Jan. 8, 1963 P. E. HIXON ETAL 3,072,037

CONTINUOUS FILM PROCESSING APPARATUS

Filed March 17, 1960

FIG. 1

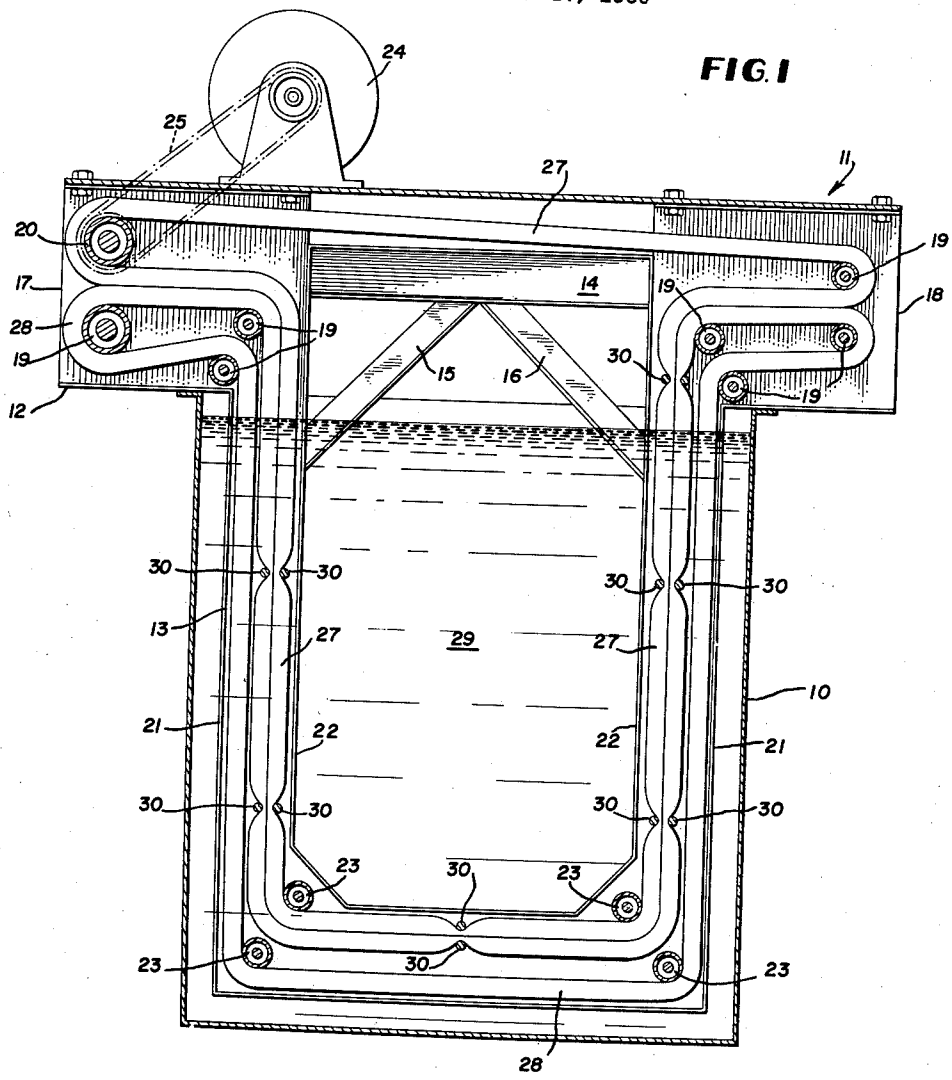




FIG. 2



FIG. 3

INVENTORS
PHILIP E. HIXON
ELMER E. WHITE
BY
ATTORNEY

United States Patent Office 3,072,037
Patented Jan. 8, 1963

3,072,037

CONTINUOUS FILM PROCESSING APPARATUS

Philip E. Hixon, 156 Willowood Drive, Wantagh, N.Y., and Elmer E. White, 905 Orlando Ave., West Hempstead, N.Y.

Filed Mar. 17, 1960, Ser. No. 15,707
3 Claims. (Cl. 95—94)

The present invention relates to improvements in a photographic material processing apparatus, and relates more particularly to a continuous photographic material processing apparatus employing endless belts for conveying photographic prints through a treating bath.

In the treating of photographic sheet material, such as the processing of prints for example, it has been customary to dip the exposed print in a plurality of baths or solutions, a minimum number of which is generally four, namely a developer, a short stop, a fixer, and a washer. Heretofore, there have been several attempts to provide machines to permit the automatic immersion of the photographic prints in the solutions. However, these prior art machines have left much to be desired, in that they have not provided means to handle photographic prints of varying widths without altering the apparatus. Moreover, in order that the photographic prints be properly processed, tanks of appreciable size were required to give the photographic print the necessary time in the solution. Such tanks not only cost more, but also required more floor space.

The present invention overcomes these and other disadvantages by providing a machine through which photographic prints of appreciable length may be processed. In the apparatus of this invention, photographic prints of any width may be processed since endless belts of many widths may be employed, depending upon the size of the tank used, employing tanks which are smaller in volume than those heretofore found necessary.

An important object of this invention is to provide improved means by which a strip of photographic material is guided, fed through and processed in one processing operation or a series of processing operations.

Another object of this invention is to provide a conveyor for the photographic sheet material in the form of cooperating endless belts of spongy material.

Still another object of this invention is to provide conveyor belts of a spongy synthetic polymeric material which processes the photographic sheet material while transporting the same through tanks containing the several processing solutions required.

More specifically, the apparatus of the present invention is so designed that it will continuously move a photographic print or other sheet through one or a series of tanks wherein the print or sheet is treated with solutions of developer, short stop, fixer and wash, by means of a pair of cooperating endless belts comprised of a spongy material, particularly a belt made in whole or in part of resilient cellular material having a basis of a synthetic elastomer such as, for example, polyurethane.

Other objects and advantages of this invention will be readily apparent from the following detailed description when considered in connection with the accompanying drawing wherein:

FIG. 1 is a vertical cross-sectional view of a preferred embodiment of the invention; and

FIGS. 2 and 3 are cross-sectional views of two types of endless belts employed in the apparatus of our invention.

The apparatus in which the present invention is embodied is one of a group of similar apparatuses which are especially useful for producing on a commercial scale photographic negatives or prints.

Referring now to the drawings and particularly to FIG. 1, there is shown a tank **10** containing one of the various

liquid baths essential to the successive automatically performed steps of a photographic material developing process. Although only one tank is shown in the interest of brevity, it is to be understood that a series of identical tanks are normally used in a complete developing process. The tanks contain in successive order from the starting to the finishing of the process, a developing solution, a short stop solution, a fixing solution, and a washing solution which may be water. As the photographic strip must be immersed in the various solutions, there is provided means to carry the strip downwardly towards the bottom of the tanks, and thence upwardly out of each tank, whereby the strip may come into contact with the solution for the necessary length of time. To this end, there is fixed in each tank **10**, a unitary assembly, generally indicated by reference numeral **11**, which includes a superstructure **12** and a vertical open framework **13**. The assembly **11** is braced by cross-pieces **14**, **15** and **16**.

The superstructure **12** is provided with brackets or plates **17** and **18** on which are suitably mounted a plurality of idler guide rollers **19** and a driven roller **20**. The framework **13** includes spaced members **21** and **22** forming a passageway for a purpose hereinafter set forth. The framework suitably mounts a plurality of idler guide rollers **23**. The roller **20** is driven by a motor **24**, fixed to the top of superstructure **12**, through a belt **25**.

Trained about the driven roller **20** and guide rollers **19** and **23** are two endless belts **27** and **28** which cooperate to traverse photographic prints through the treating solution **29** in tank **10**. Means are provided along the run of the belts **27** and **28** for the purpose of constricting the belts at spaced points along said run. This means may be in the form of bars **30**, **30** suitably carried by the framework **13** and on plate **18**, as shown, or in the form of idler roller bars, not shown. These constrictions in the run of the belts cause the belts to be alternately squeezed and released.

In accordance with our invention, the belts **27** and **28** are made of any resilient cellular or spongelike material, preferably having a basis of a synthetic polymeric material. Optimum results are obtained by the use of cellular polyurethane. The belt of cellular polyurethane material may be used free of any backing such as is shown at **31** in FIG. 2 or, as is shown in FIG. 3, with a backing of a polymeric material which may be bonded, with the aid of a suitable adhesive if necessary, to the cellular belt. The backing may also take the form of a film or a woven, knitted or netted fabric made from polymeric filamentary materials. It has been found that an eminently suitable material for the backing is a polymerization product of vinylidene chloride homopolymer or copolymer, such as the product sold under the trade name "Saran."

The backing **32** is placed on the face of the belts coming into contact with the guide rollers and the constricting members with the open cellular faces being in contacting relation.

As stated, the belts are alternately squeezed and released by the series of constricting or pinch elements **30**, **30** positioned along the travel of the belts. The squeezing and releasing action of the elements **30**, **30** on the belts is in effect a pulsating action and causes photographic solutions to be absorved by and released from the belts. This pulsating action processes the photographic strip as it is conveyed by the endless belts through each tank, thus more efficiently treating the photographic strip or print.

In using this apparatus for its intended purpose, a photographic print, for example, is introduced into the apparatus, at the left side thereof, the print being engaged between the two spongy belts and travels a course, defined by the framework, through the treating solution. At the right side discharge end of the apparatus, the print leaves the tank and is transferred directly to an identical process-

ing apparatus containing a different photographic processing solution. In the normal processing of a print four of these apparatuses are required and four tanks employed would contain solutions of "developer," "short-stop," "fixer" and "wash," respectively. At the completion of the washing process, the print is fed on to a continuous dryer which forms no part of the present invention.

While one embodiment of the invention has been disclosed, it is to be understood that the inventive idea may be carried out in a number of ways. This application is, therefore, not to be limited to the precise details shown, but is intended to cover all variations and modifications thereof falling within the spirit of the invention or the scope of the appended claims.

We claim:

1. In a photographic print processing apparatus, the combination with a tank for holding a processing liquid, of an assembly operatively positioned in said tank, said assembly including a superstructure and a framework supported thereby, rollers mounted on said superstructure and said framework, a pair of belts of spongy cellular material

trained over said rollers for receiving a photographic print therebetween, means for effecting movement of said belts, and a plurality of means positioned at spaced points along the path of travel of said belts in said tank for applying a constricting pressure to said belts whereby the liquid, taken up from the tank by the belts, is applied to the print held therebetween by a pulsating action.

2. A photographic print processing apparatus according to claim 1, wherein the belts are of spongy cellular polyurethane.

3. A photographic print processing apparatus according to claim 2 wherein tthe polyurethane belts have a backing of a vinylidene chloride material.

References Cited in the file of this patent

UNITED STATES PATENTS

429,705	Steffens	June 10, 1890
1,308,709	Hamburger	July 1, 1919

FOREIGN PATENTS

116,864	Germany	Jan. 17, 1901