

- [54] **STRIPPER FINGER DESIGN TO PREVENT "OIL-ON-THE-COPY"**
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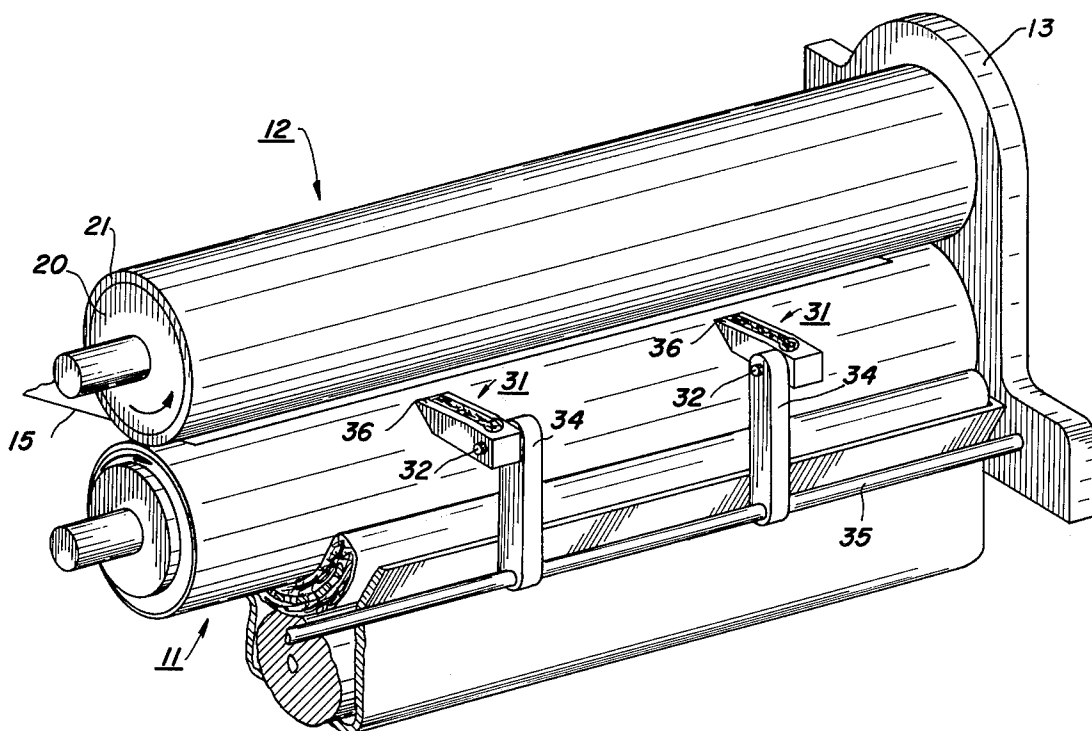
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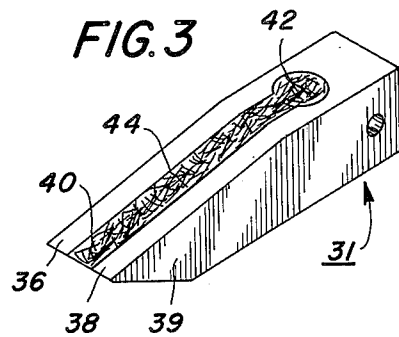
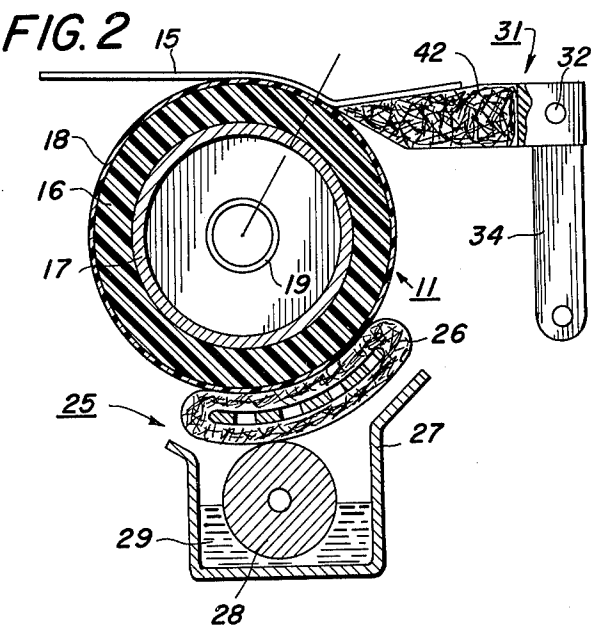
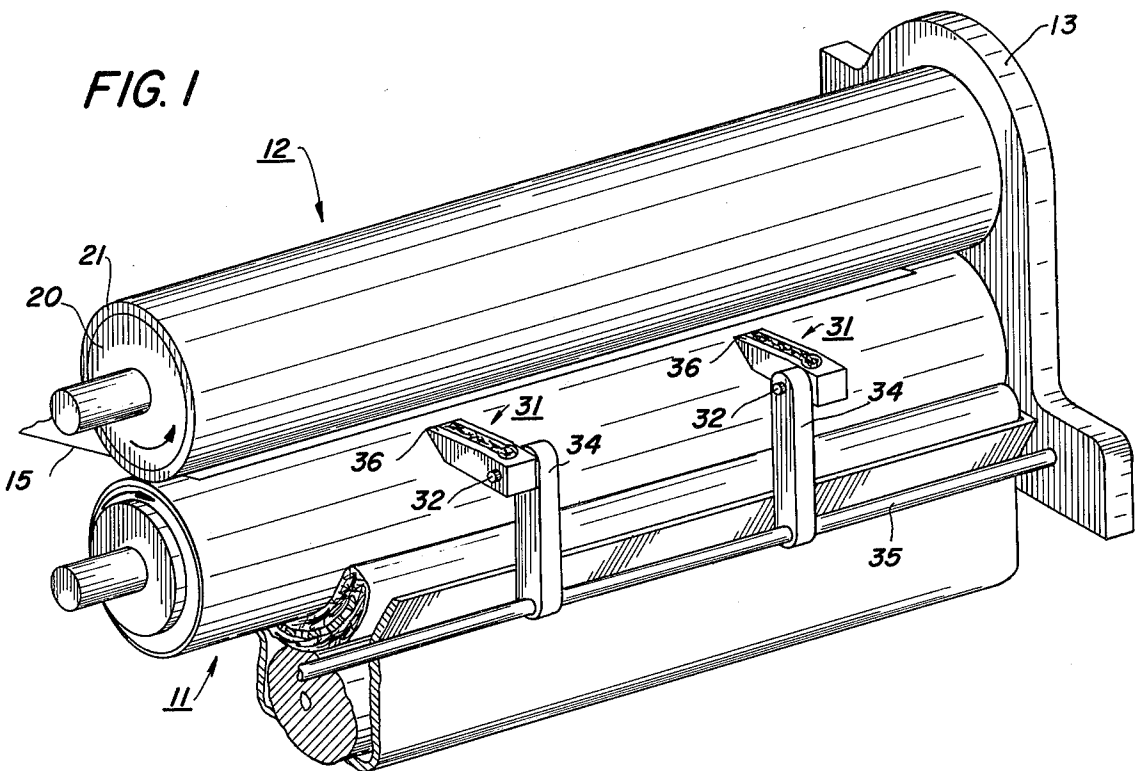
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[57] **ABSTRACT**
Fuser for a xerographic reproducing apparatus characterized by the provision of means for stripping the copy paper from the heated fuser roll. The stripping means is characterized by the provision of a plurality of bifurcated finger-like elements wherein an oil absorbent material is disposed between the portions forming the bifurcation for the purpose of removing excess release agent material at the leading edges of the finger-like elements.

7 Claims, 3 Drawing Figures





STRIPPER FINGER DESIGN TO PREVENT "OIL-ON-THE-COPY"

BACKGROUND OF THE INVENTION

This invention relates, in general, to apparatus for stripping copy paper from a heated fuser roll in a xerographic reproducing apparatus and, more particularly, to stripping apparatus suitable for stripping copies from a fuser roll to which a liquid release agent has been applied for preventing toner offset.

In the process of xerography, a light image of an original to be copied is typically recorded in the form of a latent electrostatic image upon a photosensitive member with subsequent rendering of the latent image visible by the application of electroscopic marking particles, commonly referred to as toner. The visual image can be either fixed directly upon the photosensitive member or transferred from the member to a sheet of plain paper with subsequent affixing of the image thereto.

In order to permanently affix or fuse an electroscopic toner material onto a support member by heat, it is necessary to elevate the temperature of the toner material to a point at which the constituents of the toner material coalesce and become tacky. This action causes the toner to be absorbed to some extent into the fibers of the support member which in many instances constitutes plain paper. Thereafter, as the toner material is cooled, solidification of the toner material occurs causing the toner material to be firmly bonded to the support member.

In both the electrographic as well as the xerographic recording arts, the use of thermal energy for fusing toner images onto a support member is old and well-known.

One approach to thermal fusing of electroscopic toner images onto a support has been to pass the support with the toner images thereon between a pair of opposed roller members at least one of which is either externally or internally heated.

During operation of a fusing system of the above-described type, the support member to which the toner images are electrostatically adhered is moved through the nip formed between the rolls with the toner image contacting the fuser roll to thereby produce heating of the toner images within the nip. By controlling the heat transferred to the toner and by the provision of proper roll surface materials virtually no offsetting of the toner particles from the copy sheet to the fuser roll is experienced under normal conditions. This is because the heat applied to the surface of the roller is insufficient to raise the temperature of the surface of the roller above the hot offset temperature of the toner whereat the toner particles of the image areas of the toner would liquefy and cause a shearing action in the central portion of the molten toner to thereby result in offset. Shearing occurs when the inter-particle forces holding the viscous toner mass together is less than the surface energy forces tending to offset it to a contacting surface such as the fuser roll.

Occasionally, however, extraneous toner particles will be offset to the fuser roll by an insufficient application of heat to the surface thereof; by imperfections in the properties of the entire surface of the roll, or by the toner particles insufficiently adhering to the copy sheet by the electrostatic forces which normally hold them

there. In such a case, extraneous toner particles may be transferred to the surface of the fuser roll beyond the nip, with subsequent transfer to the back-up roll during periods of time when no copy paper is in the nip and before the back-up roll can be moved out of contact with the the fuser roll.

It will be appreciated that in order to prevent such toner particles being transferred to the copy paper it is necessary to remove the toner particles from the fuser roll and/or the back-up roll. It will be further appreciated that if enough toner accumulates on the back-up roll the paper feed will be affected.

One arrangement for minimizing the foregoing phenomena, commonly referred to as "offsetting", has been to provide a fuser roll with an outer covering or sleeve of polytetrafluoroethylene, commonly known as Teflon, to which a release agent such as silicone oil is applied. Silicone based oils, which possess a relatively low surface energy, have been found to be a material that is suitable for use in the heated roll fuser environment. In practice, a thin layer of silicone oil is applied to the surface of the heated roll to thereby form an interface between the roll surface and the toner images carried on the support material. Thus, a low surface energy layer is presented to the toner as it passes through the fuser nip and thereby prevents toner from adhering to the fuser roll surface. Although the low surface energy oils generally act as a non-wetting fluid in regard to most support materials, it has been found that a mechanical flowing of the release agent from the roll onto the support material will occur if an excess of oil is allowed to accumulate in a region where it can come into contact with the copy paper. Accordingly, the amount of oil applied to the roll surface is generally metered under controlled conditions to maintain a relatively thin coating of the release agent on the roll surface.

As the copy sheet passes out of the nip formed by the fuser roll and the back-up roll, it is necessary to provide means such as stripper blades or finger-like members to insure that the copy paper proceeds along a predetermined path from the nip of the fuser roll and back-up roll to a conveyor belt or the like for moving the copy paper towards the exit of the machine or apparatus. Such stripper members usually contact the surface of the roll and it has been found that due to such contact the oil forming the release agent tends to accumulate at the point of contact near the leading edge of the stripper member. It has been found that such accumulation will cause excess amounts of oil to be picked up by the copy paper thus adversely affecting the quality of the copy produced.

It is therefore the principal object of the present invention to provide an improved roll fusing device for fixing toner images.

Another object of the present invention is to provide improved means for removing a copy sheet from the surface of a heating fusing roll.

Yet another object of the present invention is to provide a stripping device in conjunction with a heated fusing roll which minimizes the effect of oil accumulated at the contact surface between the stripping means and the fuser roll.

BRIEF SUMMARY OF THE INVENTION

The above-cited objects of the present invention are accomplished by means of a sheet removal device which is adapted to move between the surface of an oil

coated fuser roll and an image bearing support member carried thereon. The sheet removal device is characterized by the provision of one or more bifurcated stripper elements having an oil absorbent material disposed in the bifurcation of the stripper element in order to absorb the oil tending to accumulate at the leading edge of the stripper member away from the leading edge and into a reservoir for containing the oil so removed from the leading edge of the stripper member.

For a better understanding of the present invention as well as other objects and further features thereof, reference may be had to the following detailed description of the invention to be read in conjunction with the accompanying drawings wherein:

FIG. 1 is a perspective view in partial section illustrating a heated pressure roll image fixing assembly employing the sheet removal apparatus of the present invention;

FIG. 2 is an end view partially in section, of the lower fuser roll of the assembly shown in FIG. 1 illustrating the sheet removal apparatus of the present invention positioned in an operative orientation; and

FIG. 3 is a perspective view of a stripper member forming a part of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

Referring now to FIG. 1, there is shown a typical heat pressure roll fusing system utilizing the sheet removal apparatus of the present invention. A pair of co-acting fuser rolls, including a lower heated roll 11 and an upper back-up roll 12, are rotatably mounted within a support frame 13 and have drive means (not shown) operatively associated therewith for rotating the rolls at synchronous speeds in the direction indicated by the arrows. One of the roll members, in this particular case the bottom roll 11, is provided with an internal source of heat energy and it is arranged so that its outer surface contacts the toner image bearing side of a copy sheet 15 as the sheet is transported through the nip of the fuser roll assembly. The lower or heated roll 11 is formed of a resilient blanket 16 which is supported by a rigid core 17 and has a thin layer of relatively abhesive material 18, for example, polytetrafluoroethylene, positioned thereover. Disposed axially through the interior of the rigid core 17 is a quartz heating lamp 19 which functions to transfer the proper amount of energy to the roll member so as to raise the surface temperature thereof to a predetermined operating level.

The upper or back-up fuser roll 12 is made of a relatively rigid cylindrical substrate 20, preferably steel or aluminum, over which is provided a relatively thick sleeve 21 of polytetrafluoroethylene. In operation, the two rolls 11 and 12 are mounted in the frame so that the upper resilient roll 12 is deformed against the more rigid lower heated roll 11 thus creating an extended nip therebetween through which the copy sheet is passed during the fusing process. During passage of the sheet, sufficient pressure and heat energy is transferred from the fuser assembly to the copy sheet to effect the desired toner coalescing and consequently image fixing. It will be appreciated that while the rolls 11 and 12 are disposed in a particular orientation relative to each other therefore the fuser roll 11 is subadjacent the back-up roll 12, the positions of the rolls can be interchanged without departing from the spirit and scope of the invention. It will further be appreciated that suitable means should be provided for maintaining the rolls

11 and 12 out of contact with each other during periods of non-operation. To this end, mechanism (not shown) can be provided which will move one or the other of the rolls from its normal operating position to a retracted position whereby the rolls are out of engagement.

Alternatively, one of the rolls 11 and 12 could be provided with a flat spot thereon extending the longitudinal axis thereof and the rolls could be so synchronized as to be brought to a rest position whereby the flat portion of the one roll is opposite the other roll.

In order to prevent the toner particles forming the image carried by the support sheet from being offset onto the heated roll surface of roll 11, as the sheet is drawn through the fuser nip, the heated roll is provided with a layer of oil constituting a release agent capable of preventing the toner particles from being offset to the heated roll surface. Silicone based oils have been found to be suitable release agents for this intended purpose.

An oil applying mechanism, generally referenced 25, is positioned adjacent to the lower portion of the heated fuser roll 11 as illustrated in FIGS. 1 and 2. An applicator wick 26 is mounted in the upper part of the housing 27 and is arranged to contact the lower portion of a heated roll surface. A rotating oil metering cylinder 28 is located directly beneath the wick and serves to transport a predetermined amount of oil from a housing sump region 29 upwardly into contact with the wick surface. Sufficient oil is carried to the wick by the metering roll to allow the wick to apply to the outer periphery of the fuser roll a relatively even layer of oil. The oil layer applied to the fuser roll surface must be thick enough to act as an interface between the roll surface and the copy sheet to prevent toner offsetting but yet must be thin enough to prevent wetting of the copy sheet as it comes through the fuser nip. For further information concerning this type of oil metering system reference may be had to U.S. Pat. No. 3,718,116.

As the image-bearing support sheet passes through the nip of the fuser roll assembly the sheet tends to follow the rotation of the heated fuser roll surface thereby necessitating the provision of some mechanism for effecting the removal of the support sheet from the fuser roll surface, after the image has been fixed thereto. To this end, one or more pickoff or stripper fingers 31 are mounted slightly after the nip of the fuser roll assembly and are arranged to be disposed between the fuser roll surface and the copy sheet moving through the nip. As the copy sheet leaves the fuser nip it comes into contact with the upper surface of the stripper fingers 31. The fingers thus are interposed between the sheet and the fuser roll to thereby redirect the sheet along a predetermined path of travel away from the roll thereby effecting the desired separation of the copy sheet from the fuser roller.

In a system such as herein contemplated, therefore wherein release agent is applied to the fuser roll, the pickoff fingers trap oil or release agent at the line of contact of the finger with the fuser roll thereby producing an excess amount of oil at such line of contact resulting in transfer of an excessive amount of oil to the copy sheet. Accordingly, the fingers 31 are constructed in a particular manner in order to alleviate the problem of excessive oil accumulation.

As illustrated in FIGS. 1 through 3, the sheet removal apparatus of the present invention comprises a pair of

pickoff fingers 31 which are pivotably mounted upon the free ends of pivot pins 32. The pivot pins 32 are anchored at one end thereof is generally vertical support members 34 which are, in turn, supported by an elongated member 35 secured to the support frame 13. Each finger is provided with a contacting edge 36 of relatively small thickness formed by a top surface 38 and a bottom surface 39. The fingers are supported in the fuser assembly such that the lower or bottom surface 39 rests on the fuser roll 11 and is retained in that position due to gravitational forces.

From a consideration of FIG. 3 it can be seen that the pickoff finger 31 comprises an elongated slot 40 beginning at the leading edge 36 and terminating with an aperture 42 rearwardly of the leading edge 36. A pad 44 disposed in the elongated slot 40 and in the aperture 42 serves to absorb the oil tending to accumulate at the leading edge 36 and by a wicking action carry the oil rearwardly of the leading edge 36 to the portion of the pad 44 disposed in the aperture 42 which serves as a reservoir for the oil.

It has been found that absent the pad 44 the leading part of the slot 40 acts like a large capillary that would hold the oil picked up from the fuser roll. The oil thus picked up would be held until a second capillary system is provided with a smaller mean capillary radius. The paper, stripper finger contact point constitutes such a smaller capillary which would cause the oil to be transferred to the paper. However, since the slot and aperture are filled with the porous material, for example, absorbent paper, cellulose sponge or nomex sponge, the oil will be wicked away from the tip of the stripper finger thus preventing oil getting onto the paper copy.

To prevent toner from adhering to the surface of the pickoff fingers 31 as copy sheets are drawn thereover, the picker fingers are preferably constructed of a material that will neither mechanically nor chemically interact with the toner in a manner to cause the toner to adhere to the surfaces thereof. Such materials, as aromatic polyesters, as for example, Ebonol as manufactured by the Carborundum Company of Sanborn, New York, which are loaded with trifluoroethylene filler; amide imides, as for example, Amoco A1-11L4 as supplied by the Amoco Chemical Company of Seymour, Indiana, which are loaded with a graphite or trifluoroethylene filler, poly imides, as for example, Vespel as manufactured by the Dupont Company, which are coated with a layer of trifluoroethylene have all been found to exhibit non-adhering or abhesive characteristics to toner and are well-suited for the use in such a construction.

While this invention has been described with refer-

ence to the structure disclosed herein, it is not necessarily confined to such details as set forth and this application is intended to cover such modifications or variations which may come within the scope of the following claims.

What is claimed is:

1. Apparatus for affixing toner particles to a substrate, said apparatus comprising:
 - a heated roll;
 - a back-up roll forming a nip with said heated roll through which such substrate passes with said toner particles in contact with said heated roll;
 - means for applying a material to said heated roll which minimizes the adherence of toner particles to said heated roll; and
 - stripper means contacting said heated roll and disposed between said heated roll and said substrate for insuring movement of said substrate along a predetermined path, said stripper means including means for conveying excess amounts of said material away from the area of contact of said stripper means with said heated roll.
2. Apparatus according to claim 1 wherein said material comprises silicone oil.
3. Apparatus according to claim 2 wherein said conveying means comprises an oil absorbent material.
4. Apparatus according to claim 3 wherein said stripper means comprises at least one bifurcated member having said oil absorbent material disposed in the bifurcation.
5. Mechanism for removing substrate material from a heated roll adapted to fuse toner particles thereto wherein the surface of the heated roll is provided with material for preventing adherence of the toner particles thereof, said mechanism comprising:
 - at least one pickoff finger pivotally supported relative to said heated roll such that a leading edge thereof contacts the surface of the heated roll; and
 - means associated with said at least one pickoff finger for absorbing excessive amounts of adherence-preventing material and conveying said excessive amounts away from said leading edge.
6. Apparatus according to claim 5 wherein said means associated with said at least one stripper finger comprises an elongated slot extending from said leading edge and communicating rearwardly of said leading edge with a relatively large aperture; and
 - wherein said absorbing material is disposed in said elongated slot and said aperture.
7. Apparatus according to claim 6 wherein said adherence-preventing material comprises silicone oil.

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