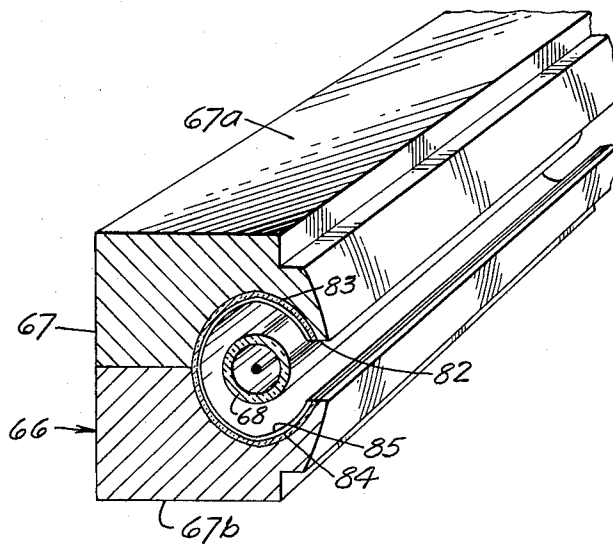


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J. W. ULSETH ETAL
INFRA-RED REFLECTOR ASSEMBLY FOR
THERMOGRAPHIC COPYING MACHINE
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INFRA-RED REFLECTOR ASSEMBLY FOR THERMOGRAPHIC COPYING MACHINE

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Original application Apr. 5, 1960, Ser. No. 20,039, now Patent No. 3,150,262, dated Sept. 22, 1964. Divided and this application Apr. 13, 1962, Ser. No. 198,388

3 Claims. (Cl. 250-88)

This application is a division of application Serial No. 20,039 filed April 5, 1960, and entitled, Thermographic Copying Machine, now Patent No. 3,150,262, issued September 22, 1964.

This invention relates to improvements in thermographic copying machines and has particular reference to a low cost machine capable of rapidly and efficiently producing any desired number of reproductions of graphic originals on heat sensitive copy paper. The improved machine is light in weight and readily portable, having physical dimensions approximating those of a portable typewriter. The low contour of the improved machine makes it particularly suited to desk-top use.

Compactness is lent to the improved machine by the embodiment therein of a transparent tubular copy roll within which a lamp and reflector assembly is mounted, there being means for pressing a composite of graphic original and copy sheet into intimate contact with the outer surface of the copy roll as the composite passes the area in which the irradiation of the lamp is concentrated by the reflector assembly. The improved machine has variable speed means and is provided with a single control knob which affords selective control of energization of both the lamp and the drive motor as well as selective control of the position of the lamp and reflector assembly and the speed at which the copy roll is driven. The efficiency of the machine is enhanced by the use of irradiating means, for subjecting a composite of graphic original and copy sheet to brief intense radiation, comprising a novel reflector construction affording improved reflectance and stability characteristics, and with which the present invention is particularly concerned.

The invention can best be understood by reference to the accompanying drawing representing in perspective an enlarged partial section of the lamp and reflector assembly of the improved machine.

The preferred irradiating means takes the form of a lamp and reflector assembly 66 comprising an elongated tubular lamp 68 disposed substantially at the focus thereof. The reflector 67 and lamp 68 of the assembly 66 are fixed relative to each other.

It will be observed that the reflector 67 has a relatively narrow lengthwise opening 82 which concentrates the radiant energy from the lamp 68 along a relatively narrow band. In the presently preferred form of the invention the reflector opening 82 has a width of 1/4 inch, and the lamp 68 is of the tungsten filament type having a length of 10 inches and an electrical rating of 1350 watts at 280 volts.

The reflector 67 is characterized by exceptional reflectivity, i.e. greater than 93 percent reflectance of infrared, excellent heat stability, low cost and light weight. The reflector 67 may be made of a pair of complementary

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metal shells 67a and 67b, preferably of aluminum which may be formed to the desired shape by suitable machining, extrusion, rolling or other means. The inner surface 83 of the reflector 67 is overlaid with a thin layer 84 of low temperature porcelain enamel. The layer 84 may be applied by spraying the surface 83 with a thin layer of a slip comprising slurry of a low temperature frit, an opacifier, suitable suspending or binding agents and water. The frit preferred for this purpose is a substantially lead free alkali titania silicate glass of the type commercially available under the trade name 3M brand Aluminum Frit No. 8102. The thickness of the layer of slip is preferably held within close tolerances at 0.002 inch in thickness. The reflector 67 is then baked at the slip's curing temperature, i.e., at 970°-1000° F., which is below the melting temperature of the aluminum base, and is then allowed to cool. The resulting enamel layer 84 is characterized by an extremely smooth surface with a high gloss. The reflector 67 is then placed in a vapor coating apparatus and a thin film of chromium or nickel containing bonding agent is vapor coated thereon. Suitable bonding agents are elemental chromium and Inconel, an alloy of iron, chromium and nickel. A thin film 85 of gold is then vapor coated onto the surface of the porcelain enamel layer 84 bearing the bonding agent, the amount of gold being preferably just sufficient to provide opacity, although slightly less or slightly more than that required for opacity may be applied. If a bonding agent is not used, the gold layer 85 may be vapor coated directly onto the porcelain enamel layer 84, and a bond therewith can be produced by a second baking operation at a temperature just below the 1000° F. softening temperature of the enamel.

The improved reflector 67 is superior to reflectors heretofore known and in particular is superior to reflectors in which the reflective material is electroplated directly onto a metallic base, since in the latter type, surface irregularities in the base are imparted to the reflective layer. In the instant reflector, such irregularities are not imparted to the surface of the enamel layer, which is extremely smooth and glossy. The porcelain enamel layer 84 provides a chemically inert and heat insulating barrier between the metal of the base 67 and the metal of the reflective layer 85 preventing chemical reaction or alloying of these metals which would deleteriously affect the reflective properties of the layer 85. Since the ceramic layer 84 maintains the barrier even at high temperatures, the reflector 67 has high temperature stability heretofore unobtainable. Moreover, the heat insulating qualities of the layer 84 prevents excessive heating of the low temperature alloy base 67.

What is claimed as the invention is:

1. A lamp and reflector assembly adapted to provide improved reflectance and stability in a thermographic copying machine and comprising an elongate tubular lamp fixedly disposed substantially at the focus of an elongate reflector comprising a pair of complementary aluminum shells defining an interior cavity and a narrow lengthwise opening for concentrating the radiant energy from said lamp along a narrow band, a thin layer of low temperature porcelain enamel having a smooth high gloss finish bonded to the cavity-defining surfaces of said shells, and a thin metallic gold film having at least 93 percent reflectance for infra-red radiation bonded to said enamel layer.

2. A reflector characterized by high reflectivity and

high temperature stability and comprising: a pair of complementary aluminum shells defining an elongate interior cavity, for confining an elongate tubular lamp in fixed position at the focus thereof, and a narrow lengthwise opening for concentrating radiant energy from a said lamp along a narrow band; a thin layer of low temperature porcelain enamel having a smooth high gloss finish bonded to the cavity-defining surfaces of said shells; and a thin metallic gold film, having at least 93 percent reflectance for infra-red radiation, bonded to said enamel layer.

3. A reflector characterized by high reflectivity and high temperature stability and comprising: a pair of complementary aluminum shells defining an elongated interior cavity, for confining an elongated tubular lamp in fixed position at the focus thereof, and a narrow lengthwise opening for concentrating radiant energy from a said lamp along a narrow band; a thin layer of low temperature porcelain enamel having a smooth high gloss finish bonded to the cavity-defining surfaces of said shells; a thin film of metallic bonding agent, including a metal selected from the class consisting of nickel and chro-

mium, bonded to said enamel layer; and a thin metallic gold film, having at least 93 percent reflectance for infra-red radiation, bonded to said metallic film.

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