Jan. 12, 1926. 1,569,048

F. J. J. STOCK

APPARATUS FOR REGENERATING CINEMATOGRAPHIC FILMS

Original Filed April 24, 1923 2 Sheets-Sheet 1

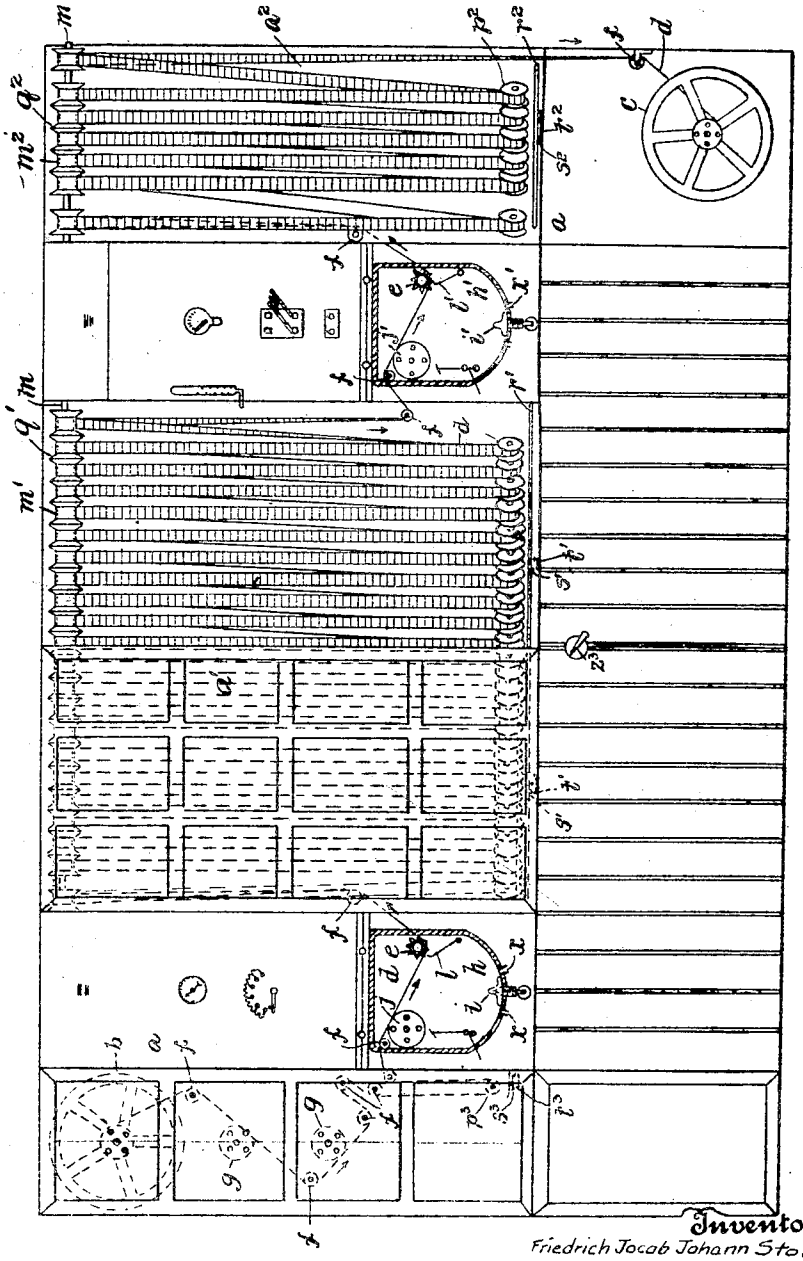


Fig. 1.

Inventor
Friedrich Jacob Johann Stock

By his Attorney

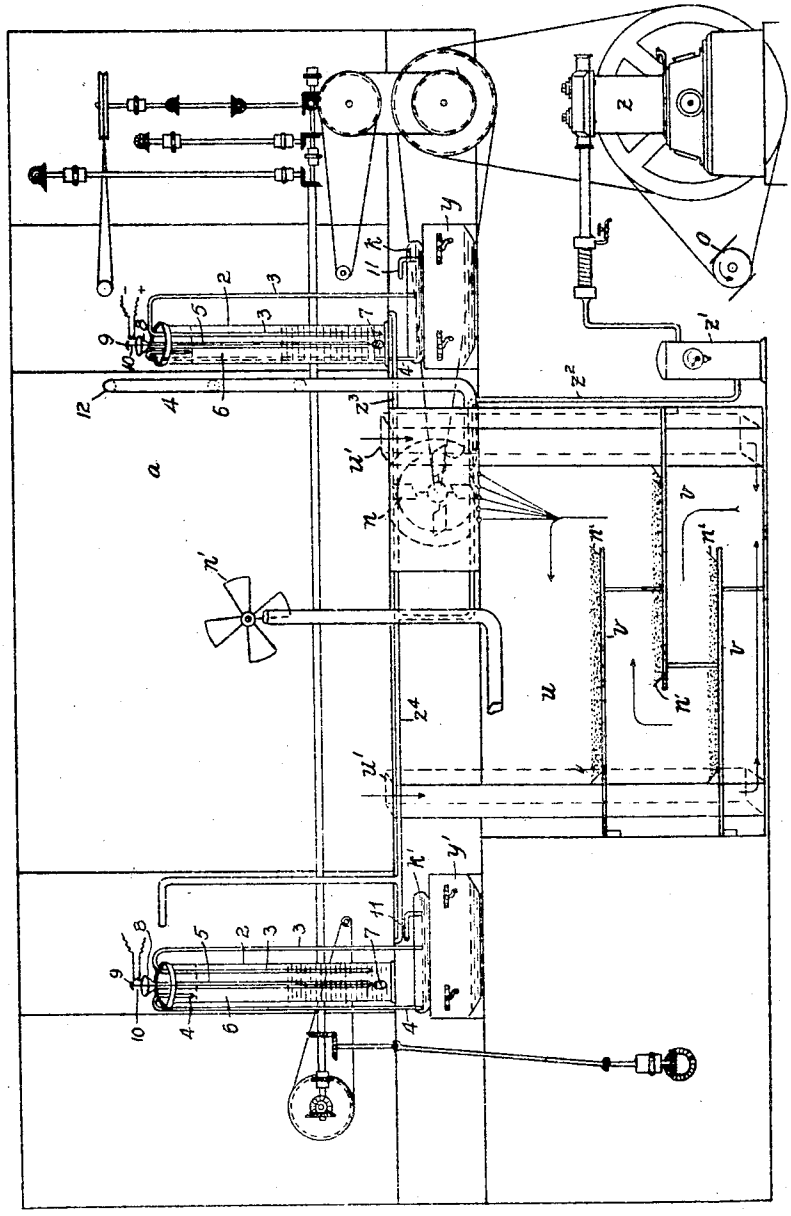
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Fig. 2.



Friedrich Jacab Johann Stock
INVENTOR:
By Otto Munn
his ATTORNEY.

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UNITED STATES PATENT OFFICE.

FRIEDRICH JOHANN JACOB STOCK, OF MUNICH, GERMANY.

APPARATUS FOR REGENERATING CINEMATOGRAPHIC FILMS.

Original application filed April 24, 1923, Serial No. 634,249. Divided and this application filed October 4, 1924. Serial No. 741,781.

To all whom it may concern:

Be it known that I, FRIEDRICH JOHANN JACOB STOCK, a citizen of the German Republic, and resident of Munich, Bavaria, Germany, have invented certain new and useful Improvements in Apparatus for Regenerating Cinematographic Films (for which I have filed an application in Germany, S33221 VI/57a, filed May 20, 1920), of which the following is a specification.

This invention broadly relates to a device for regenerating worn or aged films, or the negatives from which cinematographic film bands are reproduced. It refers in particular to an apparatus for carrying out the process of regenerating worn or aged films as described and claimed in my application for U. S. A. Letters Patent, Serial Number 634,249 of April 24, 1923, and which consists in subjecting the film, each side separately, to the action of various solving agents which penetrate into the material, swelling and superficially liquefying it, and in thereafter drying and rehardening the film.

The accompanying drawings illustrate a preferred form of aforesaid apparatus. In these drawings—

Fig. 1 is a front elevational view with some of the doors removed to disclose interior construction, and

Fig. 2 is a rear elevational view of the apparatus.

Arranged within the casing or housing *a* is a drum *b* to receive the worn film *d*, while *c* is a drum upon which the restored film is wound. The film is unwound from the drum *b* by the intermediary of the motor *o*, feed rollers *e* and guide rollers *f*. It moves in the direction of the arrows in order to be wound onto the drum *c*.

Upon leaving the drum *b* the film is first passed over two cylindrical brushes *g* to be freed from any particles of dust or impurities, whence it is led into the atomizing chamber *h* in which the emulsion side of the film is subjected to the direct and indirect action of the nozzles *i* for the emulsion solvent. The action of the atomizer is preferably controllable. The solvent, which is supplied to the atomizer from the tank *k* is sprayed in finely comminuted uniform condition partly onto a rapidly rotating applying brush *j* which applies the solvent to the film, and partly onto the film direct. In order to be able to effect a greater or lesser distribution of the solvent, the atomizing nozzle *i* is rotatable as well as angularly adjustable within its chamber *h*. Any excessive quantity of solvent passes out of the chamber *h* into a container *y*, for which purpose discharge tubes *x* are provided, from where it is collected to be reused.

From the chamber *h* the film passes into section *a'* of the casing *a*, wherein it is subjected first to the action of a current of hot air or steam caused by the motor-driven fan *n*, and subsequently to a drying current of air which will be more particularly referred to at a later stage. The film then passes into a second atomizing chamber which is denoted by *h'*, and in which the back, that is the celluloid side of the film is treated with a solving agent. The solvent, in this case, issues through the adjustable nozzle *i'* which is supplied from the tank *k'*, onto the applying brush *j'*. The reference *l'* denotes a guard or protector shielding the feed roller *e* against the solvent, while *x'* are discharge pipes through which excessive solvent can flow to the container *y'*.

After its passage through the chamber *h'* the film is led into section a^2 where it is subjected to the action of the vapours arising from the solvent, so that drying and hardening of the film at this end of the apparatus is retarded or delayed until the solvent has had sufficient time to penetrate right into the material.

In the upper parts of the divisions *a'* and a^2 toothed drums or rollers *m'* and m^2 are mounted in spaced relation upon and rotatable with the shaft *m*. The film passing over these drums forms depending loops in the lower bights of which comparatively heavy rolls *p'* and p^2 are placed. As the shaft *m* rotates, the loops of the film are advanced each independently of the other and in the manner of a worm conveyer; the face, i. e. the emulsion side of the film being thereby always directed outwardly and thus fully subjected to the action of the air or steam. It will be noticed that, although this manner of advance of the film is a positive one, it is not rigid, because the rollers *p'* and p^2

are hanging in free suspension and are not journalled in any fixed bearings. Any irregularities in the feed of the film will therefore simply cause unevenness in the length of the loops, but will not in any way affect the action of the apparatus.

Inasmuch as the film does not reach the toothed drums m', m^2 in exactly vertical direction it might occur that certain parts of it (for example badly joined or torn parts) would not properly engage the rollers, and in order to prevent this taking place, guide discs q' and q^2 are arranged between the toothed drums or rollers m', m^2.

Adjacent to the floor of the compartments a', a^2 are vertically movable contact plates r', r^2, carrying the contacts s', s^2; the said contact plates being normally pressed yieldingly upward. Should one of the loops of the film happen to tear or become too long, the weight of the roller p' or p^2 therein would impact with the plate r' or r^2, causing its contact s' or s^2 to engage with the contacts t' or t^2, thus closing a circuit to actuate an audible or visible signal (not shown) and by means of any known mechanism which it is thought unnecessary to illustrate, stop the motor, cut out the heating device, and interrupt the flow of the solvents.

The air current is preferably heated by being passed over electric heating devices arranged in the blast pipe of the fan. The current is preferably caused to flow in a circuit, by means of the fans so as to make the greatest use of the heat it contains. The moisture which the air takes up in the section a' is given off to a hygroscopic body arranged in the path of the air current. As will be seen from Fig. 2, there is provided at the rear of the apparatus a chamber u containing calcium chloride, or the like, over which the air entering the chamber through the pipes u' flows in the direction of the arrow, thereby passing off its contents of moisture to the said calcium chloride. The dehydrated air is then drawn by the fans n and n' from the chamber u through suitable pipes or openings, past the electrical heaters by fan n and is blown into the casing a through the pipe 12 passing thence through the tube u', back into chamber u.

z is the compressor for compressing the air used for atomizing the solvents, and z' is the air chest from which the compressed air is conducted through the pipes z^2, z^3, z^4 to the nozzles. Branches lead to the pressure guage which, being a commonly used and known instrument, is not particularly referred to. z^5, (Fig. 1) is a valve member for closing the compressed air conduit.

In order that the levels of the solutions in the containers k, k' may be maintained uniform I preferably provide feeding means having an automatic intermittently operating siphon as illustrated in Fig. 2. The solvent container is denoted by 2 and it is provided at its upper end with a tightly fitting stopper through which the tubes 3 and 4 are passed. The tube 3 is bent intermediate its ends, one branch extending nearly as far as to the bottom of the container 2 and the other branch extending nearly to the bottoms of the solvent containers k, k'. The second tube 4 is also bent intermediate its ends, one branch terminating directly below the stopper of the container 2, while the other branch is so deeply immersed into the container k or k' respectively, that its opening is sealed by the liquid. A third tube, 5, extends into the container 2 and serves to fill the latter. Operable within the container 2 is a float 7 on a rod 6, which closes the lower ends of the tubes 5 when the container is filled. The rod 6 extends above the filling-in funnel 8 of the tube 5 and is provided at its upper end with a finger 9 which, when the float descends, closes the contacts 10 of an electric circuit containing a visible or audible signal (not shown) and which is operated by the closing of the circuit.

Container 2 is completely filled with liquid, and if suction is applied by any suitable means to the tubes 3, the latter act as siphons. The fluid will pass through the tubes 3 out of the containers 2 into the containers k, k', until the liquid level in the latter seals the lower ends of tubes 4. The result of this is a rarification of the air in the space above the liquid level in container 2 and the cessation of flow through the siphon tube 3 into the containers k, k'. If the atomizing means be set into operation by opening the valve member z^5, the fluid will be sucked by the atomizers i, i', through the tubes 11 out of the containers k, k', and the liquid level in the latter drops. However, as soon as the liquid level drops below the lower ends of the tubes 4, air will flow therethrough, which will pass to the container 2 thus passing the passage of fluid from container 2 to the containers k, k', this action continuing until the fluid again seals the lower ends of the tubes 4 and thus stopping the admission of air into the container 2. In this manner the liquid levels in k and k' are maintained practically constant.

In case the container 2 becomes emptied to such an extent that the float drops, finger 9 will close the contact 10 thus giving the signal indicating that container 2 needs replenishing.

The mechanism for the transmission of movement from the motor o to the several working parts of the device is clearly shown in Fig. 2 and is thought not to require description in detail as it does not form part of the invention.

What I claim is:—

1. An apparatus for regenerating worn film bands comprising in combination a casing having two compartments for the treatment of the emulsion side and of the base side respectively of the film, a drying chamber after the first compartment and a vapor chamber after the second compartment, positively moved conveyers within each of the said chambers to convey the film band in a number of worm-like advancing independent loops, and means to positively and automatically advance the film through the apparatus.

2. An apparatus for regenerating worn film bands comprising in combination a casing having two closed compartments for the treatment of the emulsion side and of the base side respectively of the film, means for applying solvent to the film in each of the said compartments, a drying chamber after the first compartment and a vapor chamber after the second compartment, positively moved conveyer rolls within each of the said chambers to convey the film in a number of worm-like advancing independent loops, a loose roller placed in each of said loops, and means to positively and automatically advance the film through the apparatus.

3. In an apparatus for regenerating film bands, in combination within a casing, means for advancing the film through the casing, enclosed atomizing devices for applying solvents to the surfaces of the film, heating and drying chambers within the casing, means to supply hot steam and air in one of the chambers, spaced conveyer rolls for the film at the top of the said chambers to movingly suspend the film in freely depending loops, guard flanges between the said conveyer rolls, loose rolling weights adapted to be placed in the lower bights of the loops, and electric contact members at the bottom of the chambers to close a signalling circuit on any of the weights coming into contact therewith, to simultaneously stop the motor as well as the flow of liquid and to also cut out the heating apparatus provided for the supply of hot air.

In witness whereof I affix my signature.

FRIEDRICH JOHANN JACOB STOCK.