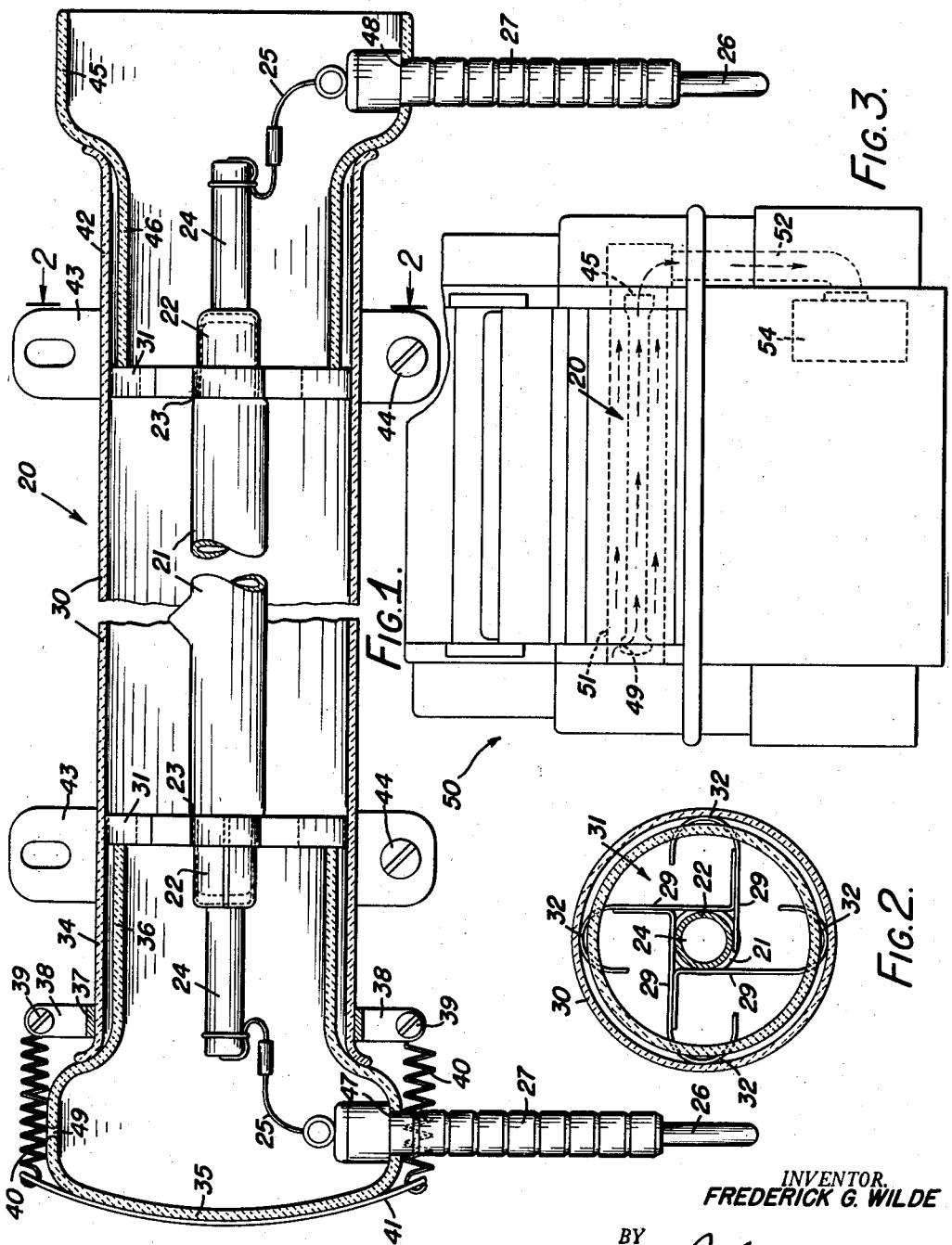
Sept. 29, 1959 F. G. WILDE 2,906,901

QUARTZ LAMP MOUNTING

Filed July 14, 1955 2 Sheets-Sheet 1




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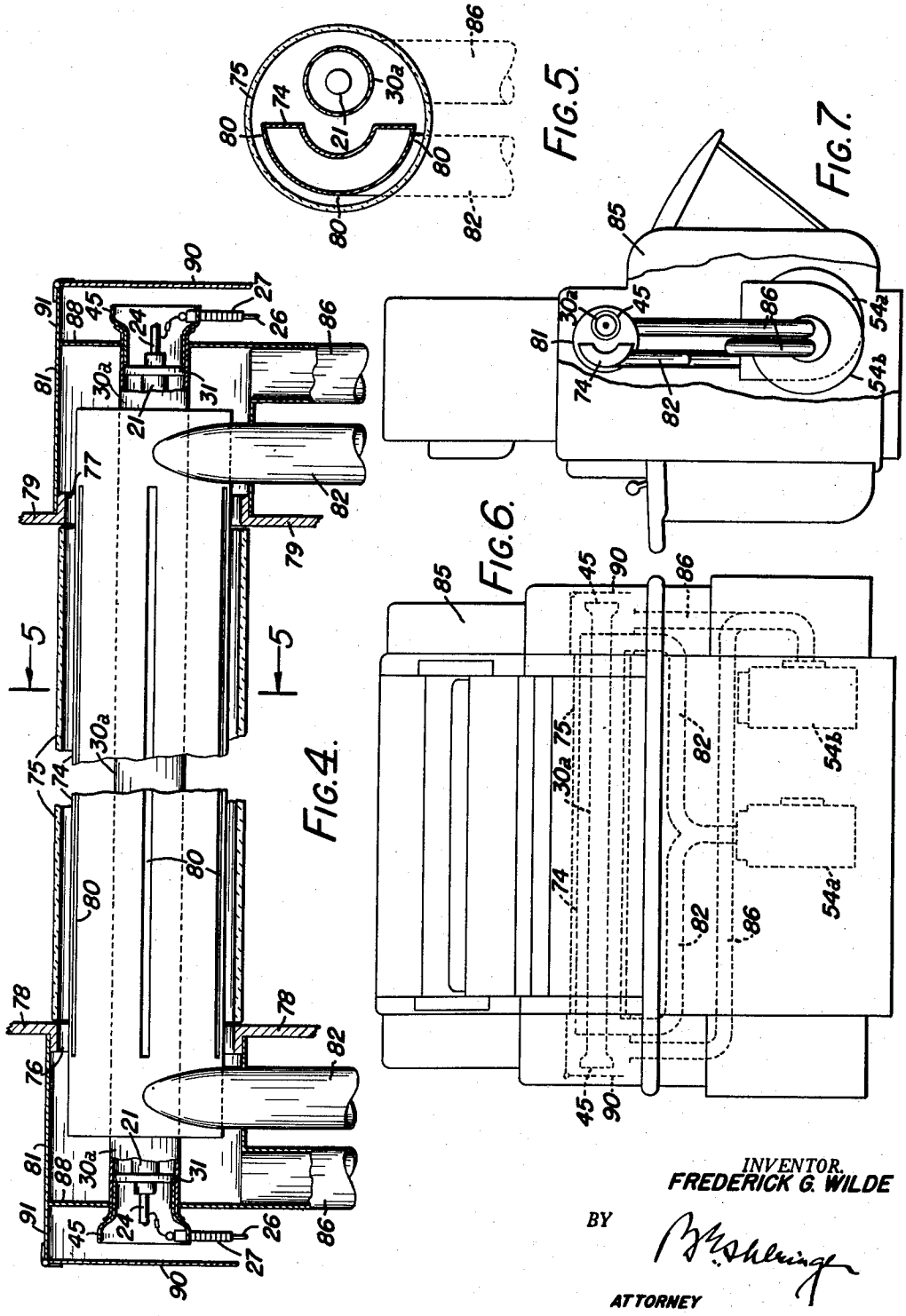
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# QUARTZ LAMP MOUNTING

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4 Claims. (Cl. 313—23)

The present invention relates generally to machines for making reproductions, such as blueprints, blueline prints, brownline prints and the like. More particularly, the invention relates to an improved lamp unit for use in such machines.

In these machines, a tracing, or other matter to be reproduced, is placed upon sensitized paper and fed by belts over a revolving glass contact cylinder in which a lamp unit is mounted, so that the light from the lamp will expose the sensitized paper.

The conventional lamp unit comprises a quartz high pressure mercury vapor lamp, which has an electrode sealed in each end, and a surrounding glass envelope in which the lamp is mounted coaxially. One way of supporting the lamp in the envelope is to mount it adjacent each end in mica baffle plates which have central openings which receive the lamp tube and whose peripheries engage the inside wall of the envelope. Each end of the glass envelope is closed by a glass cover having a small ventilating hole in it.

In the past, such lamp units have not performed as satisfactorily as desired. The mica baffle plates tend to cause a delay in warmup time of the lamps. The mica being cold tends to keep the electrodes from warming up. This delays the start of useful operation of the machine. With prior lamp mountings, moreover, the free circulation of air through the envelope is prevented. As a result, the lamp, operating under high voltage, frequently becomes overheated with long use and, in time, crystallization of the lamp tube takes place, causing pitting of the tube, which breaks the vacuum and terminates the life of the lamp.

In addition, it has been difficult to assemble prior lamp units in the field because the mica supports, for instance, have to be positioned about the lamp tube and seated securely against the inner wall of the envelope. It has been the practice therefore to ship the lamps assembled in their glass envelopes. This increases the shipping bulk which means increased shipping costs, and also increases the danger of breakage.

One object of this invention is to provide a lamp unit for print-making machines which can be quickly and easily assembled in the field, and which can, therefore, be shipped disassembled.

Another object of the invention is to provide a lamp assembly for machines of the character described which will make it possible to ship lamps separate from envelopes, and which will make it simple for a man in the field to install a lamp in a machine.

Another object of this invention is to provide a lamp assembly of the character described which will permit of a substantially shorter warmup time than conventional lamp units.

Another object of this invention is to provide a lamp assembly so constructed as to increase lamp life.



A further object of this invention is to provide a lamp assembly so constructed that the heat generated by the lamp can be continuously drawn away from the lamp, thereby preventing deterioration and pitting of the lamp tube.

Another object of this invention is to provide a lamp assembly which is so constructed that air can readily be circulated over the lamp to keep it from heating up excessively.

Still further objects of this invention are to provide a lamp assembly of simplified but rugged construction which will permit readily changing lamps without having to change envelopes.

Other objects of the invention will be apparent hereinafter from the specification and from the recital of the appended claims.

In the drawings:

Fig. 1 is a fragmentary axial section of a lamp assembly constructed according to one embodiment of this invention;

Fig. 2 is a section taken on line 2—2 of Fig. 1 looking in the direction of the arrows;

Fig. 3 is a front view on a greatly reduced scale of a print-making machine showing diagrammatically the manner of mounting this lamp assembly in the machine and the means for circulating air through the envelope to cool the lamp;

Fig. 4 is a fragmentary axial section of a lamp assembly constructed according to another embodiment of this invention, and showing more or less diagrammatically the mounting of this assembly and the air duct connections thereto;

Fig. 5 is a transverse section on the line 5—5 of Fig. 4 looking in the direction of the arrows;

Fig. 6 is a front view on a very much reduced scale of the print-making machine and illustrating, in particular, how the lamp assembly is connected to the blowers of the machine for cooling the lamp and its envelope; and

Fig. 7 is a side view of the machine, a portion being broken away, to show one open end of the lamp assembly, the blowers and their connections.

Referring now to the drawings by numerals of reference, and first to the embodiment shown in Figs. 1–3 inclusive, 20 indicates generally the lamp unit. This lamp unit comprises a quartz, high-pressure, mercury vapor lamp which is in the form of a cylindrical tube 21 closed at each end by an end member 22. These end members are of slightly smaller diameter than tube 21 thereby forming a shoulder 23 adjacent each end of the tube.

Extending outwardly of each end member 22 is a vacuum seal 24 having a lead wire (not shown) passing axially through it which connects to an electrode, projecting inside the tube 21. Each electrode is connected to an insulated conductor 25 which is in turn connected to a source of high voltage electrical power through a conductor rod 26 incased in insulating beads 27.

Tube 21 is supported coaxially within a cylindrical envelope 30 which is open at both ends and which is made of a glass generally unaffected by heat, chemicals, or electricity, such as "Pyrex" glass. The tube is supported in the envelope by a pair of resilient, spider-like supports 31 which engage the peripheries of end members 22 of the lamp and which seat against the shoulders 23. Each support 31 comprises four resilient straps 29 which are brazed or soldered together at their

inner ends to form a hollow square, and which are reversely bent at their outer ends, as denoted at **32**. The hollow square formed by each set of straps is adapted to receive and resiliently grip an end member **22** and hold it securely. The reversely bent portions **32** of the straps provide spring portions which resiliently engage the inside wall of the envelope **30**. Thus the supports **31** serve to resiliently but securely support the lamp tube **21** in the envelope **30**.

The ends of envelope **30** flare outwardly somewhat, as shown; and, one end **34** of the envelope is closed by a glass cover **35**. Cover **35** has an elongate neck portion **36** which fits into envelope **30** and which engages at its inner end against the outer face of the support **31** which is adjacent that end of the envelope.

Cover **35** is held in place by a split ring **37** which embraces the flared end **34** of the envelope. This ring is provided with diametrically-located ears **38**, to each of which there is secured by a screw **39** one end of a coil spring **40**. The other end of each of these springs **40** is connected to a strap **41** that engages over the outer end of cover **35**.

The opposite end **42** of envelope **30** is open, but a glass sleeve **45** is inserted in this open end. This sleeve has an outer flared end and an elongate neck portion **46** similar to neck **36**. Neck portion **46** at its inner end engages the spider-like support **31** which is adjacent end **42** of the envelope, thereby holding this support against the cooperative shoulder **23** on the tube **21**. For clearness of illustration the space between neck portion **46** and the inside wall of end **42** of envelope **30** is shown exaggerated in Fig. 1. Actually there is considerable surface contact between the parts **46** and **42**, and sleeve **45** may be held in place, therefore, solely by friction. The envelope is secured in place by conventional hangers **43** which are fastened in conventional manner by screws **44** to the holders (not shown) which support the lamp unit inside the contact cylinder of the machine.

Cover **35** and sleeve **45** are provided with holes or outlets **47** and **48**, respectively, through which the conductor rods **26** and insulating beads **27** pass. Cover **35** is also provided with a small aperture **49** which serves as an inlet for air.

In use, the lamp unit is mounted within a conventional glass contact cylinder, over which the sensitized paper is drawn to expose it. **50** indicates the machine generally, and **51** denotes the glass contact cylinder and its support. The cylinder is mounted in conventional manner to revolve in the machine around the lamp unit **20**. Both ends of the contact cylinder are open.

In order to prevent overheating of tube **21** when the lamp is mounted in a print-making machine and is in operation, a system for circulating air about the lamp is provided, as shown in Fig. 3.

Print-making machines of the type, to which this invention applies, are customarily provided with suction-actuated separators or tanks for separating the prints from the tracings after prints have been made. The air pump employed for operating these suction-actuated separators can also be used for operating the air-cooling system for the lamp. Thus, the end of the contact cylinder support, to which the open end of sleeve **45** is adjacent, may be connected by a conduit **52** with the air suction pump **54**. As the pump operates, then, air is drawn through the left hand open end of the contact cylinder **51**, the hole **49** in the envelope cover **35**, around and about the lamp **21** for the full length of the lamp and through duct **52** to pump **54**. The suction exerted on the open end of sleeve **45** will pull the air out of the envelope **30**. The path of travel of the cooling air is denoted by the arrows in Fig. 3. Pump **54** may be connected to a ventilating stack, not shown, through which the air from around the lamp and hot air and ammonia vapors can be expelled from the machine into the outside atmosphere. The air entering the envelope comes from the room in which the machine is located, entering the machine through clearances between the frame members at the side of the machine or through any other gaps or openings.

Such air movement through envelope **30** is impossible with quartz lamp units employing mica baffle plates for supporting the quartz tube, because the baffle plates bar free passage of air. With the spider-like supports **31**, the air can flow readily through the envelope **30** and about and along the lamp.

The hole **49** in cover **35** is of small, predetermined size so as to limit the rate at which air may be sucked into envelope **30**. By thus controlling the volume of air passing through envelope **30**, excess cooling of lamp tube **21** is prevented. If a large hole was employed, or no closure **35** was used at all, too great a volume of air would be drawn through the envelope and overcool the tube. Overcooling would reduce the pressure of the mercury within the tube and cause a loss of light output and decreased light intensity.

Controlled-cooling of lamp tube **21** gives it a longer life by eliminating the possibility of overheating with resulting crystallization and pitting. In turn, tube **21** does not heat the glass contact cylinder **51** in which it is mounted as much as it otherwise would. Thus, a lower surface temperature of contact cylinder **51** is obtained which is highly desirable because smoother transmission of tracings and sensitized paper through the machine results. This is because there is less likelihood of the papers sticking to the glass contact cylinder, when the revolving cylinder is cool.

Another advantage of the structure described is that by drawing air through envelope **30**, ozone, which is produced around the quartz lamp, is removed. Thus, the presence of an objectionable ozone odor around the machine is obviated.

The elimination of the baffle plates also greatly decreases the warm-up time for the unit. It has been found that a unit **20** constructed according to this invention warms up and is ready for print-exposing in less than two minutes after the lamp switch is snapped on, compared to the seven minutes or more required of units supported by mountings of prior design. Further, the simpler construction of unit **20**, makes it possible to ship the lamp separate from the envelope. This makes it easier to pack lamps against breakage in transportation; and the whole unit can be easily and quickly assembled at its destination with little or no danger of any of the parts being broken.

Figs. 4–7 show a modified lamp mounting. In this mounting a stream of air is passed over the periphery of the envelope, instead of being passed through the envelope as in the previously described embodiment of the invention. The envelope, which is denoted at **30*a***, may be of the same general construction as envelope **30**. The envelope **30*a*** is shown in Fig. 4 with the ends partly broken away.

The lamp tube **21** is of conventional construction and is connected in conventional manner to the source of electrical power. The lamp tube construction may be like that previously described. The lamp tube may be supported in the envelope **30*a*** by spider-like supports **31** similar to those previously described. The ends of the envelope **30*a*** have glass sleeves **45** inserted in them, similar to sleeve **45** previously described. Both ends of envelope **30*a*** are, therefore, left open. The whole lamp unit, comprising lamp and envelope, is mounted, as in the previously described embodiment of the invention, inside the rotary glass contact cylinder and its support, here denoted at **75**.

For cooling the lamp tube in this embodiment of the invention, however, air is pulled over and around the envelope **30*a*** for the full length thereof. For this purpose, there is a generally crescent-shaped duct **74** mounted within the contact cylinder **75**. Openings **76** and **77** are provided in opposite side walls **78** and **79** of the frame

of the machine in registry with the contact cylinder **75** and its support, and drums **81**, which are secured to the side walls **78**, **79**, respectively, enclose openings **76** and **77**, respectively. Duct **74** is closed at both ends, but has a plurality of elongate slits **80** extending longitudinally of it and opening into contact cylinder **75**. The contact cylinder is supported in conventional manner by conventional journals from the walls **78** and **79** and the inner ends of the drums **81** are secured to these walls about the openings **76** and **77**, respectively, in air-tight relation thereto and to the contact cylinder **75**. Opposite ends of duct **74** are connected by tubular conduits **82**, with a blower **54***a* which is mounted in the base of the machine **85**. The drums **81** are closed at their outer ends and are connected by tubular conduits **86** with a second blower **54***b* also mounted in the base of the machine.

The ends of the envelope **30***a* and the sleeves **45** project outwardly through the outside walls **88** of the drums **81**.

The blower **54***a* is connected to crescent-shaped duct **74** so that air is drawn in from the outside and is driven through conduits **82** into duct **74** and through the slits **80** therein into contact cylinder **75**, and around and along the periphery of envelope **30***a*; and the blower **54***b* is connected to drums **81**, so that the air flowing into the contact cylinder **75** through slits **80** in duct **74** will be drawn from the cylinder **75** through drums **81** and ducts **86** and exhausted to the outside atmosphere by the blower **54***b*. Thus, air will be circulated around envelope **30***a* to cool lamp **21**. Since the open ends of envelope **30***a* are outside of the air-circulating system, the quartz lamp tube **21** within the envelope is not subjected directly to the forced-draft of cooling air. However, the lamp tube is cooled indirectly by the cooling of envelope **30***a* which surrounds it. Moreover, since the ends of the envelope are open, air can flow through the envelope; and heat inside the envelope will, therefore, be dissipated without lowering the lamp temperature to any undesirable degree.

To protect the machine operator from the lamp if for some reason be or she opens one of the side doors of the machine while it is in operation, metal flaps **90** are provided to register with the opposite ends of the envelope **30***a*. These flaps are hingedly connected to brackets **91**, that are supported from drums **81**, and may be swung upwardly when the lamp is not in use to allow ready access to the lamp.

The results obtained through this embodiment of the invention are similar to those achieved with the embodiment of the invention shown in Figs. 1–3. An important advantage of both embodiments is that tube **21** is prevented from overheating and thus has a much longer operating life. Further, the use of supports **31**, instead of mica baffle plates, to support the quartz lamp tube inside of the envelope, reduces lamp warm-up time, permits quick assembly of the lamp unit, makes assembly of the unit by men in the field much easier, lowers shipping costs, and reduces the likelihood of parts breakage.

While the invention has been described in connection with two different embodiments thereof, it will be understood that it is capable of further modification, and this application is intended to cover any variations, uses or adaptations of the invention following, in general, the principles of the invention and including such departures from the present disclosure as come within known or customary practice in the art to which the invention pertains, and as fall within the scope of the invention or the limits of the appended claims.

Having thus described my invention what I claim is:

1. In a machine for making reproductions on light-sensitive sheets, an elongate, tubular lamp, a transparent envelope surrounding said lamp, means for supporting said lamp in said envelope in radially-spaced relation to said envelope, a transparent, rotary, tubular contact cylinder surrounding said envelope in radially-spaced relation thereto, a duct within said cylinder, means connecting said duct with a source of air under pressure, said duct having openings extending axially and circumferentially of said envelope to deliver the air along and around said envelope, said duct projecting beyond opposite ends of said cylinder, a second duct system, said second duct system enclosing the first-named duct and having air-tight connection with said cylinder at opposite ends thereof, suction means for withdrawing air from said cylinder, and means connecting the second duct system with suction means to suck air from said cylinder, said envelope projecting at opposite ends beyond and through the second duct system and being open at its opposite ends, said envelope being open at both ends to atmosphere, whereby outside air may circulate by convection through said envelope while air is being positively circulated about and along said envelope.

2. In a machine for making reproductions on light-sensitive sheets, an elongate, tubular lamp, a transparent, generally cylindrical envelope surrounding said lamp, means for supporting said lamp in said envelope in radially-spaced relation to said envelope, a transparent, rotary, tubular contact cylinder surrounding said envelope in radially-spaced relation thereto, a conduit in said cylinder extending axially of said envelope and having air discharge openings therein that extend axially and circumferentially of said envelope, said conduit being closed except for said openings, means for connecting said conduit with a source of air under pressure, and separate means for withdrawing air from said cylinder, the opposite ends of said envelope being open and protruding beyond said cylinder, whereby outside air may circulate by convection through said envelope while air is being positively circulated about and along said envelope.

3. In a machine for making reproductions on light-sensitive sheets, an elongate, tubular lamp, a transparent envelope surrounding said lamp, means for supporting said lamp in said envelope in radially-spaced relation to said envelope, a transparent, rotary, tubular contact cylinder surrounding said envelope in radially-spaced relation thereto, ducts registering with said cylinder and having air-tight connection therewith and closing opposite ends, respectively, thereof, said envelope projecting at opposite ends through said ducts and being open at said opposite ends, a conduit in said cylinder extending axially of said envelope and having air discharge openings therein that extend axially and circumferentially of said envelope, means for connecting said conduit with a source of air under pressure, and means for connecting said ducts to suction means for withdrawing air from said cylinder, whereby air may circulate by convection through said envelope while air is being positively circulated about and along said envelope and said cylinder.

4. In a machine for making reproductions on light-sensitive sheets, an elongate lamp tube, a transparent envelope surrounding said lamp tube for the full length thereof, resilient means for resiliently supporting said lamp in radially spaced relation to said envelope, said lamp tube having shoulders formed adjacent opposite ends by reduced diameter portions thereof, said resilient supporting means having openings therethrough for the passage of air along said lamp tube and comprising a pair of spiders seated against said shoulders respectively, each spider comprising a plurality of resilient straps connected together at their inner ends to form a central opening for receiving and resiliently gripping said lamp tube, each of said straps having a reversely bent portion at its outer end that resiliently engages the inside of said envelope, two transparent holders having neck portions inserted in opposite ends of said transparent envelope frictionally to engage the inside wall of said envelope and abutting against said spiders respectively, one of said holders being in the form of a sleeve and being open at its outer end, and the other of said holders constituting a closure for

one end of said envelope but having a small diameter hole through it to permit limited circulation of air through the envelope, a transparent, rotary, tubular contact cylinder surrounding said envelope in radially-spaced relation thereto, the open end of said sleeve extending beyond the corresponding end of said contact cylinder, and a duct connecting suction means in air-tight relation with said corresponding end of said contact cylinder, said contact cylinder being open at its opposite end, whereby air can be drawn into said envelope through said hole and through said contact cylinder.



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