(12) UK Patent Application (19) GB (11) 2 259 466 (13) A

(43) Date of A publication 17.03.1993

(21) Application No 9119475.3

(22) Date of filing 11.09.1991

(51) INT CL[5]
B05C 1/08 // G03G 15/20

(52) UK CL (Edition L)
B2L LCGB
B6C CBRD

(56) Documents cited
None

(58) Field of search
UK CL (Edition K) B2L, B6C
INT CL[5] B05C 1/08

(71) Applicant
Xerox Corporation

(Incorporated in the USA – New York)

Xerox Square, Rochester, New York 14644,
United States of America

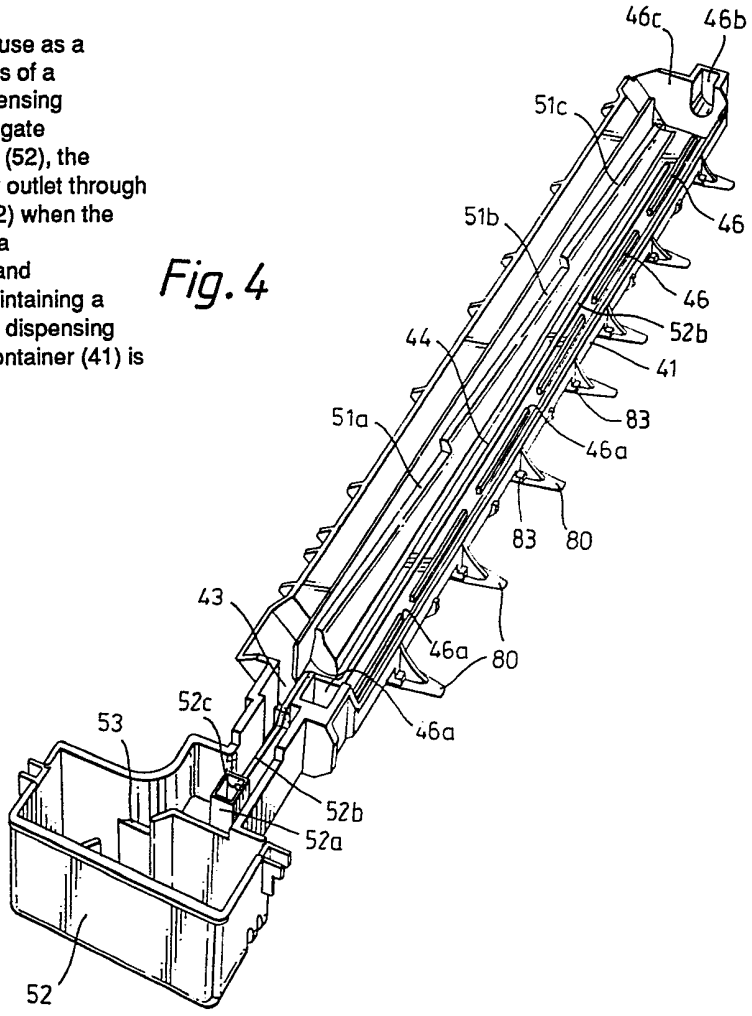
(72) Inventor
Ducan I Stevenson

(74) Agent and/or Address for Service
R G Johnson
Rank Xerox Limited, Patent Department, Albion House,
55-59 New Oxford Street, London, WC1A 1BS,
United Kingdom

(54) Liquid dispensing apparatus

(57) A liquid dispensing apparatus suitable for use as a release oil applicator in a toner fusing apparatus of a xerographic copier or a printer. The liquid dispensing apparatus includes a storage reservoir, an elongate dispensing container (41) and an overflow tank (52), the dispensing container (41) including an overflow outlet through which liquid overflows into the overflow tank (52) when the liquid in the dispensing container (41) reaches a predetermined level. A further reservoir (52a) and connecting feed pipe (52b) are provided for maintaining a liquid supply to a remote region of the elongate dispensing container (41) when the elongate dispensing container (41) is slightly tilted from the horizontal.

Fig. 4



GB 2 259 466 A

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

Fig. 1A

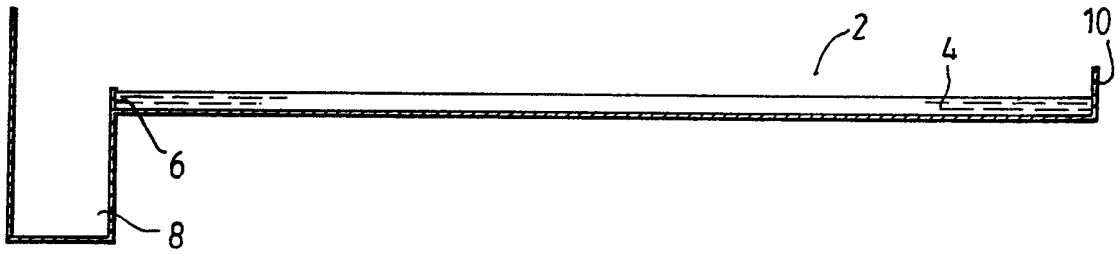


Fig. 1B

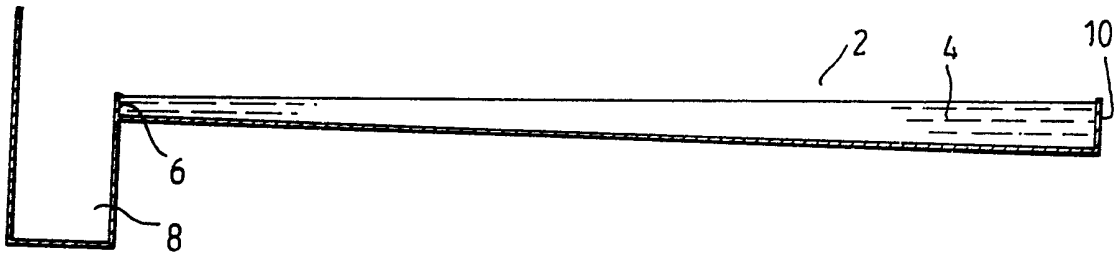
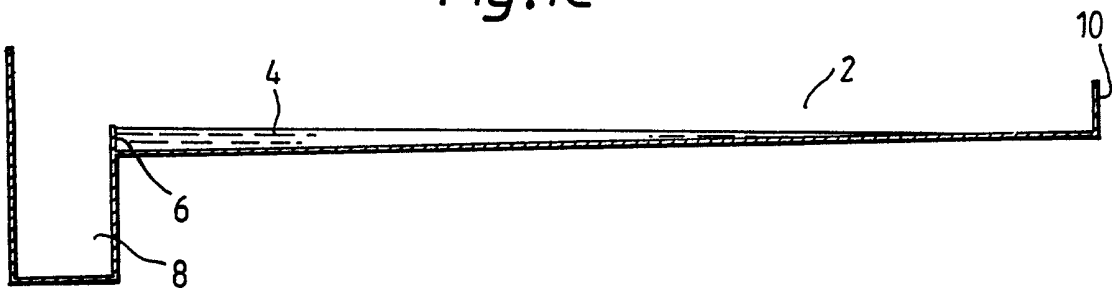


Fig. 1C



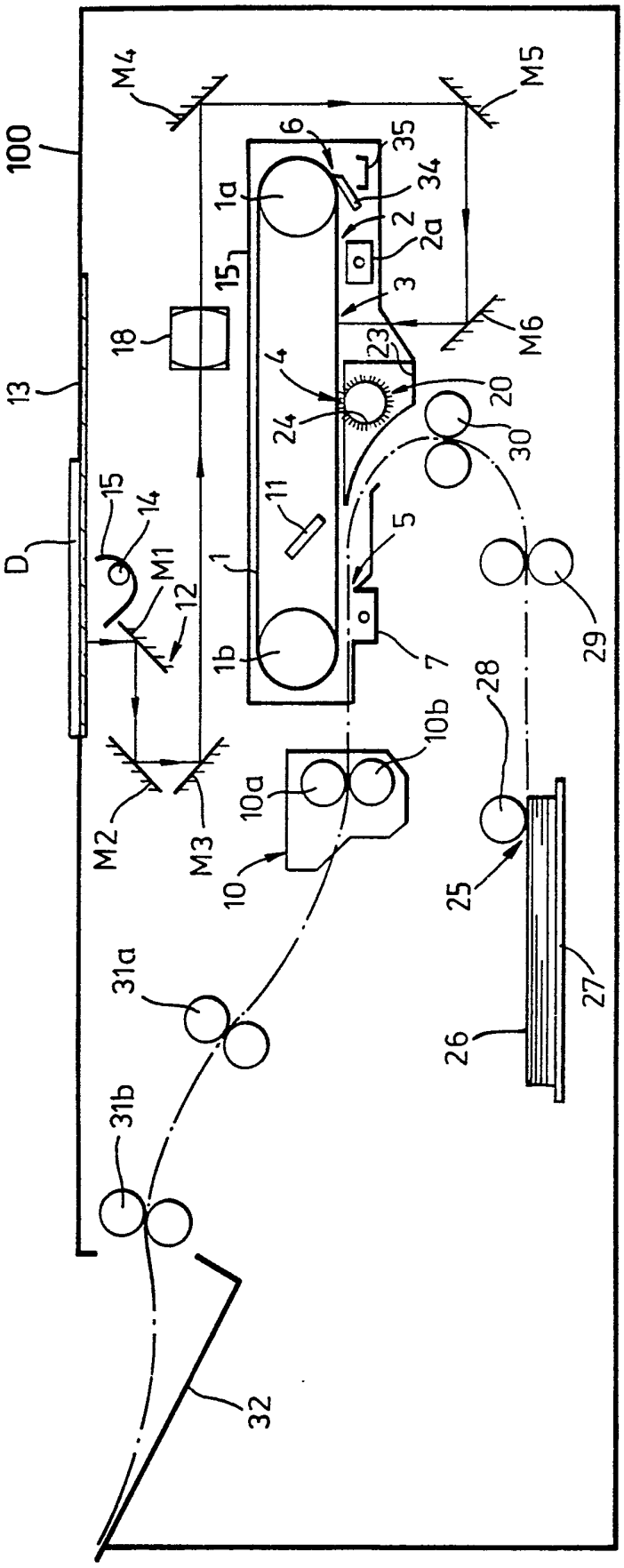

100
M4
M5
6
35
34
1a
2
2a
3
15
18
M6
23
4
20
24
30
13
11
5
D
15
14
M1
12
1
1b
7
29
28
10b
10a
M2
M3
10
25
31a
27
26
31b
32

Fig. 2

Fig. 3

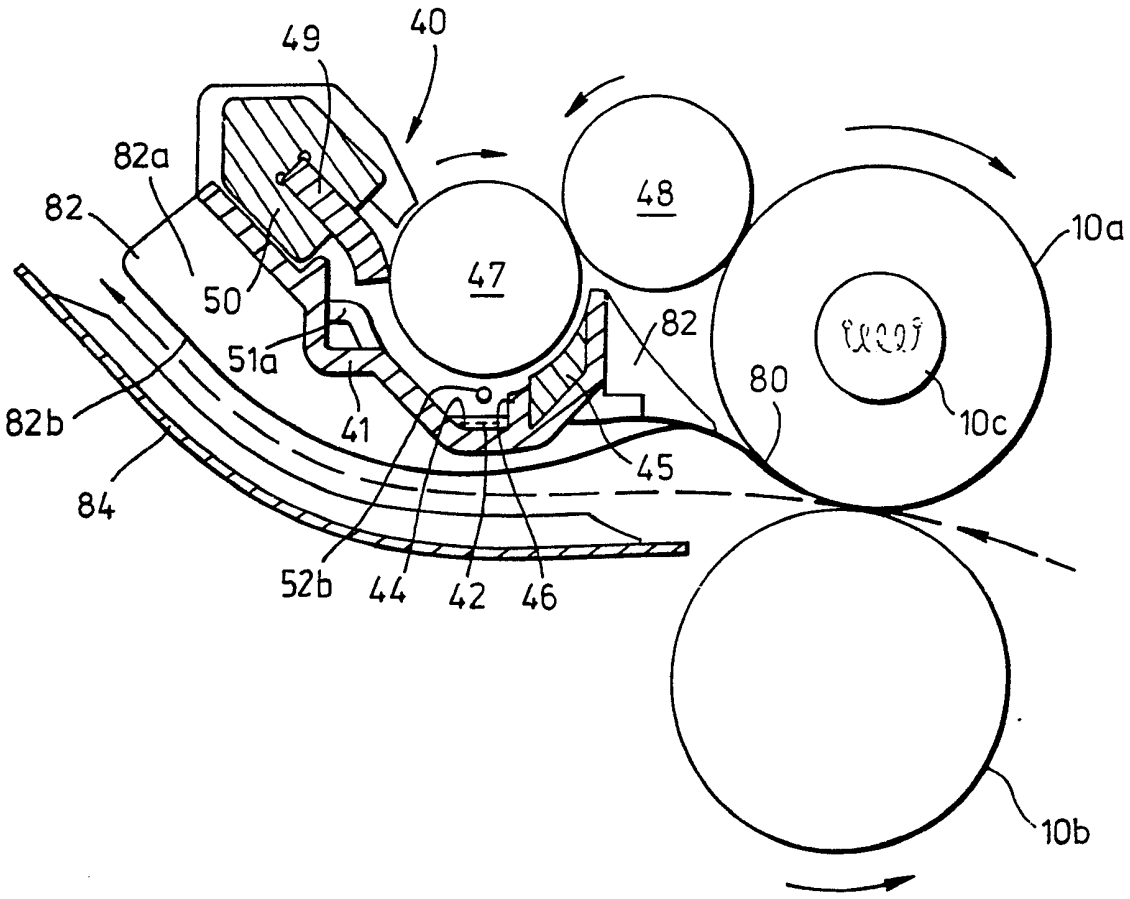


Fig. 4

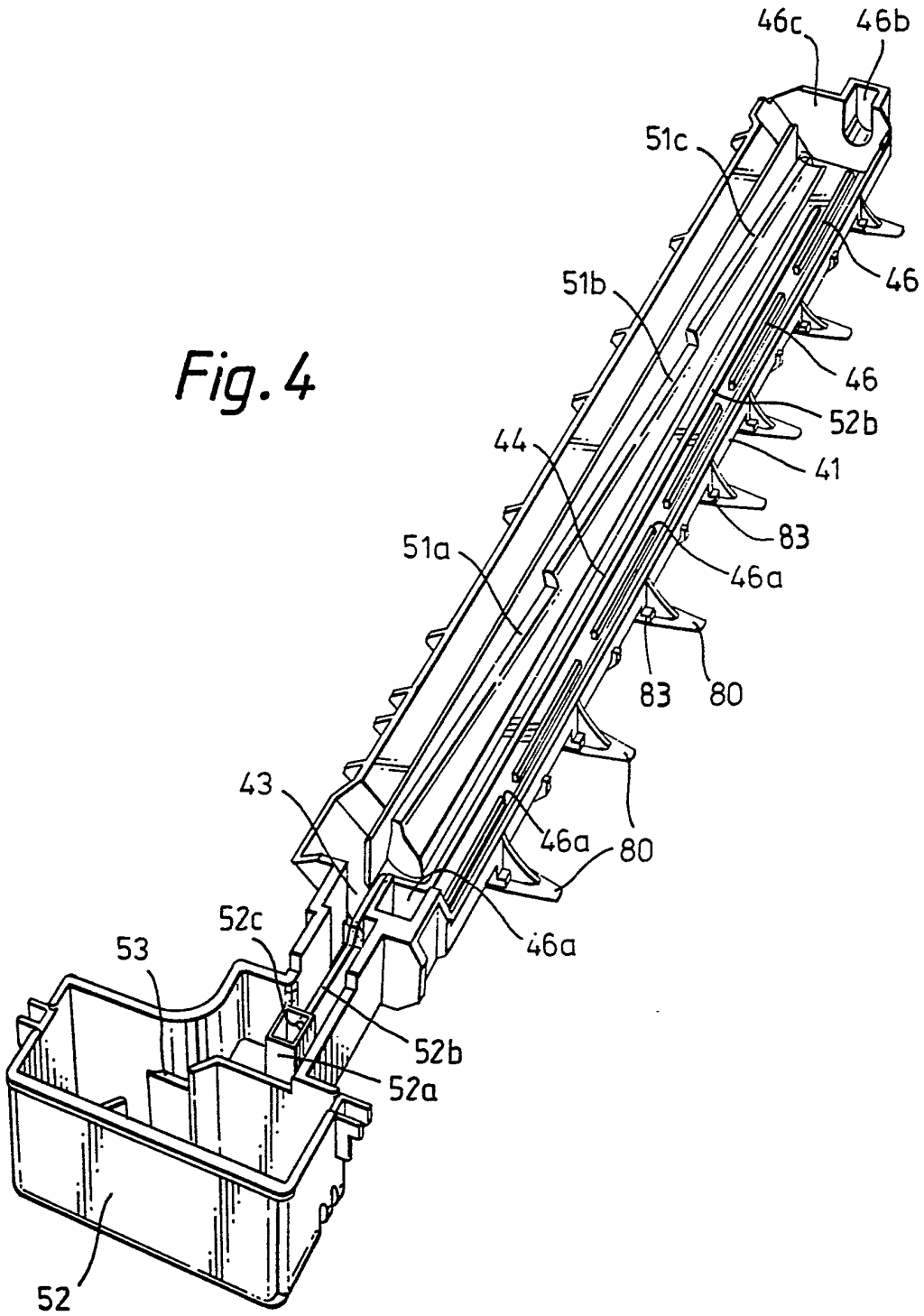

46c
46b
51c
46
51b
46
52b
44
41
83
51a
46a
83
80
43
46a
80
52c
53
46a
52b
52a
52

Fig.5

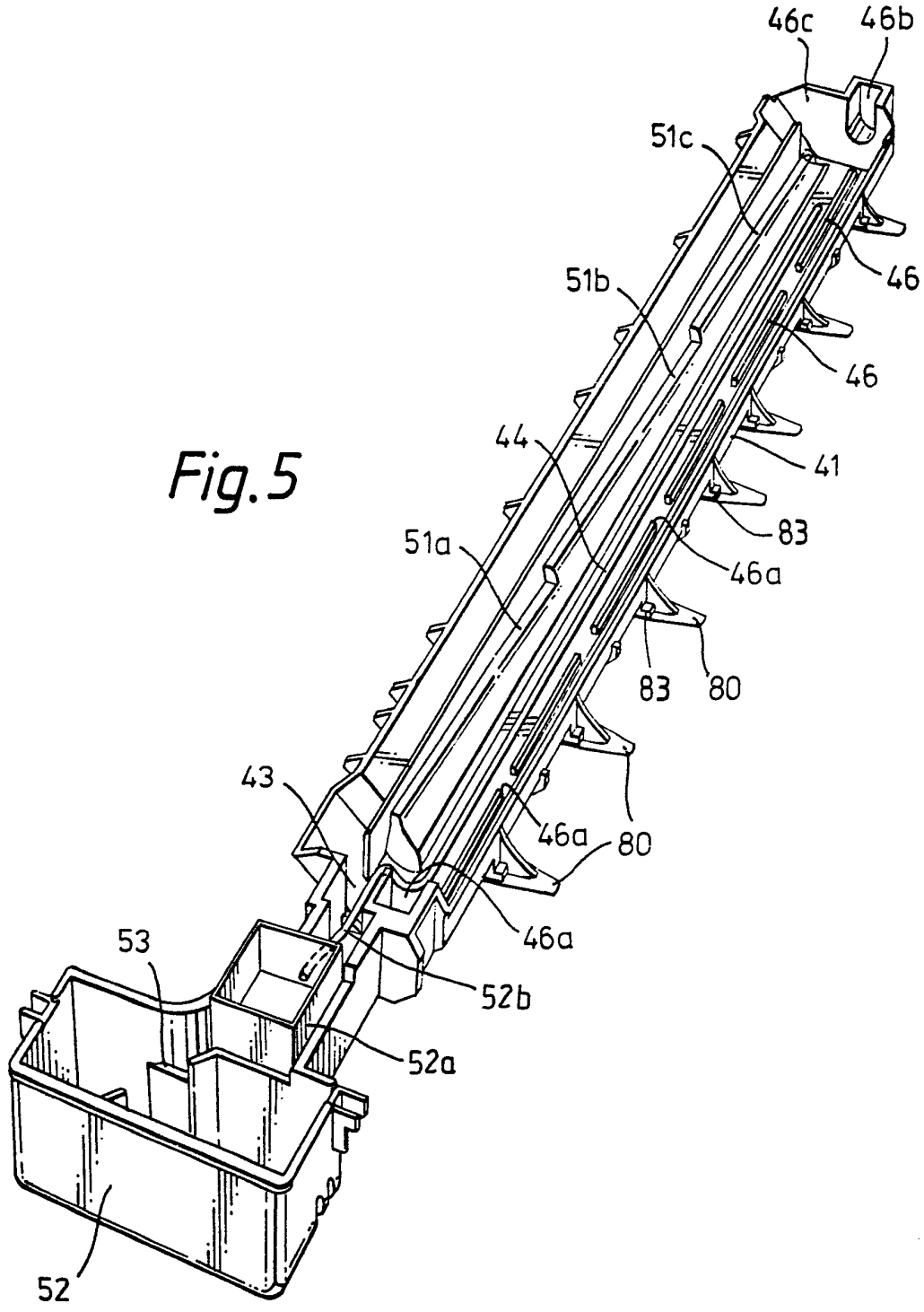

46c
46b
51c
46
51b
46
44
41
83
51a
46a
83
80
43
46a
80
46a
53
52b
52a
52

Fig. 6

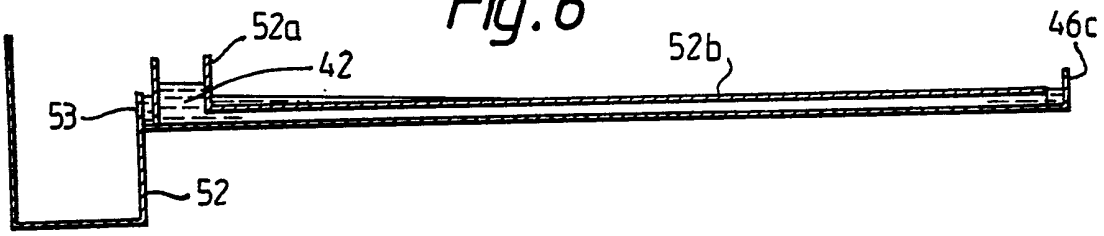


Fig. 7

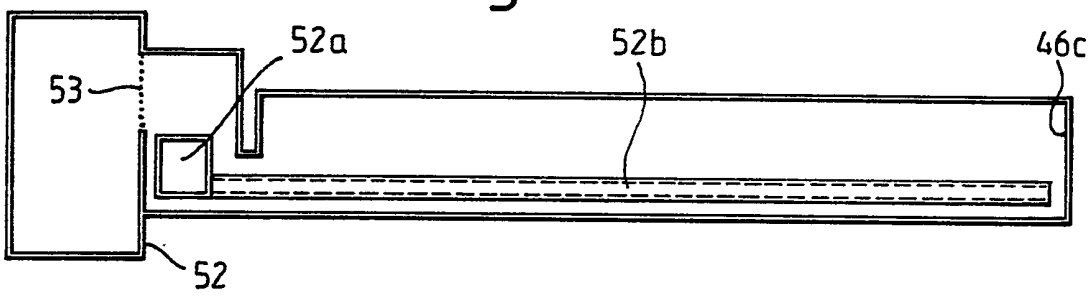


Fig 8

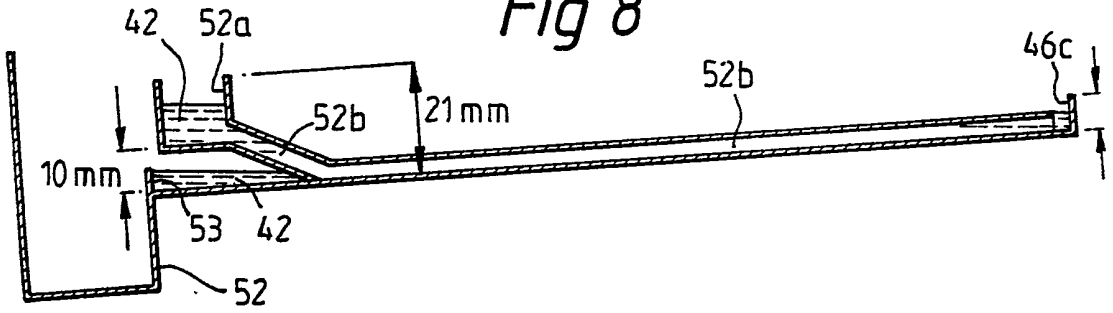
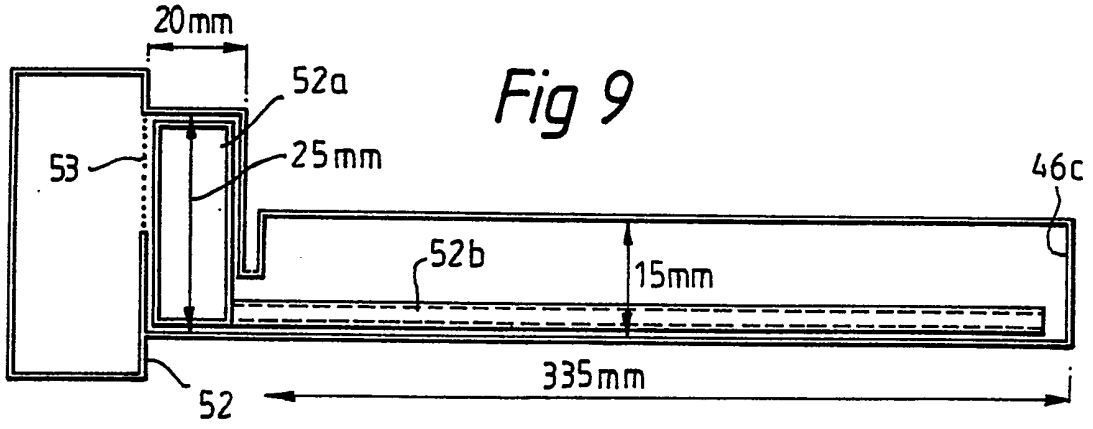


Fig 9



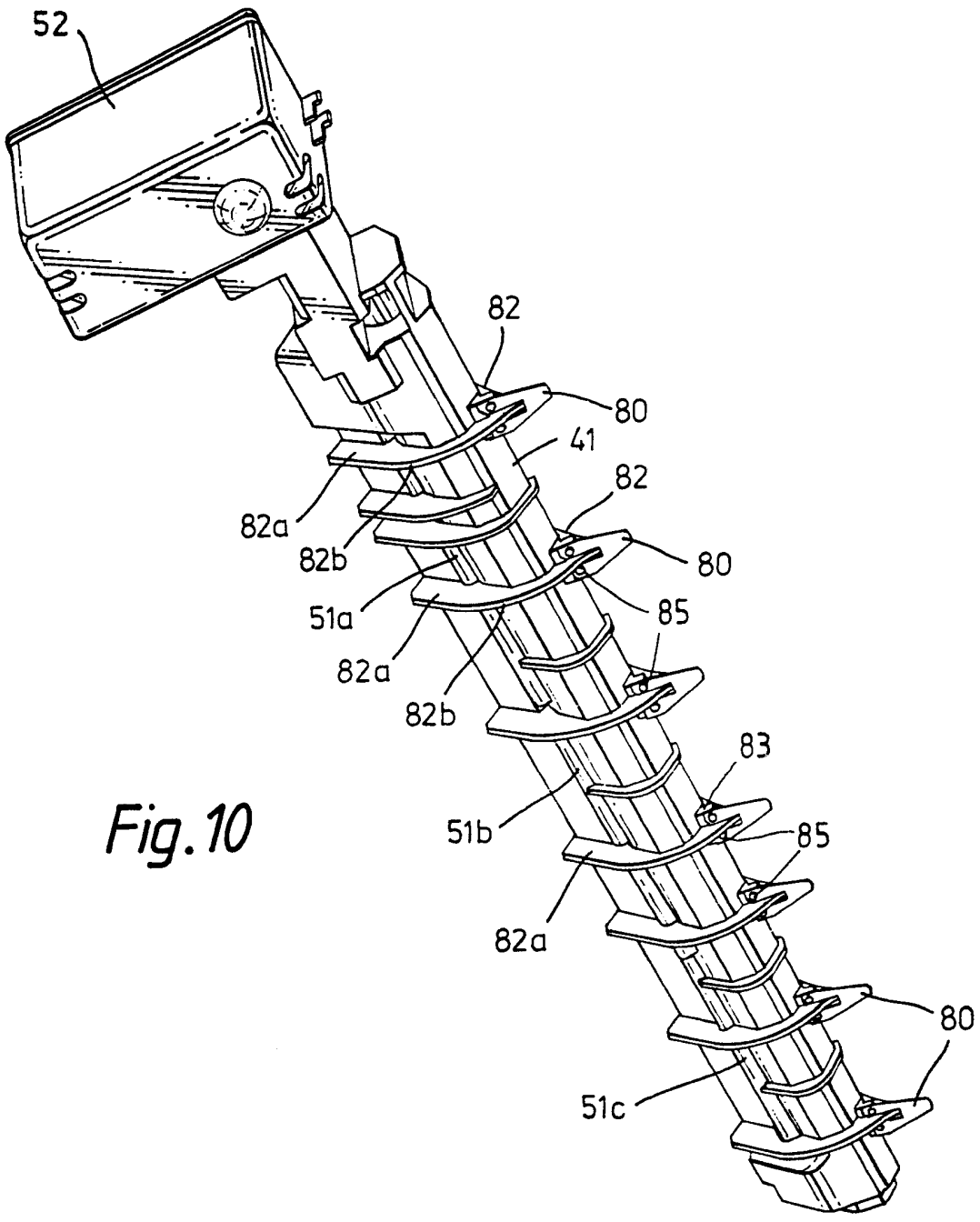


Fig. 10

Liquid Dispensing Apparatus

This invention relates generally to a liquid dispensing apparatus which is particularly, although not exclusively, suitable for use in the fuser of an electrostatographic recording machine such as, for example, a xerographic copier or a printer.

In a xerographic copier or printer a light image of an original document to be reproduced is recorded in the form of a latent electrostatic image on a photosensitive member. The latent image is rendered visible by the application of a resin-based powder known as toner. The visual toner image is transferred electrostatically from the photosensitive member on to sheets of paper or other substrates. The toner image is then fixed or "fused", for example by applying heat and pressure, which causes the toner material to become soft and tacky whereby it is able to flow into the fibres or pores of the substrate or otherwise upon the surface thereof. Thereafter, as the toner material cools, it solidifies and is bonded firmly to the substrate. In the electrostatographic art generally the use of thermal energy and pressure for fixing toner images on to a substrate is well known.

It has long been recognised that one of the fastest and most positive methods of applying both heat and pressure for fusing the toner image to the substrate is by direct contact of the resin-based toner image with a hot surface such as a heat roller which also applies pressure to the substrate. One approach is to pass the substrate with the toner image thereon between a pair of opposed rollers forming a nip, at least one of the rollers being internally heated. The actual temperature and pressure ranges will of course vary depending upon the softening range of the particular resin used in the toner. Typically, however, it will be necessary to heat the toner powder above 180°C. Temperatures of 198°C or even higher are not uncommon in commercial fusers. Corresponding nip pressures are in the range of 690 to 1380kNm^{-2}.

A problem with this kind of fuser is that, as the toner becomes tacky, it can stick to the surface of the fuser roller which is undesirable because some of the toner on the fuser roller can then be transferred to subsequent substrates being fused and, moreover, those subsequent substrates will in their turn give rise to even more toner sticking to the fuser roller. This effect, known as "offset", clearly impairs copy quality. Furthermore, if the rollers are rotated when there is no substrate present in the nip therebetween, toner may also be transferred from the fuser roller to the backup roller so that when a substrate subsequently passes through the nip some of the toner may be transferred to the reverse side thereof.

An arrangement for minimising the problem of offset has been to provide a fuser roller with an outer surface or covering of, for example, polytetrafloroethene known by the trade name Teflon, to which a liquid release agent such as silicone oil is applied. The thickness of the Teflon is typically of the order of tens of microns and the thickness of the oil is less than 1

micron. Silicone based oils, for example polydimethylsiloxane, which possess a relatively low surface energy, have been found to be suitable for use in the heated fuser roller environment where Teflon constitutes the outer surface of the fuser roller. In practice, a thin layer of silicone oil is applied to the surface of the heated roller to form an interface between the roller surface and the toner images carried on the substrate. Thus, a low surface energy layer is presented to the toner as it passes through the fuser nip thereby preventing toner from offsetting to the fuser roller surface.

In attempts to improve the quality of the image fused by a heat roller fuser, such rollers have been provided with conformable surfaces comprising silicone rubber or Viton (Trademark of E I Du Pont for a series of fluoroelastomers based on the copolymer of vinyladinefluoride and hexafluoropropylene). As in the case of the Teflon coated fuser roller, release fluids such as silicone based oils are applied to the surface of the silicone rubber or Viton to both minimise offsetting and to facilitate stripping. When the fuser system is one which provides for applying silicone oil to silicone rubber or Viton, a low viscosity silicone oil (i.e. in the order of 100 to 1000 centistokes) has most commonly been employed, although liquids of relatively high viscosity, for example 12,000 to 60,000 centistokes and higher, have also been used.

Various forms of applicator have been employed to supply the liquid release agent to the surface of the fuser roller. Thus, for example, US Patent No. 4 231 653 discloses an applicator comprising an elongate trough for containing a supply of release oil. A wick which is partially immersed in the release oil supply draws the oil up from the trough for application to the fuser via a pair of cooperating rollers in pressure contact, namely a driven oil application roller and a freely rotatable oil supply roller. The wick is in engagement with the oil supply roller and thus applies the release oil directly to the surface thereof. The oil supply roller slips on the application roller and is not rotated when there is some oil present between the two rollers, but as the oil runs out the oil supply roller is driven by the oil application roller since the coefficient of friction therebetween is increased. In other words, the oil supply roller is rotated only when there is little or no oil on the surface of the oil application roller due to the application of oil to the fuser and thus the cooperating roller pair acts as a metering device for checking the amount of release oil conveyed to the fuser.

Generally in prior art applicators the release oil is introduced into the supply trough at a single inlet usually at one end of the trough and distribution of the oil along the full length of the trough relies (a) on the oil reaching a level in the trough and (b) on the capillary capability of the wick. These processes tend to be relatively slow especially in view of the viscosity of the release oil and consequently points along the trough remote from the inlet may receive insufficient oil for stripping or may even suffer complete oil starvation particularly if the machine - and hence the trough - is tilted. The provision of additional oil inlets along the

length of the trough would also aid distribution but this would increase cost and may not be possible if stringent space constraints have to be observed.

As mentioned above one of the problems associated with machines of this type arises if the trough is tilted, perhaps by as little as $1\frac{1}{2}$ degrees to the horizontal, as it may result in oil starvation. This problem is illustrated in Figures 1A, 1B and 1C which are side on views of a trough 2 in three orientations.

It is imperative that the trough 2 is kept full with an adequate level of oil 4. This is accomplished by overfilling the system, and by providing a weir 6 over which excess oil flows into a spillover chamber 8. A pump is provided to feed the oil from the spillover chamber 8 back into the trough 2. Fig 1A illustrates the trough 2 in a horizontal orientation, whereas Figs 1B and 1C illustrate the trough 2 in a slightly tilted orientation. Fig 1B shows the trough 2 tilted down at the back and Fig 1C shows the trough 2 tilted down at the front.

The case in which the trough 2 is tilted down at the back is handled for tilts of up to approximately $1\frac{1}{2}$ degrees, as shown in Figure 1B, by providing a back wall 10 of appropriate height. The geometry of the machine defines the height of the back wall 10 and hence the height of the weir 6 since it is vital that, in the worst case, oil does not flood from the back of the machine.

When the trough 2 is tilted the other way, as shown in Fig. 1C, the weir 6 is not high enough to allow oil all the way to the rear of the trough 2. Various measures, such as delivery ramps, have been used in known machines to distribute some oil to the rear of the trough 2 but the majority of oil transport is via capillary flow through the wick. In high volume uses, however, there is not enough time for the wick to deliver any oil and oil starvation results.

It is an object of the present invention to provide a liquid dispensing apparatus for alleviating the problem of oil starvation by maintaining the oil supply along the length of the trough in circumstances where the trough is tilted up at the back by, for example, $1\frac{1}{2}$ degrees to the horizontal.

Accordingly, the present invention provides a liquid dispensing apparatus including a storage reservoir, an elongate dispensing container and an overflow tank, the dispensing container including an overflow outlet through which liquid overflows into the overflow tank when the liquid in the dispensing container reaches a predetermined level, characterised by a further reservoir for receiving liquid from the storage reservoir and a feed pipe connected to an outlet of the further reservoir extending from that outlet to a region of the dispensing container remote from said overflow outlet, the further reservoir and the feed pipe being arranged to maintain a liquid supply to that remote region of the dispensing container when the liquid dispensing apparatus is slightly tilted from the horizontal.

In one embodiment of the invention at least a portion of the further reservoir is located within the trough and the feed pipe extends within and along the trough. In a

preferred embodiment the further reservoir and feed pipe are designed to be loosely fitted within the trough such that they can be dropped into the trough during assembly. In a further preferred embodiment the further reservoir is located immediately adjacent to or in close proximity to said overflow outlet.

In one application the liquid dispensing apparatus is used as a release oil applicator in a toner fusing apparatus of a xerographic copier or a printer.

Accordingly, the present invention also provides an apparatus for fusing toner images on copy substrates including a heat and pressure fuser and a release oil applicator therefor, the release oil applicator including a storage reservoir, a dispensing container having an elongate trough for containing a supply of release oil and an overflow tank, the trough including an overflow outlet through which release oil overflows into the overflow tank when the release oil in the trough reaches a predetermined level, and means for taking up release oil from the trough for application to the fuser, characterised by a further reservoir for receiving release oil from the storage reservoir and a feed pipe connected to an outlet of the further reservoir extending from that outlet to a region of the trough remote from said overflow outlet, the further reservoir and the feed pipe being arranged to maintain a liquid supply to that remote region of the trough when the trough is slightly tilted from the horizontal.

The invention will be described further, by way of examples, with reference to the accompanying drawings, in which:-

Figures 1A, 1B and 1C are side on schematic views of a trough containing liquid in various orientations,

Figure 2 is a schematic cross section of a xerographic copier incorporating a fuser apparatus employing a release oil applicator in accordance with an embodiment of the present invention,

Figure 3 is an enlarged cross section of the fuser apparatus in Figure 2 showing a cross section through a release oil applicator,

Figure 4 is a perspective view from above showing the inside of the applicator trough according to one embodiment of the invention,

Figure 5 is a perspective view from above showing the inside of the applicator trough according to a further embodiment of the invention,

Figures 6 and 7 are schematic side on and plan views of the applicator trough in Figure 4,

Figures 8 and 9 are schematic side on and plan views of the applicator trough in Figure 5 and

Figure 10 is a perspective view showing the underside of the applicator trough of Figures 4 and 5.

Figures 1A, 1B and 1C have been described hereinbefore in order to explain the problem of oil starvation arising from a trough tilted down at the front. The reference signs used in Figures 1A, 1B and 1C are different to the reference signs used in the other Figures 2 to 10. It is noted however that in Figures 2 to 10 the same reference signs are used to indicate the same features.

The invention will be described hereinafter in relation to its use as a release oil applicator in a toner fusing apparatus of a xerographic copier. It will be understood that this is by way of example only as the release oil applicator can likewise be used in a toner fusing apparatus of a printer or as a liquid dispensing apparatus in applications outside the xerographic field.

Referring firstly to Figure 2, there is shown schematically a xerographic copy machine incorporating an embodiment of the present invention. The machine includes an endless flexible photoreceptor belt 1 mounted for rotation (in the clockwise direction as shown in Figure 2) about support rollers 1a and 1b to carry the photosensitive imaging surface of the belt 1 sequentially through a series of xerographic processing stations, namely a charging station 2, an imaging station 3, a development station 4, a transfer station 5, and a cleaning station 6.

The charging station 2 comprises a corotron 2a which deposits a uniform electrostatic charge on the photoreceptor belt 1.

An original document D to be reproduced is positioned on a platen 13 and is illuminated in known manner a narrow strip at a time by a light source comprising a tungsten halogen lamp 14. Light from the lamp is concentrated by an elliptical reflector 15 to cast a narrow strip of light on to the side of the original document D facing the platen 13. Document D thus exposed is imaged on to the photoreceptor 1 via a system of mirrors M1 to M6 and a focussing lens 18. The optical image selectively discharges the photoreceptor in image configuration, whereby an electrostatic latent image of the original document is laid down on the belt surface at imaging station 3. In order to copy the whole original document the lamp 14, the reflector 15, and mirror M1 are mounted on a full rate carriage (not shown) which travels laterally at a given speed directly below the platen and thereby scans the whole document. Because of the folded optical path the mirrors M2 and M3 are mounted on another carriage (not shown) which travels laterally at half the speed of the full rate carriage in order to maintain the optical path constant. The photoreceptor 1 is also in motion whereby the image is laid down strip by strip to reproduce the whole of the original document as an image on the photoreceptor.

By varying the speed of the scan carriages relative to the photoreceptor belt 1 it is possible to alter the size of the image along the length of the belt, i.e. in the scanning direction. In full size copying, that is to say with unity magnification, the speed of the full rate

carriage and the speed of the photoreceptor belt are equal. Increasing the speed of the scan carriage makes the image shorter, i.e. reduction, and decreasing the speed of the scan carriage makes the image longer, i.e. magnification.

The image size can also be varied in the direction orthogonal to the scan direction by moving the lens 18 along its optical axis closer to the original document i.e. closer to mirrors M2 and M3, for magnification greater than unity, and away from the mirrors M2 and M3 for reduction, i.e. magnification less than unity. When the lens 18 is moved, the length of the optical path between the lens and the photoreceptor, i.e. the image distance, is also varied by moving mirrors M4 and M5 in unison to ensure that the image is properly focused on the photoreceptor 1. For this purpose mirrors M4 and M5 are suitably mounted on a further carriage (not shown).

At the development station 4, a magnetic brush developer system 20 develops the electrostatic latent image into visible form. Here, toner is dispensed from a hopper (not shown) into developer housing 23 which contains a two-component developer mixture comprising a magnetically attractable carrier and the toner, which is deposited on the charged area of belt 1 by a developer roller 24.

The developed image is transferred at transfer station 5 from the belt to a sheet of copy paper which is delivered into contact with the belt in synchronous relation to the image from a paper supply system 25 in which a stack of paper copy sheets 26 is stored on a tray 27. The top sheet of the stack in the tray is brought, as required, into feeding engagement with a top sheet separator/feeder 28. Sheet feeder 28 feeds the top copy sheet of the stack towards the photoreceptor around a 180° path via two sets of nip roller pairs 29 and 30. The path followed by the copy sheets is denoted by a broken line in Figure 2. At the transfer station 5 a transfer corotron 7 provides an electric field to assist in the transfer of the toner particles thereto.

The copy sheet bearing the developed image is then stripped from the belt 1 and subsequently conveyed to a fusing station 10 which comprises a heated roller fuser to which release oil is applied as described in more detail below. The image is fixed to the copy sheet by the heat and pressure in the nip between the two rollers 10a and 10b of the fuser. The final copy is fed by the fuser rollers into catch tray 32 via two further nip roller pairs 31a and 31b.

After transfer of the developed image from the belt some toner particles usually remain on the surface of the belt, and these are removed at the cleaning station 6 by a doctor blade 34 which scrapes residual toner from the belt. The toner particles thus removed fall into a receptacle 35 below. Also, any electrostatic charges remaining on the belt are discharged by exposure to an erase lamp 11 which provides an even distribution of light across the photoreceptor surface. The photoreceptor is then ready to be charged again by the charging corotron 2a as the first step in the next copy cycle.

The photoreceptor belt 1, the charge corotron 2a, the developer system 20, the transfer corotron 7, the cleaning station 6, and the erase lamp 11 may all be incorporated in a process unit 15 adapted to be removably mounted in the main assembly 100 of the xerographic copier.

As shown in more detail in Figure 3, the fuser 10 comprises a driven heat roller 10a made for example of a steel cylinder coated in Viton (Trademark) and having a 1KW tungsten filament lamp 10c disposed along its axis. A driven pressure roller 10b which may also comprise a steel cylinder with a Viton coating is urged against the heat roller 10a, for example by springs (not shown) suitably applying a force of approximately 68 kg, thereby forming a nip between the two rollers 10a and 10b where fusing takes place.

The path of a copy sheet through the fuser is represented by a broken-line arrow in Figure 3. In order to prevent toner offset and to aid stripping the copy sheet from the heat roller 10a, a silicone lubricating oil is applied to the surface roller 10a by an applicator 40.

The oil applicator 40 comprises an elongate trough 41 which is also shown in perspective views in Figures 4 and 5, which show different embodiments. The release oil 42 is introduced into the trough 41 from a supply source (not shown) at an inlet 43 at one end and flows along a channel 44 at the base of the trough towards the opposite end thereof. A wick 45 is retained internally adjacent the side of the trough by a castellated wall 46 extending upwardly from the base of the trough. It is noted that, for the sake of clarity, the wick is not shown in the perspective views of the trough in Figures 4 and 5. Release oil is able to flow through the gaps 46a in the wall 46 to reach the wick 45 which draws the oil up and applies it to the surface of a metering roller 47 against which the wick 45 engages. The metering roller 47, in the form of a tube made for example of stainless steel is journaled in bearings 46a and 46b at the extremeties of the trough 41. The manner in which the metering arrangement operates is described in detail below. The metering roller applies the release oil to a donor roller 48 with which it is in contact and the donor roller 48 transfers a controlled amount of oil to the surface of the heat roller 10a. The donor roller 48 may be in the form of a tube made of for example aluminium coated with silicone rubber. The direction of rotation of all the rollers is shown by short solid-line arrows in Figure 3, but it is noted that only the heat roller 10a is directly driven. The pressure roller 10b, the donor roller 48 and metering roller 47 are both driven by the heat roller 10a.

A metering blade 49 which may be made for example of an elastomer such as Viton (trade mark) is fixed in a holder 50 with the holder end of the blade set at a predetermined distance from the surface of the metering roller 47 thus controlling the loading of the blade on the roller 47. In this manner the blade removes surplus oil from the roller 47 in a cutting tool fashion to leave thereon a coating of a predetermined thickness.

The metering blade 49 is arranged such that the surplus oil removed from the roller 47 will find its way under gravity back to channel 44 in the base of trough 41. A series of three similar ramps 51a, 51b, 51c are disposed in saw-tooth configuration along the full length of the side wall of the trough directly below the metering blade 49. Oil which is removed from roller 47 by the blade 49 falls onto the ramps 51a, 51b, 51c and fills the space between the ramps and the roller 47. The direction of rotation of roller 47 tends to prevent the oil falling directly back into the channel 44 at the bottom of the trough. Instead the oil flows down the ramps under gravity before spilling over the edge back into the channel 44 at the bottom of the trough. This arrangement ensures rapid and effective distribution of the release oil along the full length of the trough provided the trough is not tilted.

In order to set up a complete continuous circulation system the channel 44 at the base of the trough 41 may slope gently downwards from the end adjacent ramp 51c to the end of the trough adjacent input 43. Any excess oil may then be collected in a reservoir 52 adjacent input 43 and the level of supply oil in the trough may be set at a desired limit by providing a dam 53 at the entrance to the reservoir at a predetermined height so that only when the oil level exceeds the desired level will it spill over the dam into the reservoir.

In order to ensure adequate flow of release oil to the extremity 46c of the trough 40 when the trough 40 is tilted with its extremity 46c raised, similar to that described with reference Figure 1c, a further reservoir 52a and feed pipe 52b are designed as a "drop-in" feature that enables the tilt problem to be overcome. The reservoir 52a is box shaped and designed to be accommodated in the inlet section 43 of the trough 40 adjacent the overspill reservoir 52. The feed pipe 52b is connected to an outlet 52c of the reservoir 52 and extends along the trough 40 with its open end disposed opposite the extremity 46c. Both the reservoir 52a and the feed pipe 52b are made from a metal, typically brass. The oil entering the system from a storage reservoir is fed to the reservoir 52a, the reservoir 52a being designed so that its walls are high enough so that, when in the tilted position illustrated in Figure 6, they are higher than the open end of the feed pipe 52b. This means that the oil will flow from the reservoir 52a along the feed pipe 52b to enter the trough 40 at a location adjacent the extremity 46c.

In this way the oil entering the trough 40 will do so at the back end of the trough 40 and run down to the front end, wetting the wick in the process, and then flow back over the dam 53 into the overspill reservoir 52.

Figures 6 and 7 are schematic side and plan views respectively, of the oil applicator shown in Figure 4. As shown in Figure 6 the level of the oil 42 in the reservoir 52a is higher than the height of the dam 53 thereby maintaining a flow of oil along the feed pipe 52b. As can be seen from Figure 7, it is important to keep a return path for the oil to the dam 53, since it is the dam 53 that acts as the limiting device to stop oil from spilling anywhere other than

into the spillover reservoir 52. The feed tube 52b is kept to as small a diameter as possible to allow it to fit into the limited space available.

The embodiment shown in Figure 5 differs from that of Figure 4 only in the dimensions and location of the reservoir 52a. In the embodiment of Figure 5 the reservoir 52a is designed to be accommodated snugly in the top of a portion of the inlet section 43 allowing a return channel for the oil beneath the reservoir 52a. This can be better seen from Figure 8 which shows a schematic side-on view of the applicator of Figure 5 in a tilted orientation with the extremity, or back end, 46c raised. The feed tube 52b is kept to as small a diameter as possible, as in the embodiment shown in Figure 4, to allow it to fit into the trough 40. Typical dimensions, in millimetres, are shown in Figures 8 and 9 to illustrate the extremely limited space available.

It will be appreciated that one particular usefulness of the embodiments described above is that the reservoir 52a and feed pipe 52b can be made simply and cheaply, for instance out of a brass tube and pressing, and then dropped into current configurations of applicators without involving modifications to any other part.

In addition to the release oil, mechanical aids in the form of resilient blade-like stripper fingers 80 are provided at intervals along the length of the fuser system to strip the copy sheet paper from the fuser. To this end the remote end of the fingers 80 bears against the heat roller surface on the exit side of the fuser as shown in Figure 3. As can be seen most clearly in Figures 4, 5 and 10, the stripper fingers 80 which may for example be made of steel shim, are tapered and present a truncated V-shape with the tips of the fingers having a convex curvature. The stripper fingers 80 are fixed directly, to mounting platforms 83 by means of projections integral with the external wall of the trough 41, which are heat staked to form a rivet head 85. Each finger 80 has a centrally located slot 81 enabling the finger 80 to be fitted on to an external rib 82 formed integrally on the external wall of the trough. During stripping the fingers 80 tend to be deflected upwards in such manner as to increase their curvature adjacent the fuser roller 10a. On the upper side of the fingers 80 the ribs 82 protrude further than the slots 81 so that if the fingers are subjected to a particularly strong stripping - and hence bending - force, they abut the ribs 82 which thus provide strengthening support preventing them from flipping over in the direction of rotation of the fuser roller 10a while at the same time reducing the effective unsupported length so that the fingers tend to curve away from the heat roller 10a preventing gouging.

On the underside of the fingers 80 the ribs 82 extend around substantially the whole perimeter of the external wall surface of the trough and flare into wider portions 82a away from the stripper fingers 80. The ribs 82a have a convex outer edge 82b. Each rib 82 is integral with the trough so that the whole item may be moulded as a unit for example from plastics material. The ribs 82 form a two-fold function, firstly they act as strengthening members for

the trough, and secondly they act as an upper guide device for a copy sheet exiting the fuser rollers. The copy sheet exiting the fuser is also guided on its lower side by a guide member complementary to the curved edge 82b of ribs 82. The guide member is suitably made of sheet metal and is mounted on the fuser assembly 10. The guide ribs 82 are provided at intervals along the length of the trough, and are positioned so that one is located near the edge of all common paper sizes to inhibit jams due to edges snagging or curling. The depth of the ribs 82 is sufficient to safeguard against copy sheets contacting the underside of the trough which would generate undesirable drag forces which is beneficial because at this stage the copy sheets are hot and damp and as such their normal dry paper strength is diminished. Moreover, it will be noted that with this arrangement the stripper fingers 80 are in line with the ribs 82 so that they too function in the same beneficial manner in relation to various paper sizes and form a continuous smooth path in combination with the ribs.

In view of the foregoing description it will be evident to a person skilled in the art that various modifications of the embodiments described may be made within the scope of the present invention. For example, the reservoir 52a can be supported on top of the side walls of the trough 40 as opposed to the snug fit illustrated in Figure 5. Furthermore, whereas the description above relates to the use of a liquid dispensing apparatus in a fuser apparatus of a xerographic copier it will be appreciated that it can also be utilized in a fuser apparatus of a printer. The liquid dispensing apparatus can also find applications outside the xerographic fields for use in equipment, where there is a need to maintain a liquid supply along an elongate dispensing container should the container become tilted.

Claims:

1. A liquid dispensing apparatus including a storage reservoir, an elongate dispensing container and an overflow tank, the dispensing container including an overflow outlet through which liquid overflows into the overflow tank when the liquid in the dispensing container reaches a predetermined level, characterised by a further reservoir for receiving liquid from the storage reservoir and a feed pipe connected to an outlet of the further reservoir extending from that outlet to a region of the dispensing container remote from said overflow outlet, the further reservoir and the feed pipe being arranged to maintain a liquid supply to that remote region of the dispensing container when the liquid dispensing apparatus is slightly tilted from the horizontal.

2. A liquid dispensing apparatus as claimed in claim 1, characterised in that at least a portion of said further reservoir is located within the elongate dispensing container.

3. A liquid dispensing apparatus as claimed in claim 1 or claim 2, characterised in that said feed pipe extends within and along the elongate dispensing container

4. A liquid dispensing apparatus as claimed in any one of claims 1 to 3, characterised in that said further reservoir and said feed pipe are designed to be loosely fitted within or to the elongate dispensing container such that they can be readily assembled with the elongate dispensing container.

5. A liquid dispensing apparatus as claimed in any one of claims 1 to 4, characterised in that the further reservoir is located immediately adjacent to or in close proximity to said overflow outlet.

6. A release oil applicator for use in a toner fusing apparatus of a xerographic copier or printer, characterised in that the release oil applicator includes a liquid dispensing apparatus as claimed in any one of claims 1 to 5.

7. A printer including a heat and pressure fuser and a release oil applicator, characterised in that the release oil applicator is as claimed in claim 6.

8. A xerographic copier including a heat and pressure fuser and a release oil applicator, characterised in that the release oil applicator is as claimed in claim 6.

9. An apparatus for fusing toner images on copy substrates including a heat and pressure fuser and a release oil applicator therefor, the release oil applicator including a storage reservoir, a dispensing container having an elongate trough for containing a supply of release oil and an overflow tank, the trough including an overflow outlet through which release oil overflows into the overflow tank when the release oil in the trough reaches a predetermined level, and means for taking up release oil from the trough for application to the fuser, characterised by a further reservoir for receiving release oil from the storage reservoir and a feed pipe connected to an outlet of the further reservoir extending from that outlet to a region of the trough remote from said overflow outlet, the further reservoir and the feed pipe being arranged to maintain an oil supply to that remote region of the trough when the trough is slightly tilted from the horizontal.

10. A liquid dispensing apparatus substantially as hereinbefore described with reference to, and as illustrated in, Figure 4 or Figure 5 of the accompanying drawings.

11. An apparatus for fusing toner images on copy substrates including a heat and pressure fuser and a release oil applicator therefor, the release oil applicator being substantially as hereinbefore described with reference to, and as illustrated in, Figure 4 or Figure 5 of the accompanying drawings.

Examiner's report to the Comptroller under Section 17 (The Search Report)

Application number: 9119475.3

Relevant Technical fields

(i) UK Cl (Edition K) B2L B6C

(ii) Int Cl (Edition 5) B05C 1/08

Search Examiner: M ELLIOTT

Databases (see over)

(i) UK Patent Office

(ii)

Date of Search: 23 JANUARY 1992

Documents considered relevant following a search in respect of claims 1 TO 11

Category (see over)	Identity of document and relevant passages	Relevant to claim(s)
	NONE	1 to 11

k9 - c:\wp51\doc99\fil000130

Category	Identity of document and relevant passages	Relevant to claim(s.

Categories of documents

X: Document indicating lack of novelty or of inventive step.

Y: Document indicating lack of inventive step if combined with one or more other documents of the same category.

A: Document indicating technological background and/or state of the art.

P: Document published on or after the declared priority date but before the filing date of the present application.

E: Patent document published on or after, but with priority date earlier than, the filing date of the present application.

&: Member of the same patent family, corresponding document.

Databases: The UK Patent Office database comprises classified collections of GB, EP, WO and US patent specifications as outlined periodically in the Official Journal (Patents). The on-line databases considered for search are also listed periodically in the Official Journal (Patents).

Published 1993 at The Patent Office, Concept House, Cardiff Road, Newport, Gwent NP9 1RH. Further copies may be obtained from Sales Branch, Unit 6, Nine Mile Point, Cwmfelinfach, Cross Keys, Newport, NP1 7HZ. Printed by Multiplex techniques ltd, St Mary Cray, Kent.