

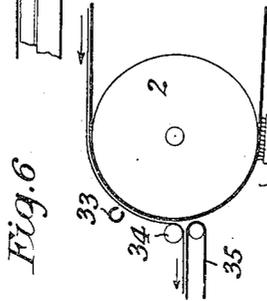
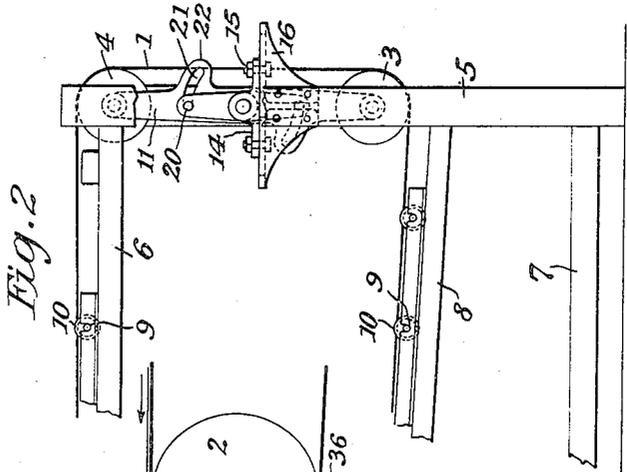
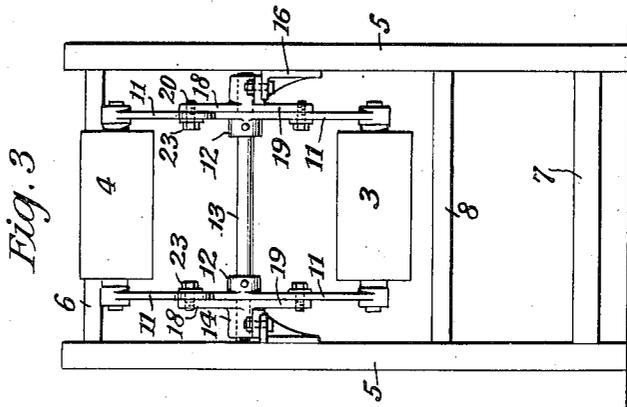
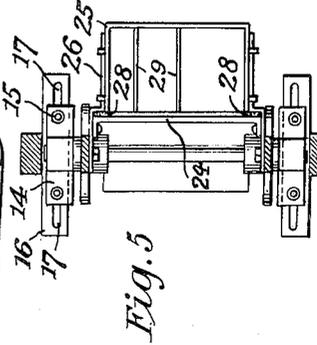
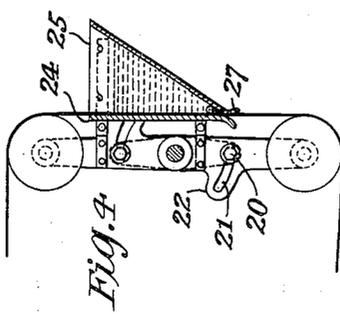
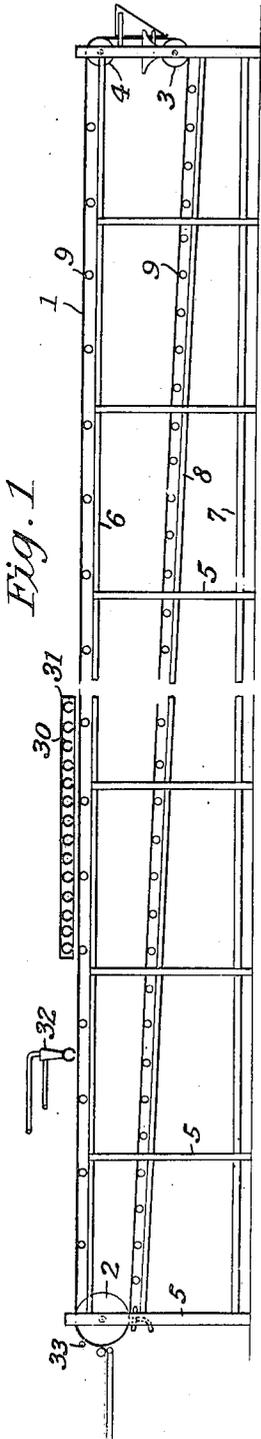
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C. P. OLSON

FILM MAKING MACHINE

Filed Dec. 7, 1921



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UNITED STATES PATENT OFFICE.

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FILM-MAKING MACHINE.

Application filed December 7, 1921. Serial No. 520,487.

To all whom it may concern:

Be it known that I, CARL P. OLSON, a citizen of the United States, residing in the town of Irvington, county of Essex, and State of New Jersey, have invented certain new and useful Improvements in Film-Making Machines, of which the following is a specification.

This invention relates generally to apparatus adapted to form thin films from solutions of nitrocellulose or the like, and particularly to apparatus for the manufacture of imitation metallic film.

It has for its objects the formation of such films as a continuous process at a rapid rate by simplified machinery adaptable to solutions of high or low viscosity.

With the foregoing main objects in view and further lesser objects, supplemental thereto, as hereinafter set forth, my invention consists, broadly stated, in the provision of an endless band constituting the film carrier, which band has an upward run affording a film-forming surface adapted to be coated with solution from a trough, one of whose sides is constituted by the upwardly moving run of the band. My invention further consists in means adapted to move said upward run of the band, together with said trough forming the source of supply of the coating solution so as to angularly displace same relatively to a vertical plane, while maintaining the initial tension of the band and its contact with the trough.

I have found that with certain classes of solutions, under adverse atmospheric conditions, it requires a longer time to dry the formed film than is normally afforded by a revolving surface employed as a film-forming carrier, unless either the speed be so reduced as to become impracticable or the periphery of such surface be of such length as becomes practically prohibitive because of the high cost of a drum adequate for such duty. Such a drum must be of extreme smoothness, without seam, joint or blemish. The ideal material, glass, cannot be produced commercially in drum form of adequate dimensions. A metallic surface is obtainable, but at a prohibitive cost, and is liable to injury. The rapid production of film is handicapped by use of drums of such diameters as are obtainable at reasonable cost. To overcome these difficulties, I have devised an endless metallic band and a novel feed therefor, and means for regulating such feed

in accordance with the atmospheric conditions and the viscosity of the coating solution.

In the accompanying drawings which form a part of this specification, Figure 1 is a view in elevation of a conventionalized apparatus embodying my invention, Figure 2 is a like view of a part thereof, showing the upward run of the band and the tilting means associated therewith. Figure 3 is an end view of the structure of Figure 2. Figure 4 is a view in sectional elevation of a detail of Figure 2, and of the solution supply-trough and parts associated therewith. Figure 5 is a horizontal sectional view of the structure of Figure 4. Figure 6 is a view similar to Figure 1 of the film delivery end of the band.

Like numerals of reference indicate the like parts throughout the several figures, in which 1 is an endless metallic band about thirty inches wide and one hundred twenty-five feet long, on each run, adapted to be driven by the roll 2, which is about four feet in diameter and driven by a suitable motor, not shown. This band passes around the lower roll 3, thence upward and over the upper roll 4. These rolls are each about two feet in diameter. The roll 2 is suitably journaled in a frame consisting of a series of vertical members 5 and two pairs of horizontal members, one pair, 6, at the top, and another, 7, at the bottom, with an intermediate pair, 8, diagonally disposed, suitably cross-braced. The top members, 6, and the intermediate pair, 8, afford bearings for the axles of a series of flanged rolls 9, spaced about six feet apart on the upper run, and three feet apart on the lower run of the band, as shown in Figure 2, adapted to support the horizontal and diagonal runs of the belt, the flanges, 10, of these rolls serving as guides preventing sidewise movement of the belt. The rolls 3 and 4 are journaled in a frame having the arms 11 provided with sleeves 12 pinned to and adapted to rock with the shaft 13. This shaft is supported at its ends in bearings 14 held by bolts and nuts 15, to a bracket 16. This bracket has the slots 17 through which the bolts 15 extend and along which slots the bolts may be moved and set tightly. Each bearing 14 has an upwardly extending arm 18 and a downwardly extending arm 19, and each of these arms has a bolt 20 adapted to extend through

a curved slot 21 formed in an arm 11 and an offset 22 of said arm. The bolts 20 are held by the nuts 23. Mounted on the arms 11 is the backing or guide 24 adapted to hold the belt inflexibly against the open side of the trough 25. This trough is a V-shaped three-sided container, its side next the belt being cut away, the belt forming the fourth side thereto, as shown in Figures 4 and 5. It is suitably supported by bracket arms 26 bolted to the arms 11. The opening between the bottom of the trough and the belt is closed by a felt strip or doctor 27 which extends upward at either edge of the sides of the trough between these sides and the belt, as shown in Figure 5, and indicated as 28. The trough is provided with vertical, removable, partitions 29 adapted to determine the width of the film to be coated upon the band. A source of drying medium is shown in Figure 1, comprising a series of perforated pipes 30 in a suitable housing 31 adapted to supply heated air under pressure to the film. 32 is an injector located about ten feet from the heater and adapted to spray the dried film with a coating of size, as shown in Figure 1. 33 is a source of supply of moisture, such as a perforated pipe, adapted to dampen the film and cause it to contract away from the roll 2, as shown in Figure 2. 34 is a guide roll adapted to change the direction of the film as it peels away from the roll 2 and to deliver it to an endless band conveyor 35. 36 is a steam-fed brush adapted to clean the film-forming surface of the belt.

The method of operation of my machine is as follows: The band is first set in motion, and then, from a source of solution-supply where the desired ingredients are suitably mixed, not here illustrated, the trough is filled, if a full width, i. e., 30 inch, film is to be made, or such part of the trough as the partitions are adjusted to, in case a narrower film is to be made. The backing 24 holds the band against the edges of the trough at bottom and sides, while the band itself is in contact with the solution for the full height thereof in the trough, which level is kept constant by a feed from the said source.

The trough is supported from the arms 11, 11 which carry the rolls, and tilts accordingly with the rolls when these are moved from the vertical position illustrated. In this position, there is attained the maximum drainage of the solution from the band. From this position the rolls may be moved to incline the band and the trough, so that the drainage can be lessened; to effect this, assuming the rolls in vertical relation, as shown in Figures 1, 2 and 4, the bolts 15 are loosened and the bearings 14 are moved to the right along the bracket 16, the bolts 65 being moved therewith along the slots 17.

Moving the bearings 14 to the right, also moves the shaft 13 to which the arms 11, 11 are held by the sleeves 12 pinned to the shaft. As the belt 1 is non-elastic, when the shaft 13 moves to the right, the arms 11, 11 carrying the rolls 3 and 4, rotate on the shaft to compensate for the strain exerted on the rolls. Since the bottom pair of pins 20, 20, carried by the lower pair of arms 19, 19, exert their pressure against the right-hand ends of their slots 21, 21, and tend thereby to move the roll 3 to the right; and since the top pair of pins 20, 20, carried by the upper pair of arms 19, 19, are at the left-hand end of their slots 21, 21, and are free to move therein, the forces impressed on the arms 11, 11, result in tilting the roll supporting frame and its arms. In consequence, as the roll 3 moves to the right, the roll 4 moves to the left. The guide 24 and the trough 25, both being fixed to the frame, tilt therewith, the top of the trough moving to the left and the bottom moving to the right. The limit of their tilted position affords minimum drainage of solution from the belt. Reversal of the motion, i. e., moving the bearings 14 to the left, increases the drainage to the limiting position illustrated as that of the maximum. Intermediate positions afford variations in drainage as desired for variations in thickness of the film. The coating formed is examined, and by inspection of its thinness and texture as it dries, the operator determines its merit or demerit, and adjusts the incline of the belt to vary the thickness of the film, if required. Since the rate of back flow of the coating solution is dependent on the slope of the belt, the amount of material remaining on the belt to form the film is controlled by this adjustment.

The minimum deposit is attained by the vertical disposition of the rolls, and as the belt departs from the vertical, presenting an inclined run to the solution, more solution will adhere. The more viscous the solution, the more nearly vertical is the belt adjustment. The less viscous the solution, the more the inclination to which the belt is set. After the deposited film has travelled approximately seventy feet, at the rate of fifteen feet per minute, the film is subjected to a hot-air blast for about twenty feet of its run, and then is, if it is desired to produce a sized leaf, subjected to a spray from a transverse pipe supplied by an injector fed from a source of compressed air and another source of suitable adhesive solution. After approximately twenty feet of continued travel, the film passes around the driving roll 2, is wetted by a suitable moistening device, contracts away from the band, and is guided to a travelling belt and conveyed to a cutting table or the like.

Having thus described my invention and

the preferred means adapted structurally to embody same, I claim:

1. In a film-forming machine, in combination, an endless metallic band, rotatable supports therefor adapted to move said band in a substantially triangular path whose section lies in a horizontal plane, said path affording an upward run of said band; tilting means associated with a pair of said supports adapted to vary the inclination of said band upon its upward run, and coating means located between said pair of supports and comprising a container for a film-forming solution, said container being adapted to present said solution directly to the film-forming face of said band.

2. In a film-forming machine, in combination, an endless metallic band, means adapted to move said band in a substantially triangular closed path whose section lies in a vertical plane, said path including an upward run; and means adapted to coat said band with a film-forming fluid upon the upward run of the band, said means including a V-shaped trough adapted to contain said film-forming fluid and to maintain same in contact with the film-forming face of said band throughout the depth of said contained fluid.

3. In a film-forming machine, the combination of an endless metallic band, means adapted to move said band in a substantially triangular path, means adapted to coat said band with a film-forming solution upon the upward run of said band, said means including a trough, one of whose sides is closed by said band, and means adapted to vary the inclination of said band upon its upward run.

4. In a film-forming machine, the combination of an endless metallic band adapted to travel in a closed path, said path including an upward run, and means adapted to vary the inclination of the upward run while preserving the tension of the band constant.

5. In a film-forming machine, the combination of an endless metallic band adapted to travel in a closed path, said path including a substantially straight vertical upward run of said band, means adapted to permit said band to coat itself with a film-forming solution upon said upward run, and means adapted to regulate the depth of such coating comprising a tilting container for said solution.

6. In a film-forming machine, the combination of an endless metallic band adapted to travel in a closed path over a plurality of rolls, three of said rolls being adapted to change the direction of the belt, whereby a horizontal run and a vertical run are afforded, two of said rolls being adapted to vary the inclination of the vertical run, a coating means contiguous to the vertical run, and a drying means adjacent said horizontal run.

7. In a film-forming machine, the combination of an endless metallic band adapted to travel in a closed path over a plurality of rolls, three of said rolls being adapted to change the direction of the belt, whereby a horizontal run and a vertical run are afforded, a coating means contiguous to the vertical run, a drying means adjacent said horizontal run, the rolls limiting the vertical run having axes adapted to be relatively displaced while remaining parallel, and means adapted to effect such displacement and to preserve the length of the closed path constant.

8. In a film-forming machine, a feed device consisting of a container for the film-forming solution, said container having an open vertical side adapted to be closed by an upwardly moving band, said band and means adapted to move said band continuously in a closed path and supporting means common to said band and container whereby both may be tilted.

9. In a film-forming machine, the combination of an endless band, means adapted to move said band in a closed path, a pair of rolls adapted to guide said band in an upward direction as a part of said path, and means adapted to vary the relationship of said rolls about a common axis.

10. In a film-forming machine, the combination of a band, means adapted to move said band in a triangular path, one run whereof is horizontal and another run whereof is vertically upward, a coating device adapted to supply a film-forming solution to the upward run, said device consisting of an open-sided container, the edges bordering such open side being in indirect contact with said band, and a guide adapted to maintain said band in said contact with said edges.

11. In a film-forming machine, the combination of a band, means adapted to move said band in a triangular path, one run whereof is horizontal and another run whereof is vertically upward, a coating device adapted to supply a film-forming solution to the upward run, said device consisting of an open-sided container, the edges bordering such open side being in indirect contact with said band, a guide adapted to maintain said band in said contact with said edges, and an interposed packing along the said edges adapted to contact directly with said band.

12. In a film-forming machine, the combination of a band, means adapted to move said band in a triangular path, one run whereof is horizontal and another run whereof is vertically upward, a coating device adapted to supply a film-forming solution to the upward run, said device consisting of an open-sided container, the edges bordering such open side being in indirect contact with said band, a guide adapted to maintain said band in said contact with said edges, and

means adapted to preserve the relative positions of said coating device, band and guide when the inclination of upward travel of said band is varied from the vertical.

5 13. In a film-forming machine, the combination of a band, means adapted to move said band in a triangular path, one run
10 whereof is horizontal and another run whereof is vertically upward, a coating device adapted to supply a film-forming solution to the upward run, said device consisting of an open-sided container, the edges bordering such open side being in indirect contact with
15 said band, a guide adapted to maintain said band in said contact with said edges, means adapted to preserve the relative positions of said coating device, band and guide when the direction of upward travel of said band is varied from the vertical, and means adapted
20 to vary the inclination of upward travel of said band from and to the vertical.

14. In a film-forming machine, the combination of a band, means adapted to move said band in a triangular path, one run

whereof is horizontal and another run where- 25
of is vertically upward, a coating device adapted to supply a film-forming solution to the upward run, said device consisting of an open-sided container, the edges bordering
30 such open side being in indirect contact with said band, a guide adapted to maintain said band in said contact with said edges, means adapted to preserve the relative positions of said coating device, band and guide when the inclination of upward travel of said band
35 is varied from the vertical, and means adapted to vary the inclination of upward travel of said band from and to the vertical, said means comprising a pair of rolls having their axes parallel to and in the same plane
40 with a shaft midway between said rolls, arms mounted upon said shaft, bearings at the ends of said arms, in which bearings the axes of the said rolls are journaled, and means adapted to move said arms through an
45 arc, the axes of the rolls remaining in a plane common to the said shaft.

CARL P. OLSON.