

Oct. 6, 1959

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2,907,259

COMBINED EXPOSING AND DEVELOPING APPARATUS FOR PHOTOPRINTS

Filed March 26, 1956

2 Sheets-Sheet 1

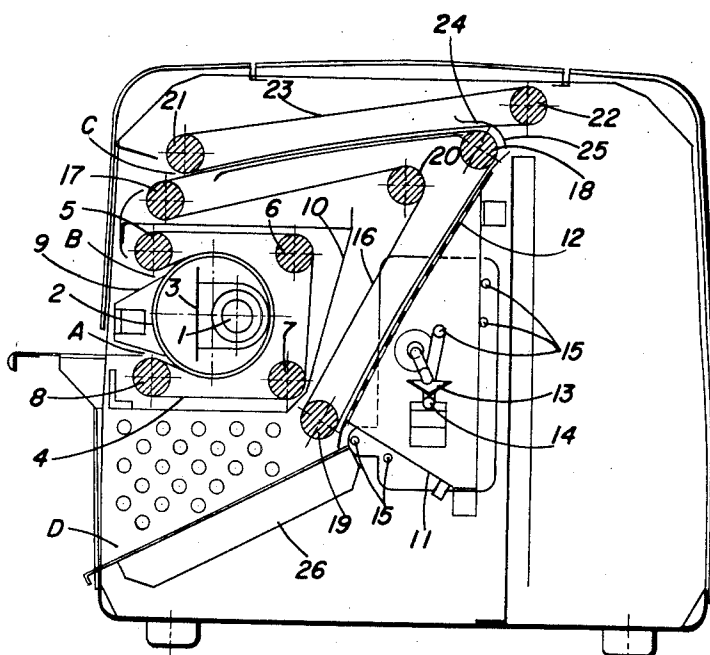


Fig. I

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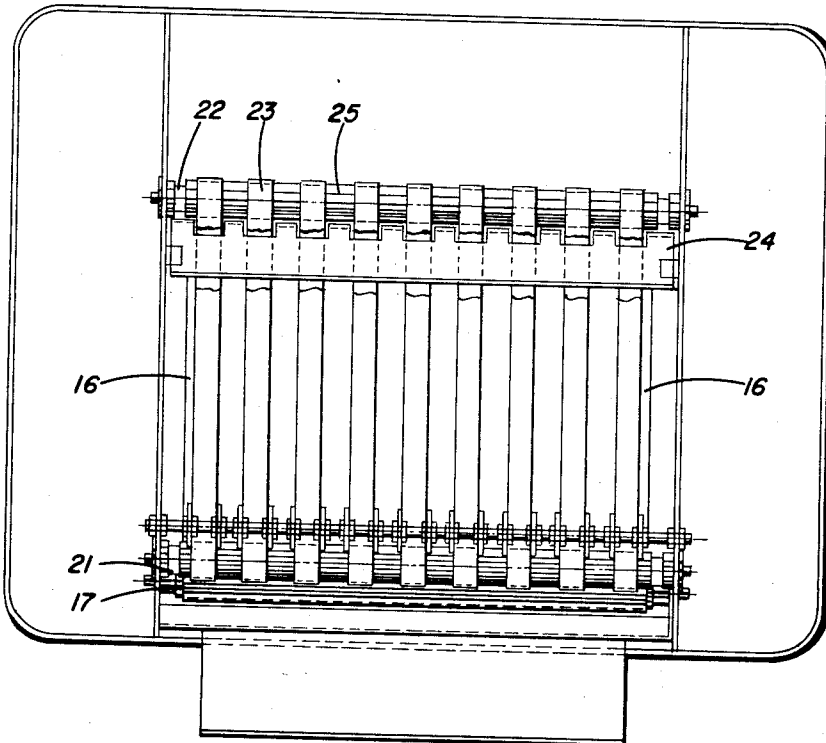


Fig. I

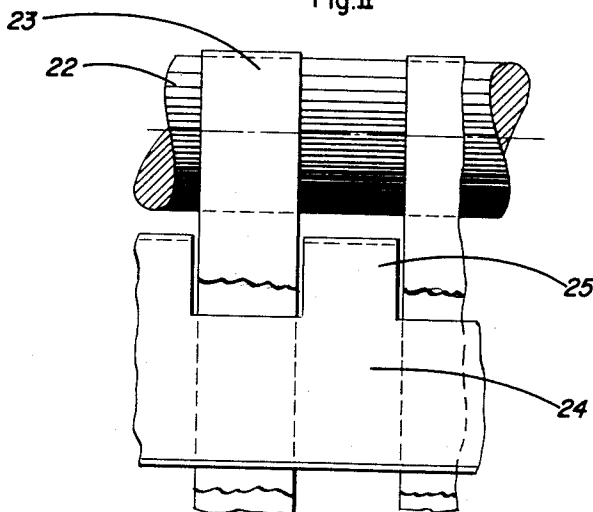


Fig. II

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COMBINED EXPOSING AND DEVELOPING APPARATUS FOR PHOTOPRINTS

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Application March 26, 1956, Serial No. 573,998

Claims priority, application Germany April 2, 1955

1 Claim. (Cl. 95—77.5)

The present invention is concerned with a combined exposing and developing apparatus for photoprints in which the light sensitive papers after exposure are developed with a gaseous developer, preferably gaseous ammonia.

Such combined apparatuses are already known and in use in the art of making photoprints. Originally, exposure and development were performed in two separate apparatuses. However, when designing an apparatus in which both, exposure as well as ammonia development, were to be performed, several problems had to be solved. One of them was to transfer in an advantageous way the exposed material from the exposure section of the apparatus to the development section; another was to devise a practical method for separating the exposed paper from the original.

In one of the known combined apparatuses, the light sensitive paper together with the original are introduced at the front side of the apparatus, and the exposed and developed paper, i.e. the finished copy, as well as the original are issued separately at the front side. In this known apparatus, the light sensitive paper together with the original are conveyed to a rotatable exposing cylinder lying parallel to the front side of the apparatus by means of a system of endless conveyor belts, then are carried around part of the cylinder circumference while lying on the curved surface of the cylinder, and thereafter are carried away from the cylinder at a place lying above the feeding place. By a suction device the exposed paper and the original are separated from each other, and the original is issued at the front side of the apparatus. By means of an endless conveyor belt the exposed paper is then pressed against the perforated bottom of a tank containing the gaseous developer from underneath with its sensitized surface turned upwards and slid along the perforated bottom of the tank. Thus the exposed paper is developed by the developing gases penetrating through the holes in the bottom of the tank. The finished copy is finally transported towards the front side of the apparatus and issued there.

Now it has been found that a combined exposing and developing apparatus is improved if its parts are arranged in a different way from the prior art construction described above. Thus, in the apparatus according to the present invention, the tank for holding the gaseous developer is arranged behind the exposing cylinder about level with it, and the perforated wall, which is the developing surface of the tank, faces the exposing cylinder. Further the endless conveyor belt, which transports the exposed paper to the developing tank and then along its developing surface, is arranged as to move above the exposing cylinder, then around a guide roller which deviates the conveyor belt downwards to the developing surface and then along the latter. Further there is arranged above the above mentioned conveyor belt another endless band conveyor system which may be composed of a plurality of endless bands and which is lying on the first mentioned conveyor belt.

Further it has been found that for accurate guidance of

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the photo prints an apparatus according to the present invention is of special advantage in which a sheet metal guide which is provided with slot-like recesses confining finger-like pieces of the sheet metal guide passes from above and behind said guide roller through the second-mentioned conveyer band system whereby the individual bands of the second conveyer band system run through one of the slot-like recesses and the finger-like pieces of the sheet metal guide pass through the spaces between the individual bands of the second conveyer band system and bend around the guide roller in the direction towards the developing surface, thus guiding the papers deviated around the guide roller into the space between the perforated developing surface and that part of the conveyer belt which is sliding thereon.

Fig. 1 is a view in cross sectional elevation of a simplified schematic form of the apparatus according to the present invention.

Fig. 2 is a view in plan of the apparatus showing in particular the arrangement of the second mentioned conveyer band system lying above the conveyer belt, and of the sheet metal guide provided with recesses, part of the upper portion of each conveyer band being shown cut away to permit an unobstructed view of the sheet metal guide.

Fig. 3 is a view in enlarged plan of a part of Fig. 2 with parts broken away.

The light sensitive paper together with the original lying thereon are fed into the front side of the apparatus as shown at a feed plate A. The original and exposed sheet after passing around the exposing cylinder 2 both leave the apparatus at a point B on the front side of the apparatus. The original, which now lies beneath the exposed light sensitive paper, falls down onto the feed plate, while the exposed paper is manually re-fed into the apparatus at C with its image side turned upwards and, after development, leaves the apparatus at D also at the front side.

The light sensitive paper fed to the apparatus at A is exposed through the original to the light of a tubular light source 1, while rotating for a certain distance with the rotating exposing cylinder 2, against which the paper is pressed by means of the endless conveyor belt 4. A reflector 3 is provided to make certain that exposure of the paper is performed only during that portion of its travel where it is firmly pressed against cylinder 2 by means of conveyor belt 4. Conveyor belt 4 is led by four rolls (rolls 5, 6, 7 and 8) of which roll 5 is driven and roll 6 is a tightening roll. At B, after the exposure is complete, original and exposed paper are wiped off the exposing cylinder by means of a wiper 9. The exposure section of the apparatus is screened against the other parts of the apparatus by a casing 10, which in particular prevents the access of developing gases escaping from the developing section.

The tank 11 for holding the ammonia which serves as a developing gas is provided with a perforated wall 12. The ammonia gas, which is generated by evaporating ammonia water in the evaporation trough 13 heated by means of the heating rod 14, flows through the perforated wall and contacts exposed papers passing along that wall, whereby the papers are developed. Preferably, the perforated wall 12 of the tank 11 is inclined as shown in such a way that it approaches closer to the front of the apparatus at the bottom. Advantageously, additional heating rods 15 are provided by which the gas tank 11 and the perforated wall 12 may be heated to prevent condensation of water at the perforated wall.

The 7-shape conveyor belt 16 transports the exposed paper from the exposing cylinder 2 to a place above the perforated wall 12 and from there along the latter. The conveyor belt 16 is led by four rolls (17, 18, 19 and 20) of which roll 20 is a tightening roll and at least one of the

rolls 17, 18 or 19 is a driven roll. For a distance reaching from the front side of the apparatus to the perforated wall and extending above exposing cylinder 2 endless narrow conveyer bands 23 moving around driven roll 21 and tightening roll 22 contact the conveyer belt 16. Thus the exposed paper is caught between the conveyer belt 16 and the conveyer bands 23 and led to the perforated wall 12. At a place above the perforated wall 12 the conveyer belt 16 curves around the guide roller 18 and subsequently passes along the perforated wall 12. When no paper is being transported along the perforated wall 12, the holes in the latter are tightly sealed by the elastic endless conveyer belt 16.

At the place where the prints change direction above the perforated wall 12, a sheet metal guide 24 provided with recesses is mounted which assures that the paper is guided into the space between the conveyer belt 16 and the perforated wall 12. Fingers 25 of the sheet metal guide 24 protrude from above into the spaces between the single belts 23, and then at a certain distance bend around roll 18 and finally aim towards the space between roll 18 and perforated wall 12. After development the copies are carried to a chute 26 and from there to the outlet D at the front side of the apparatus.

Apart from the two conveyer systems, belt 16 and bands 23 of which partially are lying on each other, and the conveyer system in the exposure section, the apparatus according to the present invention needs no further devices for the transportation of the papers or originals, such as compressed air jets or suction devices. In spite of this the operation of the apparatus is very simple. All steps of the process, i.e. feeding the light sensitive paper together with the original into the apparatus, refeeding the exposed paper from the exposing to the development section, and taking off the original used and the finished copy, are done from the front side of the apparatus, a very important feature when the apparatus is to be operated by a sitting person in an office. Another advantage in this connection is that the finished copies issue at a point beneath the feed table and can thus be immediately seen by the operator. A further advantage of the apparatus according to the present invention is its low height due to the special arrangement of the exposing cylinder and the tank for the developing gas. A further feature of the apparatus, which is of special advantage for office use, is that the developing surface may be tilted in the approved manner thus admitting developing gases of a very low degree of humidity to the paper, so that only very little ammonia adheres to the finished copies. If a suitable developing

temperature is maintained, developing time is short and thus operational efficiency of the apparatus great.

Having thus described the invention, what is claimed is:

A combined exposing and developing apparatus of small outside dimensions comprising an enclosure having openings on the front side for the insertion and removal of light sensitive paper and an original to be copied, a light transmitting cylinder rotatably mounted closely adjacent the front of the enclosure between the top and bottom thereof, a first conveyer belt extending around more than half of the cylinder for maintaining the original and paper in contact therewith and to provide for insertion of the paper and original at the lower portion thereof and removal of the paper and original from the upper portion, a source of light within the cylinder for exposing the paper through the original, a second conveyer belt arranged in generally 7-shape and extending from adjacent the top of the cylinder inwardly into the casing and downwardly at an incline toward the front of the casing, the entrance and exit of the first conveyer and the entrance of said 7-shape conveyer being substantially the same distance from the front side of the enclosure, the parts being so dimensioned and so positioned that a substantial part of the cylinder lies within the legs of the 7-shape conveyer, a third conveyer including a plurality of spaced substantially coplanar belts arranged to coact with the upper run of the second conveyer, a plurality of fingers extending from the spaces between the belts of the third conveyer and guiding around the apex of the 7-shape conveyer, a perforated wall extending downwardly from said fingers and arranged to confine the paper between itself and the downwardly extending run of the 7-shape conveyer, a tank extending rearwardly and downwardly from said perforated wall for confining vapors to contact the paper fed between said perforated wall and said downwardly extending run of said 7-shape conveyer, and means to receive the paper from the lower end of said perforated plate and the lower end of said downwardly extending run of the said 7-shape conveyer.

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