United States Patent [19]

Thettu

[11] **3,831,553**

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[54] **WICK FOR OIL DISPENSING APPARATUS**

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[73] Assignee: **Xerox Corporation,** Stamford, Conn.

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[52] **U.S. Cl.** **118/266,** 118/264

[51] **Int. Cl.** **B05c 11/00**

[58] **Field of Search** 432/59, 60, 61, 62; 118/637, 203, 264, 265, 266, 267

[56] **References Cited**

UNITED STATES PATENTS

2,830,534	4/1958	Springer et al.	101/132.5
3,291,466	12/1966	Aser et al.	432/60
3,331,592	7/1967	Cassano et al.	432/60
3,716,221	2/1973	Gorka	118/60

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Assistant Examiner—Leo Millstein

[57] **ABSTRACT**

Apparatus for lubricating the heated fuser roll in a heated pressure xerographic fusing system. The apparatus includes an applicator roll for providing a film of oil to a wick assembly having a main wick contacting the fuser roll and an auxiliary wick contacting the applicator roll and the main wick at one end and an oil supply at the other end to dispense sufficient oil when the applicator roll is inoperative. The improvement is in the form of a sponge member inserted between the main wick, auxiliary wick, and applicator roll to limit the flow of oil onto the main wick thereby preventing oversaturation thereof.

2 Claims, 4 Drawing Figures

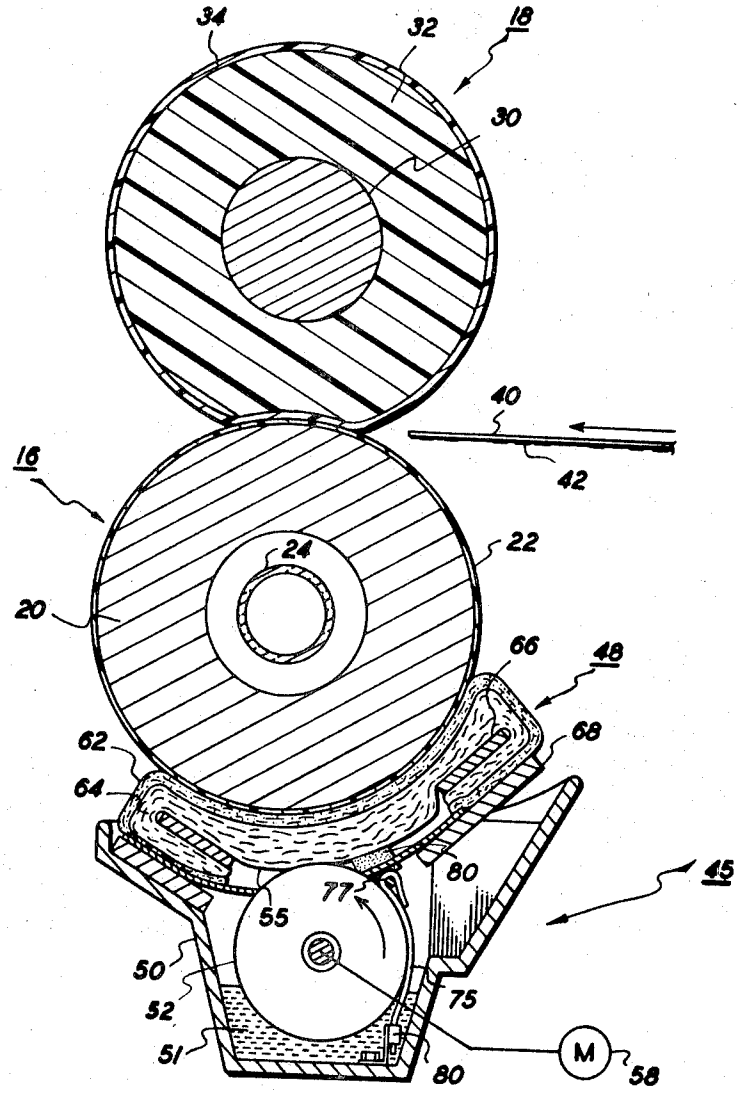
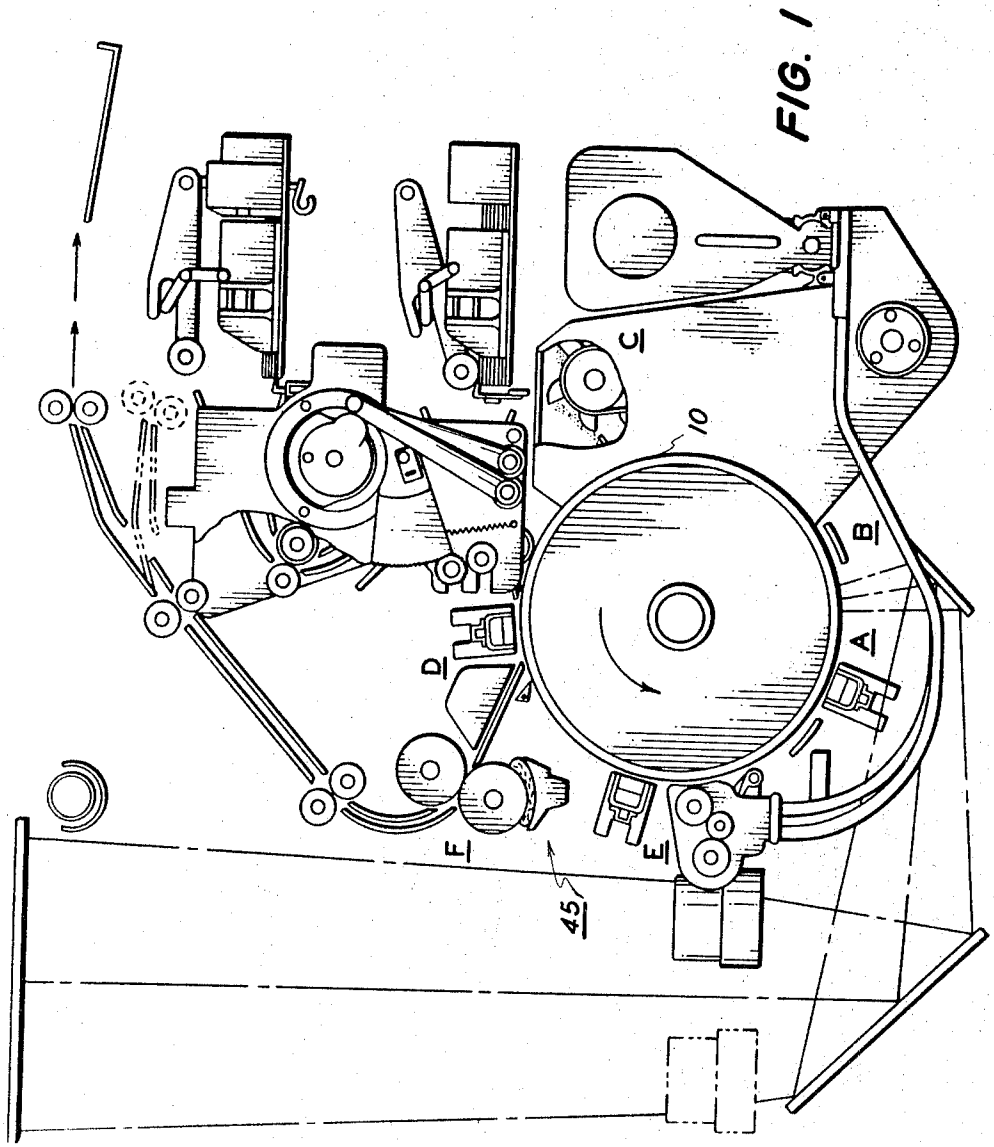


FIG. 1



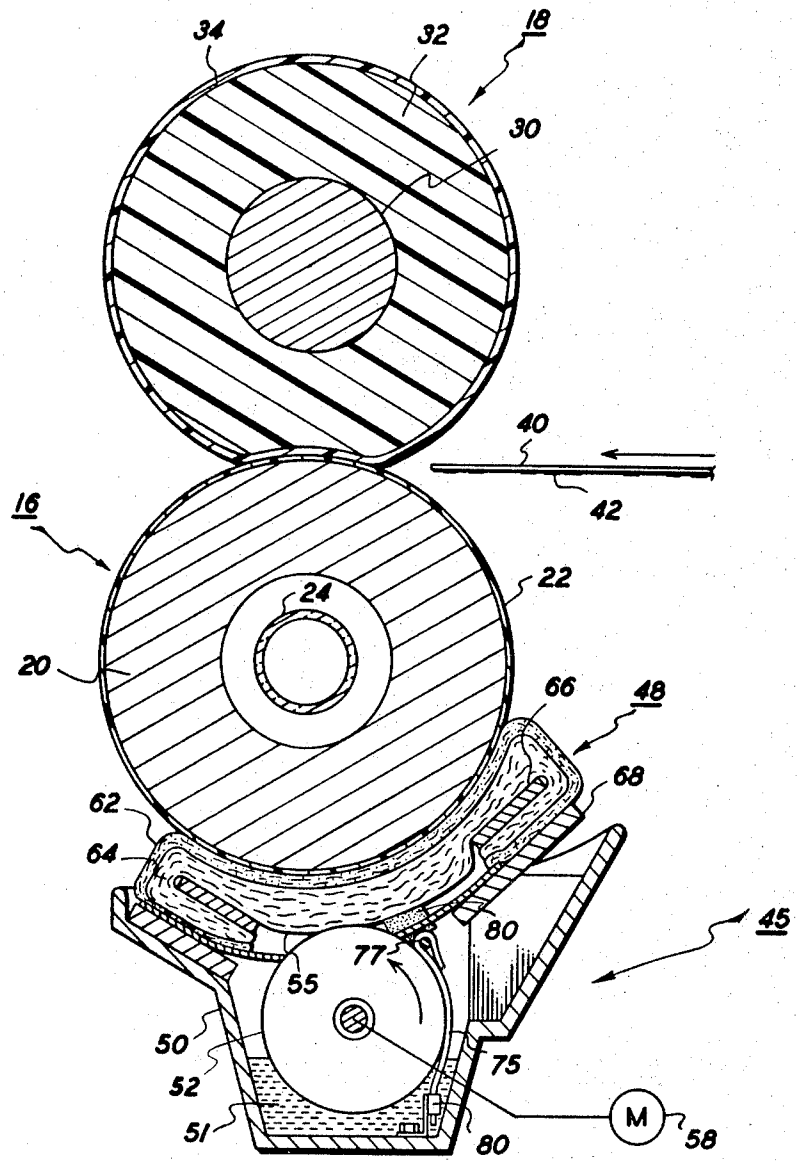

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FIG. 2

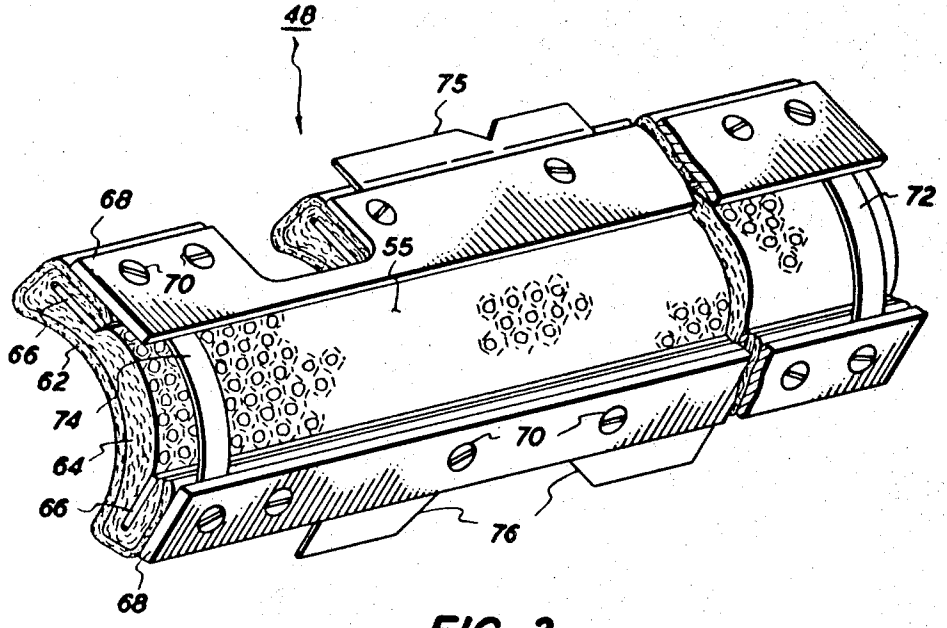

FIG. 3

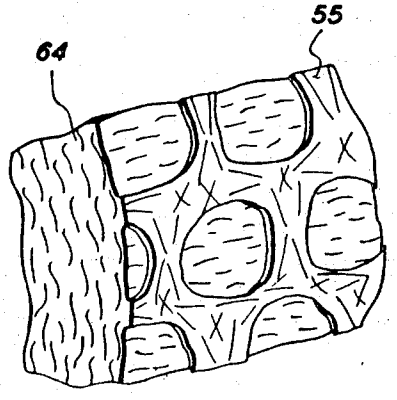

FIG. 4

WICK FOR OIL DISPENSING APPARATUS

This application relates to fusing systems and in particular to an improved lubricating apparatus for removing toner particles from the fuser roll of a heated pressure fusing system.

In the practice of xerography as described in U.S. Pat. No. 2,297,691 to Chester F. Carlson, a xerographic surface comprising a layer of photoconductive insulating material affixed to a conductive backing is used to support electrostatic images. In the usual method of carrying out the process, the xerographic surface is electrostatically charged uniformly over its surface and then exposed to a light pattern of the image being reproduced to thereby discharge the charge in the areas where the light strikes the layer. The undischarged areas of the layer thus form an electrostaic charge pattern in conformity with the configuration of the original light pattern.

The latent electrostatic image can then be developed by contacing it with a finely divided electrostatically attractable material such as a powder. The powder is held in image areas by the electrostatic charges on the layer. Where the charge field is the greatest, the greatest amount of powder is deposited; where the charge field is least, little or no material is deposited. Thus, a powder image is produced in conformity with the light image of the document or object being reproduced. The powder is subsequently transferred to a sheet of paper or other surface and suitable affixed thereto to form a permanent print.

One typical device for fixing the toner particles to the backing sheet is by a heated pressure fuser roll system in which the copy sheet is passed through the nip of a Teflon coated heated fuser roll and a backup roll as described in U.S. Pat. Nos. 3,256,002 and 3,268,351. In such fusing systems, care must be taken to remove unwanted toner particles from the heated fuser roll prior to its contact with the copy being fused. If care is not taken to keep the fuser roll free of toner particles, these toner particles can build up on the face of the fuser roll and degrade the quality of the fix by removing the fusing properties on the surface of the roll contacting the copy sheet and toner images. Furthermore, such unwanted toner particles can be released from the fusing roll upon its subsequent contact with the image to fuse toner particles to the copy sheet in non-imaged areas. A wick is generally used to dispense silicone oil by gravity on the external Teflon surface of the heated fuser roll by a pad overlying the heated fuser roll.

While the gravity dispensing wick in pad form is satisfactory where the wick is elevated over the nip it is not altogether satisfactory in other arrangements such as where the heated fuser roll is disposed as the bottom roll of the fusing system.

The instant invention is an improved wicking apparatus which improves the flow of oil onto the bottom roll of a heated pressure roll fusing system described in U.S. Pat. No. 3,718,116, issued on Feb. 27, 1973.

It is therefore an object of the present invention to improve heated pressure fusing systems.

It is another object of the present invention to improve lubricating wick assemblies of high temperature stability for use with heated pressure fusing systems.

It is another object of the invention to provide wicking assemblies capable of retaining oil over a long shutdown period against gravity.

It is still another object of the present invention to enhance the wicking properties of an oil dispensing wick.

It is still another object of the present invention to provide an improved oil wicking assembly which is compatible with silicone and conforms to objects.

It is still another object of the invention to provide an oil wicking assembly which has a main wick and an auxiliary wick to dispense sufficient oil to the main wick in the event that the main wick applicator is inoperative without oversaturation of the main wick.

It is still another object of the present invention to minimize unnecessary maintenance of copier/duplicator systems.

These and other objects of the instant invention are obtained by a new and improved lubricating wick assembly which comprises a main wick which contacts the heater fuser roll and an applicator roll and an auxiliary wick and sponge member which control the flow of oil onto the main wick. The auxiliary wick has one end extending below the oil supply level and the other end in contact with the applicator roll and sponge member which contacts the main and auxiliary wicks and applicator roll.

Further objects of this invention together with additional features and advantages thereof will become apparent from the following detailed description of the embodiment of the invention when read in conjunction with the accompanying drawings wherein:

FIG. **1** is a schematic representation of an automatic xerographic reproducing machine incorporating a heated pressure fusing system utilizing the improved oil dispensing apparatus of the present invention;

FIG. **2** is a side sectional view of the heated pressure fusing system according to the present invention;

FIG. **3** is an isometric view of the wicking assembly; and

FIG. **4** is an exploded view of the substantially smooth fuzz-free lower surface of the wicking assembly.

Referring now to the drawings as shown in FIG. **1** an embodiment of the invention in a suitable environment such as an automatic xerographic reproducing machine. The automatic xerographic reproducing machine includes a xerographic plate or surface **10** formed in the shape of a drum. The plate has a photoconductive layer or light receiving surface on a conductive backing journaled in a frame to rotate in a direction indicated by the arrow. The rotation will cause the plate surface to sequentially pass a series of xerographic processing stations.

For purposes of the present disclosure the several xerographic processing stations in the path of movement of the plate surface may be described functionally as follows:

- a charging station A which the uniform electrostatic charge is deposited onto the photoconductive plate;
- an exposure station B at which light or radiation pattern of copies to be reproduced is projected onto the plate surface to dissipate the charge in the exposed areas thereof to thereby form a latent electrostatic image of the copies to be reproduced:
- a developing station C at which xerographic developing material including toner particles have an electrostatic charge opposite to that of the latent electrostatic image is cascaded over the latent electro-

static image to form a powdered image in configuration of the copy being reproduced;

a transfer station D which the powdered image is electrostatically transferred from the plate surface to a transfer material such as paper which is then passed through heated pressure fusing system according to the present invention as will be described hereinafter; and

a drum cleaning and discharge station E at which the plate surface is brushed to remove residual toner particles remaining thereon after image transfer and at which the plate is exposed to a relatively bright light source to effect substantially complete discharge of any residual electrostatic charge remaining thereon.

Referring now in particular to FIG. **2** there is shown the heated pressure fusing system of the present invention which includes a heated fuser roll **16** and a backup pressure roll **18.** Fuser roll **16** is a hollow circular cylinder with a metallic core **20** and a Teflon layer **22.** A lamp **24** serves as a source of thermal energy and is located at the center of the fuser roll. Power to the lamp is controlled by a thermal sensor generally called a thermistor contacting the periphery of the fuser roll as described for example in U.S. Pat. No. 3,357,249. The backup roll **18** is also a circular cylinder and is made up of a metal core **30** surrounded by a thick rubber layer **32** and also a Teflon layer **34** to prevent soaking silicone oil into rubber layer **32** and subsequent swelling.

When the two rollers **16** and **18** are engaged as shown in FIG. **2** the applied load deforms the rubber in the pressure roll to provide the nip with a finite width. The copy sheet **40** electrostatically bearing the toner images **42** on the other side thereof is brought into contact with the nip of the rolls with the toner image contacting the fuser roll **16.** For a given temperature of the fuser roll, the fusing rate will depend upon the contact arc length of the support material against the dwell time, i.e., the time the toner image remains between the fuser roll **16** and the backup roll **18.** Dwell time can be varied either by changing the surface velocity of the rolls or by varying the contact arc length and holding the speed of the roll the same. Contact arc length depends on the softness of the rubber on backup roll **18** and on the amount of pressure between the rolls **16** and **18.** The mechanism for driving the rolls for lowering and raising the rolls into contact can be accomplished by any suitable means as that described for example in U.S. Pat. No. 3,291,466 or by a suitable mechanical camming device.

As a sheet of material is advanced between the rolls **16** and **18** the toner image on the support material will contact the peripheral heated surface of the roll **16** whereby the toner image becomes tackified and in this tackified condition the toner will tend to offset on this roll except that it is partially prevented from doing so by the Teflon coating on the roll. It is by the lubricating wick assembly of the present invention which is used to apply a thin film of offsetting preventing liquid such as silicone oil to the Teflon surface **22** of the fuser roll **16** that offset is prevented.

An oil applicator apparatus **45** includes lubricating wick assembly **48,** an oil pan **50** for maintaining a supply of silicone oil **51** and an applicator roll **52.** The oil pan is loaded against the fuser roll by a spring action mounting not described as details of the mounting form no part of the present invention. Applicator roll **52** is used to convey a thin film of oil to the bottom face **55** of the lubricating wick assembly as the applicator roll is rotated in the direction shown by the arrow. Desirably, the applicator roll **52** is driven by an oil dispenser motor **58** which is energized during the fusing operation depending upon the number of copies being produced. In accordance with thepresent invention lubricating wick assembly **48** includes two different layers the present wicking materials. One layer **62** is Teflon which contacts the surface of the fuser roll **16.** Another layer **62** is made of Nomex which has its underside **55** in contact with the applicator roll **52.** Both Teflon and Nomex are trademarks of DuPont Corporation, Wilmington, Delaware. Layers **62** and **64** are assembled in overlapping relationship and their ends are clamped between plates **66** and **68** which are secured by any suitable means such as screws **70** as best shown in FIG. **3.** Spring metal brackets **72** and **74** serve to provide support and conforming characteristics to the fuser roll for the assembly. Tab portions are provided for facilitating the handling of the lubricating wick assembly for insertion and removal of the assembly into and out of the fuser system. Teflon is used as the upper layer because it has high lubricating characteristics as well as thermal stability at elevated temperatures ranging up to 400° F and above. Nomex is used as a lower layer because of thermal stability at elevated temperatures up to 400° F and above and due to its high oil retention characteristics.

In order to enhance the oil retention characteristics and also enable trouble-free application of oil to the surface of the Nomex layer **64,** the lower surface **55** is flame treated to burn all the loose fibers to render a reticulated pattern free of loose fibers as best shown in FIG. **4.** Burning should be sufficient to form the surface fibers into a porous membrane or a finished pattern. It has been found that removal of these fibers from the Nomex layer has enabled a high oil retention of the layer while insuring that the applicator roll does not stall which is normally the case where the layer is dry which is caused by oil leaking through loose fiber material. Since the applicator roll motor is desirably of a lower power unit it is essential that there be no binding between the Nomex layer and the applicator roll causing the motor to stall. It has been observed that with the fuzz and/or loose fibers removed that motor stalling is prevented and high oil retention qualities retained.

In accordance with the present invention, the oil dispensing apparatus utilizes an auxiliary wick **75** which may be made out of any suitable wicking material and which supplies oil to the wick assembly **48** through a sponge member **80.** Suitable materials for the auxiliary wick are Corfam, Nomex and Dacron. Preferably the auxiliary wick material will be able to withstand high temperatures, as high as 400° F. The auxiliary wick is arranged so that it is touching the applicator roll and the sponge member **80** which also contacts the applicator roll and wick assembly. Any suitable material may be used for sponge member **80.** Preferred materials are hexa fluoropropylene, vinylidine fluoride or Viton fluoroelastomer, a registered trademark manufactured by DuPont Corporation, Wilmington, Delaware, fluoro silicone rubber, urethane foam, and mixtures thereof. The auxiliary wick is maintained in position by support member **77** which is made of any suitable thermally conductive material and is secured in place by a hold-

ing member **80** supported on the bottom of the oil pan. Sponge member **80** has a cellular structure which serve to ensure that oil flow to the main wick is controlled to prevent oversaturation thereof. Support bracket **77** preferably is made of any suitable thermally conductive material such as metal in order to enhance the transfer of oil from the auxiliary wick to the applicator roll. It has been found that a temperature gradient may exist between the auxiliary wick and the applicator roll and hence a thermally conductive support member serves to minimize this temperature gradient. The auxiliary wick **75** serves to bring the oil up to the applicator roll to a level such that upon rotation of the roll during one-half of one copy time, the oil contacts the wick assembly after passing through sponge member **80.** It has been found that the auxiliary wick is useful especially during a short run operation when rotation of the applicator roll is small and the oil to the wick assembly must be supplemented to equalize the differential supplied during a much longer run. Thus, in the case of a long run, the oil will be primarily supplied by the applicator roll through sponge member **80** due to a lag in the capillary action of the auxiliary wick. But during a single or shorter run, the oil dispensing level is increased due to oil coated onto the top of the applicator roll surface by the auxiliary wick and application through sponge member **80.** It is especially important that the main wick not become overly saturated with oil and the sponge member accomplishes this purpose.

By the above invention it has been found that the wick assembly including the sponge provides the many advantages described above and additionally minimizes any variation in the oil film being dispensed due to changes in the oil level in the oil pan. Specifically, due to the configuration of the main wick, auxiliary wick, applicator roll and the unique arrangement of the sponge member, a uniform and controlled amount of oil is continuously supplied to the heater fused roll irrespective of changes in the oil level.

While the instant invention as to its object and advantages has been described as being carried in a specific embodiment thereof it is not intended to be limited thereby but it is intended to be covered broadly within the scope of the appended claims.

What is claimed is:

1. In a heated pressure roll fusing system for fusing toner images produced by an electrostatic copying machine in which a heated fuser roll disposed below the copy path is coated with an oil to prevent toner offset, an improved oil dispensing apparatus comprising

an application roll mounted for rotation in oil for dispensing oil onto the lower surface of a wicking assembly which is positioned between said applicator roll and a heated fuser roll,

a sponge member positioned intermediate said applicator roll surface and wicking assembly to control the flow of oil onto said wicking assembly,

wherein said wicking assembly includes main wick means and auxiliary wick means with said sponge member positioned therebetween,

wherein said auxiliary wick means is positioned in contact with the applicator roll surface extending from said sponge member to the surface of the oil.

2. Apparatus according to claim **1** wherein said sponge member is made of a material selected from the group of hexa fluoropropylene vinylidene fluoride, fluoro silicone rubber, and urethane rubber.

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