Jan. 21, 1969 M. B. FLEISHER ET AL 3,422,741

PHOTOGRAPHIC DEVELOPING APPARATUS

Filed June 4, 1965 Sheet 1 of 3

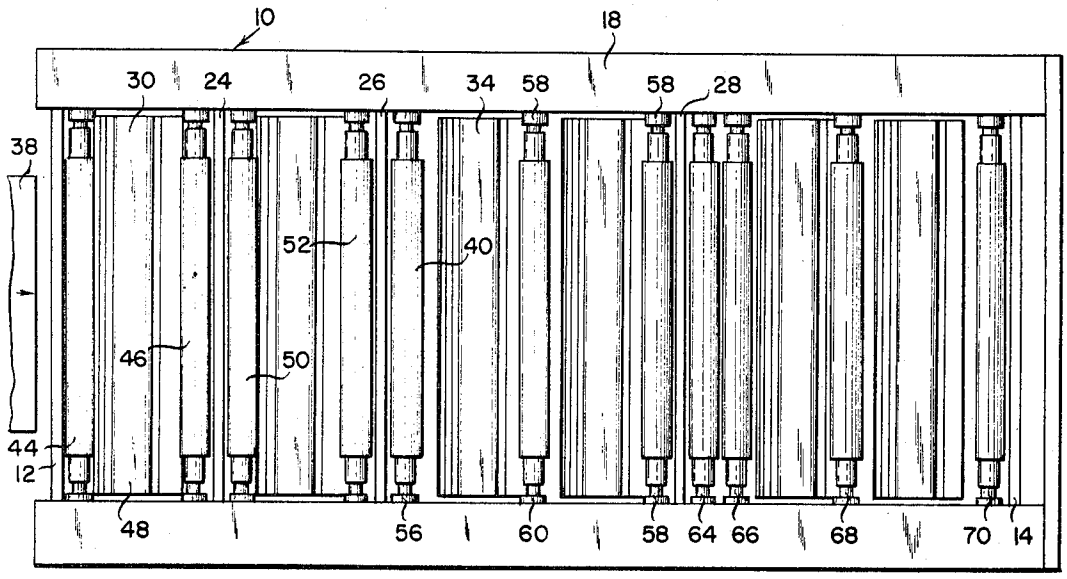


Fig. 1

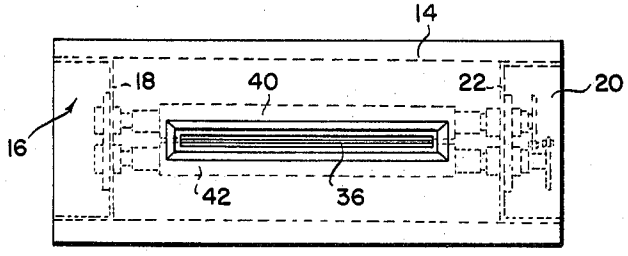


Fig. 2

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PHOTOGRAPHIC DEVELOPING APPARATUS

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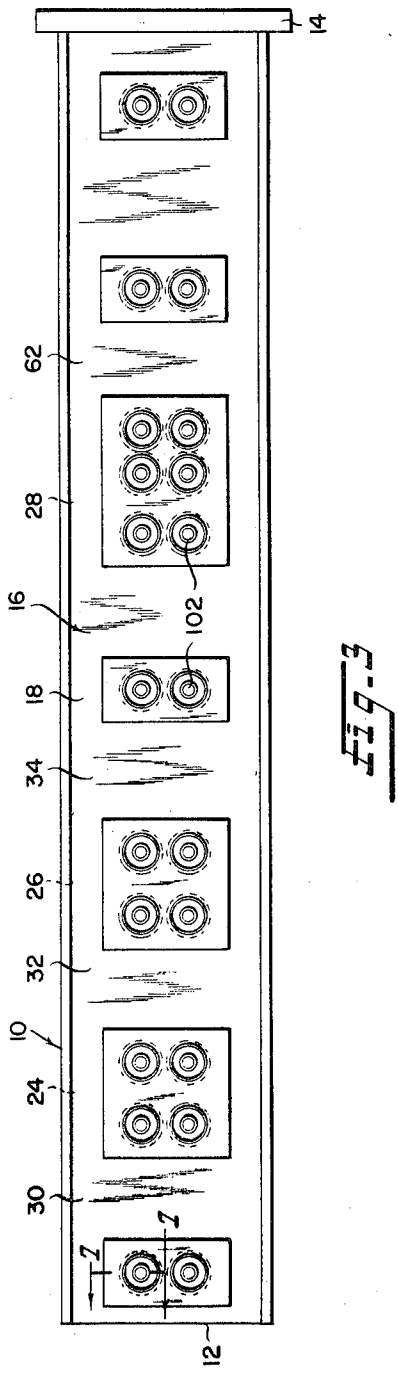


Fig. 3

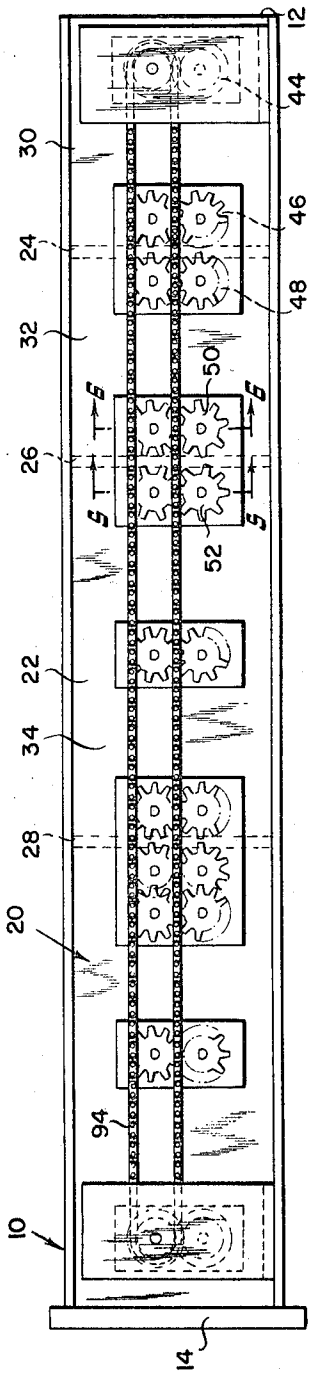


Fig. 4

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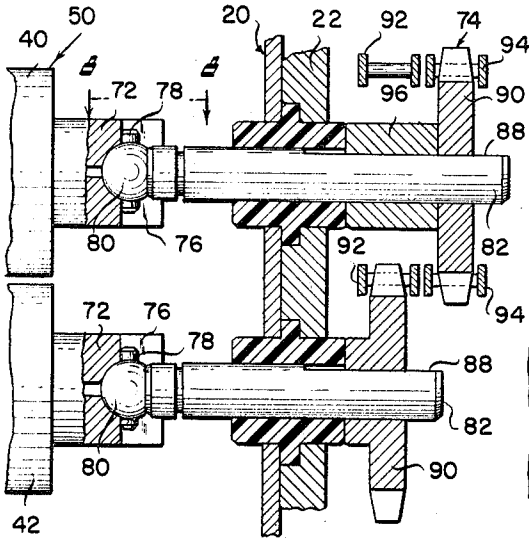


Fig. 5

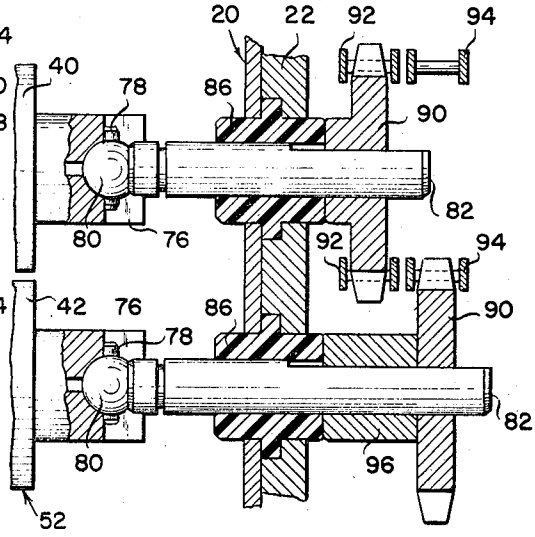


Fig. 6

Fig. 7

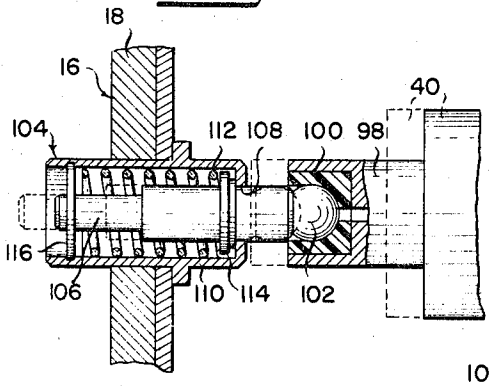


Fig. 8

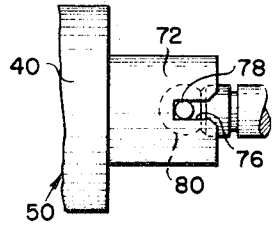


Fig. 9

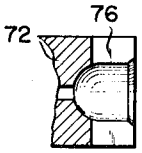
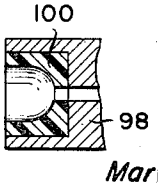


Fig. 10



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3,422,741

PHOTOGRAPHIC DEVELOPING APPARATUS

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U.S. Cl. 95—94 5 Claims
Int. Cl. G03d 3/12

ABSTRACT OF THE DISCLOSURE

An apparatus for processing a strip of photographic film consisting of a series of processing stations and transport rollers associated therewith. The transport rollers are detachably connected by a ball and socket arrangement to stub axles which are mounted in the housing of the apparatus whereby the rollers may be easily removed for cleaning. Each of the stub axles has a sprocket wheel mounted on one end thereof for engaging an endless chain which serves to rotatably drive the transport rollers.

The present invention relates to apparatus for processing a strip or roll of photographic film material and the like.

It is an object of the present invention to provide a photographic developing apparatus which can automatically process a photographic sheet of material by feeding the material through a treating process, such as developer solution, fixer solution, wash solution and the like, in a reliable and rapid manner, without injury to the film sheet or its delicate emulsion coatings.

It is another object of the present invention to provide a photographic film developing apparatus in which a continuous strip of film is fed between pairs of nip rollers in a substantially horizontal and straight line plane through the apparatus, and through a plurality of different treating stations in the apparatus in a continuous and rapid manner without causing any damage to the film.

It is yet another object of the present invention to provide a film developing apparatus that has a plurality of mating rollers through which the film is fed, which rollers can be rapidly replaced or removed so they can be readily cleaned if necessary.

It is another object of the present invention to provide a film developing apparatus in which the strip of film is fed in a substantially horizontal plane in a straight line path through a plurality of coacting rollers, and in which novel drive means or a novel means of rotating the pairs of rollers is provided.

It is another object of the present invention to provide a film developing apparatus in which mating pairs of nip rollers are driven by a double chain mechanism or means both chains of which are driven in the same direction.

Another object of the present invention is to provide a film developing apparatus provided with drive rollers which have spring loaded bearing means for snapping the rollers into place in the apparatus and in which rollers can be readily removed and cleaned or replaced from the apparatus by snapping the spring loaded bearing means in the opposite direction.

It is another object of the present invention to provide a photographic developing apparatus that has a minimum requirement for maintenance of the various pairs of rollers utilized in the apparatus, and which rollers can be readily dismantled and replaced with another roller without completely dismantling the apparatus.

Another object of the present invention is the provision of a simple photographic developing apparatus which is reliable, and relatively inexpensive in its drive

parts, and in which the parts utilized are standard and interchangeable, and do not require any unusual and complicated parts.

Various other objects and advantages of the present invention will be readily apparent from the following detailed description when considered in connection with the accompanying drawings forming a part hereof and in which:

FIGURE 1 is a top plan view of the developing apparatus embodied in the present invention.

FIGURE 2 is an end elevational view illustrating the slot or passage through which the strip of film passes.

FIGURE 3 is a side elevational view of the spring bearing means side of the apparatus.

FIGURE 4 is a side elevational view of the apparatus illustrating the drive means side.

FIGURE 5 is an enlarged detail view taken along the line 5—5 of FIGURE 4.

FIGURE 6 is an enlarged detail view taken along the line 6—6 of FIGURE 4.

FIGURE 7 is an enlarged detail view taken along the line 7—7 of FIGURE 3.

FIGURE 8 is a sectional view taken along the line 8—8 of FIGURE 5.

FIGURE 9 is a sectional view taken along the line 9—9 of FIGURE 10, and

FIGURE 10 is a detailed view of the roller end for receiving the ball socket of the spring bearing means.

Referring to the drawings, the reference numeral **10** generally designates a photographic developing machine or apparatus having a front or inlet end **12** and a rear or exit end **14**.

The apparatus is provided with a spindle or spring loaded bearing side **16** having a vertical side wall **18** and a drive sprocket side **20** having a vertical side wall **22**.

The apparatus is provided with a plurality of vertically disposed partition members **24**, **26** and **28** extending transversely of the longitudinally extending side walls **18** and **22** so that a series of processing stations or compartments **30**, **32**, and **34** are provided in the apparatus. The processing or treating station **30** is preferably a developer station while the station **32** is a fixer station, and the station **34** is a washer station. The following compartments are an additional washer station followed by dryer stations. It is, of course, realized that these different stations are given by way of example and that the apparatus can have any type of processing station desired therein.

Referring to FIGURE 2, it will be seen that a substantially horizontal slot or passageway **36** is provided in each of the end walls of the apparatus and the partitions so that a strip of film material **38** indicated in FIGURE 1 can be readily passed through the plurality of slots in order to be treated in the various stations, and so that it can further be readily passed from one processing station to the next and out of the rear end of the machine.

The slots are all disposed in horizontal alignment with each other so that the process utilized in the present apparatus is a straight line travel path for the strip of film material **38** being processed.

Each processing station is provided with a pair of mating or coacting rollers adjacent their inlet and another pair of coacting rollers adjacent their outlets which act as nip rollers to pull or feed the strip of film material **38** through the processing stations or compartments. The rollers also serve as barriers to prevent treating solutions leaving their respective compartments. The rollers are identical to each other and consist of an upper roller **40** and a lower roller **42**. The surface of the rollers is preferably of a resilient material such as rubber or a synthetic material that will not damage the film as it is pulled between the rollers. Referring to FIGURES 5 and 6, it will

be noted that the spacing between the rollers is predetermined so as to be able to thread the film strip therethrough. Referring to FIGURE 1, the treating station **30** is provided with a pair or set of inlet rollers **44** and a pair or set of exit rollers **46** between which is disposed an applicator member **48** that provides a surface for supporting the strip of film as it passes between the inlet rollers **44** and the exit rollers **46**.

The treating station or compartment **32** is provided with a pair of inlet rollers **50** and a pair of exit rollers **52** and has an applicator **54** therein.

The compartment **34** is provided with a pair of inlet rollers **56** and a pair of exit rollers **58** and a middle pair of rollers **60** with the usual applicators.

The rear compartment or treating station **62** between the partition **28** and the rear end of the apparatus is provided with a first pair of inlet rollers and a second pair of inlet rollers **64** and **66**, respectively, and thereafter has the usual applicator for introducing a liquid solution into the compartment, after which is disposed a pair of middle rollers **68**. Another applicator is provided in this compartment adjacent the middle rollers **68** and a pair of exit rollers **70** are provided adjacent the rear end of the compartment.

Each of the rollers has a reduced or necked down portion **72** as best seen in FIGURES 5 and 6, for attaching the end of the roller to a drive means generally designated **74**. It will be noted that the reduced roller portion **72** is provided with a diametrical slot **76** extending through the end thereof adapted to receive the pin **78** of a ball socket **80** on the end of a spindle or stub shaft **82**. The ball **80** snaps into a resilient complementary hemispherical recess or socket **84** in the portion **72** of the roller. The pin **78** will cause the stub axle **82** to drive or rotate the roller.

The stub axle **82** is journalled in a nylon bushing **86** which extends through the vertical side of the apparatus as best shown in FIGURES 5 and 6. The upper surface of the stub axle **82** is flat as indicated at **88** so that chain sprockets **90** may be disposed on the stub axle **82** and will cause the axle or shaft to rotate when driven by chain belts **92** and **94**.

It will be noted that the chain belts **92** and **94** are of the endless type and form a double chain driven from the same shaft and in the same direction. The direction of rotation of the chain belt is indicated by the arrows in FIGURE 4. The chain belts **92** and **94** are carried by the sprocket wheels so that the sprocket wheels forming a pair, for example, the upper roller **40** and the lower roller **42**, will be driven in the direction indicated by the arrows in FIGURE 4 so as to pull or thread the strip of film material through the apparatus.

Referring to FIGURES 4 and 5 it will be seen that the lower roller **42** and its sprocket wheel **90** is disposed on the machine so that the sprocket wheel **90** will be carried by the lower portion of the inner endless chain **92**. It will also be noted that the upper roller **40** is operatively connected to the sprocket wheel **90** and the sprocket wheel **90** connected to the upper roller **40** is disposed outwardly of the lower sprocket wheel **90** so that the upper roller **40** is driven by the chain belt **94** and in the direction indicated in the arrows in FIGURE 4, with the FIGURE 5 indicating the direction of rotation of the rollers **50** therein.

Referring to FIGURES 4 and 6, it will be noted that the pair of rollers **52** are disposed on the respective stub shafts or axles in a reverse direction with respect to the positioning of the sprocket wheels on the rollers described in connection with FIGURE 5. In this case it will be noted that the lower sprocket wheel **90** which drives the lower roller **42** is disposed outwardly of the upper sprocket wheel **90** which drives the upper roller **40**, or in other words the drive of the pair of rollers **52** is reversed with respect to the drive of the rollers described in connection with FIGURE 5 and the pair of rollers **50**. The outermost sprocket wheel **90** is placed or positioned outwardly of the innermost sprocket **90** by the use of nylon spacer members **96** as best seen in FIGURES 5 and 6. The lower of the pair of rollers **52** is disposed on the stub axle **82** so as to be driven by the sprocket chain **94** while the upper sprocket wheel **90** is disposed on the upper axle **82** so as to be driven by the sprocket chain **92** and the direction of rotation of the chain and the sprocket wheels is indicated by the arrows in FIGURE 4.

Referring to FIGURE 7, there is illustrated therein the structure or construction of the opposite end of all of the rollers in the apparatus. This end of the rollers also has a reduced or necked down portion **98** in the end of which is disposed a core or nylon socket **100** adapted to receive the ball joint **102** of the spring loaded bearing means generally indicated as **104**.

The spring loaded bearing means of the present invention permits the individual rollers to be snapped into place and to be readily detached from the apparatus when necessary for cleaning or for replacement. The ball **102** snaps into a recess in the core **100** which is readily deformable by the ball joint. The ball is disposed on a spindle **106** which extends through an opening **108** in a cylindrical housing or casing **110**. The casing **110** extends through the vertical side **18** of the apparatus and has a spring **112** disposed therein and mounted around the spindle **106**. A collar **114** is fixed on the inner end of the spindle **106** and a retainer ring **116** is fixed on the inner surface of the housing **110** so that the spring normally biases or urges the collar **114** and the ball **102** to its innermost position, as indicated in solid lines in FIGURE 7, at which time the roller **40** is properly attached to the apparatus for rotation thereof by the drive mechanism already described.

When it is desired to remove a roller from the apparatus it is only necessary to force or push the roller **40** in a direction toward the left, when looking at FIGURE 7, to the position indicated by dotted lines, so as to overcome the force of the biasing spring. Thereafter, the right end of the roller may be readily removed from the drive stub axle **82** and the roller **40** is then pulled to the right so that the ball **102** comes out of the core **100**. Thus, the rollers can be readily attached and detached as desired.

In operation, when it is desired to process a strip of film **38** as indicated in FIGURE 1, the drive mechanism, not shown, for the plurality of sprocket wheels to which the drive rollers **40** and **42** are attached, is put into operation and the strip of film **38** is threaded through the plurality of horizontal slots or passages **36** as shown in FIGURE 2 and between each pair of rollers passing through the various treating stations. Depending upon the positioning of the sprocket wheels as shown in FIGURES 5 and 6, on their respective stub axles, the pairs of rollers can be rotated in the desired direction so that the nip rollers will thread or pull the strip of film through the apparatus.

Since the individual rollers are normally held in an operative position by an individual spring bearing means for each individual roller, it is readily observable that the individual rollers can be quickly snapped out of place and replaced with a new roller, or cleaned if desired.

Thus, the present invention provides a novel film processing apparatus with a novel double chain drive means that can be readily assembled to drive the individual rollers in a desired direction, and all of which parts can be readily detached and reassambled by unskilled labor.

It will, of course, be understood that various changes may be made in the form, details and arrangements of the parts without departing from the scope of the invention as set forth in the appended claims.

What is claimed is:

1. A film developing apparatus comprising in combination:

(a) a plurality of treating stations,

(b) film passage means in each of said stations for passing a strip of film material therethrough,

(c) a plurality of stub axles,

(d) a sprocket wheel connected to each of said stub axles,

(e) at least one pair of coacting rollers in each station for threading a strip of film therethrough, each of said rollers detachably connected to one of said stub axles by a ball and socket joint,

(f) a spacer member disposed on one of said stub axles to position said sprocket wheels out of vertical alignment with each other; and

(g) double chain drive means connected with said sprocket wheels for rotating said rollers in opposite directions.

2. The apparatus of claim 1 wherein each of said ball and socket joints has a slot adapted to receive a pin to lock said joints.

3. A film developing apparatus comprising in combination:

(a) a plurality of treating stations,

(b) film passage means in each of said stations for passing a strip of film material therethrough,

(c) at least one pair of coacting rollers in each station for threading a strip of film therethrough,

(d) drive means for rotating said rollers in opposite directions; and

(e) spring bearing means for each roller for detachably connecting each roller to said drive means, said spring bearing means comprising a housing with a spindle therein, said spindle having a ball at one end, a socket adapted to receive said ball attached to said roller, and biasing means for urging said ball into said socket.

4. The apparatus of claim 3 wherein said housing is cylindrical, said spindle has a collar, said biasing means is spring mounted on said spindle with one end bearing against said collar, and a retainer ring is disposed in said housing bearing against the outer end of said spring.

5. In a film developing apparatus having side walls, a pair of transversely extending coacting rollers, said rollers being disposed in vertical alignment with each other for threading a strip of film material therebetween, each of said coacting rollers being provided with a spring bearing member carried in one of said side walls including a cylindrical housing with a spindle extending therethrough, a collar on said spindle, a retainer ring attached to said housing, a spring mounted in said housing on said spindle between said retainer and collar, a ball on said spindle, and each roller having a resilient socket for receiving said ball therein, means for driving each of said pairs of rollers comprising a stub axle for each roller, a sprocket wheel mounted on each axle for driving a roller, a separate chain belt drive for each of said sprocket wheels for rotating them, said sprocket wheels being disposed out of vertical alignment with each other, and said chain belts being disposed adjacent each other to form a pair of symmetrical chain belt drives and said chain belts being rotated in the same direction, whereby said coacting rollers are turned in opposite directions.

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U.S. Cl. X.R.

95—89; 226—188, 189