April 2, 1968 J. T. HELLYER 3,375,770

PHOTOGRAPHIC PROCESSING MACHINE

Filed July 20, 1965 2 Sheets-Sheet 1

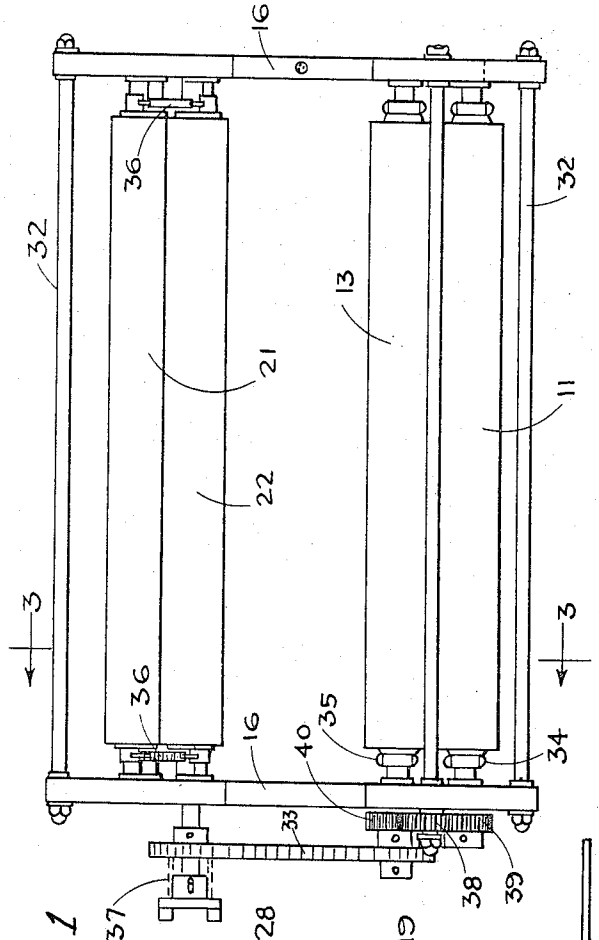


FIG. 1

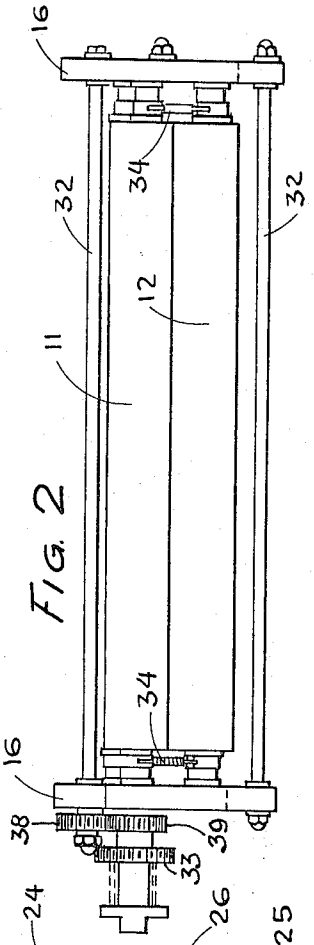


FIG. 2

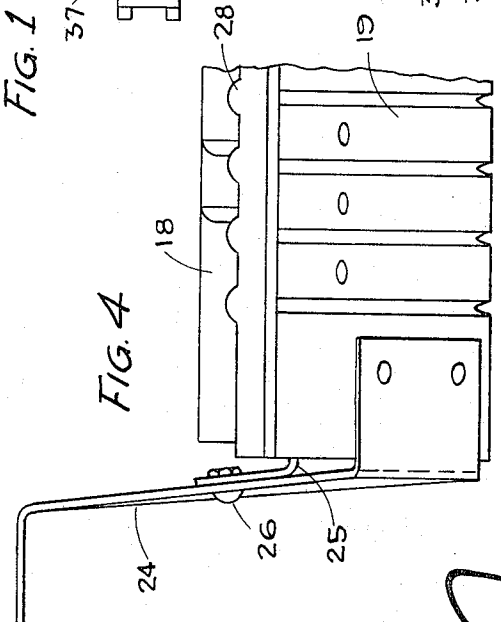


FIG. 4

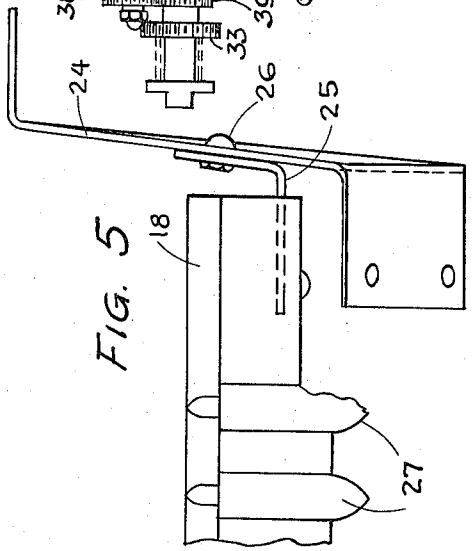


FIG. 5

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PHOTOGRAPHIC PROCESSING MACHINE

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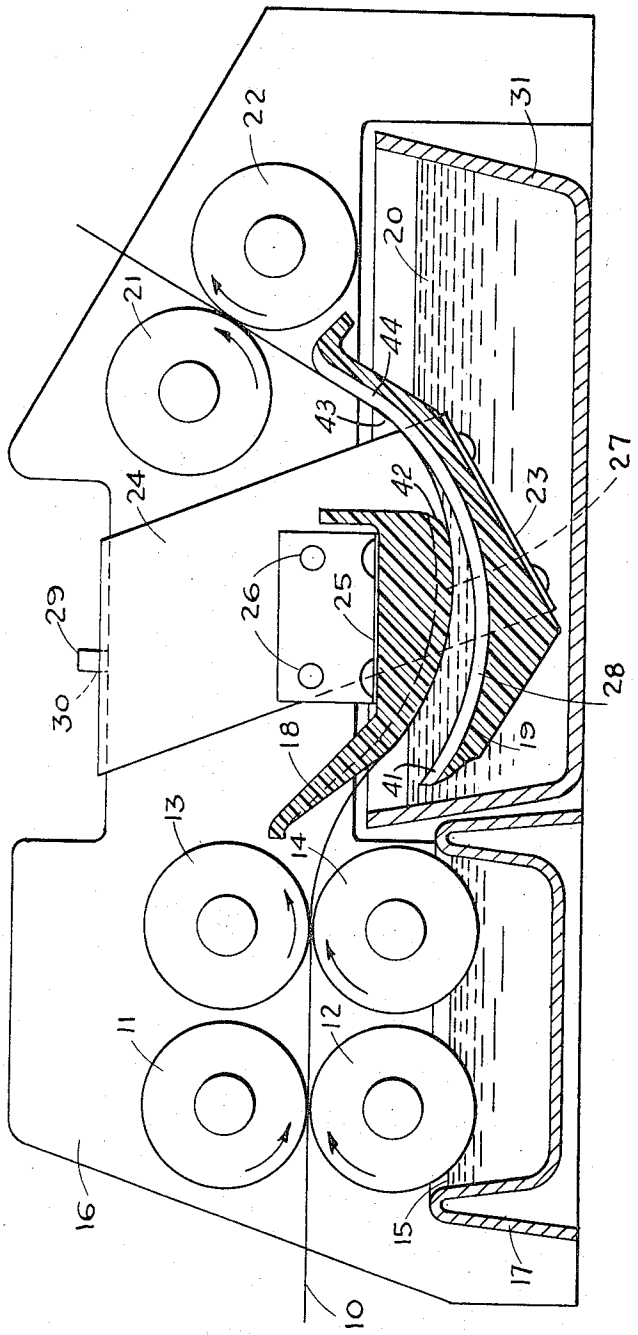


FIG. 3

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United States Patent Office 3,375,770
Patented Apr. 2, 1968

3,375,770

PHOTOGRAPHIC PROCESSING MACHINE

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Filed July 20, 1965, Ser. No. 473,315
3 Claims. (Cl. 95—94)

ABSTRACT OF THE DISCLOSURE

This photographic processing machine, designed for speedier finishing of prints, has two closely spaced pairs of rubber covered feed rolls cooperating with a developer bath, the first pair being under light spring pressure to promote good wetting with developer while the second pair operates with heavier spring pressure to squeegee excess developer off the paper for economy but mainly more evenness of distribution and for better stabilization in the second bath. A third pair of spring pressed rubber covered feed rolls, serving as final squeegee rolls, driven in timed relation to the first mentioned ones obtains properly timed sequence in the passing of the paper from the first bath through the second, the third pair being arranged so that paper emerging from the second bath rises at a steep angle for quicker drainage by gravity of a large percentage of the stabilizer solution back into the second bath before the paper reaches these last rolls. A guide system provided between the second and third set of rolls in connection with the stabilizer bath consists of vertically spaced gently curved plastic guides, the upper one of which is disposed to maintain even tension on the paper between the second and third pair of rolls by holding the paper immersed in the stabilizer just to the right extent and no more, while the lower one cooperates with the upper one to guide only the leading and trailing ends of the paper properly to avoid backups or bunchings and help at its trailing end to direct the paper finally upwardly at a sharp angle to the last rolls. Both guides have longitudinally extending ribs in offset relationship to one another for light line contact with the paper on both sides, but mainly on the back, so that there will be no traces of adhesion and no scuffing of the surface due to passage through the guide system.

This invention relates to a photographic processing machine and is more particularly concerned with one capable of operation at a speed of one inch per second in producing a continuous tone photographic print that is commercially acceptable, using what are known as stabilization materials.

The present machine is of novel design and construction and has:

(1) Two sets of spring pressed rubber-covered drive rolls in closely spaced parallel relationship between which the exposed paper with its emulsion side down is fed horizontally from the printer, the lower drive rolls dipping into a developer solution for a double "kiss" treatment to insure good and even overall developing of the latent images, despite the one inch per second rate of feed, the first pair of rolls operating with lighter spring tension so as to promote good wetting with developer, and the second pair of rolls operating with heavier spring tension to squeegee excess developer off the paper back into the bath for economy but mainly to insure more evenness of distribution of developer for better prints and also to ease the stabilization in the second bath;

(2) A third pair of spring pressed rubber covered squeegee rolls driven in timed relation to the first mentioned rolls so as to obtain perfectly timed sequence in the passing of the paper from the first bath through the second bath, the squeegee rolls being disposed so that the paper

emerging from the second bath rises at an angle of approximately 60° for quicker drainage by gravity of a large percentage of the stabilizer back into the second bath before the paper reaches the last squeegee rolls, so that the finished print emerges approximately 85% dry, without any "hesitation marks" or other blemishes, and

(3) A guide system consisting of vertically spaced gently curved plastic guides disposed between the drive rolls and squeegee rolls, the upper guide maintaining even tension on the paper between the second and third pairs of rolls while holding the paper immersed in the stabilizer to the right extent, while the lower guide cooperates with the upper one to guide the leading and trailing ends properly and avoid backups or bunchings and direct the paper finally upwardly at a sharp angle to the squeegee rolls, the guides both having longitudinally extending ribs for light line contact with the paper on both sides to guide it through the stabilizer bath in perfectly timed sequence with the aforesaid double kiss treatment in the developer bath, thereby insuring a continuous tone photographic print that is commercially acceptable, without any traces of adhesion or scuffing of the surface due to passage of the paper through the guide system.

The invention is illustrated in the accompanying drawings, in which—

FIGS. 1 and 2 are a plan view and front view, respectively, of the roller assembly for my improved photographic processing machine;

FIG. 3 is a more or less diagrammatic section on the line 3—3 of FIG. 1 showing the relationship of the closely spaced two pairs of drive rolls to the developer bath and the relationship of the squeegee rolls to the stabilizer bath and to the guide system between the two sets of rolls, and

FIGS. 4 and 5 are fragmentary rear views at opposite ends of the guide system, FIG. 5 showing the lower guide removed to better illustrate the evenly spaced parallel rounded shape of the ribs on the upper guide, the same shaped ribs being also provided in evenly spaced parallel relation on the lower guide in offset relationship to the ribs on the upper guide, as seen in FIGS. 3 and 4.

The same reference numerals are applied to corresponding parts throughoutt he views.

Referring to the drawings, the exposed paper is indicated at **10** in FIG. 3 as fed horizontally to the processor from a printer with its exposed emulsion side down, passing first through two pairs of horizontal spring pressed rubber-covered drive rolls **11–12** and **13–14** disposed in closely spaced parallel relationship and turning in the direction of the arrows, the lower rolls **12** and **14** dipping into a developer solution **15** of a double "kiss" treatment of the emulsion to insure good and even overall developing of the latent images, despite the one inch per second rate of feed. The rolls **11–14** are suitably mounted in bearings in parallel vertical side frames **16** between which the container **17** for the developer bath **15** is provided. It is important that the paper **10** travel at the right speed for proper timing of the action of this developer on the exposed face in relation to immersion in the stabilizer bath if the resulting picture is to come out right. The guides **18** and **19** insure immersion in the stabilizer bath **20** in the right timed relation to the first treatment and keeping it in the stabilizer bath long enough to neutralize the action of the developer before the paper emerges and passes through the spring pressed rubber-covered squeegee rolls **21–22**. These rolls are driven in timed relationship to the drive rolls **11–14** and are so disposed that the paper **10**, running through the stabilizer bath between the guides **18–19** is directed by the lower guide **19** upwardly at an angle of approximately 60° for good drainage of as much of the stabilizer as possible before the squeegee action occurs to remove nearly all of the remaining chem-

ical, the paper leaving the rolls **21–22** being approximately 85% dry so that no separate drier is needed. The importance of accurate timing is apparent when it is known that a hesitation line appears plainly on a print if there is even the slightest interruption in the continuous feeding of the paper through the processing machine. Harder rubber (#65 Durometer) is used in the upper rolls **11, 13,** and **21** than in the lower rolls **12, 14,** and **22,** the latter being #50 Durometer.

The elongated, gently curved guides **18** and **19** are made of a suitable plastic material, the lower guide **19** being secured at its opposite ends to inwardly bent end portions **23** of metal brackets **24** mounted on the side frames **16,** while the upper guide **18** is suitably secured at its opposite ends to other sheet metal brackets **25** secured, as by means of rivets **26,** to the brackets **24.** Longitudinally extending ribs **27** of gently rounded form are provided in evenly spaced parallel relation on the lower face of the upper guide **18** and these ribs are in offset relation to similar ribs **28** provided in evenly spaced parallel relation on the upper or inner face of the lower guide **19.** Studs **29** on the side frame members **16** extend through holes **30** in the brackets **24** for removably securing the brackets **24** in place on the side frame members **16.** A container **31** for the stabilizer bath **20** extends between the side frame members **16** and has the guide system **18–19** extending into it, as clearly seen in FIG. 3.

Referring to FIGS. 1 and 2, the side frame members **16** have stainless steel tie-rods **32** rigidly interconnecting the same, none of these rods being shown in FIG. 3. The lower squeegee roll **22** has a chain belt connection with the upper drive roll **13,** as indicated at **33** in FIG. 1.

In operation, the present machine operates with what are known as stabilization materials, which require absolute processor accuracy for uniformly good results. The slightest hesitation in paper flow through the processor would cause blemishes, lines, and other objectionable results in the finished prints. Provision is made for automatic chemical replenishment so as to maintain the correct liquid level of the developer and stabilizer chemicals in the two containers **17** and **31** continuusly, which is important in assuring quality processing. Stainless steel tension springs **34** and **35** provide correct roller contact pressure constantly between drive rollers **11** and **12** and drive rollers **13** and **14,** respectively, and similar stainless steel tension springs **36** provide correct roller contact pressure between the squeegee rolls **21–22.** Lighter spring tension is provided on rolls **11–12** than on rolls **13–14** for the reasons stated earlier. About the same heavier tension is provided on squeegee rolls **21–22** as on rolls **13–14,** as both sets of rolls function in a similar capacity. The integrated roll-guide system makes it possible to feed extremely thin papers without special preparation, as well as double weight papers. A spring loaded drive coupling **37** is provided between the squeegee roll **22** and the drive motor (not shown), the latter being suitably housed at one end of the machine. An intermediate idler gear **38** meshing with gears **39** and **40** provided on the projecting ends of the shafts of the upper rolls **11** and **13** serves to transmit the positive drive between the two sets of drive rolls **11–12** and **13–14,** thereby insuring perfectly timed sequence in the feeding of the paper through the two chemical baths so that the finished print emerges not only 85% dry so that a separate drier is unnecessary but also without any hesitation marks or other blemishes thereon. With the two pairs of drive rolls **11–12** and **13–14** in such closely spaced relation, there is every assurrance of positive even chemical application regardless of the one inch per second rate of feed. The upper guide **18** maintains the tension in the paper **10** even between the second and third sets of rollers, holding the paper immersed in the stabilizer to exactly the right extent at all times, the lower guide **19** cooperating with the upper one to guide the leading and trailing ends properly to avoid backups or bunching, and it serves also to direct the leading end sharply upwardly between the squeegee rolls. The longitudinally extending gently rounded ribs on these two gently curved guides **18** and **19** insure good guiding function without any danger of scuffing or marking on the print, while at the same time, insuring good opportunity for the stabilizer to reach every portion of the surface of the paper. In closing, it is important to note that the leading edge **41** of the lower guide **19** is not only farther away from the upper guide **18** than is the trailing edge **42** of the upper guide **18** from the lower guide **19,** but, the leading edge **41** of the lower guide **19** is submerged in the stabilizer bath **20,** and both of these features are important to the proper handling of the paper in the high speed processing of it. The submerged disposition of the leading edge **41** of the lower guide eliminates contamination by deposits of developer, which would otherwise accumulate at this point and ultimately end in spoilage of prints, while the converging arrangement of the complementarily curved surfaces of the guides **18** and **19** toward the trailing edge **42** of the upper guide **18** insures proper setting of the paper **10** as it passes through the stabilizer bath **20** so that it doesn't actually come into contact with the upper surface of the lower guide **19** until at the point **43** on the trailing end **44** of the lower guide **19,** where the paper is directly upwardly at an angle of approximately 60° toward the last set of squeegee rolls **22.** In other words, the conformation and disposition of the upper and lower guides **18** and **19** with respect to one another are considered critical, because other guides shaped differently and differently arranged with respect to one another which I have tried were unsuccessful, whereas the ones herein shown give uniformly good results. A continuous roll of paper can be fed through the present machine without bunching or slipping. Even the most critical reproduction requirements are met with blacker blacks and whiter whites.

It is believed the foregoing description conveys a good understanding of the objects and advantages of my invention. The appended claims have been drawn to cover all legitimate modifications and adaptations.

I claim:

1. In a photographic processing machine comprising two baths, the first and relatively short bath being for developer solution, the second and relatively long bath being for stabilizer solution, two vertically arranged pairs of coacting horizontal driven feed rolls disposed in closely spaced parallel relation between which a continuous strip of exposed paper is fed emulsion side down horizontally into the machine and receives allover wetting with developer solution on the emulsion side from the two lower feed rolls by reason of their both dipping into the first bath, the first pair of rolls being mainly wetting rolls, the second pair of rolls serving both as wetting and squeegee rolls, a pair of vertically spaced generally horizontal guides dipping into the second bath and having the paper leaving the feed rolls guided therebetween so as to be immersed in the stabilizer solution in a predetermined closely timed relation to the wetting of the emulsion side with developer solution for good continuous tone photographic printing despite a fast feed rate, the upper one of said guides being convexly curved downwardly and disposed with only its trailing end portion submerged in the second bath, while the lower one of said guides is concavely curved and disposed in spaced relation to the upper guide with only its leading end portion submerged in the second bath; said upper guide dipping the paper into said second bath while maintaining even tension on the paper between the second pair of rolls and a third pair of rolls, said lower guide contacting the paper only after it leaves the upper guide and directing it sharply upwardly for quick drainage back into the second bath of excess stabilizer solution immediately after immersion, and a third pair of feed rolls which are coacting horizontal squeegee rolls driven in timed relation to the other feed rolls and disposed over the second bath and having the

paper passing therebetween for removal of most of the remaining stabilizer solution not previously drained off.

2. A photographic processing machine as set forth in claim 1 wherein the leading end portion of the lower guide and the trailing end portion of the upper guide are disposed in inwardly converging relationship to one another.

3. A photographic processing machine as set forth in claim 1 wherein the leading end portion of the lower guide and the trailing end portion of the upper guide are disposed in inwardly converging relationship to one another, and the trailing end portion of the lower guide extends well beyond the trailing end of the upper guide and is curved upwardly relative thereto for directing the paper sharply upwardly as it leaves the second bath for passage between the third pair of feed and squeegee rolls.

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