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Solar-Photo-Mechanical Proofing Machine That Uses The Diazo Dry Process

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ABSTRACT
The development of a Solar- Photo-Mechanical Proofing Machine has been presented in this paper. Based on the fabrication and operational principles, the device is cheaper to operate, since an energy for its operation is sourced freely from the sun. It is envisaged that the machine will find wide applications in rural areas lacking electricity supplies due to the fact that the copies produced compared favourably with those printed with the conventional machine.

I. INTRODUCTION

Traditionally, printing has been defined as a method of applying under pressure, a certain quantity of colouring agent onto a specified surface to form a body of text or an illustration. Some recently developed processes for reproducing texts and illustrations, however, are no longer dependent on the mechanical concept of pressure or even on the material concept of colouring agent. Since these processes represent an important development that may ultimately replace the other processes, printing should probably now be defined as any of several techniques for reproducing copies of identical texts and illustrations in black or in any other colour on a durable surface. It is also true that after five centuries during which printing has maintained a quasi monopoly of the transmission or storage of information, this role is being seriously challenged by new audiovisual and information media. Nevertheless, its own field remained immence.

It is possible to trace the origin of printing as early as 255 BC, during the Han Dynasty in China. When paper was invented around 105 AD, early documents and manuscripts were copied and recopied by hand. Frequent copying mistakes were made from one edition to another. After many years, copies often differed significantly from the original manuscript. Around 175 AD, the Chinese began the practice of cutting in stones the writings of important scholars. The stones were placed in centers of learning, and students made “rubbings” or copies on paper from the carving.**Adams and Faux (1953)**

The process was faster than hand copying and all editions were identical to the first. It is not possible to identify a date when carvings and paper came together but it is known that in China in 953 AD, under the administration of Feng Tao, a large scale block printing operation began in order to reproduce the Confucian Classics.**Adams and Faux (1953)**During the Sung Dynasty, around 1401 AD a man named Pi Sheng invented movable printing type. He made a separate piece of clay type for each character. The use of movable type did not develop in China because the Chinese language has thousands of different characters. Printers would have had to make too many pieces of type. They found it easier to print from wood blocks. While the people of the Orient were printing from wood blocks, the people of Europe were still producing hand written books. Many Monks spent their lives laboriously copying books with quills and reeds. In the late 1300’s Europeans developed block printing. The earliest dated European wood block print is a picture of Saint Christopher printed in 1423**The world book encyclopedia, (1991)**About this same time Europeans began to produce block books by binding prints together.

Johannes Gutenberg and his associates began printing by using separate pieces of raised metal type about 1440. Gutenberg developed a printing press from a machine used to press grape or cheese. He assembled his pieces of type in a form and then inked the type. Next, he placed paper on the type. The Gutenberg press could print about 300 copies a day **The world book encyclopedia, (1991)** Since then, many printing and photocopying media have been established.

Printing of engineering drawing and all its like, dates back to the time of old when drawing was found as the best way of communicating engineering ideas**Mcmurtrice D. C. (1943)** . More copies of the drawing were made available for circulation by re-drawing the original copy several times. Since the production of engineering drawing takes time and energy, the frequent re-drawing of such engineering ideas in order to produce more copies is often cumbersome. The bid to circumvent this cumbersomeness led to the discovery of photo-mechanical-proofing machine and other duplicating media including the advent of computer aided design softwears.

The conventional equipment for proofing and plating transparent materials can be used interchangeably. The simplest one is made up of a vacuum frame and some high-intensity light source. The vacuum frame holds the transparent film in contact with the proofing or plating material. The light source produces the actinic light that exposes the emulsion coated on paper. The emulsion coated paper is then chemically processed to produce an image that represents the final press sheet. The three common types of emulsion coated papers used in photo-mechanical-proofing are blue printing papers, brownlines and diazo paper .While the blue print and the brownline papers, after exposure to light are finally processed by washing in water, the diazo paper is developed after exposure to light by placing in contact with a special liquid or gas (generally ammonia fumes).

The solar photo-mechanical-proofing machine developed in this paper operates on the same principles as the electrically operated one but it uses solar rays in place of the fluorescent tubes. As an alternative to the electrically operated photo-mechanical-proofing machine, it can be used in any part of the world where the sun shines. It is also preferred to the conventional one because it involves only the capital cost of purchase and does not involve the recurrent cost of running since its operation is based on free energy from the sun.

II. LIGHT SOURCE CALIBRATION

The control of exposure is the most important variable in the plating and proofing processes. The problem (as with line photography) is that accurate exposure is not necessarily related to the time. In the conventional equipment the exposure is controlled using a light integrator. It is pertinent to mention at this juncture that in any equipment, whether using a simple toggle switch or a sophisticated integrator, the initial problem is to determine the quantity of exposure needed to produce a quality proof image. Although most emulsion manufacturers recommend exposure for general lighting situations, the actual exposure differ for each working situation and so the trial and error method is used until a perfect proofing is achieved.

III. CONSTRUCTIONAL PROCEDURE AND MATERIAL SELECTION

Having understood thoroughly the working principles and techniques of the conventional mechanical-proofing machine, a design concept was conceived and aimed towards constructing a device that could be used with solar energy adopting the diazo dry process.

Being guided by economy, cost and availability of the components involved in a functional proofing machine, the following materials were selected and listed in table 1

TABLE 1: MATERIALS USED AND THEIR COSTS

S/No	DISCRIPTION	DIMENSION	QUANTITY
1	Plywood	1220 x 2440 mm	3
2	Plane mirror	1220 x 1220 mm	1
3	Plane glass	1220 x 1220 mm	1
4	Foam	1220 x 1220 mm	1
5	Cotton cloth	1300 x 1300 mm	1
6	Screws and nails	50 mm	1 pkt .each
7	Hinges	75 mm	4
8	Ash colour paint	4 litres	1

0.91 x 0.91m plywood was cut and 0.91 x 0.91 x 0.025m foam was laid on top of the it . The foam was covered with the cotton cloth to form the base box. 0.91 x 0.91m plane glass was framed with the same plywood and hinged to the box. The assembly was made in such a way that when the glass cover was closed, it exerted some pressure on the foam. The whole top assembly was mounted on a stand that allowed it to be raised and lowered accordingly. A tall rectangular box 0.3 x 0,3 x 1.22m was constructed with plywood and had doors at the top and the lower part of one side. The top door was for loading the diazo paper while the bottom side door was for loading a container of liquid ammonia. The box was made to be air tight to prevent the escape of the ammonia gas.

A 0.91 x 0.91m plane mirror was glued to a 0.91 x 0.91m plywood and both were mounted on an adjustable stand. The development concept of the solar operated photo-mechanical-proofing machine is as shown in figs 1

IV. OPERATIONAL PROCEDURE

The engineering drawing which must be on a tracing paper was placed on top of a diazo paper. Both were placed on the foam and covered with the glass which exerted some pressure on the sheets. All the operations were however carried out in a dark room with a window to let in some high intensity rays when required. The box containing the drawings was raised against the window that remained in the closed position. The window was opened and the plane mirror, which was placed outside the building was used to reflect solar rays to strike the drawing for a duration of one minute after which the window was closed again. The diazo paper was removed and dropped into the rectangular box containing ammonia fumes. On soaking for about five minutes, the diazo paper was removed thereby allowing the original drawing to appear on the diazo paper which has not been exposed to sunlight before the operation began.

On observation it was discovered that the original drawing appeared perfectly on the diazo paper comparing favorably with that produced with the conventional machine.

Many more tests were run on the machine to further investigate its performance of the machine. It is important to state that all the results were satisfactory.

V. CONCLUSION

Since the machine performed excellently,and compared favorably with the conventional one, its mass production will enhance engineering activities in the rural areas where there is no electricity. Also cost of production, running and maintenance were very much cheaper than the conventional machine. This will still act as a motivator to the end users.

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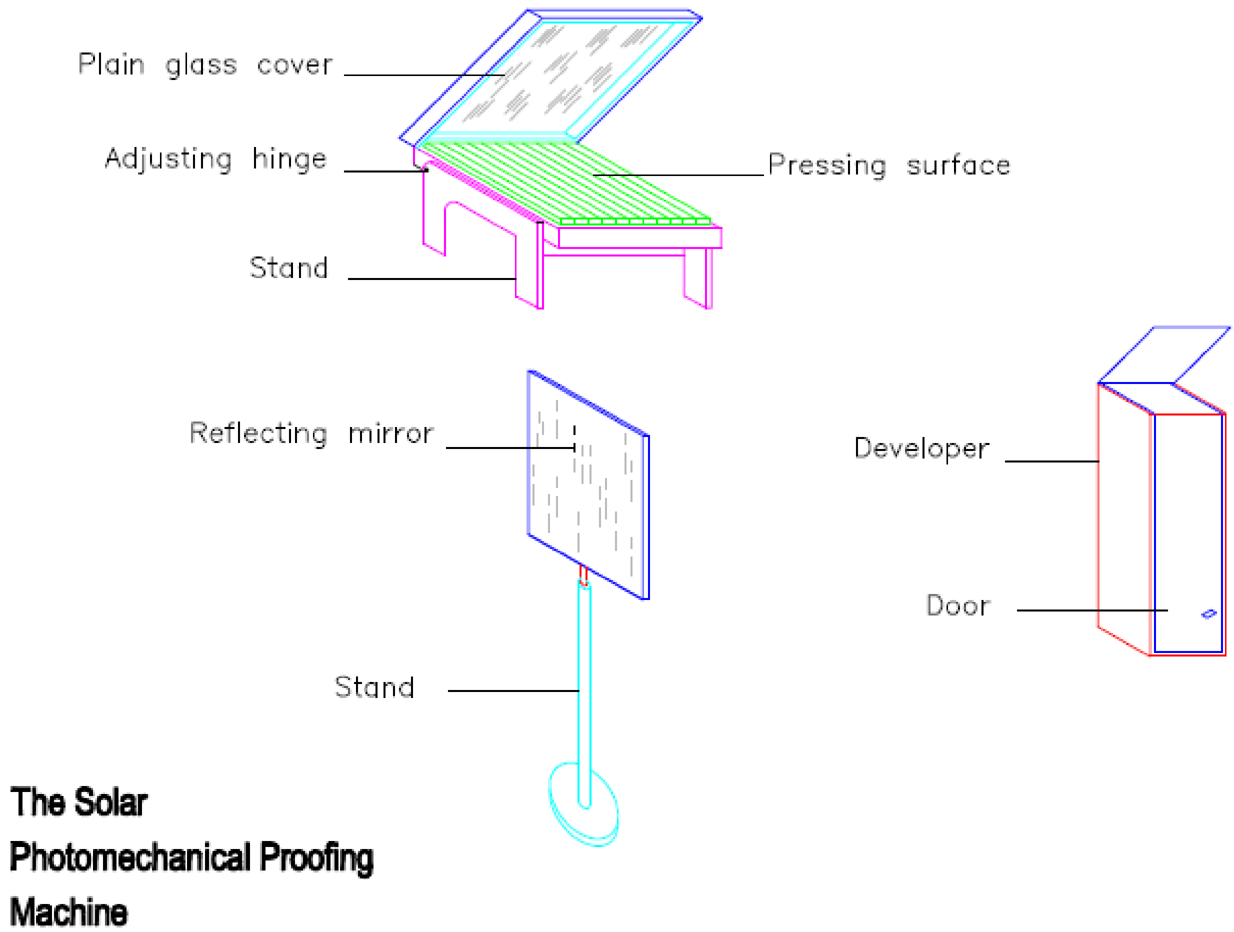
Plain glass cover
Adjusting hinge
Pressing surface
Stand
Reflecting mirror
Developer
Door
Stand
The Solar Photomechanical Proofing Machine

FIGURE 1