INKING PAD AND USE THEREOF

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References Cited

UNITED STATES PATENTS

2,517,753 8/1950 Ximenez et al....................................... 29/132 X
3,022,542 2/1962 Davis.............................................. 401/198 X
3,039,908 6/1962 Parmele............................................. 401/198 X
3,080,600 3/1963 Stevens........................................... 401/199
3,111,702 11/1963 Berger............................................ 131/207 X
3,147,698 9/1964 Ross............................................... 101/149.2
3,377,124 4/1968 Matsumoto........................................ 401/198
3,399,021 8/1968 Matsumoto........................................ 401/199
1,829,579 10/1931 Beach................................................ 101/125 X

2,006,364 7/1935 Morse.............................................. 101/348 X
2,466,785 4/1949 Schreyer......................................... 401/198
2,651,255 9/1953 Wallich........................................... 101/125
3,004,941 10/1961 Mestdagh et al............................... 260/29.4
3,063,897 11/1962 Labino.......................................... 264/324
3,204,871 9/1965 Callander........................................... 222/187 X
3,277,819 10/1966 Berkland........................................ 101/125
3,335,660 8/1967 Vosburg.......................................... 101/125
3,442,209 5/1969 Funahashi....................................... 101/327

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ABSTRACT

An inking pad is formed of a porous mat of glass fibers bonded
with a thermosetting resin binder, the mat providing an ink
reservoir which dispenses ink contained therein to the surface
thereof. The pad preferably also includes a cloth cover on
the surface of the mat providing an inking surface on the pad.
An ink applicator constitutes the inking pad and ink contained
therein. An inking pad unit includes a holder for the inking
pad, having structure for mounting in an inking device. An inking
device includes the inking pad and means for mounting the
inking pad for transmitting ink to a surface to be inked. A method of supplying ink to a surface evenly and with con-
trolled flow of ink involves placing a surface to be inked in ink-
king relation to the inking pad containing ink.

9 Claims, 18 Drawing Figures
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INKING PAD AND USE THEREOF

BACKGROUND OF THE INVENTION

This invention relates to an inking pad and its use.

Inking pads have been formed of numerous and varied materials, including fibrous, porous elastomeric, and porous plastic materials. The prior materials have varying fluid retention capabilities and saturation capacities. Materials having low fluid retention and/or saturation properties require frequent re-inking, to maintain a sufficient ink supply and/or to avoid excessive surface concentrations or leakage of ink where retention is poor. In applications involving the supply of ink to the pad during use, saturation capacity represents a less significant factor, but fluid retention capability remains important. The ability to re-ink the pad and the ease of re-inking also are important in such applications.

Probably the most vexing problem in the use of inking pads concerns metering control, that is, control of the ink flow to the surface of the inking pad without overinking or leakage. The materials in common use, especially in applications involving a continuous ink supply, tend to overink, and ink drips from the pad when not operated, owing to the relatively poor fluid retention properties. In order to minimize this problem, pads are inked below their capacity, and in the case of pads continuously supplied with ink, valving arrangements are provided to control the flow of ink to the pad. Nevertheless, changes in temperature, atmospheric pressure, and viscosity of the various ink components make metering control difficult and unreliable.

Additional problems concern the properties of the pad materials. The neoprene rubber and plastic foams used for pad materials have a tendency to swell after saturation with inks. This distorts the printing surface of the pad and also the cellular structure of the foam materials. The intended fluid retention properties are, therefore, upset, causing the pad to overink or leak. An even printing surface and proper metering of ink to the surface are two of the most important properties a well functioning printing applicator must have.

The rubber and plastic pad materials have substantial compressibility, so that ink is squeezed out of the pad when subjected to substantial stamping or printing pressure on the inking surface. Consequently, valving has been needed for accommodating the ink expressed from the pad, to prevent ink from being forced out in normally sealed locations. Also, for these and other materials, an ink distributor screen has been necessary for distributing the ink from a source of supply or a reservoir across the area of the pad in the process of continuously supplying ink thereto. Otherwise, locally high concentrations of ink were formed in the pad, especially in the center.

A more specific problem with prior pad materials concerns the organic solvent-containing inks, especially the fastdrying printing inks. Such inks not only cause swelling problems in neoprene and certain plastics, but they dry out within the pads and stop the flow of ink unless special measures are taken to keep the pad usable, as by keeping the pad in a solvent vapor atmosphere when not in use. The ink drys within the pad owing to the inspiration of air by the pad upon relaxation following pad compression.

A popular ink applicator of the prior art overcomes problems occasioned by poor fluid retention but is limited in its application. Such applicator is formed of a pad of microporous thermoplastic resin material having an ink incorporated in the material during its manufacture. While the applicator is useful as a self-contained unit, it can only be made with a limited selection of inks, and its re-inkability is limited. The type of ink required limits stencil printing use to nitrocellulose-coated stencils, inasmuch as the ink destroys other stencil emulsions.

SUMMARY OF THE INVENTION

The present invention provides a new and improved inking pad which overcomes the deficiencies of the prior art and provides important advantages thereover. In the invention, an inking pad is formed of a porous mat of glass fibers bonded with a thermosetting resin binder, the mat providing an ink reservoir which disperses ink contained therein to the surface thereof. In a preferred embodiment of the invention, a cloth cover on the surface of the mat provides an inking surface on the pad. An ink applicator according to the invention includes the inking pad and an ink contained in the mat.

The invention also provides an inking pad unit for mounting in an inking device which includes the inking pad, a baffle secured to the holder, and means on the pad for fastening the unit in an inking device. An improved inking device according to the invention includes the inking pad and means for mounting the inking pad for transmitting ink to a surface to be inked. Preferred inking devices include hand stamps or printers, mimeograph duplicating machines, and offset printers.

The invention further provides a method of supplying ink to a surface evenly and with controlled flow of ink which involves placing a surface to be inked in a transmitting relation to the inking pad containing an ink.

The inking pad of the invention has outstanding ink retention properties together with good saturation capacity, rendering the pad eminently suitable for use both as a self-contained ink applicator and in continuous ink supply systems for a wide variety of applications. Ink is supplied to the surface of the pad evenly and with controlled flow of ink, with no concentration of ink appearing on the pad surface even during long rest periods, and with no leakage. The transfer of ink to a surface to be inked likewise is high uniform and remains so throughout extended use, whether the pad is employed as a self-contained ink applicator or in a system supplying additional ink thereto.

The inking pad has been found to be equally useful with all printing inks yet tried, whether oil, water, oil-water or solvent base, including especially solvent-containing fast-drying and other stencil printing inks. The inking pad is impervious to any known ink base material in industrial use, and it does not swell or distort with any of the inks. No control of ink viscosity is required, and normal variations in atmospheric temperature and pressure conditions pose no problems. The solvent-containing fast drying inks do not dry within the pad when saturated, owing to negligible air inspiration into the pad.

The inking pad is readily re-inked, whether for use as a self-contained ink applicator or in a system employing continuous ink supply. Ink is absorbed into the pad rapidly and is homogeneously distributed throughout, so that no distributor device is needed in the continuous ink supply system. A uniform flow and inking. No valving is required, either for supplying ink to the pad or for return flow of ink from the pad in use.

The new inking pad having the foregoing characteristics is useful in substantially any application where an ink transfer is necessary. Among the many uses of the pad are in hand stamps or printers of various types, stamp pads, inking rolls or pads for printing machines, marking and numbering devices, computer printers, and accounting machines, and mimeograph machines.

BRIEF DESCRIPTION OF THE DRAWINGS

The attached drawings illustrate preferred embodiments of the invention without limitation thereto. In the drawings, like elements are identified by like reference symbols in each of the views, and:

FIG. 1 is a perspective view of a disposable hand stamp or printer according to the invention;
FIGS. 2 and 3 are, respectively, transverse and longitudinal sectional views thereof;
FIG. 4 is a perspective view of the inking pad thereof;
FIG. 5 is a transverse sectional view of another embodiment of a hand stamp according to the invention, having a removable inking pad unit;
FIG. 6 is a perspective view of the inking pad unit of FIG. 5;
FIGS. 7, 8 and 9 are, respectively, transverse sectional, longitudinal sectional, and bottom plan views of an additional embodiment of a hand stamp according to the invention, hav-
ing a removable inking pad unit, means for securing a stencil on the surface of the inking pad, and ink supply means; FIGS. 10 and 11 are, respectively, transverse and longitudinal sectional views of a further embodiment of a hand stamp according to the invention, having a rocker type construction and including a removable inking pad unit and means for securing a stencil on the surface of the inking pad; FIG. 12 is a longitudinal sectional view of a still further embodiment of a hand stamp according to the invention, having a rocker type construction, a removable inking pad unit, stencil securing means, and ink supply means; FIG. 13 is a perspective view of a stencil drum for a mimeograph duplicating machine according to the invention; FIG. 14 is a transverse sectional view of the stencil drum of FIG. 13, taken on line 14—14 thereof; FIG. 15 is a fragmentary longitudinal sectional view of the stencil drum of FIG. 13, also illustrating drive structure connected thereto; FIG. 16 is a perspective view of apparatus for offset printing according to the invention; FIG. 17 is an exploded perspective view of an ink roller attachment in the apparatus of FIG. 16; and FIG. 18 is a fragmentary elevational and partly sectional view of a mat drum and drive structure connected thereto in the apparatus of FIG. 16.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to the drawings, the illustrative preferred embodiments of the inking pad of the invention are shown in the several views incorporated in preferred inking devices of the invention. In FIGS. 1-4, a disposable hand stamp or hand printer 10 having a generally rectangular inking pad 12 is illustrated. In addition to the pad, the stamp includes means for mounting the pad constituting a rectangular hollow frame or backing member 14 having a central circular opening 16 therethrough, a hollow handle 18 mounted on the frame and extending into the opening 16, and a plug 20 inserted into the inner open end of the handle. The hand stamp 10 is intended for use as a disposable or throwaway stamp, to be discarded when the ink content is exhausted.

The inking pad 12 is formed or constructed of a porous mat 22 of glass fibers bonded with a thermosetting resin binder, the mat providing an ink reservoir which disperses ink contained therein to the surface thereof. The mat 22 is a generally rectangular body having a concave inner, ink-receiving surface 23 and a flat outer, inking surface 26. The pad also includes a cloth cover 24 on the inking surface 26 of the mat 22, covering the mat surface and providing an inking surface 28 on the pad.

The materials of which the mat 22 and the cover 24 are formed are basically the same for the several inking pads employed in the various inking devices illustrated in the drawings, and are described in greater detail hereinafter.

The edges of the mat 22 are sealed by a layer or coat 30 of adhesive-sealer, which serves to prevent the escape of ink at the edges. The cover 24 is secured to the mat 22 at the edges and on the inner surface 23 of the mat, adjacent the edges, by the same adhesive-sealer as is employed for sealing the edges. A suitable oil, water and solvent-resistant adhesive-sealer is employed, and in the illustrative embodiments of the invention, it is a conventional heat-cured or air-dried solvent base nitrile adhesive suitable for use with, inter alia, synthetics, metals, fabrics, fibers, and foams. In use, the pad 12 is impregnated with ink, and the ink-containing pad provides an ink applicator, for applying ink from the inking surface 28 of the pad to a surface to be inked.

The frame 14 and the handle 18 preferably are one-piece members molded of thermoplastic synthetic resin. The frame includes an inner peripheral shoulder 32 which receives the pad 12 thereon, nested in the frame. The inner corners of the pad are secured to the shoulder by a layer 34 of the adhesive employed on the pad. The frame 14 forms an additional ink reservoir 35 with the pad 12, communicating with the inner, ink-receiving surface 23 of the mat 22. Longitudinally extending spaced reinforcing ribs 36 extend in the reservoir 35 from the inner surface of the frame 14 to the inner surface 23 of the mat. The ribs both reinforce the frame 14 and support the pad 12 when pressure is applied thereto.

The handle 18 includes a neck 38 which is received in the central opening 16 in the frame 14, where the handle and the frame are secured together as by fusion or an adhesive. The plug 20, of rubber or other suitable material, is optional, and when employed, is inserted in the neck 38 of the handle. The pad 12 is saturated with ink in manufacturing the hand stamp 10, and the stamp may be used without additional ink supply until the ink is exhausted. If desired, additional ink may be supplied to the reservoir 35 during assembly, and if a greater supply of ink is desired, the plug 20 may be omitted and the handle 18 filled with ink during assembly, for greater stamp life.

The hand stamp 10 is designed particularly for simple, convenient use in printing with small stencils, of area corresponding to the area of the inking surface 28 of the pad 12. Such stencils are used for addressing and labelling purposes, such as when it is desired to imprint cartons or other containers with consignee information. A stencil is placed on the inking surface 28 of the inking pad 12 and adheres thereto, and the handle 18 is gripped by the user for placing the pad in ink-transmitting relation to a surface to be inked. The stencil is placed in contact with the surface, and ink flows through the stencil openings onto the surface to form a stencil print thereon. A stencil will adhere to the inking surface 28 without other means for securing the stencil thereon, for a limited number of printings, e.g., 25 printings.

The mat 22 serves to retain the ink contained therein without over-inking, yet disperses the ink to its inking surface 26 evenly and with controlled flow of ink as contact is made with a surface to be inked. The cover 24 further improves the evenness of application from the pad surface 28 and metering control, while providing additional advantages, as described subsequently. The sealing means provided by the sealing layer 30 on the mat edges and by the closed frame 14 sealed to the corners of the pad 12 by the sealing layer 34 limits the transmission of ink from the stamp to transmission from the pad inking surface 28. There is no leakage or dripping either from the pad inking surface 28, or from or around the edges of the pad 12.

The hand stamp 10 is also long lasting. As an example, it was found that when the hand stamp 10 was used in the foregoing manner, a pad 12 having a one-fourth inch thick mat 22, saturated with ink and having no additional supply of ink, produced between 10,000 and 15,000 good stencil prints, depending on the letter size cut on the stencil. When the print becomes light, indicating exhaustion of the ink, the stamp may be discarded.

It will be apparent that a device similar to the hand stamp 10 may be employed as a stamp pad, substituting an imperforated frame or case for the frame 14 and the handle 18. Such stamp pad may serve for inking rubber stamps and the like as in office work, in which case it may be provided with a lid or closure, or it may be mounted on apparatus or equipment for inking metal, rubber or other printing characters, such as a numbering device. The stamp pad likewise is long-lasting and may be made economically, so that it may be discarded and replaced when the ink is exhausted, with no necessity for a re-inking operation.

FIGS. 5 and 6 illustrate a hand stamp 42 similar to the embodiment of FIGS. 1-4 but having a removable or detachable inking pad unit 44 intended for disposal and replacement as the ink contained in the pad unit becomes exhausted. The stamp 42 includes the pad unit 44, a rectangular hollow frame 46, and a hollow handle 48. The pad unit 44 includes an inking pad 50 formed of a mat 52 of bonded glass fibers and a cloth cover 54. The mat 52 is a generally rectangular body having a flat outer inking surface.
5 and a concave inner surface 58. The edges of the mat are sealed by a layer 60 of adhesive-sealer, of the type previously described. The pad unit 44 also includes a rectangular hollow holder or subframe 62, preferably molded of plastic. The holder includes an inner peripheral shoulder 64 receiving the inner corners of the mat 52, and longitudinally extending reinforcing ribs 66 extending to the inner surface 58 of the mat. The holder 62 is secured to the corners of the mat 52 by a coat of the same adhesive as employed for the sealing layer 60. The cover 54 extends over the inking surface 56 of the mat, around the edges of the mat, and over the upper edges of the holder, to which the cover is secured by a layer 70 of the same adhesive material. A central opening 68 is provided in the holder, and the wall thereof is threaded for fastening the pad unit 44 in the stamp 42.

The pad unit 44 is received telescopically within the stamp frame 46, which has a central opening 72 registering with the threaded opening of the holder 62. A sealing gasket 74 of rubber or other suitable material is inserted between the holder 62 and the frame 46. The assembly is completed by the handle 48 having a threaded neck 76, with the neck inserted through the frame opening 72 into threaded engagement in the holder opening 68, securing the parts together.

The hand stamp 42 is intended for use in the same manner as the embodiment of FIGS. 1-4, except that the pad unit 44 may be unfastened from the handle 48, discarded, and replaced by a fresh pad unit when the ink becomes exhausted, while the frame 46 and the handle remain in service. There is no necessity for the consumer to ink the pad or supply ink to the device. It will be noted, however, that the holder 62 forms an additional ink reservoir 78 with the pad 50, whereby if desired, an additional supply of ink may be contained in the stamp 42 behind the mat 52, for absorption at the inner surface 58 thereof. Ink may be added through the frame and holder openings 72 and 68, and if further desired, the handle 48 may be filled with ink. As in the preceding embodiment, the frame 46 and the handle 48 may be constructed of plastic, or other suitable materials of construction may be employed.

FIGS. 7-9 illustrate a stencil holding hand stamp 80, similar to the preceding embodiments and also having structure for supplying the stamp with ink and for clamping a stencil on the stamp. The stamp 80 includes a rectangular inking pad unit 82 similar to the pad unit 44 of FIGS. 5 and 6, a rectangular hollow frame 84 similar to the frame 46 of FIG. 5, a holder 88 secured to the frame, a gasket 86 serving both as an ink container and as a handle for the stamp.

As in the embodiment of FIGS. 5 and 6, the pad unit 82 includes an inking pad 90 formed of a porous bonded glass fiber mat 92 and a cloth cover 94 thereover, and a hollow rectangular holder 96 receiving the mat 92 therein and adhesively secured thereto. The mat 92 is a generally rectangular body having a flat outer inking surface 98 and a concave inner inking receiving surface 100. The edges of the mat are provided with a sealing layer 102 of adhesive-sealer.

The holder 96 forms an ink reservoir 104 with the pad 90, for containing ink between the inner surface 106 of the holder and the inner surface 100 of the mat 92. Reinforcing ribs 107 on the holder extend between its inner surface 106 and the mat inner surface 100. An ink inlet opening 108 is provided in the center of the holder 96, in communication with the reservoir 104. Fastening or mounting screws 110 are mounted in the holder 96 and project outwardly therefrom, for fastening the pad unit 82 in the stamp 80. The cover 94 extends over the inking surface 98 of the mat 92, to provide an inking surface 112 on the pad 90, and around the edges of the pad this 82, where it is adhesively secured to the outer periphery of the holder 96.

The frame 84, preferably constructed in this embodiment of metal, includes integral outwardly extending tabs 114 and 116, in pairs of spaced tabs located at the ends of the frame on opposite sides thereof, and a circular central opening 118 bored therby a raised frame portion 120. A rectangular gasket 122 is interposed between the frame 84 and the holder 96. The fastening screws 110 extend through holes in the gasket 122 and the frame 84 for securing the pad unit 82 thereto by thumb nuts 124 engaging the outer surface of the frame.

The adapter 86 is a conventional circular coupling member preferably constructed of metal, and is mounted in the central opening 118 of the frame 84. The adapter has a bottle receiving recess 126 in register with a dispensing opening 128, and the wall of the recess is threaded internally. A flanged neck portion 130 of the adapter is crimped over the inner surface of the raised frame portion 120 to secure the adapter 86 to the frame 84. A circular gasket 132 is interposed between the adapter 86 and the rectangular gasket 122, to increase the gasket thickness in this area for a tight seal. Openings are provided in the gaskets 122 and 132 in register with the holder inlet opening 108 and the adapter dispensing opening 128.

The squeeze bottle 88 is a conventional article, preferably constructed of resilient plastic, and it includes a threaded neck 134 threadedly engaged in the recess 126 of the adapter. An O-ring seal 136 is interposed between the end of the bottle neck 134 and the base of the adapter recess 126. It will be noted that no valving need be provided for supply of ink from or return ink flow to the squeeze bottle 88.

The stamp 80 is supplied to the user with the squeeze bottle 88 separate from the remainder of the stamp, filled with ink and capped. In use, the bottle neck 134 is threadedly inserted into the adapter 86, and ink from the bottle is supplied through the dispensing opening 128 and the holder inlet opening 108 to the reservoir 104, by normal flow supplemented with hand pressure on the bottle, as may be preferable. Ink is absorbed from the reservoir through the inner surface 100 of the mat 92 and permeates the mat homogeneously throughout. The mat may or may not also be pre-inked.

The stamp 80 is intended for use with a stencil mounted on the inking surface 112 of the pad 90, as in the preceding embodiments. Also, means are provided for securing a stencil on the inking surface 112, which means are generally conventional. A hinge pin 138 is mounted in suitable openings in the tabs 114 of one side of the frame 84. A clamp 140 is pivotally mounted on the hinge pin 138, and it includes a bent preferably metal strip 142 and a generally rectangular wire ring 144 terminating in a bent finger-operated latch member 146. The ring 144 is secured within the bent strip 142, so that members pivot together. The strip 142 terminates in a pinch flange 148.

Employing the stamp 80, one side margin of a stencil is first placed on the side edge of the pad 90 adjacent to the pinch flange 148, with the clamp 140 swung down and away from the pad 90. The end margins of the extend beyond the end edges of the pad 90 at this time. The clamp 140 then is swung about the hinge pin 138, so that the pinch flange 148 pinches the side margin of the stencil against the adjacent edges of the pad 90, while the ends 144 of the ring 144 engage and clamps the end margins of the stencil against the adjacent end edges of the pad 90. The latch member 146 snaps over and engages the top of the frame 84, to clamp the stencil securely on the pad 90, ready for use. The stencil is removed simply by detaching the latch member 146 from the frame 84, swinging the clamp 140 outwardly from the pad 90, and lifting the stencil off of the pad.

The stamp 80 is constructed for extended use, so long as the pad unit 82 and particularly the cover 94 thereof remain serviceable, with need only for substituting a fresh bottle 88 filled with ink from time to time as the ink supply is exhausted. If necessary or desired, the pad unit 82 may be replaced periodically, removing the thumb nuts 124 for this purpose, removing the pad unit 82 and inserting a new unit, and securing the new unit by the thumb nuts.

FIGS. 10 and 11 illustrate a rocker-type of stencil holding hand stamp 150 having a disposable inking pad unit 152 and generally conventional means for securing a stencil on the surface of the inking pad thereof. The rocker type of stamp is
tended for use by rocking the inking or printing surface on a surface to be printed, and is frequently preferred as more reliably providing good prints, especially in the larger sizes.

The stamp 150 includes the pad unit 152, a generally rectangular metal frame 154, metal clamps 156 mounted on opposite sides of the frame, and a handle 158 secured to the parts together. The pad unit 152 includes a concavo-convex porous bonded glass fiber mat 160 having a convex outer inking surface 162 and a concave inner surface 164. As in the prior embodiments, a sealing layer 172 of adhesive-sealer is provided on the edges of the mat 160. A pad holder 166 is adhesively secured to the edges of the mat, and a cloth cover 168 extends outwardly over the surface 162 of the mat and is secured to the edges of the holder, the cover providing an inking surface 170 on the pad unit.

A nut member 174 is secured on the inner surface of the holder 166, and a central opening 176 having threaded walls extends through the member and through the holder, in register with a corresponding opening in the frame 154. An inner gasket 178 is interposed between the holder 166 and the frame 154, and an outer gasket 179 is interposed between the frame 154 and the handle 158. The handle 158 is provided with a threaded end 180, which is inserted through the outer gasket 179, the frame 154, and the inner gasket 178 into threaded engagement in the opening 176, to secure the parts together.

The clamps 156 include stpilc holding strips 182 having bent ends 184 extending along opposite sides of the pad unit 152. Finger-operated levers 186 are integral with the strips 182 and index outwardly through slots in the frame 154, for pivotal movement of the clamps 156 on the frame. Actuating flanges 188 are integral with the strips 182 and extend inwardly therefrom beneath the frame 154.

Flat springs 190 are mounted to the undersurface of the frame 154 at opposite ends thereof, by means of screws 192, supporting strips 194 beneath the springs, and nuts 196. The opposite ends of the springs extend beneath the actuating flanges 188 on the clamps 156, engaging the flanges and biasing them upwardly to urge the holding strips 182 into clamping position against the pad unit 152. The clamps are opened by moving the levers 186 thereof towards the handle 158.

The rocker hand stamp 150 is intended for use with pre-inked pad units 152 which are discarded when exhausted and replaced, while the remainder of the stamp remains in service.

A stencil is held in place on the inking surface 170 of the pad unit 152 by placing the stencil on the surface with opposite side margins thereof extending beyond the sides of the pad unit, while the clamps 156 are opened by the levers 186, and then releasing the levers to clamp the side margins of the stencil against the pad unit. In this connection, there is greater need for stencil securing means on the rocker type stamp than on the flat stamps, inasmuch as the stencils are more prone to wrinkle on the former.

FIG. 12 illustrates a rocker type stamping hand stamp 200 like that of FIGS. 10 and 11, with the addition of structure like that of FIGS. 7 and 8 for supplying the stamp with ink. The stamp 200 includes a pad unit 202, which is like the pad unit 152 of FIGS. 10 and 11, having a bonded glass fiber mat 201, a pad holder 203 secured thereto, and a cloth cover 205 thereover providing an inking surface 207 on the unit. In this case, the pad unit 202 is intended for extended use with its ink content being replenished as it is consumed, although the pad unit 202 may be removed and replaced if desired.

The stamp 200 is modified from the stamp 150 of FIGS. 10 and 11 in the use of screws 204 to secure the frame 206 to the pad unit 202. The screws are inserted through aligned holes in the frame 206, a gasket 208 and the pad holder 203 into nuts 211 on the inner surface of the holder 203. A squeeze bottle 214 serving as an ink container and handle is mounted by means of an adapter 216 secured to a raised frame portion 218 having a second gasket 220 therebeneath, all in the manner described with reference to the corresponding parts in FIGS. 7 and 8. Ink is supplied from the bottle 214 to a reservoir 224 formed by the pad holder 203 and the mat 201, from which the ink is absorbed by the mat.

Clamp structure identical to that illustrated in FIGS. 10 and 11 is employed, of which only the springs 222 corresponding to the springs 190 shown in such views and their mounting structure are illustrated. The stencil is secured on the pad unit 202 as in the embodiment of FIG. 10.

FIGS. 13–15 illustrate a cylinder type stencil drum 230 for a mimeograph duplicating machine, which incorporates an inking pad 232 according to the invention to provide improved metering and obviating leakage. Except for the use of the inking pad 232 and associated structure, the stencil drum and the remainder of the stamper and machine, not illustrated, are conventional in label printing machines.

The stencil drum 230 includes a pair of spaced parallel generally circular end plates 234 and 235, provided with shaft-receiving slots 236. A V-shaped cover plate 238 extends between the end plates 234 and 235, adjacent the inner ends of the slots 236, and is mounted on supporting plates 239 secured to the end plates.

The inking pad 232 is an elongated arcuate structure curved circularly about the longitudinal axis of the drum. The pad includes a porous mat 240 of bonded glass fibers having an outer inking surface 242 and inner ink-receiving surface 244, and a cloth cover 246 adhesively secured around its periphery to the inking surface 242 of the mat and extending an outer inking surface 248 on the pad. All edges of the mat 240 are sealed by a layer 250 of adhesive-sealer. The pad 232 is mounted on the supporting plates 239 and secured thereto, and is also secured at its end edges to the end plates 234 and 235, and at its side edges to the cover plate 238, by a layer of the same adhesive.

As in the preceding embodiments, the mat 240 provides an ink reservoir on the drum. The cover plate 238 and the mat provide an additional ink reservoir 252 communicating with the inner surface 244 of the mat 240, for continuously supplying replacement ink to the mat. Ink is supplied to the reservoir 252 through a filler tube 254 in a corresponding opening in one end plate 235, the filler tube being closed by a cap 256 when not being used.

A stencil clamp assembly 258 includes a rod 260 extending through holes 262 in the end plates 234 and 235 and terminating in a lever 264 extending across the end plates 235. The lever is biased in the clockwise direction as viewed in FIG. 13, by spring means not shown. A fingerpiece 266 is pivotally mounted on the end plate 235 by means of a screw 268, and a cam portion 270 of the fingerpiece normally prevents the lever 264 from turning. When the fingerpiece is operated in the clockwise direction, it permits the lever to turn in the clockwise direction, thus releasing the clamp.

The stencil clamp 258 also includes clip-mounting bars 272 fixedly secured to the rod 260, and an angular stencil clip 274 secured to the ends of the bars. In use, the clip engages an edge of the cover plate 238, for clamping the end of a stencil therebetween. When a stencil is to be inserted or removed, the fingerpiece 266 is operated to release the lever 264 and permit clockwise rotation thereof under spring bias, whereby the clip 274 also rotates in the clockwise direction to leave a space between the clip and the cover plate 238 for stencil movement. After clamping one end of the stencil in place, the remainder of the stencil is carried around the inking pad 232 on the inking surface 248 thereof, after which the drum 230 is rotated in the clockwise direction for inking or printing a series of sheets in ink-transmitting relation to the drum, in conventional manner.

The drum 230 is mounted on a drive shaft 276 extending through the end plate slots 236, and the shaft is journalled on the frame of the machine, represented schematically by the member 278 shown in broken lines in FIG. 15. The drum and the drive shaft are interconnected for rotation together, by means of a lug 280 secured to the shaft by a set screw 282, and a drive pin 284 press-fitted in a corresponding opening 286 in the lug and slip-fitted in an enlarged opening 288 in one end plate 234. The drive shaft is locked in place adjacent the
removing end plate 235 (see FIG. 13) by a cam latch 290 pivotally mounted on the plate 235 by a screw 292 and held in latching position by a coil spring 294 attached to a pin 295 on the end plate. The shaft is unlatched by turning the latch 290 in the counterclockwise direction against the spring tension. The knife is driven means of a sprocket 276 coupled to the drive shaft 276 at the opposite end thereof, and a link chain 298 coupling the sprocket with a drive motor, not shown.

While the illustrative stencil drum 320 is designed for rotation about a horizontal axis for printing labels and the like, similar apparatus constructed for rotation of a stencil drum about a vertical axis may be employed for printing on vertical surfaces, owing to the unique fluid retention characteristics of the inking pad 332 and particularly the mat 346 thereof. Such apparatus may be used to advantage for marking both sides of cartons on conveyor lines, for example.

FIGS. 16–18 illustrate offset printing apparatus according to the invention in a label printing machine. The machine is like that employed for mimeograph duplication in FIGS. 13–15, except that the stencil drum 230 has been removed and replaced by the offset printing apparatus. Previously, offset printing apparatus had been employed in the machine, including a gravure inking roll, an ink bath, and a doctor blade. The apparatus of the present invention may be employed in place of the prior apparatus, or together with such apparatus for special applications, such as printing certain categories of ink.

The offset printing apparatus includes a mat drum 300 having a longitudinal slot 302 therein, which receives the same shaft 276 illustrated in FIGS. 13–15. The shaft is journaled on the frame 278, secured to the mat drum for rotation therewith, and driven in the same manner as in the embodiment of FIGS. 13–15, and like numerals are applied to like parts. The drive pin 290 is also employed in slip-fitting engagement in a recess 304 in the mat drum 300.

A rubber printing mat 306 having raised characters 305 is mounted on a brass backing 307 on the drum 300 for printing labels, all in a conventional manner. An ink roller attachment 308 according to the invention is mounted on the frame 278 for inking the characters 305 on the printing mat 306. The attachment is supported by mounting brackets 310 secured to the frame 278, and a transverse mounting bar 312. A support block 314 in the attachment is seated on the mounting bar 312, and the attachment is transversely adjustably secured to the bar by means of a mounting screw 316 on the support block. The support block 314 mounts a rocker arm 318 for swinging movement on a pivot rod 320 extending from the block. A pressure adjusting screw 322 is movably mounted on a bar 324 on the block 314, and is threaded into the rocker arm 318. A coil compression spring 326 is interposed between the bar 324 and the rocker arm 318, and is held in place by insertion of the screw 322 therethrough. The adjusting screw is turned for raising or lowering the rocker arm 318, and the compression spring maintains the arm under predetermined downward or inward pressure. A pressure release lever 328 engages the rocker arm 318 for raising or withdrawing the rocker arm against the spring pressure by operation of the lever.

A rolling mounting stub shaft 330 is journaled for rotation on the rocker arm 318 and is movable therewith about the pivot rod 320, to and from the mat drum 300. An inking roll assembly 332 is mounted on the rolling mount shaft for rotation therewith. The assembly includes a tubular core 334 received on the shaft 330 in frictional engagement therewith, and a tubular inking roll or pad 336 adhesively secured to the core. A handling knob 338 having a central bore 339 is inserted into the core 334 in frictional engagement therewith. A quick-set release fastener 340 includes a connecting rod 342 which is inserted through the knob bore 339 into a corresponding recess 344 in the roll mounting shaft 330 for removably securing the inking roll assembly 332 on the shaft. A guard plate 345 is mounted on the support block 314 and extends across the face of the inking roll 336 in spaced relation thereto.

The inking roll 336 includes a tubular porous mat 346 of bonded glass fibers, having an outer peripheral inking surface 347 and layers 348 of adhesive-sealer on the ends thereof. A cloth cover 350 is mounted on the outer surface 347 of the mat 346 therearound and is adhesively secured thereto adjacent the ends 366 fastened to the drive shaft 276 at the opposite end thereof, and a link chain 298 coupling the sprocket with a drive motor, not shown.

In operation, the inking roll 336 is urged against the rubber mat 306 under the pressure of the compression spring 326 as the mat is rotated, and the inking roll is rotated by engagement with the mat. The characters 305 on the rubber mat 306 are inked by the inking roll 336, and labels or other sheets are printed by transfer of the ink from the character thereto. When not in use, the lever 328 is operated to withdraw the inking roll 336 from engagement with the mat 306, thereby preventing the roll from inking the mat and also avoiding the formation of a depression in the roll by continued pressure thereon. The inking roll assembly 332 is used until its ink content is exhausted, after which it may be discarded. Alternatively, the inking roll assembly may be re-inked and returned to service, so long as it remains in good condition.

The ink roller attachment 308 and similar structure according to the invention eliminate the need for ink baths, doctor blades, ink transfer rollers, and the like as previously employed. Such attachment and similar structures may replace prior apparatus or may be added to existing machinery or equipment to perform additional inking functions.

The porous mats of bonded glass fibers employed in the invention, such as the mats 22 (FIGS. 1–4), 52 (FIGS. 5 and 6), 92 (FIGS. 7–9), 160 (FIG. 10 and 11), 201 (FIG. 12), 240 (FIGS. 13–15), and 346 (FIGS. 16–18), employed in the illustrative embodiments, preferably are made in the manner disclosed in U.S. Pat. No. 3,063,887, also preferably being bonded with a thermosetting resin binder as disclosed in U.S. Pat. No. 3,004,941, the mats being wound on mandrels in the process of manufacture according to the first-mentioned patent so as to provide the hereinafter-described mat density. Prior to the invention, products made in such manner have been employed in filters for pressure filtration of ink materials, paints, gasoline, and other materials. However, so far as is known, applicants were the first to discover and utilize the outstanding fluid retention and other characteristics in inking pads, devices and methods, to solve the hitherto unsolved problems of inking operations and provide marketed advantages and improvements over the prior inking art.

The mat structures employed in the inking pads of the present invention are constructed according to U.S. Pat. No. 3,063,887, by producing glass fibers and spraying them with aqueous-solvent liquid water-dilutable fusible resin compositions, as described in that patent and in U.S. Pat. No. 3,004,941, to produce a loose, unbonded or uncured fiber mat. The mat is wound on a mandrel to provide the desired density and the thermosetting binder thereof is cured, as described in U.S. Pat. No. 3,063,887. A high degree of control and resulting uniformity is achieved in this manner.

Cylindrical tubular mat products are formed, and the mat bodies employed in the present invention are cut therefrom to proper size and shape for use in the inking pads. In view of the configuration of the products, they are readily cut into the desired concavo-convex mat articles employed in the inking pads of the embodiments of FIGS. 10–18. When a flat outer surface is desired on the mat, as in the embodiments of FIGS. 1–9, the product is cut to provide such outer surface, while the inner surface remains concave and may serve to provide the desired reservoir, such as the reservoirs 35, 78, and 104 in FIGS. 1–9. In general, for concavo-convex structural strength as well as ink capacity, it is preferred that the resulting mat thickness be a minimum of about one-quarter inch. A thickness of about one-half to three-fourths inch is generally adequate and preferred.

The mat employed in the inking pad of the invention is formed of glass fibers preferably having an average diameter
of up to about 10 microns, more preferably, in the range of about 1.5–10 microns. It will be understood that in the process of manufacture, both larger and smaller diameter fibers are formed, and the foregoing values are average diameters. In the illustrative embodiments of the invention, the average glass fiber diameter is in the range of about 4–8 microns. While the reasons for the improved results of the invention are not fully known, and without wishing to be bound by any theoretical considerations, it would appear that the outstanding fluid retention properties of the mat are derived from the physical properties of the fibers, and conditions of surface tension and capillarity. The fibers are randomly oriented, and the void spaces or pores are in communication throughout the mat, so that ink is absorbed and homogeneously distributed throughout the mat, and thereafter is evenly dispersed to the mat surface. The mat is lacking in interference to liquid flow such as encountered in foam rubber, plastics and the like.

The glass fibers are bonded together with a thermosetting resin binder to provide a porous mat. In the preferred embodiments of the invention, the binder comprises a phenol-formaldehyde resin, more preferably, a cured mixture of phenol-formaldehyde and dicyandiamide-formaldehyde partial condensates, as described in U.S. Pat. No. 3,004,941. Alternatively, it is contemplated in the invention that other thermosetting resins may be employed as the binder, including, for example, urea-formaldehyde and other phenolic-aldehydehyde condensation products including preferably urea-formaldehyde and melamine-formaldehyde as well as phenol-formaldehyde resins.

The preferred mixtures of phenol-formaldehyde and dicyandiamide-formaldehyde partial condensates, which are cured to provide the resin binder, are liquid reaction products of about 0.8–3 mols, preferably 1.5–2.5 mols of formaldehyde per mol of phenol, and about 0.5–2 mols, preferably 1.2–1.6 mols of formaldehyde per mol of dicyandiamide, for the respective condensates. The proportion of dicyandiamide formaldehyde partial condensate in the liquid condensate mixture may be up to about 50 percent by weight of the solids. In the illustrative embodiments, a liquid mixture of partial condensates is prepared as described in Example III of U.S. Pat. No. 3,004,941. The mol ratios are about 2.2 mols of formaldehyde reacted with each mol of phenol, and about 1.6 mols of formaldehyde reacted with each mol of dicyandiamide. The dicyandiamide-formaldehyde partial condensate constitutes about 45 percent by weight of the condensate mixture, on a solids basis.

The thermosetting resin binder preferably is present in a proportion of about 5–35 percent by weight of the mat. It is further preferred that the binder proportion be about 8–25 percent of the mat, particularly when employing a cured mixture of phenol-formaldehyde and dicyandiamide-formaldehyde partial condensates as the binder.

The glass fiber mat may be produced according to the aforesaid U.S. Pat. No. 3,063,887 with a density controlled by the manner and tightness of winding the initial mat material on a mandrel, so that desired mat product densities are achieved within a tolerance of about plus or minus one-half percent per cubic foot of mat product volume. The mat employed in the invention preferably has a density selected to provide from relatively slight to very little compressibility under hand pressure, whereby there are no problems of unwanted ink expression due to compression, or leakage of ink, and good structural strength is achieved, especially in machine applications, while maintaining sufficient porosity.

The mat employed in the invention preferably has a density of about 5–15 pounds per cubic foot, more preferably about 7–12 pounds per cubic foot. The lower density mats, up to about 9.5 pounds per cubic foot, have proven to be preferable for flat hand stamps, providing a slight compressibility for printing on surfaces not perfectly flat. Such densities also are preferable for both flat and roller type disposable pad hand stamps or printers, and for other applications employing disposable or non-refillable inking pads, such as inking rolls.

In such cases, normal hand or machine pressure enables more of the ink content of the mat to be dispersed to the surface for printing, providing a higher yield of usable ink. The mats of higher density, ranging up from about 10 pounds per cubic foot, are preferred for use in refillable inking pad applications, where compressibility is not needed for surface printing, as in the roller type hand stamps, and refillable stencil drums and inking rolls. The higher structure strength of the denser materials is especially desirable for machine applications, and a lower ink yield is of no consequence when the ink content is replenished from a reservoir.

The saturation capacity of the mat does not vary appreciably with density in the preferred ranges, for example, being about 0.5 fluid ounce per cubic inch of mat for mat densities of about 7–12 pounds per cubic foot as in the illustrative specific embodiments of the mat. In tests employing ink-saturated mat bodies having an average glass fiber diameter of 4.5 microns 18–20 percent of binder by weight of the mat, and a mat thickness of three-fourths inch, at a pressure of three ounces per square inch applied to the mat, about 51 percent of the ink content was dispersed for printing from an 8.3 pound density mat, about 37 percent from a 9.8 pound density mat, about 9 percent from a 10.5 pound density mat, and about 2 percent from an 11.9 pound density mat.

Other illustrative mats prepared according to the preferred embodiment, and particularly suitable for use in refillable roller type hand stamps and stencil drums include a mat having an average glass fiber diameter of 4.5 microns, a density of 10 pounds per cubic foot, and a binder content of 9 percent by weight; and a mat having an average fiber diameter of 7 microns, a density of 12 pounds per cubic foot, and a binder content of 9 percent. For applications where slight compressibility is desired, similar materials having lower densities, as described above, may be employed to best advantage.

The glass fiber mat of the invention may be employed alone as an inking pad, if desired. However, in general, it is preferred that the inking pad also include a cloth or the like on the surface of the mat, which provides an inking surface on the pad. Illustrative covers are indicated in the drawings by the reference numerals 24 (FIGS. 1–4), 54 (FIGS. 5 and 6), 94 (FIGS. 7–9), 168 (FIGS. 10 and 11), 205 (FIG. 12), 246 (FIGS. 13–15), and 350 (FIGS. 16–18).

The cloth cover performs several functions: It assists in providing even application of ink and control of ink metering, it prevents feathering and avoids fiber texturing of printed characters; and it prevents peeling of the mat material, especially in rotating use. In general, any fabric may be used, such as silk, cotton, rayon and synthetics, with proper selection for the specific use and for the type of ink employed. As examples, cotton flannel is generally suitable, muslin is advantageous for inking rolls, and oxford cloth is suitable for use in providing more restricted flow for fine print and detail. The cloth cover tends to spread the ink most evenly over the surface of the inking pad. When printing through a stencil, a cloth cover avoids fabric texturing on the resulting print where large print openings are involved, although such texturing may not appear when using typed stencils, and in providing more restricted flow for fine print and detail. The cloth cover may be detachable, especially where it suffers from wear, as in stencil drums.

The inking pad is readily impregnated with ink, e.g., by immersion at ambient temperature and pressure for about one hour for complete saturation, or at high temperature and/or pressure for shorter periods of time. Ink absorption is sufficient to maintain saturation when in contact with a supply of replacement ink. Owing to the materials of which the mat is formed, there is no apparent practical limitation on the type of ink that might be employed, all printers inks yet tested having proven to be entirely suitable, and the pad is not swollen, distorted, or attacked by the inks.

Employing mat structures having the above-described mat densities, it is merely necessary for the inking pad to be contacted with or placed in ink-transmitting relation to a surface
3,678,848

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to be inked, for effective inking. The ink reservoir provided by
the mat dispenses ink contained therein to the surface thereof
as rapidly as it is removed by a contacting surface, without
need for any appreciable compression of the pad. The only
need for slight compression of the inking pad is when contact-
ing flat surfaces with the flat hand stamps, to accommodate
printing surface irregularities, as described above. At the same
time, the slight compressibility of the lower density materials
does provide a greater ink yield and therefore may be prefera-
ble in throwaway or non-refillable inking pads. The mat hav-
ing the characteristics described above is resilient, so that it
regains its original shape and contour after being compressed.

The mat inherently possesses excellent metering properties,
which are further accentuated by the cloth cover. Metering is
constant for the various types of ink and unaffected by varia-
tions in viscosity. Consequently, the prior common problem of
poor metering and resulting variations in inking are overcome
most advantageously. Improvements The invention thus pro-
vides an inking pad constituting a marked improvement in the
art, providing corresponding improvements in inking devices
employing the pad and increasing the range and versatility of
operation, and a new and improved method of supplying ink
to a surface evenly and with controlled flow of ink employing
the new inking pad. While a number of preferred embodi-
ments of the invention have been illustrated and described, it
will be apparent to those skilled in the art that numerous other
applications of the invention may be made and various
changes and modifications may be made, within the spirit and
scope of the invention. It is intended that such applications,
changes and modifications be included within the scope of the
appended claims.

We claim:

1. An inking device including: means for mounting an inking pad on said mounting means and formed of a porous mat of randomly oriented glass fibers having an average diameter of 1.5–10 microns bonded with a thermosetting resin binder in an amount of 5–35 percent by weight of the mat, said mat having a density of 5–15 pounds per cubic foot and providing an ink reservoir which disperses ink to the surface thereof when ink is contained therein, and a cloth cover on the surface of said mat providing an inking surface on the pad.

2. An inking device according to claim 1 wherein said binder comprises a phenol-formaldehyde resin.

3. An inking device according to claim 2 wherein said binder comprises a cured mixture of phenol-formaldehyde and dicyandiamide-formaldehyde partial condensates.

4. An inking device according to claim 1 having an ink contained in said mat.

5. An inking device according to claim 4 wherein said binder comprises a cured mixture of phenol-formaldehyde and dicyandiamide-formaldehyde partial condensates present in an amount of about 9–25 percent by weight of the mat, and said mat has a density of about 7–12 pounds per cubic foot.

6. An inking device according to claim 5 wherein said glass fibers have an average diameter of about 4–8 microns.

7. An inking device according to claim 1 including a stencil drum having means for controlling ink in offset printing.

8. An inking device according to claim 1 including handle means attached to said mounting means and providing a hand stamp therewith for manually placing the inking pad in inking relationship to a surface to be inked.

9. An inking device according to claim 1 wherein said inking pad comprises an inking roll mounted on rotatable mounting means for transferring ink in offset printing.

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