

Sept. 30, 1941.

C. D. KNOWLTON
APPARATUS FOR COATING

2,257,261

Filed Nov. 24, 1939

3 Sheets-Sheet 1

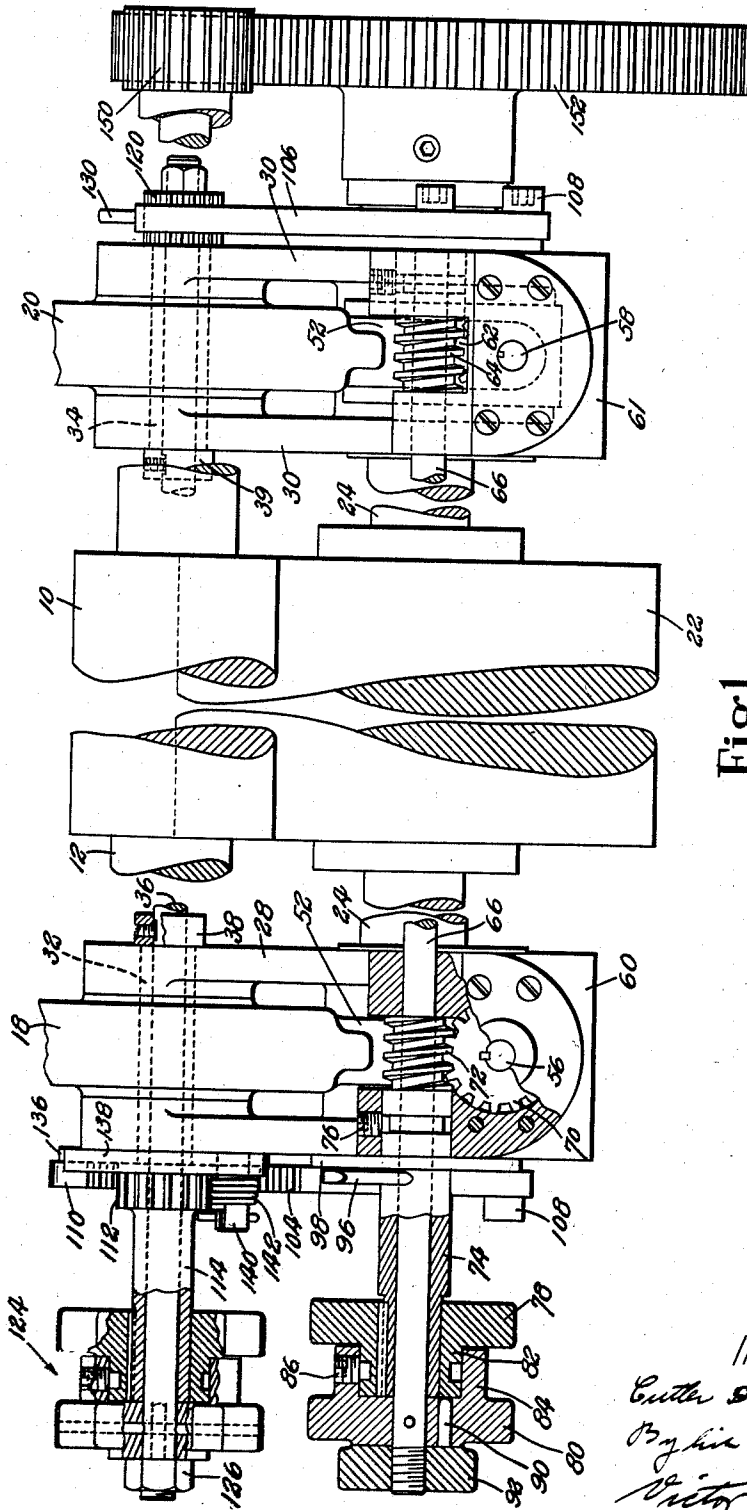


Fig. 1.

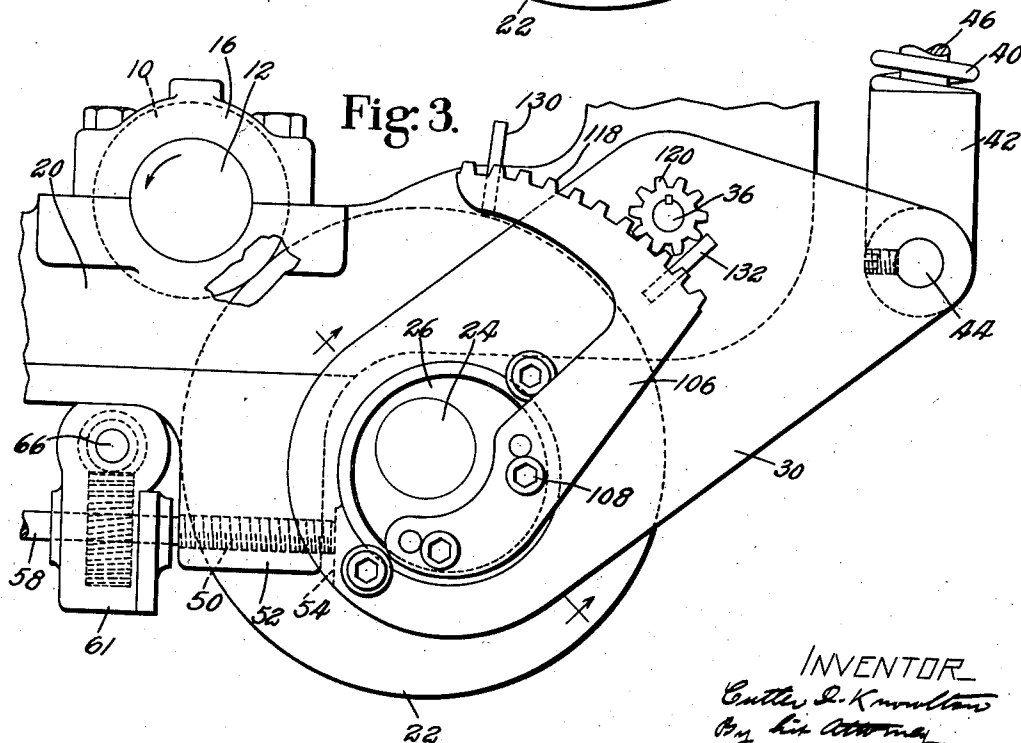
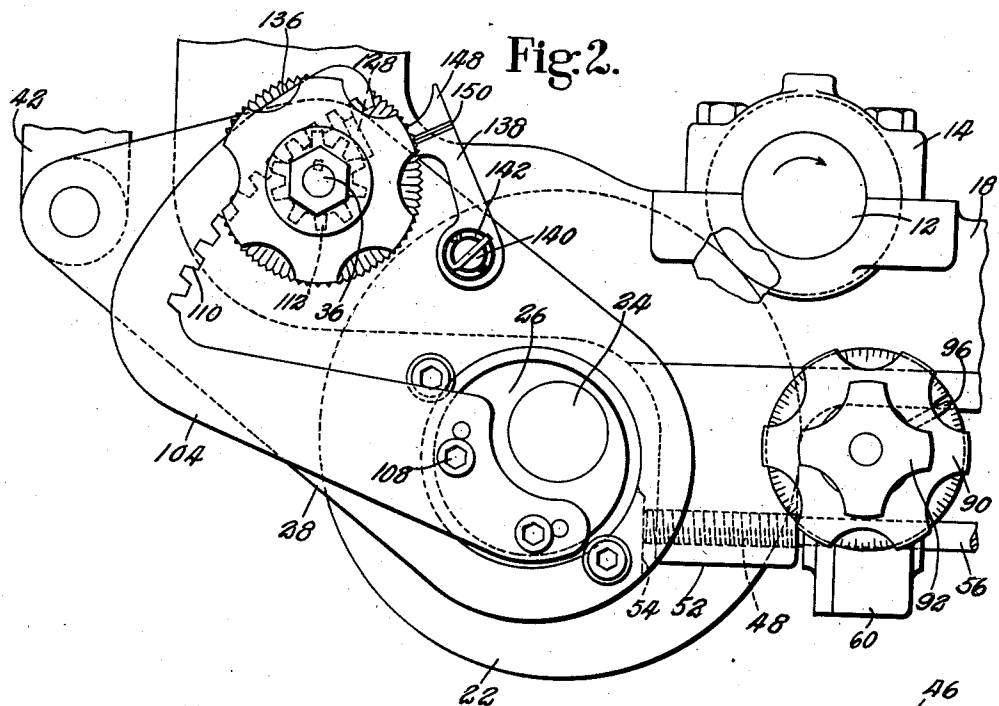
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3 Sheets-Sheet 2



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3 Sheets-Sheet 3

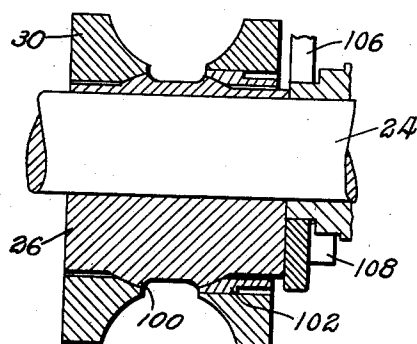


Fig. 4.

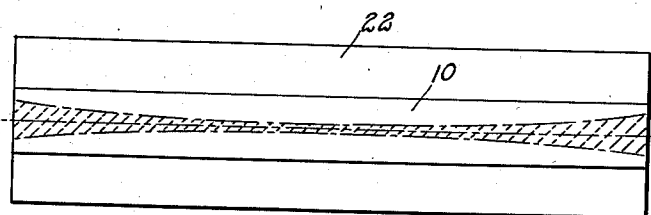


Fig. 5.

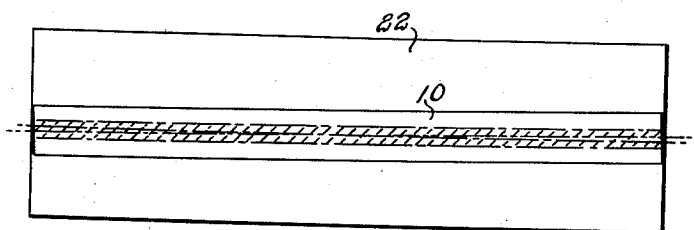


Fig. 6.

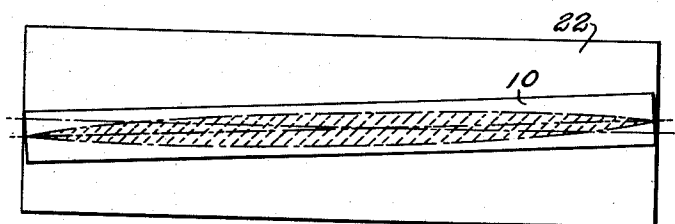


Fig. 7.

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2,257,261

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Application November 24, 1939, Serial No. 305,945

9 Claims. (Cl. 91—50)

This invention relates to coating applying machines such, for example, as machines for applying adhesives to articles from which box blanks are made. One form of machine to which the present invention is applicable is illustrated in Letters Patent of the United States No. 1,988,451, granted January 22, 1935, on application filed in my name.

One of the objects of the present invention is the provision of a machine for applying a uniform thickness of coating material to an object to be coated. A conventional type of machine for applying coating to articles employs a coating supply or pick-up roll which receives coating from a reservoir, the coating being supplied thereby to an applying roll rotating in contact with the supply roll, the material to be coated passing over the applying roll. In the manufacture of blanks from which boxes are to be made, for example, it is desirable to apply a very thin coating of adhesive to the materials to be made into box blanks and, accordingly, the rolls are maintained very close to one another. Pressure is applied to the opposite ends of the rolls to press the adjacent ends close together to produce coating of the desired thickness. The axes of the rolls are usually maintained parallel to one another but with this arrangement there is a tendency for the rolls to bend slightly under the influence of this end pressure. The result of this is that the pressure decreases toward the central portions of the rolls. This bending or bowing of the rolls may be due to a bending of the shafts on which the rolls are mounted and also, if either of the rolls has a peripheral surface of a material such as hard rubber, by the flexibility of this surface. The result of the unequal pressure between the rolls is to cause the transfer of a film of coating material of greater thickness to the central portion of the applying roll than to the ends thereof so that the film of coating material deposited upon the work is not of uniform thickness. While this variation in thickness may be very small, and of the order of a very few thousandths of an inch, the variation is material if the thickness of the coating material is to be only a few thousandths of an inch, as is customary in the application of adhesives to materials used in making box blanks.

One of the features of the present invention is the arrangement of the rolls so that the pressure between the rolls is uniform throughout the lengths thereof whereby a uniform thickness of coating may be transferred to the material being coated. In order to produce this result, the axes

of the rolls are skewed slightly relatively to one another to produce a slight wrapping of the rolls around one another so that the same pressure is exerted between the rolls at all points along the contiguous surfaces thereof. The more the rolls are skewed relatively to one another, the greater is the pressure between the rolls at their mid points relative to that at the ends thereof, and by properly adjusting the relative skewing of the rolls, a uniform pressure along the entire length of the rolls may be obtained to cause a uniform thickness of coating material to be applied to the work.

Another feature of the invention is the provision of means by which either end of one of the rolls may be selectively adjusted with respect to the other roll and, if desired, both ends of one of the rolls may be simultaneously adjusted with respect to the other. To this end, provision is made for connecting the adjusting means for each end of the roll so that they will be operated as a unit when it is desired to adjust both ends of the roll simultaneously.

These and other features of the present invention will now be more particularly described by reference to the accompanying drawings and pointed out in the appended claims.

In the drawings:

Fig. 1 is a front elevation, certain parts being broken away and other parts shown in section, of a portion of one form of machine embodying the principles of the present invention;

Fig. 2 is a left elevation of the mechanism illustrated in Fig. 1;

Fig. 3 is a right elevation of the mechanism illustrated in Fig. 1;

Fig. 4 is a sectional view of one of the eccentric bearings supporting the coating supplying roll;

Fig. 5 is a view illustrating diagrammatically the distribution of pressure between the two rolls when the axes are parallel to one another;

Fig. 6 is a view similar to Fig. 5 but showing the rolls with the axes thereof skewed slightly to one another; and

Fig. 7 is a view similar to Fig. 6 but with the axes of the rolls skewed excessively with respect to each other.

The coating-applying roll 10 is mounted on a shaft 12 supported in bearings 14 and 16 (Figs. 2 and 3) mounted on the fixed arms 18 and 20, respectively, which extend substantially parallel to one another and which form part of the frame work of the machine. The applying roll 10 is formed of any suitable material such as hard rubber and is arranged to receive coating mate-

rial from a supply or pick-up roll 22, a portion of which rotates in a receptacle (not shown) containing the coating material. The supply roll has a relatively hard surface compared to that of the roll 10 and may be made of steel or bronze. The roll 10 transfers the coating material from the roll 22 to the work to be coated which passes over the roll 10.

The roll 22 is mounted on a shaft 24 which is supported at its ends by means of eccentric bearings 26 one of which is illustrated in section in Fig. 4, these bearings being in turn supported by the U-shaped frames 28 and 30. These frames are swingably supported by means of sleeves 32, 34 (Fig. 1) which pass through the arms 18 and 20 rearwardly of the roll supporting shaft 12 and these sleeves form bearing surfaces for a shaft 36, the function of which will appear as the description proceeds. The U-shaped frames 28 and 30 engage the opposite walls of the arms 18 and 20, as indicated in Fig. 1, so that these frames are prevented from moving lengthwise with respect to the rolls 10 and 22. Collars 38 and 39 fixed to the shaft 36 engage the frames 28 and 30 to prevent axial movement of the shaft.

The U-shaped frames 28 and 30 are urged in a clockwise direction, as viewed in Fig. 3, about the shaft 36 by means of springs 40 engaging members 42 secured to a shaft 44 passing through the rear portions of the arms of the U-shaped frames 28 and 30, so as to press the coating supplying roll 22 against the transfer roll 10. The members 42 form enlarged end portions of rods 46 which may be connected with a treadle whereby the supporting frames for the roll 22 may be pivoted against the force of the springs 40 to move the coating supplying roll 22 away from the roll 10 in order to facilitate cleaning. Movement of the frames 28 and 30 under the force exerted by the springs 40 to move the roll 22 toward the roll 10 is limited by adjustable abutments 48 and 50 which are threaded through depending portions 52 of the fixed arms 18 and 20, these depending portions passing between the arms of the U-shaped frame members 28 and 30, as indicated in Fig. 1. The inner ends of the abutments 48 and 50 engage shoulders 54 (Figs. 2 and 3) of the frames 28 and 30. The forward ends of the adjustable abutments 48 and 50 are formed as reduced shank portions 56 and 58 and are journaled in U-shaped housings 60 and 61, respectively, which are fixed to the arms 18 and 20 and extend downwardly therefrom. The reduced portion 58 of the adjustable abutment 50 has keyed thereto within the housing 61 a worm gear 62 which engages a worm 64 mounted on a shaft 66 journaled in the upper portions of the gear housings 60 and 61. The shank portion 56 of the movable abutment 48 carries a worm gear 70 in the housing 60 and this worm gear engages a worm 72 mounted on a sleeve 74 journaled on the left end of the shaft 66 and in one of the arms of the gear housing 60. The right end of the sleeve 74 is formed with an annular groove which receives the reduced end of a screw 76 to prevent axial movement of the sleeve. Upon rotation of the sleeve 74 and the shaft 66 as a unit, the worms carried thereby rotate the worm gears 62 and 70 to cause simultaneous rotation of the abutments 50 and 48 which will in turn move axially since they are threaded in the depending portions 52 of the arms 18 and 20. These abutments move in the same direction so as to move the roll 22 away from the roll 10 or permit movement of the roll 22 toward the roll

10 under the force of the springs 40, depending upon the directions of rotation of the sleeve 74 and shaft 66. Thus, when the sleeve and shaft are rotated simultaneously both ends of the roll 22 are adjusted with respect to the roll 10.

It may some time be desirable to adjust one end of the roll 22 with respect to the roll 10 without similarly adjusting the other end of the roll and, accordingly, provision is made for imparting independent rotation to these members. A knob 78 is keyed to the outer end of the sleeve 74 and a second knob 80 is pinned to the outer end of the shaft 66 which extends outwardly with respect to the sleeve 74. The knob 78 is provided with a cylindrical extension 82 which fits within a cylindrical extension 84 of the knob 80. A screw 86 passes through the cylindrical extension 84 of the knob 80 and the inner end of the screw is reduced and is received in an annular groove in the extension 82 of the knob 78 to prevent relative axial movement of the two knobs. A pin 90 is slidably mounted in a hole in the knob 80, the length of the pin being slightly greater than the thickness of the knob 80. The extreme left end of the shaft 66 is threaded to receive a nut 92 which forces the right end of the pin 90 into engagement with the adjacent surface of the knob 78 when the nut 92 is tightened on the shaft 66. When the nut is thus tightened, sufficient pressure is exerted by the pin 90 on the knob 78 so that the knobs may not be rotated relative to one another whereupon rotation of either knob will cause the shaft 66 and the sleeve 74 to rotate simultaneously. If, however, the nut 92 is loosened so as to relieve the pressure between the pin 90 and the knob 78 either knob may be rotated relative to the other so that either the sleeve 74 or the shaft 66 may be individually rotated to adjust either end of the shaft 24 carrying the roll 22 relative to the other end to vary selectively the pressure between the two rolls at each end thereof, if desired, in order that a coating of varying thickness may be supplied to the roll 10. A pointer 96 carried by the sleeve 74 co-operates with suitable indicia on a plate 98 to indicate the degree of adjustment of the left end of the roll and, if the shaft 66 and sleeve 74 are moved as a unit, of the entire length of the roll.

Referring to Fig. 4, it will be noted that the exterior surface of each of the eccentric bearings 26 has bearing portions 100 formed as segments of a sphere and the arms of the associated frames 28 and 30 have correspondingly formed surfaces to permit rocking movement of the bearings 26 therein. One of the surfaces in the frames 28 and 30 may be formed upon an insert 102 to facilitate manufacture thereof. Outwardly of the bearing surfaces 100, the bearing 26 is substantially cylindrical and these surfaces are spaced from the adjacent surfaces of the U-shaped frame members to permit limited rocking movement of the bearing about an axis extending transversely therethrough. It will be understood that the bearings at both ends of the roll supporting shaft 24 are similarly formed and that the shaft is carried eccentrically thereby. Upon rotation of the bearings 26 simultaneously in opposite directions, the roll 22 is swung about an axis extending perpendicular to the axis of the roll 10, thus causing the roll 22 to be skewed with respect to the roll 10.

In order to enable this simultaneous rotation of the bearings 26 in opposite directions to effect this skewing of the rolls, arms 104 and 106

are connected rigidly to the external surfaces of the bearings, as by screws 108, these arms extending outwardly with respect to the roll 22. The arm 104 connected to the bearing at the left end of the shaft 24 has a portion extending substantially concentric with respect to the roll 22 and teeth 110 are formed on the inner side of the extended portion of the arm, as indicated in Fig. 2. The teeth 110 engage a gear 112 carried by a sleeve 114 (Fig. 1) journaled on the shaft 36. The arm 106 connected to the bearing at the right end of the shaft 24 is also provided with a portion extending substantially concentric to the roll 22 and having teeth 118 (Fig. 3) on the outer side thereof engaging a gear 120 carried by the shaft 36. If the shaft 36 and the sleeve 114 are rotated as a unit, the gears 112 and 120 will be rotated in the same direction and the rotation of these gears will be imparted to the arms 104 and 106 connected to the eccentric bearings 26. Since the teeth on the outer ends of the arms 104, 106 are oppositely disposed with respect to the gears 112 and 120, respectively, rotation of these gears in the same direction will cause the arms and the eccentric bearings to which they are connected to be rotated in opposite directions. In order to cause simultaneous rotation of the shaft 36 and sleeve 114, a knob assembly 124 may be employed, this knob assembly being similar in construction to the knob assembly, including the knobs 78 and 80, for moving the large roll toward and away from the small roll 10. The nut 126 of the assembly 124 will normally be maintained tight against the knob connected to the shaft 36 so that the two knobs will rotate as a unit, but if occasion should arise, the knob 126 may be loosened to permit independent rotation of the shaft 36 and the sleeve 114 and individual adjustment of the eccentric bearings. The spherical outer surfaces of the bearings 26 permit rocking of the bearings with the skewing of the shaft 24, so that the axes of the bearings may remain in alignment at all times.

The outer end of the arm 104 carries a pin 128 (Fig. 2) adapted to engage the gear 112 upon movement of the arm 104 in a counterclockwise direction, and this pin co-operates with the portion of the arm 104 which extends substantially radially from the bearing 26 to limit movement of the arm 104 by the gear 112 which, in turn, limits the rotational movement of the bearing 26. Pins 130 and 132 (Fig. 3) in the arm 106 similarly limit rotational movement of this arm and the bearing to which it is fixed, these pins engaging the gear 120 upon sufficient movement of the arm in one direction or the other.

In order to prevent unintentional rotation of the shaft 36, a disk 136 having a serrated edge is fixed to the shaft 36. A latch 138 is pivoted on a pin 140 mounted in the outer wall of the U-shaped frame 28 and a spring 142 connected to the pin and the latch urges the latch into engagement with the serrated edge of the disk 136. The part of the member 138 which engages the edge of the disk 136 is also serrated so that the latch 138 must be retracted against the tension of the spring 142 to permit rotation of the shaft 36, the latch having a finger piece 148 (Fig. 2) to permit of such retraction. An indicating line 150 cut into the surface of the latch 138 co-operates with indicia on the surface of the disk 136 to indicate the degree to which the rolls are skewed relatively to one another.

Figure 5 is a diagrammatic view indicating

the pressure between the two rolls when the axes are parallel. When pressure is applied to the rolls at the ends thereof to force the rolls together, as by means of the springs 40, there will be a tendency for the rolls to bow at their central portions so that the pressure between the rolls is somewhat greater at the ends thereof than at the central portion, as indicated by the shaded area bounded by the broken lines. This bowing of the rolls (or one of them) upon application of pressure to the ends thereof is caused by reason of the resiliency of the roll shafts and also by reason of the resilient surface of the applying roll 10 which may be formed, as previously stated, of hard rubber. This tendency of the rolls to bow may be very small and of the order of only a few thousandths of an inch but the result of this tendency is for a thicker film of coating substance to be transferred from the supplying roll to the applying roll so that the material being coated will have a somewhat thicker film at the center than at the ends thereof. In many types of work, such as the making of box blanks and the like, the film of glue applied to the materials making up the blanks is generally a very thin layer of the order of a few thousandths of an inch and should be uniform in thickness to secure the best results. Accordingly, this tendency of the rolls or of the applying roll to bow slightly may have an appreciable effect on the thickness of the coating material when applied to the work, particularly when this film is to be only a few thousandths of an inch thick.

If the large roll is skewed slightly relative to the applying roll it will tend to conform to and bear uniformly upon the applying roll thus causing a more uniform pressure between the rolls. The axes of the rolls may be skewed just sufficiently, as indicated diagrammatically in Fig. 6, so that the pressure throughout the lengths of the rolls is uniform, and when properly skewed to create this condition the thickness of film of the coating material supplied to the applying roll will be uniform so that a film of uniform thickness will be supplied to the material being coated. Fig. 7 indicates diagrammatically the pressure between the rolls when the rolls are skewed excessively so that the applying roll tends to wrap around the transfer roll to a greater extent than is desirable. At this time the pressure at the ends of the rolls is considerably less than at the central portions thereof and if the rolls were utilized in this condition the thickness of film applied to the work would be greater at the ends than at the central portions. The desirable condition of the rolls to obtain a film of uniform thickness is obtained by simultaneous rotation of the shaft 36 and sleeve 114 which imparts rotation of the eccentric bearings 26 in opposite directions to swing the roll 22 about an axis passing transversely through the roll and perpendicular to the axis of the roll 10, and when the proper adjustment of the roll has been made, the pressure between the rolls will be uniform throughout the lengths thereof as indicated diagrammatically in Fig. 6.

Gears 150 and 152 on the right ends of the shafts 12 and 24 respectively cause simultaneous rotation of the rolls 10 and 22 in opposite directions upon rotation of either of the gears by any suitable means. The gear 152 has a much larger pitch diameter than that of the gear 150 to impart a higher peripheral speed to the roll 10 than to the roll 22. The rotation of the roll 10 at the higher peripheral speed insures that an excessive

amount of glue will not be delivered to the roll.

Having described my invention, what I claim as new and desire to secure by Letters Patent of the United States is:

1. A coating mechanism comprising a coating-supplying roll, an applying roll receiving coating substance from the supplying roll, and unitary mechanical means for simultaneously adjusting the ends of one of said rolls in opposite directions with respect to the other of said rolls while maintaining equal pressures at the opposite ends of said rolls.

2. A coating mechanism comprising a pair of co-operating rolls, eccentric bearings supporting the ends of one of said rolls, and unitary means for simultaneously rotating said bearings in opposite directions.

3. A coating mechanism comprising a coating-supplying roll, an applying roll receiving coating substance from the supplying roll, eccentric bearings supporting the ends of one of said rolls, an arm rigidly connected to each of said eccentric bearings, said arms having offset portions extending substantially concentrically with respect to said one of said rolls, external gear teeth on the outer surface of the offset portion of one of said arms, internal gear teeth on the offset portion of the other of said arms, gears engaging the gear teeth on said arms, and means for simultaneously rotating said gears in the same direction whereby the eccentric bearings supporting said one of said rolls are rotated in opposite directions.

4. A coating mechanism comprising a coating-supplying roll, an applying roll receiving coating substance from the supplying roll, eccentric bearings supporting the ends of one of said rolls, means rotatably supporting said eccentric bearings, the surfaces between each of said bearings and its supporting means being formed as segments of a sphere, and unitary means for simultaneously rotating said eccentric bearings in opposite directions.

5. A coating mechanism comprising a coating-supplying roll, an applying roll receiving coating substance from the supplying roll, eccentric bearings supporting the ends of one of said rolls, means for simultaneously rotating said bearings in opposite directions, and means rendering said

last-named means ineffective to rotate simultaneously said bearings, whereby either of said bearings may be individually rotated.

6. A coating mechanism comprising a coating-supplying roll, an applying roll receiving coating substance from the supplying roll, means for individually adjusting each end of one of said rolls with respect to the other roll, and mechanical means connecting said adjusting means whereby adjustment of one end of said one of said rolls will cause a simultaneous adjustment of the other end of said roll in the opposite direction.

7. A coating mechanism comprising a coating-supplying roll, an applying roll receiving coating substance from the supplying roll, a rotatable sleeve, means connecting said sleeve to one end of one of said rolls to cause adjustment of said end of said roll relative to said other roll upon rotation of said sleeve, a shaft in said sleeve and operatively connected to the other end of said one of said rolls for causing adjustment of the other end thereof with respect to the other roll upon rotation of said shaft, means for individually rotating said shaft and said sleeve, and means rendering said last-named means ineffective to cause individual rotation of said shaft and said sleeve while permitting simultaneous rotation thereof.

8. A coating mechanism comprising a coating-supplying roll, an applying roll receiving coating substance from the supplying roll, unitary mechanical means for simultaneously adjusting the ends of one of said rolls about a transverse axis extending substantially through the center of said roll, said axis being perpendicular to the axis of the other of said rolls, and means for indicating the angularity between the axes of said rolls.

9. A coating mechanism comprising a coating-supplying roll, an applying roll receiving coating substance from the supplying roll, unitary mechanical means for simultaneously adjusting the ends of one of said rolls oppositely with respect to the other of said rolls while maintaining equal pressures between the adjacent ends of said rolls, and means for limiting the amount of such adjustment of said one of said rolls with respect to the other of said rolls.

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