

Nov. 3, 1925.

L. E. TAYLOR

1,560,438

METHOD OF AND MACHINE FOR COLORING MOTION PICTURE FILMS

Filed July 5, 1923

2 Sheets-Sheet 1

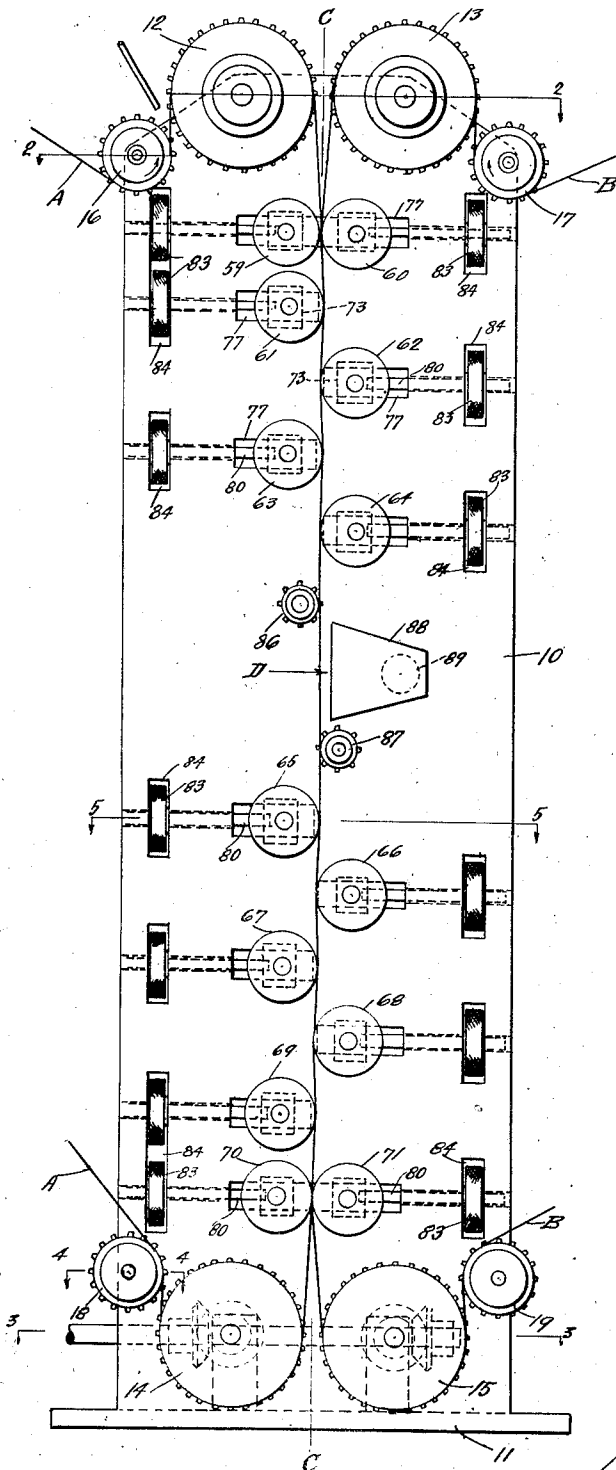


Fig. 1.

Fig. 6.

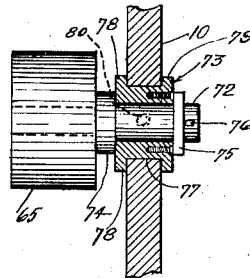


Fig. 7.

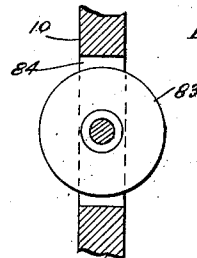
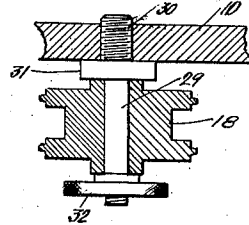


Fig. 4.



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2 Sheets-Sheet 2

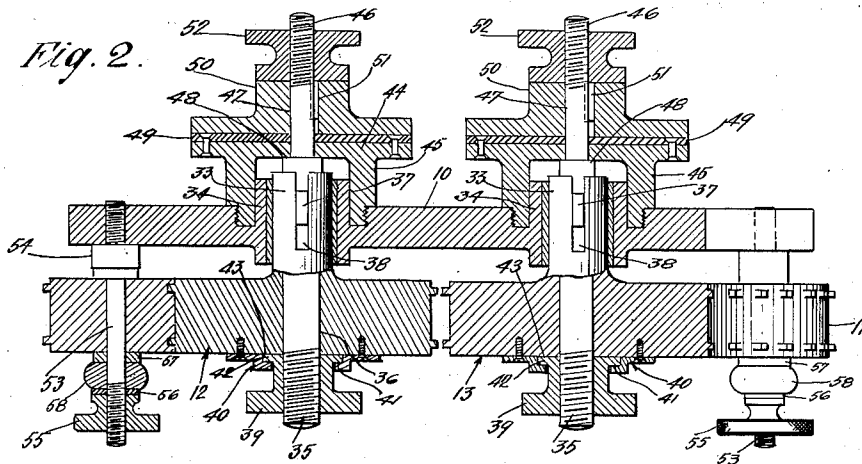


Fig. 3.

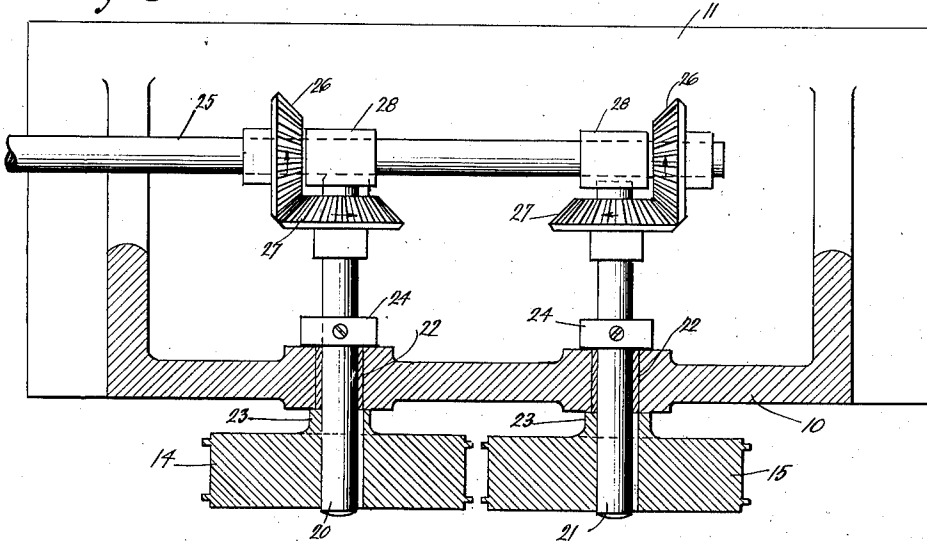
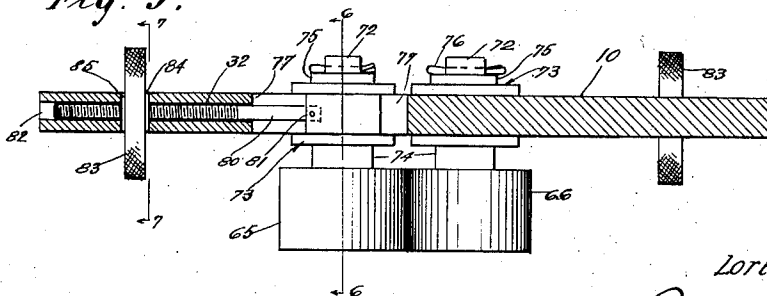


Fig. 5.



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UNITED STATES PATENT OFFICE.

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METHOD OF AND MACHINE FOR COLORING MOTION-PICTURE FILMS.

Application filed July 5, 1923. Serial No. 649,603.

To all whom it may concern:

Be it known that I, LOREN E. TAYLOR, a citizen of the United States, and a resident of Los Angeles, in the county of Los Angeles and State of California, have invented new and useful Improvements in Methods of and Machines for Coloring Motion-Picture Films, of which the following is a full, clear, and exact disclosure.

This invention pertains to a method of and means for applying coloring matter to motion picture films, and is limited to a method and mechanism for the application of such coloring matter where it is accomplished by bringing a color carrying film or print plate into pressurable contact with the film to be colored, and maintaining the two in such contact, during continuous movement, for a length of time sufficient for the transfer of the color by absorption from one to the other.

In addition to these broad features, my invention contemplates the individual manipulation of the films to bring them into perfect registration and maintaining them in such registration during their mobile contact. It also includes, in the mechanism, means for bringing the films in contact on a substantially rectilinear plane, to reduce relative distortion to a minimum; and means for observing the registration while in mobile contact. The mechanism, as well includes several novel features in adjusting means, all of which will be fully disclosed in the following specification.

I am aware that it is old in the art to color a positive print by bringing it into pressurable contact with a color carrying film or print plate, during continuous movement of the two, and to exert an individual longitudinal tension upon either or both of the films to bring them into perfect registration before coming in contact, and holding them in such registration during contact. To my knowledge the only mechanism provided for doing this work is a revoluble drum, upon which the films are rolled in pressurable contact, together with means for exerting individual longitudinal tension upon the films to bring them into registration before coming in contact and for maintaining them in such registration during their mobile contact. Owing to the films being superposed upon the cylindrical surface of the drum, one naturally travels over an arc of greater

radius than the other, consequently the outer film, or the one traveling over the arc of greater radius, must be stretched more or less to bring it into perfect registration with the film interposed between it and the periphery of the drum, or the one traveling over the arc of smaller radius, even though these films may otherwise register perfectly. As two films seldom shrink the same amount after being wet in the developing process, it is essential, in the coloring process above mentioned, to provide a means capable of exerting an individual longitudinal tension upon both of the films or at least one of them to bring them into registration; and it is also essential, for the accomplishment of good results, that means be provided for viewing the two films while in superposed relation to determine the accuracy of their registration. Therefore, having these essentials in mind, it has been my foremost object in perfecting the present invention to provide a means for accomplishing this method of film coloring, wherein the films are brought into pressurable contact upon as near a rectilinear plane as is possible, to minimize in any case the extent to which either one or both of the films must be stretched to bring them into perfect registration; and to provide a means by which the registration of the films may be observed during their mobile contact.

In the accompanying drawings I have illustrated the preferred form of apparatus suitable for carrying out the several steps of my method, in which,

Figure 1 is a front elevation of the apparatus;

Fig. 2 is a transverse sectional plan view, taken on the line 2—2 of Fig. 1;

Fig. 3 is a similar view taken on the line 3—3 of Fig. 1;

Fig. 4 is a view taken on the line 4—4 of Fig. 1;

Fig. 5 is a similar view taken on the line 5—5 of Fig. 1;

Fig. 6 is a fragmentary transverse sectional view taken as indicated by the line 6—6 of Fig. 5; and

Fig. 7 is a similar view taken as indicated by the line 7—7 of Fig. 5.

Referring now to the drawings, the numeral 10 designates generally a frame upon which the film carrying and handling mechanism is mounted. This frame is preferably in the form of a thin flat plate, compara-

tively narrow, and perpendicularly supported upon a suitable base 11. Two films, such as a color carrying film or print plate—designated in the drawings by the letter A—
 5 and the film to be colored—designated by the letter B—are primarily supported upon a pair of toothed sprockets or drums 12 and 13, respectively, mounted upon the top end of the frame 10, and a pair of similar sprockets 14 and 15 mounted adjacent the bottom
 10 end of the frame 10. Guide sprockets 16 and 17 are provided adjacent the peripheries of the sprockets 12 and 13, respectively; while take-off sprockets 18 and 19 are similarly mounted adjacent the peripheries of
 15 the sprockets 14 and 15. The distance between the sets of sprockets 12 and 13 and 14 and 15 may be varied to suit individual requirements, but ordinarily this distance will
 20 be sufficiently great to permit the films to remain in contact while traveling between them during continuous movement, a sufficient length of time to insure the transfer of the coloring matter from one to the other;
 25 and this period of contact may be shortened by increasing the speed of the mechanism, as will be more fully later explained. Both of the sets of sprockets 12 and 13 and 14
 30 and 15 are mounted in peripherally opposed relation (see Figs. 2 and 3) and spaced a short distance from each other. This space need not be any greater than is necessary to permit threading of the film A and B over
 35 and around them. The guide rollers 16 and 17 and take-off sprockets 18 and 19 are each mounted co-planar with their complementary sprockets 12 and 13 and 14 and 15, respectively.

The sprockets 14 and 15 are rigidly
 40 mounted upon shafts 20 and 21, respectively; the latter being revolubly journaled in suitable bearings 22 in the frame 10. These sprockets are each fixed and held in positive
 45 alinement, relative to each other and to the frame 10, and are held in such alinement by means of the hubs 23 engaging the outer
 50 faces of the bearings 22 and collars 24 on the shafts 20 and 21 engaging the inner faces of the bearings 22. These sprockets
 55 are positively driven, by any suitable means or motive power, through the medium of a drive shaft 25 and bevel gears 26 keyed thereon meshing with similar gears 27 keyed
 60 upon the shafts 20 and 21. The shafts 20, 21 and 25 are all journaled in suitable bearing blocks 28 supported upon the frame base 11. By this arrangement the films A and B
 65 are drawn over the sprockets 12 and 13, from the top to the bottom of the apparatus; however, this arrangement may be reversed, if desired, as it is not material in which
 direction the films travel through the machine.

The take-off sprockets 18 and 19 are identical and are illustrated in detail in Fig. 4.

They are loosely mounted upon shafts 29—which are screw-threadedly mounted at one end 30 upon the frame 10—and retained thereon by confinement between enlarged
 70 ends 31 and a cap 32 screw-threadedly mounted upon their outer ends. The films A and B, after passing over their respective sprockets 14 and 15, pass over the take-off sprockets 18 and 19 and are thereafter led to
 75 suitable winding or drying reels (not shown).

For convenience of description, the sprockets 12 and 13 will be hereinafter referred to as drag sprockets, while the positively driven sprockets 14 and 15 will be
 80 referred to as the feed sprockets.

The construction of the sprockets 12 and 13, as well as the guide sprockets 16 and 17 are identical, therefore, but one set of them will be described. The sprocket 12 is
 85 revolubly mounted upon the frame 10 by means of a tubular bearing extension 33 revolubly journaled in a frame bearing 34, and in which it is also axially slidable. A shaft 35 extends through the sleeve 33 and
 90 a co-axial bore 36 in the sprocket, having a comparatively close sliding fit therein. The sprocket 12 and shaft 35 are made to rotate together yet have a relative axial movement,
 95 by means of a key 37 extending through the shaft 35 and engaging in diametrically opposed longitudinal slots 38 in the sleeve 33.

The sprocket 12 is made axially adjustable relative to the shaft 35 by means of an adjusting nut 39, screw-threadedly mounted
 100 upon the outer end of the shaft 35. The nut 39 is rotatively joined to the sprocket 12 by means of a plate 40, secured to the outer face of the sprocket, which has an inner recess forming an annular flange 41 to over-
 105 hang and engage a peripheral flange 42 on the inner end of the nut 39. The flange 41 engaging the flange 42 holds the inner face 43 of the nut into close contact with the
 110 outer face of the sprocket; so that by rotation of the nut the sprocket may be adjusted axially relative to the shaft 35; and in doing this the bearing sleeve 33 moves axially in the bearing 34.

A friction disc 44 is rigidly mounted upon
 115 the rear face of the frame 10 by means of a tubular portion 45, the outer end of which is screw-threadedly joined to the frame in the manner illustrated. The disc 44 and
 120 sleeve portion 45 are mounted concentric with the shaft 35; the sleeve 45 being of sufficient length to permit the axial movement of the sleeve 33 in its bearing. The shaft 35 has a reduced end 46 extending
 125 through a concentric aperture 47, in the disc 44, forming a shoulder 48 which abuts against the inner face of the disc 44. The disc 44 has a frictional facing 49, such as leather or the like, rigidly secured thereto,
 130 and this is adapted to be engaged by a friction disc 50.

tion disc 50 mounted axially slidable upon the reduced end 46 of the shaft. The disc 50 is made rotatable with the shaft, yet axially slidable thereon, by means of a key 51. An adjustable nut 52 is screw-threadedly mounted upon the outer end of the shaft portion 46 and is adapted to engage the disc 50 to adjust its frictional contact with the frictional surfacing 49. When the nut 52 is tightened and the disc 50 moved into close frictional engagement with the surfacing 49, the shoulder 48 on the shaft is drawn into close frictional engagement with the opposite face of the disc 40 so that rotation of the sprocket 12 is adjustably retarded.

All of the construction and mechanism just described likewise pertains to the mechanism of the sprocket 13, which is designated by similar numerals.

The guide sprockets 16 and 17, which are provided primarily for the purpose of holding the films A and B in proper peripheral engagement with the sprockets 12 and 13, may be of the type illustrated in Fig. 4, or they may be also of the adjustably retardable type as illustrated in Fig. 2; the latter being preferred. The sprockets themselves are loosely mounted upon shafts 53—screw-threadedly mounted at one end upon the frame 10—and confined between an enlarged portion 54 adjacent their supported ends and a retarding means on their outer ends. This retarding means may consist of an adjusting nut 55 screw-threadedly mounted upon the outer end of the shaft, metal discs or washers 56 and 57 between which a compressible rubber disc or washer 58 is confined. By adjusting the nut 55 on the shaft the yielding frictional engagement between opposite faces of the sprockets and the enlarged portions 54 and washers 57 may be varied. Under ordinary circumstances, when only a slight tension on either of the films A and B, is desired, to bring them into proper registration, the sprockets 16 or 17 may be used and the sprockets 12 and 13 adjusted to rotate more or less freely. However, when a greater tension is required the sprockets 12 and 13 will preferably be used either with or without the aid of the sprockets 16 or 17.

A plurality of rollers numbered 59 to 71, inclusive, are supported upon the frame 10 intermediate the drag sprockets 12 and 13 and the feed sprockets 14 and 15. The rollers 59 and 60, as well as the rollers 70 and 71, may be properly termed alining rollers, as they are mounted in diametrically opposed relation, and their chief function is to bring the films together in substantially rectilinear alinement and hold them in contact relation, immediately after they pass from the drag sprockets 12 and 13 and until just immediately before they pass onto the feed sprockets 14 and 15. Rollers 61 to 69,

inclusive, may be properly termed contact rollers, as their chief function is to hold the superposed films in pressurable contact while passing between the rollers 59 and 60 and 70 and 71. As hereinbefore stated one of the principal objects of my invention is to bring the films into pressurable contact in as near a rectilinear plane as possible, to reduce to a minimum the extent to which one film must be manipulated to bring it into registration with the other. The rollers 61 to 69, inclusive, are provided for this purpose, to insure of the holding of the film in pressurable contact. These are arranged in two groups, including the rollers 61 to 64, inclusive, in one group and the rollers 65 to 69, inclusive, in another group, which groups are spaced from each other at about the center of the frame. The rollers comprising these groups are relatively offset both vertically and horizontally so alternate rollers comprising each group will engage opposite faces of the superposed films. They are mounted to be adjustably movable along lines transverse to a center line C passing between the rollers 59 and 60 and 70 and 71; and by causing the peripheries of the alternate rollers to extend slightly beyond this line when engaging the films A and B passing therebetween, the films will be held in pressurable contact by their traveling over a very slight zigzag course, yet substantially tangential to the peripheries of the rollers.

The details of construction of the rollers 59 to 71, inclusive, as well as the means for adjusting them, are clearly illustrated in Figs. 5, 6 and 7, and as they are all identical, but one of them will be described. It may be here noted that all of these rollers have smooth peripheries, and they may be constructed either of metal or a suitable yielding material such as rubber, or the like.

The roller 65 is keyed upon a shaft 72 which is revolvably journaled in a movable bearing block 73. The shaft 72 has an annular flange 74 which abuts against one face of the bearing block and the shaft is revolvably held in place therein by means of a collar 75 and pin 76. The block 73 is mounted to slide transversely of the center line C in an aperture 77, in the frame 10; and is retained therein by means of top and bottom flanges 78 on one side and a plate 79 secured to its opposite side, which form flanges for engaging the opposite faces of the frame. A pin 80 is secured at one end to the block 73, as by means of a pin 81; and this extends outwardly towards the outer edge of the frame through a bore 82 therein. The outer end of the pin 80 is screw-threaded for the reception of an adjusting nut 83 mounted thereon to rotate in an aperture 84. The nut 83 has a hub 85, the opposite ends of which snugly engage the vertical sides of the aperture 84. Rota-

tion of the nut 83 will cause movement of the bearing block 73 in the aperture 77, in a plane transverse to the center line C or the line of movement of the films A and B. By this adjustment of the rollers 61 to 69, inclusive, any degree of tension may be exerted upon the films A and B, passing therebetween, to hold them in a greater or less pressurable contact.

10 In the spaces intermediate the groups of rollers 61 to 64 and 65 to 69, I have mounted two toothed sprockets 86 and 87 on opposite sides of the center line passing between the rollers 59 and 60 and 70 and 71, with their peripheries substantially tangential to this line. These sprockets are of the construction illustrated in Fig. 4 and may be mounted in the same manner; as their positions are fixed in perfect planar alinement with the feed sprockets 14 and 15. The sprockets 86 and 87 are vertically spaced a sufficient distance apart so the registration of the films A and B may be observed as it passes therebetween. It is obvious from the foregoing description that the films A and B will pass downwardly from the sprockets 12 and 13 onto the sprockets 14 and 15, in superposed relation and in a plane at substantially right angles to the face of the frame 10. Thus the registration of the films may be easily viewed, intermediate the sprockets 86 and 87, by looking at them in the direction indicated by the arrow D in Fig. 1. To assist in viewing the registration of the films A and B, a hood 88 containing a small light bulb 89, may be mounted upon the face of the frame 10 with its open end adjacent the superposed films, to illuminate one side of the films.

40 In describing my method and the operation of the apparatus it is not material to the present case how or by what method the color carrying film or print plate is produced; suffice to say that it is a film carrying a solvent coloring matter upon its gelatinous surface, which, when moistened, is readily absorbed by the contacting positive print or the film to be colored. It may be mentioned, however, that such print plates are ordinarily produced from the same negative of which the film to be colored is a print, or in such a manner that the color carrying areas upon the print plate are positioned thereon to correspond to or register with corresponding areas in successive views upon the film to be colored; such, for instance, as a woman's dress, shrubbery, etc. But, even though the print plate is thus produced with all the accuracy possible in the art it still is necessary, in practically every case, to manipulate one film or the other to bring them into perfect registration for the absorption of coloring matter by one from the other.

65 In use the color carrying film or print

plate A is threaded underneath the guide sprocket 16 and over the drag sprocket 12, while the positive print B of the film to be colored is threaded underneath the guide sprocket 17 and over the drag sprocket 13, so the color carrying face of the film A will be facing the gelatinous or image carrying surface of the film B. The teeth upon the sprockets 12 and 13 and 16 and 17 engage the perforations of the films in the usual manner; and the films may be held in peripheral engagement with the guide sprockets 16 and 17 by drawing them from suitable reels or drums mounted adjacent the device.

After being passed over the upper peripheral portions of the sprockets 12 and 13 the two films are brought together between the alining rollers 59 and 60 and the latter relatively adjusted so the films will be forced into a pressurable contact between them. As both the films A and B are ordinarily dry when they are first adjusted to the apparatus, it is necessary to moisten either one or the other to soften the coloring matter on the gelatinous surface of the print plate, and this is ordinarily done by moistening either one or the other just before they come in contact. Therefore, the rolls 59 and 60 are provided not only for the purpose of initially bringing the films together and alining them relative to the sprockets 14 and 15 but they also serve to squeeze out excessive moisture from between the contacting faces of the films, thereby creating a substantial vacuum and sealing the films together. This seal, however, is not sufficient to injure the gelatinous surface of the films when they are separated.

After passing between the rollers 59 and 60 the films are threaded between the alternately opposed rollers 61, 62, 63 and 64, between the peripherally opposed sprockets 86 and 87, between the rollers 65, 66, 67, 68 and 69 and thence between the lower alining rollers 70 and 71. After passing between the alining rollers 70 and 71 the films are then threaded around the under peripheral surfaces of the feed sprockets 14 and 15 and upwardly and over the take-off sprockets 18 and 19, where they are led to suitable drying reels.

In thus threading the films through the apparatus they are first placed as nearly in register as possible and thence drawn between the opposed rollers 59 to 71, and thereby forced into a pressurable contact. This, of course, is due to adjustment of these rollers, relative to each other, so that in passing therebetween the films will be held in peripheral engagement with each of them. It may be preferable in threading the films through the apparatus to move all of the rollers 59 to 71 back from the center line C until after the film has been properly threaded over these sprockets and drawn

taut. After this the rollers may all be moved to the positions illustrated in Fig. 1 to hold the films in the pressurable contact.

The films are drawn through the apparatus by means of the feed sprockets 14 and 15, driven through the medium of shaft 25, gears 26 and 27 and shafts 20 and 21. A tension is exerted upon both films, to hold them tightly in as near a rectilinear contactual plane as possible, by means of adjustably retarding the sprockets 12 and 13, or 16 and 17, or all of them. In case it is necessary to put a greater tension upon one film to bring it into perfect registration with the other, proper adjustment is made of the complementary retardable sprockets 12, 13, 16 or 17.

The exact registration of the films may be observed at the point D by looking through the superposed films; and a perfect view of their registration may be had by the provision of the hood 88 and light 89.

The sprockets 86 and 87 are preferably mounted and fixed in perfect alinement with the sprockets 14 and 15, that is, to revolve in the same plane so that they will serve to hold the films in lateral registration. The films may be brought into perfect lateral registration by axial adjustment of the sprockets 12 and 13 upon their shafts 35 by manipulation of the adjusting nuts 39. For this purpose the sprockets 16 and 17 are mounted a sufficient distance from the sprockets 12 and 13 to permit slight lateral shifting of the films to bring them into perfect lateral registration after passing from their peripheries, without distortion of the films intermittent the sprockets 16 and 17 and 12 and 13, respectively. To facilitate this adjustment the teeth upon the sprockets 12 and 13 and 16 and 17 may be slightly smaller than the perforations. It is clear that any desired tension may be exerted upon the films A and B by adjustment of the sprockets 12 and 13 or 16 and 17, or all of them, pulling them against the positive movement of the feed sprockets 14 and 15. As the sprockets 12 and 13 and 14 and 15, whose centers are in perfect vertical alinement, are spaced slightly from each other, exerting such a tension will tend to draw the films in a straight line and separate them; but passing them between the alining rollers 59 and 60 and 70 and 71 they are brought into facial contact and by proper adjustment of the rollers 61 to 69, inclusive, slightly distorting the films in a zigzag path, against this tension will produce any desired pressurable contact between them.

Adjustment of the rollers 59 to 71 relative to each other and to the center line C is effected by rotation of the adjusting nuts 83; these being mounted and positioned upon the frame as to be manipulated by the fingers.

While I have herein shown and described the preferred specific embodiment of my invention, I nevertheless reserve the right to make such changes or modifications in structure as will come within the scope of the appended claims.

What I claim is:

1. A method of coloring films by subjecting the film to be colored to a pressurable contact with a similar film carrying coloring matter, comprising bringing the film together in contact in a substantially rectilinear plane, and exerting pressure against the contacting films at spaced points and on opposite sides thereof.

2. A method of coloring films by subjecting the film to be colored to a pressurable contact with a similar film carrying coloring matter, comprising bringing the films together in contact in a substantially rectilinear plane, and exerting pressure against the films while in contact at spaced points alternately on opposite sides thereof.

3. A method of coloring films by subjecting the film to be colored to a pressurable contact with a similar film carrying coloring matter, comprising exerting a longitudinal tension upon each film separately, bringing the film portions under tension together in contact in a substantially rectilinear plane, and exerting pressure against the films while in contact at points spaced longitudinally and on opposite sides thereof.

4. A method of coloring films by subjecting the film to be colored to a pressurable contact with a similar film carrying coloring matter, comprising exerting a longitudinal tension upon each film separately, bringing the film portions under tension together in contact in a substantially rectilinear plane, and exerting pressure against the films while in contact at points spaced longitudinally and alternately on opposite sides thereof.

5. A method of coloring films by subjecting the film to be colored to a pressurable contact with a similar film carrying coloring matter, comprising exerting a longitudinal tension upon each film separately, bringing the film portions under tension together in contact in a substantially rectilinear plane, exerting a pressure against the films while in contact at points spaced longitudinally and on opposite sides thereof, and adjusting the tension of either film to bring them to registering dimensions.

6. A method of coloring films by subjecting the film to be colored to a pressurable contact with a similar film carrying coloring matter, comprising exerting a longitudinal tension upon each film separately, bringing the film portions under tension together in contact in a substantially rectilinear plane, exerting a pressure against the films while in contact at points spaced longi-

tudinally and alternately on opposite sides thereof, and adjusting the tension of either film to bring them to registering dimensions.

7. A method of coloring films by subject-
5 ing the film to be colored to a pressurable
contact with a similar film carrying coloring
matter, comprising exerting a longitudinal
tension on portions of said films during con-
tinuous movement thereof, bringing the film
10 portions under tension together in a substan-
tially rectilinear plane, effecting a pressur-
able contact between these film portions by
exerting a pressure against them at points
spaced longitudinally and alternately on op-
15 posite sides thereof, and adjusting the ten-
sion of either film to bring them to register-
ing dimensions.

8. A method of coloring films by subject-
ing the film to be colored to a pressurable
20 contact with a similar film carrying coloring
matter, comprising exerting a longitudinal
tension on portions of said films during con-
tinuous movement thereof, bringing the film
portions under tension together in a substan-
25 tially rectilinear plane, effecting a pressur-
able contact between these film portions by
exerting a pressure against them from oppo-
site sides thereof, and bringing them to regis-
tering dimensions by adjusting the longitudi-
30 nal tension and by lateral shifting of
either film relative to the other.

9. A method of coloring films by subject-
ing the film to be colored to a pressurable
contact with a similar film carrying color-
35 ing matter comprising exerting a longitudi-
nal tension upon each film separately dur-
ing continuous movement thereof, bringing
the film portions under tension together in
a substantially rectilinear plane, effecting a
40 pressurable contact between these film por-
tions by exerting a pressure against them at
points spaced longitudinally and alternately
on opposite sides thereof, and bringing them
to registering dimensions by adjusting the
45 longitudinal tension and by lateral shifting
of either film relative to the other.

10. In a machine of the class described the
combination of sets of rollers positioned to
support portions of two films adjacent each
50 other in substantially rectilinear planes dur-
ing continuous movement thereof, means to
bring said film portions together in pressur-
able contact in facially opposed relation in
a substantially rectilinear plane, means to
55 adjust the longitudinal tension of either of
said films, and means to shift either of them
laterally to bring them to registering dimen-
sions.

11. In a machine of the class described
60 the combination of sets of rollers positioned
to support portions of two films adjacent
each other in a substantially rectilinear
plane during continuous movement thereof,
means to bring said film portions together
in pressurable contact in facially opposed

relation in a substantially rectilinear plane
by exerting pressure against them at spaced
points on opposite sides thereof, means to
adjust the longitudinal tension of either of
said films, and means to shift them laterally
70 to bring them to registering dimensions.

12. In a machine of the class described the
combination of sets of rollers positioned to
support portions of two films adjacent each
other in a substantially rectilinear plane
75 during continuous movement thereof, means
to bring said film portions together in pres-
surable contact in facially opposed relation
in a substantially rectilinear plane by exert-
ing pressure against them at points spaced
80 longitudinally and alternately on opposite
sides thereof, means to adjust the longitu-
dinal tension of either of said films, and
means to shift them laterally to bring them
to registering dimensions.

13. In a machine of the class described
the combination of two sets of sprockets po-
sitioned to support portions of two films
adjacent each other and under tension dur-
ing continuous movement thereof, means
90 intermediate said sets of sprockets to bring
said film portions together in pressurable
contact in facially opposed relation in a sub-
stantially rectilinear plane, means to posi-
tively drive one set of said sprockets, and
95 means in connection with the other set of
said sprockets to adjustably retard their
rotation to vary the longitudinal tension of
either of said films, and means to move
them axially to relatively laterally shift
100 said films, to bring them to registering di-
mensions.

14. In a machine of the class described
the combination of two sets of sprockets po-
sitioned to support portions of two films ad-
105 jacent each other, under tension, during
continuous movement thereof, means inter-
mediate said sets of sprockets to bring said
film portions together in pressurable contact
in facially opposed relation in a substan-
110 tially rectilinear plane, said means compris-
ing a plurality of rollers adapted to engage
opposite sides of said films at points spaced
longitudinally thereof, means to positively
drive one set of said sprockets, and means in
115 connection with the other set of sprockets
to adjustably retard their rotation to vary
the longitudinal tension of said films, and
means to move them axially to relatively
laterally shift said films, to bring them to
120 registering dimensions.

15. In a machine of the class described
the combination of two sets of sprockets po-
sitioned to support portions of two films ad-
125 jacent each other, under tension, during con-
tinuous movement thereof, means intermedi-
ate said sets of sprockets to bring said film
portions together in facial pressurable con-
tact in a substantially rectilinear plane, said
means comprising a plurality of adjustable
130

rollers mounted to engage said film portions at points spaced longitudinally thereof and alternately on opposite sides thereof, said rollers being adjustably movable along lines 5 transverse to the plane of travel of said film portions, means to positively drive one set of said sprockets, means to adjustably retard the other set of said sprockets to vary the longitudinal tension of either of 10 said films, and means to move them axially to laterally relatively shift either of the films, to bring them to registering dimensions.

16. A method of coloring films by subject- 15 ing the film to be colored to a pressurable contact with a similar film carrying coloring

matter, comprising exerting a longitudinal tension on portions of said films during movement thereof, bringing the tensioned film portions together in face to face contact 20 during their travel, and maintaining pressure contact between the contacting portions of the two films during travel by exerting pressure at spaced points from alternately 25 opposite sides of the two films to displace them alternately in opposite directions from the normal path they would otherwise take under tension.

In witness that I claim the foregoing I have hereunto subscribed my name this 27th 30 day of June 1923.

LOREN E. TAYLOR.