open sides of said risers and consequent individual flow communication with the interiors thereof, an open-ended, hollow packer adapted to conformably and coextensively cap a tray assembly stacked upon said base in coaction with lower margins of said panels, whereby to establish through said base, trays and packer air flow channels individually communicating with and between the riser interiors, means for releasably securing and compacting the tray and packer assembly in stacked association with the base, and means for the regulable supply of regulably-heated air to and for circulation through said risers and the air flow channels therebetween.

3. The organziation according to claim 2, wherein one of said risers detachably engages an end of the associated base for convenient removal and replacement relative thereto.

4. The organization according to claim 2, wherein the means for the regulable supply of regulably-heated air to and for circulation through said risers and the air flow channels therebetween comprises a regulably-powered blower adapted to deliver to the upper end interior of one of said risers, an independently-regulable heating unit in the path of air intake to said blower, and an outlet from the upper end interior of the other said riser.

5. The organization according to claim 2, wherein each of said trays is an integrated unit laterally wide and vertically shallow in proportion to its length characterized by an imperforate metallic floor spacedly underlying a coextensive, air-permeable, fabric sheet.

6. The organization according to claim 2, wherein each of said trays is an integrated unit laterally wide and vertically shallow in proportion to its length characterized by an imperforate metallic floor, an air-permeable, fabric sheet spacedly and coextensively overlying said floor, and an air-permeable, substantially-inextensible, reinforcing sheet coextensively underlying said fabric sheet in direct supporting relation therewith.

7. The organization according to claim 2, wherein said base is formed with a laterally-concaved top surface adapted to support the trays, and each of the latter is an integrated unit shallow in proportion to its length characterized by an imperforate metallic floor conformably registrable with said base top surface and an air-permeable, fabric sheet spacedly and coextensively overlying said floor.

8. The organization according to claim 2, wherein said base is formed with a laterally-concaved top surface adapted to support the trays, and each of the latter is an integrated unit shallow in proportion to its length characterized by an imperforate metallic floor conformably registrable with said base top surface, an air-permeable, fabric sheet spacedly and coextensively overlying said floor, and a flexible, air-permeable, substantially-inextensible, reinforcing sheet coextensively underlying said fabric sheet in direct supporting relation therewith.

9. The organization according to claim 2, wherein said base is formed with a laterally-concaved top surface

adapted to support the trays, each of the latter is characterized by an imperforate metallic floor conformably registrable with said base top surface and a flexible, air-permeable sheet spacedly and coextensively overlying such floor for conforming engagement with the floor of a superposed unit, and said packer is an integrated member formed with a floor conformably registrable with the concaved base top surface and a flat top closure spacedly thereover.

10. The organization according to claim 2, wherein

end areas of said trays and packer are partially obstructed by discontinuous vertical spacers accommodative of air circulation through said areas.

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