United States Patent [19]

Zuber et al.

[11] **3,864,710**

[45] **Feb. 4, 1975**

[54] **PHOTOGRAPHIC PROCESSING APPARATUS**

[76] Inventors: **Edward F. Zuber**, R.R. No. 2, Lyndhurst, Ontario; **Udo F. Rumpf**, 1710 John St., Thornhill, Ontario, both of Canada

[22] Filed: **Dec. 3, 1973**

[21] Appl. No.: **421,332**

[52] **U.S. Cl.** **354/316**, 354/329, 354/340

[51] **Int. Cl.** **G03d 17/00**

[58] **Field of Search** ..... 354/89 R, 93, 96, 97, 98, 354/100, 297, 299, 307, 312, 316, 323, 325, 329, 330, 331, 340, 343

[56] **References Cited**

UNITED STATES PATENTS

52,748	2/1866	Roche	95/100 X
771,358	10/1904	Dorr	95/93
1,034,467	8/1912	Kieser	95/100 UX
3,280,716	10/1966	Gall	95/89 R
3,359,880	12/1967	Huss	95/93
3,626,835	12/1971	Buechner	95/93

FOREIGN PATENTS OR APPLICATIONS

1,140,457	11/1962	Germany	95/97

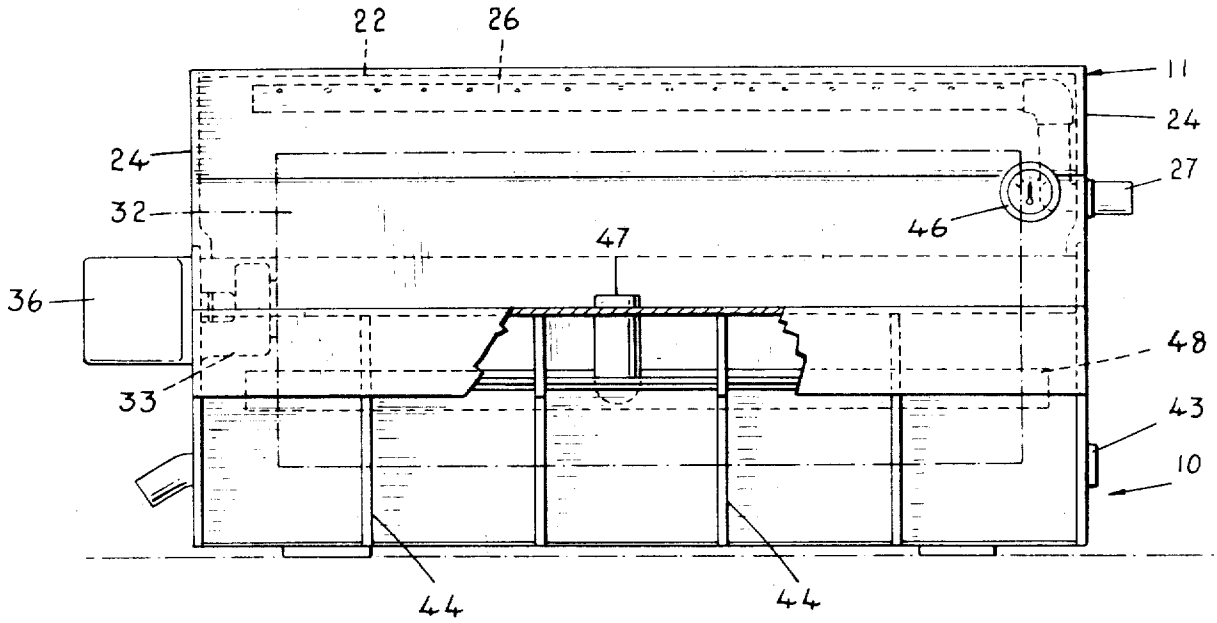
Primary Examiner—Fred L. Braun

Attorney, Agent, or Firm—Ridout & Maybee

[57] **ABSTRACT**

In a photographic processing apparatus of the type having a rotary cylindrical carrier, the photographic sheets are attached to the carrier by suction cups which engage only the rear sides of the sheets to hold the sheets to the support surface of the carrier. The apparatus has a lid which provides a vaulted interior surface to which washing liquid may be directed for washing the walls of the apparatus, the washing liquid being collected in a tray and emptied therefrom into a drainage chamber simply by tilting the apparatus from a normal upright position to a forward tilted position.

11 Claims, 5 Drawing Figures



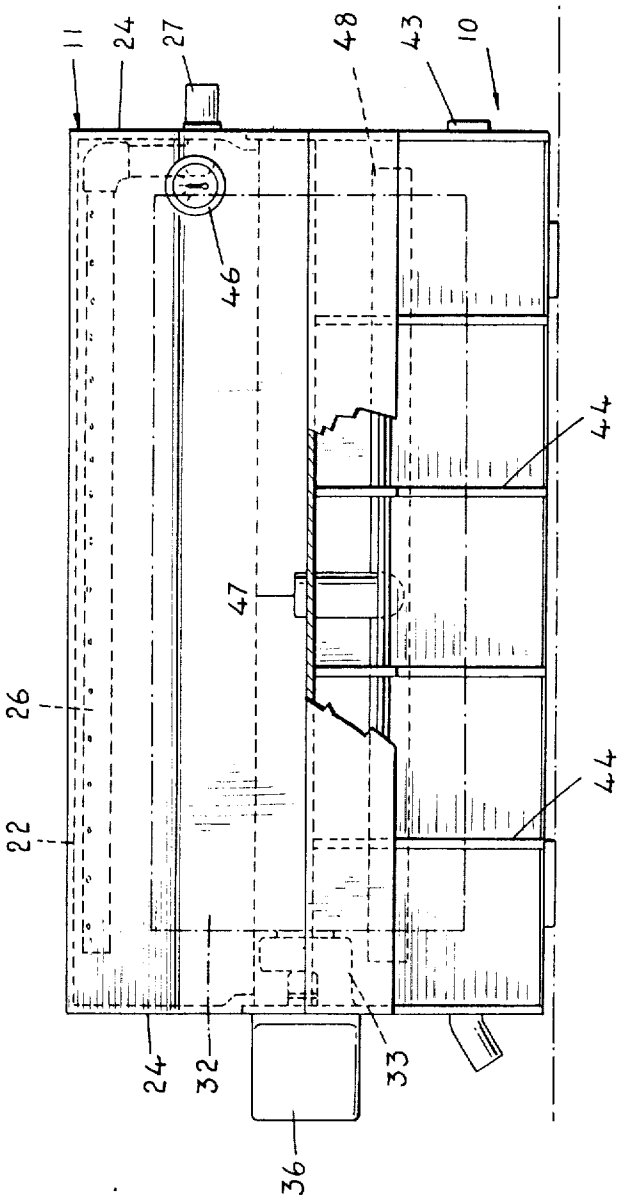
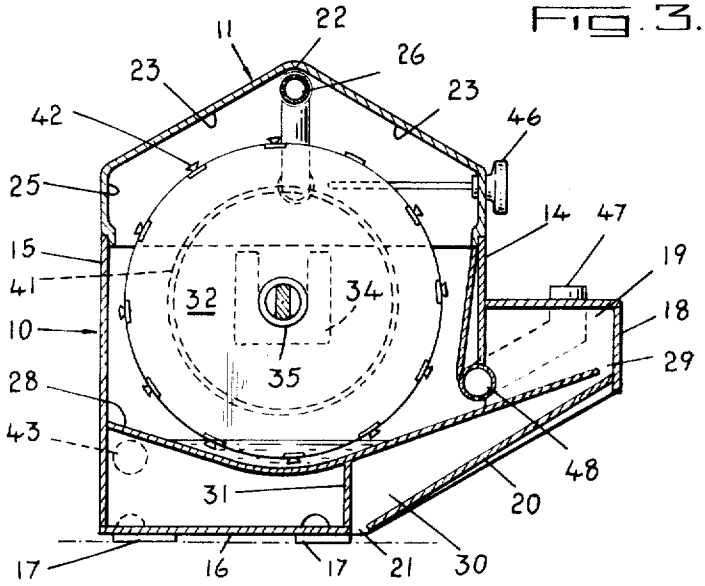


FIG. 1.

Fig. 3.


11
22
26
23
23
46
42
25
14
47
15
19
41
32
34
18
10
35
29
28
43
48
31
20
17
16
17
21
30

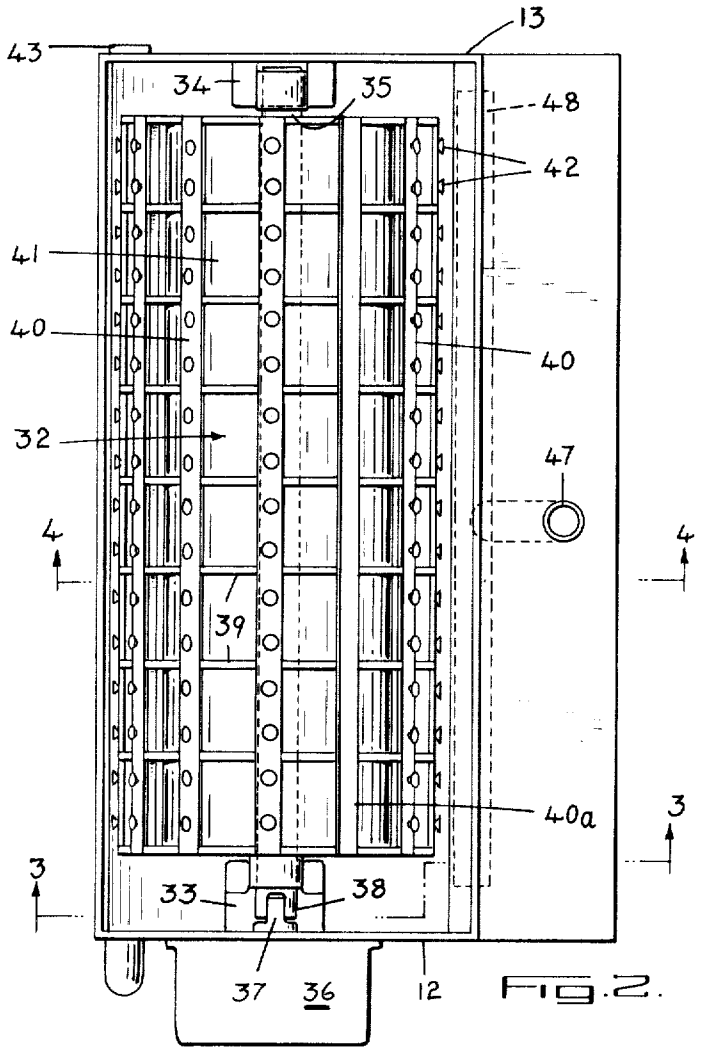
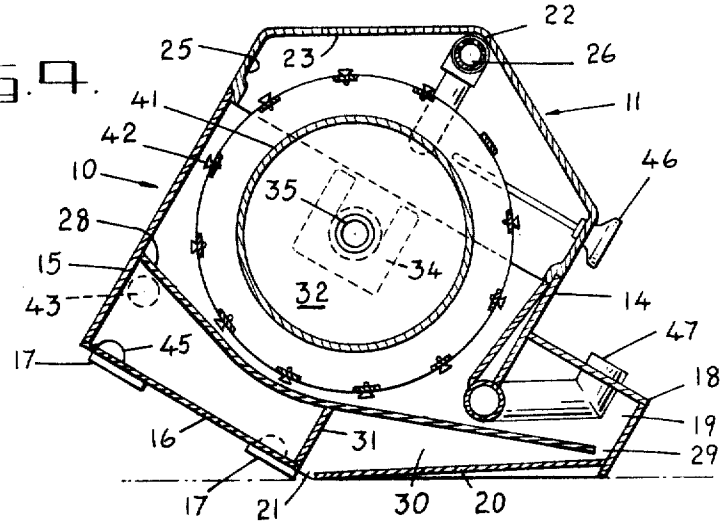

13
43
34
35
48
42
41
40
40
32
47
4
4
39
40a
3
3
33
38
37
36
12

Fig. 2.

Fig. 4.


22
25
23
26
11
41
42
10
46
35
28
34
15
32
14
43
47
45
17
18
19
16
31
29
17
21
30
20

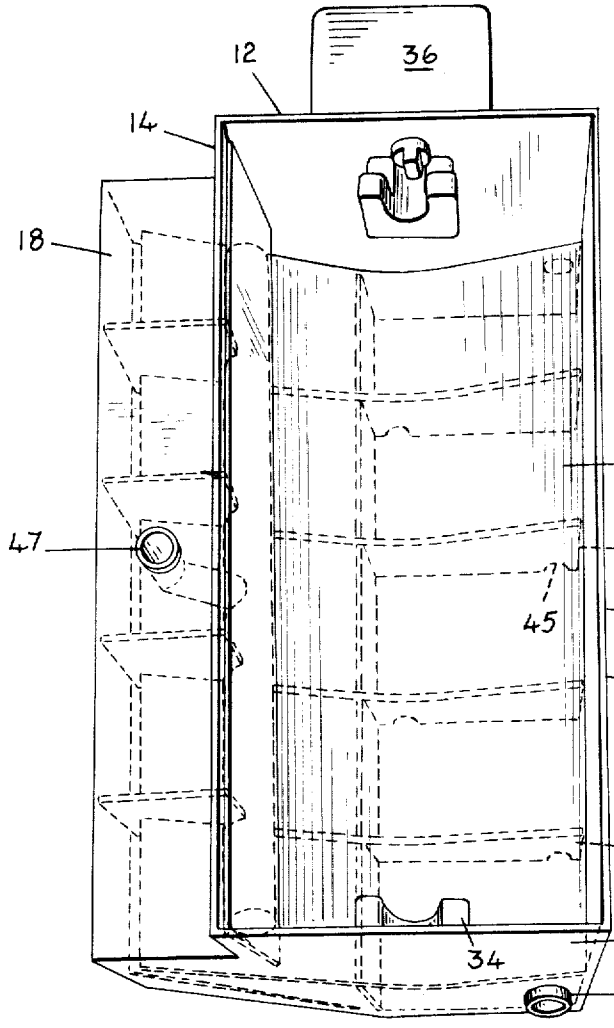

12
36
14
18
28
47
44
45
10
15
44
13
34
43

Fig. 5.

PHOTOGRAPHIC PROCESSING APPARATUS

BACKGROUND OF THE INVENTION

This invention relates to photographic processing apparatus and is concerned particularly with a drum-type processor of the type in which a photographic sheet to be processed is mounted on the external surface of a rotary drum and passed through a processing solution as the drum rotates.

Known apparatus of the type, in which the sheets are attached to the external surface of the drum by clips or pins, suffer certain serious disadvantages. In the first place, the method of attachment requires that the attachment means should engage the front, or sensitive, side of the sheets; this leads not only to wastage of the sheet material, but also to improper processing over a substantial area of the sheet in the vicinity of the attachment means. In the second place, the mechanical attachment means of the known apparatus can generally be used only with sheets of certain standard sizes, there being no provision for holding sheets of a non-standard size. In the third place, the attachment of the sheets to the drum, particularly in dark room conditions, is not a simple operation but requires some manipulative skill.

SUMMARY OF THE INVENTION

According to the present invention these disadvantages are overcome by providing the rotary carrier or drum with a plurality of discrete attachment means distributed over the cylindrical support surface of the carrier for engagement with the rear side only of the sheet material whereby to hold the sheet material to said support surface. The attachment means, for use with photographic sheet material which is water-impermeable, may comprise a plurality of suction cups mounted on the carrier.

The invention also provides a drum-type processor which is designed so as to facilitate washing of the processed material. According to another aspect of the invention, therefore, there is provided an apparatus for processing photographic sheet material comprising a light-tight housing having longitudinally extending vertical front and rear walls and a lid which can be opened to provide access to the interior of the housing, a tray-like container for processing solution mounted in the housing, a rotary carrier providing a cylindrical support surface journalled in said housing for rotation about a horizontal, longitudinal axis, attachment means on said carrier for the attachment of sheet material to be processed to said support surface, the carrier being positioned in relation to the tray-like container so as to contact the sheet material with processing solution as the carrier rotates, the lid providing a vaulted interior surface having a longitudinal apex portion and sloping portions extending therefrom to said front and rear walls, and means for supplying washing liquid to said apex portion of the interior surface for washing the interior surface and front and rear walls, the tray-like container being positioned to receive washing liquid from said front and rear walls. Such a processor is especially suitable for the processing of prints by the "total loss" method.

The tray-like container may be so arranged as to define with the front wall of the housing a passage communicating with a drainage chamber within the housing, the traylike container being arcuated about a horizontal axis, and the housing being tiltable from a normal upright position to a forward tilted position for emptying the contents of the container into the drainage chamber.

BRIEF DESCRIPTION OF THE DRAWINGS

One embodiment of the invention will now be described, by way of example, with reference to the accompanying drawings, in which:

FIG. 1 is a front elevational view, partly in section, of a processing apparatus according to the invention;

FIG. 2 is a top plan view of the apparatus with the cover or lid removed;

FIG. 3 is a cross section taken on the line 3—3 in FIG. 2;

FIG. 4 is a cross section taken on the line 4—4 in FIG. 2, but with the apparatus tilted to the forward position; and

FIG. 5 is a perspective view, from above, of the housing of the apparatus with the lid and rotary carrier removed, the figure showing internal structure of the housing.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The apparatus illustrated in the drawings is primarily intended for use in photographic printing by the "total loss" process, wherein the processing solution is used once only and then poured away. It will be appreciated, however, that the present embodiment is presented as an example only, and the invention is by no means limited in its scope to apparatus intended for such use.

The apparatus comprises a molded plastic cabinet or housing **10**, of opaque polyvinyl chloride for example, and a molded plastic lid **11** also of opaque plastic material such as polyvinyl chloride. The lid **11** is removable from the housing to provide access to the interior of the housing, but is normally closed to form a light-tight enclosure. Instead of being removable, the lid may alternatively be hinged to the rear top edge of the housing. The housing **10** provides a pair of end walls **12, 13**, a pair of longitudinally extending, vertical front and rear walls **14, 15**, a horizontal base **16** mounted on feet **17**, and a wall structure **18** extending along the front wall **14** to define a forwardly projecting compartment **19**, a sloping wall **20** extends downwardly from the wall structure **18** and is spaced from the base **16** at its lower edge to define an opening **21**.

The lid **11** is shaped to provide a vaulted interior surface having a longitudinally extending apex portion **22**, and sloping portions **23** extending between end portions **24**, and merging with vertical portions **25** aligned with the front and rear walls of the housing. A pipe **26** mounted in the lid **11**, having an inlet **27** for the supply of washing water under pressure extending through an end portion **24**, extends longitudinally immediately beneath the apex portion **22**. This pipe is formed with three rows of perforations which are positioned so as to direct the washing water onto the apex portion **22**, from which the water runs down the sloping portions **23**, vertical portions **25**, and front and rear walls **14, 15** of the housing. A hose would normally be connected to the inlet **27** for supplying the washing water.

A suitably shaped wall member **28** of polyvinyl chloride is mounted in the lower part of the housing **10** to form therein an elongated tray-like container extending between the end walls of the housing. The rear longitu-

dinal edge of the wall member **28** extends along the rear wall **15**. The wall member **28** extends beyond the bottom of the front wall **14** of the housing into the compartment **19**, its front longitudinal edge being spaced from the wall structure **18** so as to define a passage **29** communicating with a drainage chamber **30**. The drainage chamber **30** is bounded by the wall member **28**, a vertical partition wall **31** and the sloping wall **20**.

A dreem, or rotary carrier **32** for sheet material to be processed is journalled in the housing **10** for rotation about a longitudinal horizontal axis defined by journals **33, 34** mounted on the end walls **12, 13**. The rotary carrier is mounted on a drive shaft **35**, the ends of which are supported by the journals **33, 34**, which are hemicylindrical as shown to facilitate removal and replacement of the carrier. One end of the drive shaft is coupled to a drive motor (not shown) through reduction gearing, the motor and its reduction gearing being mounted in a housing **36** mounted on the end wall **12**. A spigot and socket coupling, comprising a nylon spigot **37** and a nylon socket **38**, is arranged so as to permit easy removal of the rotary carrier assembly by lifting it from the housing **10**. The rotary carrier **32** is constituted by a frame structure comprising a plurality of axially spaced discs **39**, which are connected to the drive shaft and arranged coaxially with it, and a plurality of axially extending, circumferentially spaced slats **40, 40a** which are rigidly connected to the edges of the discs. The drive shaft **35** is enclosed by a tubular shield **41** extending between the end discs **39** of the frame structure. The frame structure and tubular shield are preferably of acrylic plastic. The slats **40, 40a** define a cylindrical support surface of the rotary carrier, to which photographic sheets to be processed may be attached. The attachment means for the sheets are constituted by a plurality of suction cups **42** mounted on the slats **40**. In fact, the slats **40** are uniformly spaced, and the suction cups **42** are uniformly spaced along the slats, so that the suction cups are uniformly distributed over a major sector of the cylindrical support surface defined by the slats **40**. Suction cups are not provided on the slat **40*a***, which defines a reference position to assist in the arranging of photographic sheets on the carrier. Areas of contact adhesive may be provided along the slat **40*a*** for use with porous photographic sheet material. The suction cups **42** are of elastomeric material, such as silicone rubber; each cup has a suction face and stud-like portion projecting from its back face, which stud-like portion is inserted into an aperture in the slat so as to secure the suction cup in position.

The container wall member **28** defines with the wall **31**, rear housing wall **15**, and base **16**, a reservoir having a filling opening **43**. The reservoir is partitioned by frame members **44** which support the container wall member **28**, and which are provided with staggered openings **45** to allow liquid to flow between the reservoir components. The reservoir may be filled with water of a selected temperature and, by reason of its thermal capacity and low rate of heat loss through the walls of the housing, will retain the contents of the tray-like container at the selected temperature for a considerable time. In this way, the need for complicated thermostatic controls is eliminated.

In order to use the apparatus the user first arranges the photographic sheets to be processed on the support surface of the carrier **32**. The uniform distribution of the suction cups **42** enables sheets of non-standard sizes to be mounted, and an optimum arrangement of sheets can be found by taking the slat **40*a*** as a reference or starting position. The lid **11** is closed to provide a light-tight interior, and from this time it is no longer necessary to maintain dark room conditions. Water at a selected temperature is admitted to the heat reservoir through the inlet **43**, to raise the interior of the apparatus to the selected temperature. This temperature is measured by a thermometer **46**. When the required temperature is attained, processing solution is supplied to the tray **28** via an inlet pipe **47** extending through the upper part of the wall structure **18**, the pipe **47** being joined by a T-piece to a longitudinally extending, open-ended pipe **48** having perforations **49** arranged over the container. The container **28** is positioned in relation to the rotary carrier **32** so that as the carrier rotates, driven by the motor, the sheet material carried thereby is passed through the solution in the container. Up to now the housing **10** has been in its normal upright position illustrated in FIG. **3**. At the end of processing, the housing is tilted about a horizontal axis defined by the front edge of the base **16**, into the forward tilted position illustrated in FIG. **4**. The solution flows from the container **28** into the drainage chamber **30** via the passage **29**, and hence via the opening **21** into a sink. The housing is next returned to its upright position, and washing water is supplied to the pipe **26**, the water being directed onto the apex portion of the interior surface of the lid, from which it flows down the sloping surfaces **23**, and the housing walls, to be collected by the tray-like container **28**. Additionally, washing water is supplied to the container via the pipes **47** and **48**. A baffle plate **50** is mounted on the front wall **14** to prevent washing water from becoming trapped behind the pipe **48**. Again, in order to remove excess liquid from the container, one simply tilts the housing to its forward position, the liquid flowing to the drainage chamber **30** via the passage **29** and thence to a sink via the opening **21**.

What I claim as my invention is:

1. An apparatus for processing photographic sheet material comprising a light-tight housing, a tray-like container for processing solution mounted in the housing, a rotary carrier providing a cylindrical support surface journalled in said housing for rotation about a horizontal axis, and a plurality of discrete attachment means distributed over said support surface for engagement with the rear side only of sheet material carried by the rotary carrier whereby to hold said material to said surface, said attachment means comprising a plurality of suction cups mounted on the carrier and uniformly distributed over a major sector of said cylindrical support surface, the carrier being positioned in relation to the tray-like container so as to contact the sheet material with the processing solution as the drum rotates.

2. An apparatus according to claim **1**, in which the rotary carrier is constituted by a frame structure comprising a plurality of axially spaced discs, coaxial with said horizontal axis, and a plurality of axially extending, circumferentially spaced, slats rigidly connected to the edges of the discs and supported thereby, the suction cups being mounted on and distributed along said slats.

3. An apparatus according to claim **2**, wherein the slats are uniformly spaced, and the suction cups are uniformly spaced along the slats, the suction cups being

uniformly distributed over a major sector of said support surface defined by the slats.

4. An apparatus for processing photographic sheet material comprising a light-tight housing having a pair of end walls, longitudinally extending front and rear walls, a base wall structure, and a lid which can be opened to provide access to the interior of the housing, a tray-like container for processing solution mounted in the housing, a rotary carrier providing a cylindrical support surface journalled in said housing for rotation about a horizontal, longitudinal axis, attachment means on said carrier for the attachment of sheet material to be processed to said support surface, the carrier being positioned in relation to the tray-like container so as to contact the sheet material with processing solution as the carrier rotates, the lid providing a vaulted interior surface having a longitudinal apex portion and sloping portions extending therefrom to said front and rear walls, means for supplying washing liquid to said apex portion of the interior surface for washing the interior surface and front and rear walls, the tray-like container being positioned to receive washing liquid from said front and rear walls, and structural means defining a drainage chamber within the housing, the tray-like container providing a front longitudinal edge which defines a passage communicating with said drainage chamber, the housing being tiltable about an axis parallel to said longitudinal axis from a normal upright position to a forward tilted position for emptying the contents of said container into the drainage chamber through said passage, and said structural means including a rearwardly and downwardly sloping wall member defining with the base wall structure a drainage opening for draining the chamber when the housing is in the forward tilted position.

5. An apparatus according to claim 4, wherein the means for supplying washing liquid comprises a pipe extending longitudinally immediately beneath said apex portion and means for supplying liquid under pressure to the pipe, the pipe having rows of perforations positioned to direct washing liquid onto the apex portion of said interior surface.

6. An apparatus according to claim 4, wherein the tray-like container further defines one wall of a reservoir which is partitioned from the drainage chamber, the housing providing means for supplying liquid at a selected temperature to the reservoir for maintaining the contents of the container at the selected temperature, the container providing for heat exchange between said liquid and said contents.

7. An apparatus for processing photographic sheet material comprising:

a light-tight housing having a pair of end walls, longitudinal vertical front and rear walls, and a base wall structure, said housing being tiltable about a longitudinal axis from a normal upright position to a forward tilted position;

a lid for said housing, the lid providing a valuted interior surface having a longitudinal apex portion and sloping portions extending therefrom to said front and rear walls;

means for supplying washing liquid to the apex portion of said interior surface;

an elongated tray-like container for processing solution mounted longitudinally in said housing;

a rotary carrier providing a cylindrical support surface journalled in said housing for rotation about an axis parallel to said longitudinal horizontal axis;

a plurality of suction cups distributed over said support surface for engagement with the rear side only of sheet material carried by the rotary carrier whereby to hold said material to said support surface;

the carrier being positioned in relation to the tray-like container so as to contact the sheet material with the processing solution as the carrier rotates;

the tray-like container being positioned to catch washing liquid from said front and rear walls; and

structural means defining a drainage chamber within the housing, the tray-like container providing a longitudinal front edge which defines a passage communicating with said drainage chamber, whereby to empty the contents of the container into the drainage chamber when the housing is tilted to the forward position,

said structural means including a rearwardly and downwardly sloping wall member defining with said base wall structure a drainage opening for draining the chamber when the housing is in the forward tilted position.

8. An apparatus according to claim 7 wherein the tray-like container further defines one wall of a reservoir which is partitioned from the drainage chamber, the housing providing means for supplying liquid at a selected temperature to the reservoir for maintaining the contents of the container at the selected temperature, the container providing for heat exchange between said liquid and said contents.

9. An apparatus according to claim 7, wherein the suction cups are uniformly distributed over a major sector of said cylindrical support surface.

10. An apparatus according to claim 9, in which the rotary carrier is constituted by a frame structure comprising a plurality of axially spaced discs, coaxial with the rotational axis of the carrier, and a plurality of axially extending, circumferentially spaced, slats rigidly connected to the edges of the discs and supported thereby, the suction cups being mounted on and distributed along said slats.

11. An apparatus according to claim 10, in which the rotary carrier provides a pair of axially spaced end members and is mounted on a rotary drive shaft extending between said end members, and further comprises a tubular shield enclosing the drive shaft and extending between said end members of the carrier.

* * * * *