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E. H. BRUNNER ET AL

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MECHANISM FOR REMOVING CURLING IN BLANKS

Filed Jan. 27, 1932

2 Sheets-Sheet 1

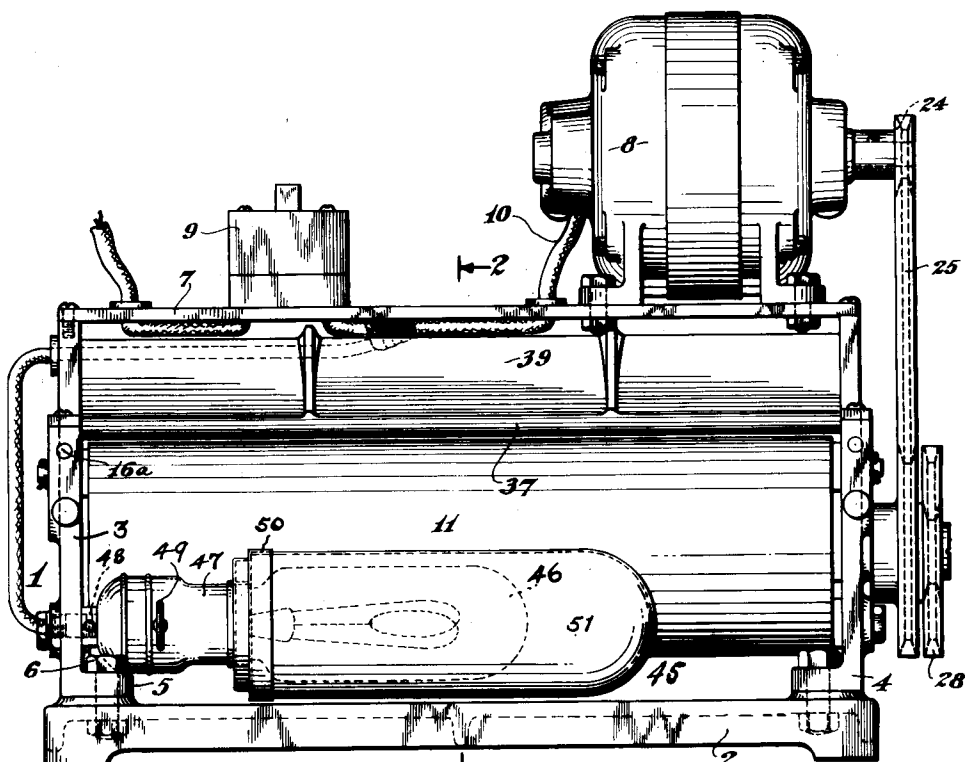


Fig. 1

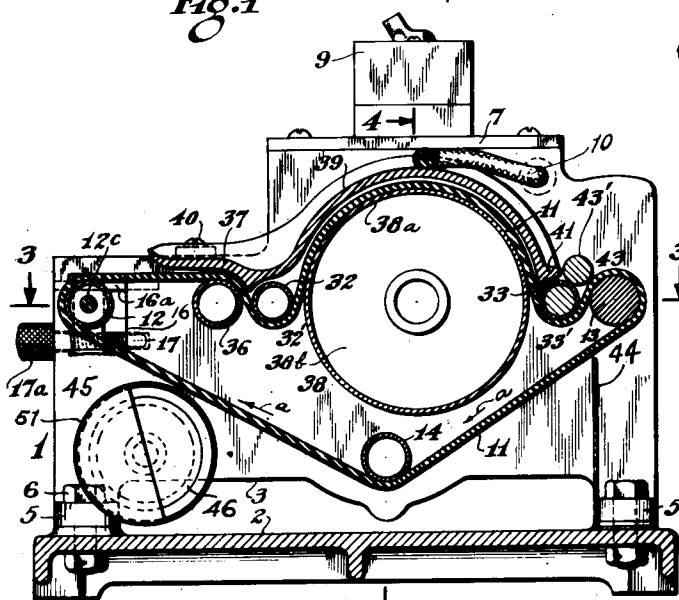


Fig. 2

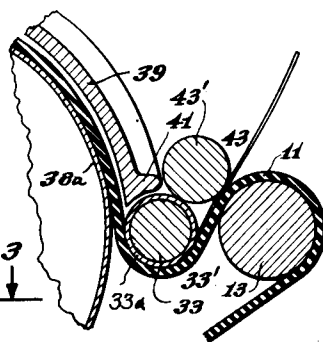
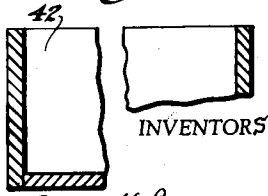


Fig. 2a



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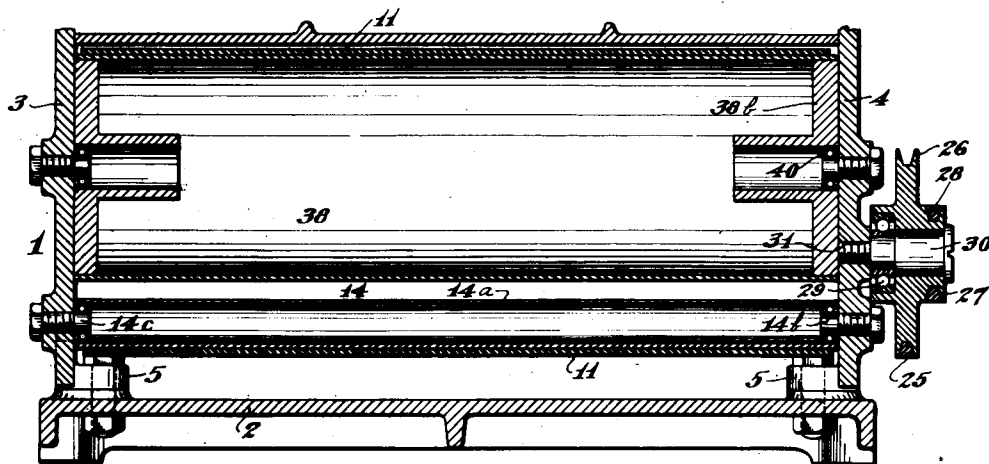
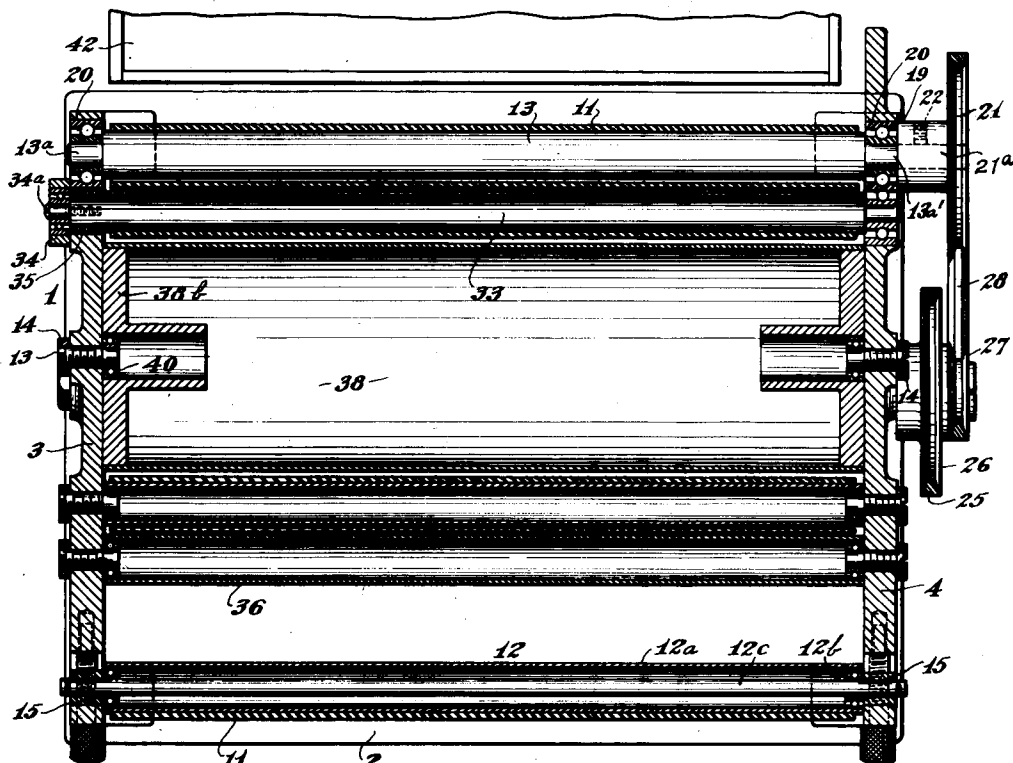
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MECHANISM FOR REMOVING CURLING IN BLANKS

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2 Sheets-Sheet 2



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MECHANISM FOR REMOVING CURLING
IN BLANKS

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15 Claims. (Cl. 92—70)

This invention relates to a mechanism for operating on blanks formed of cellulose materials to remove therefrom curling or the natural or normal tendency of the blanks to curl, due to one or more of the following reasons, to wit, dampness, atmospheric conditions, surface coatings, differences in rate of contraction of the blanks and coatings or treatment of the blanks for any purpose, whereby the blanks may be laid on a supporting surface, readily handled, stacked, wrapped or stored. The mechanism herein disclosed has been advantageously used for removing the curl in photographic prints, after the same have been developed and dried. The operations involve reversely curling each blank, that is, subjecting it to folding or rolling passes curved oppositely to its normal curling tendency, so that the resultant stresses of or in the materials constituting each blank will be equalized and thus permit it to lie substantially flat. The operation involved may be referred to as straightening or flattening, but in the practical operation of the mechanism, the blanks are or may be delivered from the mechanism in the slightly reversed curled condition, so that when they are laid on a flat surface, stacked or wrapped they will assume a permanent substantially flat condition.

One object of the invention is to provide a mechanism of this type in which the blanks may be subjected to a plurality of passes to curl them reversely to the direction of their normal curl, whereby any tendency of the material or influence therein by reason of atmospheric conditions, prior treatment or surface coatings to curl, is eliminated.

Another object of the invention is to provide a mechanism of this type having a plurality of successive passes in which the blank is flexed or curled in opposite directions alternately, the terminal or final pass serving to curl the blank reversely to its original normal curling tendency, whereby unequal tension of the fibers of the blank and surface coatings thereon are broken down or eliminated.

Another object of the invention is to provide means for reducing or eliminating the accumulation on the surfaces of the blanks of charges of static electricity, whereby the blanks may be delivered from the mechanism in a uniform manner.

Another object of the invention is to provide, in a mechanism of the type referred to, means for regulating the curling action and for aiding the delivery of the blanks from the terminal or final curling pass.

Another object of the invention is to provide improved means for softening the surface of any coating on the blank to prevent cracking of the coating during flattening or reversely curling of the blank.

A further object of the invention is to provide a mechanism of the class referred to that is relatively simple and compact, readily assembled and operated.

Other objects of the invention will be apparent to those skilled in the art to which our invention relates from the following description taken in connection with the accompanying drawings, wherein

Fig. 1 is a front elevation of a mechanism embodying our invention.

Fig. 2 is a section on the line 2—2 of Fig. 1.

Fig. 2a is a fragmentary view of parts shown in Fig. 2, enlarged, and showing a blank being delivered.

Fig. 3 is a section on the line 3—3 of Fig. 2.

Fig. 4 is a section on the line 4—4 of Fig. 2.

In the drawings, 1 indicates an entirety a frame preferably comprising a bottom member 2 and spaced vertical side walls 3, 4. These parts may comprise suitable castings. By preference each of the walls 3, 4, is provided with inturned lugs 5, which are secured to the base 2 by bolts 6. The central portions of the side walls 3, 4, are extended upwardly and support the opposite ends of a plate 7, which forms a base for an electric motor 8, where the blank moving means are to be power operated. 9 indicates a suitable switch also mounted on the plate 7 and controlling the supply of current through leads (one being shown at 10) to the motor 8.

11 indicates an endless belt or band formed of resilient, elastic material, such as rubber. By using a rubber belt, all portions of the belt maintain substantially the same tension, the belt compensates for slight disalignment of the rolls and unequal stretching throughout its length. 12, 13, indicate guide rolls for the belt 11, preferably disposed in substantially a horizontal plane, and mounted on the side walls 3, 4, adjacent their front and rear ends, respectively. As later set forth the shaft 13 is driven to drive the belt in the direction of the arrows *a* as shown in Fig. 2. 14 indicates an intermediate guide roll for the lower run of the belt mounted at its opposite ends in the side walls 3, 4, adjacent their lower horizontal edges, so as to guide the belt downwardly below and under the curling elements to be later referred to.

The roll 12 preferably comprises a hollow

cylinder 12a mounted at its ends on anti-friction bearings 12b, the inner races of the latter being supported on a shaft 12c. The opposite ends of the shaft 12c extend through openings formed in blocks 15. The blocks 15 slidably fit the lower walls of openings 16 formed in the side walls 3, 4, and pins 16a mounted in the upper portion of the openings whereby the shaft 12c may be adjusted to maintain the belt taut and under the desired tension. Each block 15 is adjusted by a rotatable rod 17 extending through an opening formed in the marginal portion of the adjacent side wall and having bearing at its inner end in the side wall inwardly of the opening 16. The intermediate portion of the screw is threaded through an opening formed in the block so as to move the latter outwardly or inwardly when the screw is turned in the proper direction. The outer ends of the rods 17 have heads 17a which engage the ends of the side wall and hold the blocks 15 in opposition to the tension of the belt 11. Due to the tension of the belt and engagement of the heads 17a with the side walls, adjustment is effected by rotating the rods 17.

The roll 13 comprises a shaft having reduced ends 13a, 13a', supported by anti-friction bearings 19 suitably seated in openings 20 formed in the side walls 3, 4. The reduced end 13a' is extended and carries at its outer end a driving element 21. The driving element is provided with a hub 21a which is secured to the shaft end 13a' by a set screw 22.

The roll 14 preferably comprises a hollow cylinder 14a mounted at its ends on anti-friction bearings 14b, the inner races of which are supported on stud shafts 14c extending inwardly from the side walls 3, 4. Each stud shaft consists of a bolt threaded through an opening formed in the adjacent wall, the inner end of the bolt being reduced and fitting into and through the inner race of the bearing.

The element 21 preferably comprises a pulley driven in the following manner: 24 indicates a pulley fixed to the shaft of the motor 8. 25 indicates a belt running over the pulley 24 and a pulley 26. 27 indicates a pulley preferably formed integrally with the pulley 26. 28 indicates a belt running around the pulley 27 and the pulley 21, whereby the latter is driven. The hub for the pulleys 26, 27, is provided on its inner end with a recess to receive an anti-friction bearing 29, the inner race of which is mounted on a stud shaft 30. The stud shaft 30 is provided with a reduced threaded inner end which is screwed into a threaded opening 31 formed in the adjacent side wall 4 to support the shaft thereon. The intermediate portion of the shaft is reduced to fit into the inner bearing race and to form a shoulder to engage therewith and clamp it against the wall 4. The outer end of the shaft 30 is enlarged to overlap the outer wall of the pulley hub. As will be understood from the drawings, the pulleys 24, 26, 27 and 21 have predetermined ratios to effect the desired reduction in the speed of the shaft 13.

32, 33, indicate spaced rolls arranged between the guide rolls 12, 13, and co-operating with the belt 11 to form a preliminary pass 32' and a terminal or final pass 33' for reversely curling, folding or flexing each blank. Each pass is made by feeding or delivering a blank (as later set forth) between the belt 11 and adjacent roll so that as the belt moves around the roll the blank is curled about the axis of the roll. The roll 32 may be constructed and mounted simi-

larly to the roll 14. The roll 33 may also be constructed and mounted similarly to the roll 14, but to permit its removal in a ready manner, the roll 33 preferably consists of a solid cylinder having an outer surface which may be formed of relatively soft rubber 33a, for a purpose later explained. The opposite ends of the cylinder are reduced, one end being mounted in anti-friction bearings carried by the wall 4 and its opposite end being mounted in anti-friction bearings provided in a plate 34 which is removably secured to the outer face of the wall 3 by upper and lower screws 34a (only one being shown). By removing the plate 34, the roll 33 may be removed endwise through an opening 35 formed in the wall 3. The roll 33 is removable to permit the substitution of a roll of a different diameter to regulate curling. The rubber surface is provided to prevent cracking of any surface coating on the blanks. The roll 33 may be solid or provided with a sleeve (as shown) formed of the desired material. If desired, the roll 32 may be mounted similarly to the roll 33.

36 indicates a roll forming a guide for the belt 11 and co-operating with a guide wall 37 to (a) iron or smooth each blank in the direction of its normal curling tendency prior to its delivery to the preliminary pass and (b) guide each blank to the preliminary pass 32'. The roll 36 is preferably constructed and mounted similarly to the rolls 14 and 32 and is arranged relatively close to the latter and in the plane of the guide rolls 12 and 13, so that in cooperation with the guide 37 each blank is carried around a portion of the roll 36 to insure ironing and smoothing thereof. The roll 36 is spaced from the roll 12 to provide between it and the roll 12 a horizontal run 11a for the belt 11, so that the blanks may be laid thereon for feeding to the guide wall 37. As shown in Fig. 2, the guide wall has an inner portion concentric to the roll 36, but spaced from the belt 11 to admit the blank between the belt and guide. The guide 37 serves to hold the blank in engagement with the belt, to smooth the blank as it is carried around the roll 36 and to guide the blank to the pass 32'. The outer portion of the guide 37 is disposed in spaced parallel relation to the run 11a, its free end being curved upwardly to form a throat for each blank.

Each blank is placed on the run 11a with its curled up surface opposed to the belt and the latter carries the blank into guiding relation to the guide 37.

As shown in Fig. 2, the belt 11 travels from the roll 12 to the roll 36, which guides it to the lower side of the pass roll 32. The guide 37 guides the blank around the roll 36 and downwardly, so that it is fed in between the belt and roll 32 and around the latter to make the first or preliminary pass, the effect of which is to reversely curl or flex the blank without cracking or damaging it or any surface coating thereon.

38 indicates as an entirety means for flexing the blanks oppositely to the direction of curling or flexing imparted to them by the pass 32' and for guiding the blanks to the pass 33'. The flexing means 38 comprise a relatively large drum or roll 38' arranged between the passes 32', 33', and over which the belt 11 runs from the roll 32 to the roll 33 and a stationary guide 39 disposed concentrically to the drum and extending in spaced relation to the belt substantially throughout that portion of the drum engaged by the belt. The front end of the guide 39 is preferably formed integrally with the guide 37, both guides con-

stituting a single casting fixed to the side walls by screws 40. The rear end of the casting may be provided with a lug secured to one of the side walls. The rear terminating end of the guide 39 is provided with a rib 41 which prevents the blanks from being carried around with the roll 33 due to charges of static electricity thereon.

The drum 38 preferably comprises a hollow sheet metal cylinder 38a having neads 38b fitted and secured in its ends in any desired manner. The heads 38b are formed with axial openings to receive suitable antifriction bearings 40 which are mounted similarly to the bearings for the rolls 14, 32 and 36.

By making the drum relatively large the blanks are conducted or carried from the preliminary pass 32' to the terminal or final pass 33' in a simple manner, the arrangement of the guide rolls 12, 13, and pass rolls 36, 32, 33 is simplified and the lower or return run of the belt is provided for by a single guide roll 14. Such construction also provides for compactness and relatively small over-all dimensions in height and length of the mechanism.

In operation of the mechanism, each blank is placed on the run 11a, with its curled up face downwardly. From this feeding station the blank is carried first around the roll 36 and in engagement with the guide 37, which tends to smooth out the blank; next, the blank is carried to and curled around the roll 32 which gives it a preliminary reverse curl; next, the blank is carried around the drum 38 in engagement with the guide 39, the co-operative relation of which flexes the blank in the direction of its normal curl or normal curling tendency; next, the blank is carried to and around the roll 33, which gives it a final reverse curl, the blank being discharged by the belt 11 and allowed to fall into a receiver 42.

From the foregoing description it will be seen that each blank is given a preliminary reverse curl and a final reverse curl to insure straightening and permanent set of the blank to enable its handling, resting or mounting on flat surfaces, mounting or attachment in albums, wrapping and storing. It will also be seen that in the disclosed construction, which is the preferred one, the blank is alternately curled or flexed in opposite directions, the effect of which is to break down unequal stresses in the fibers, coating on the blank or between the coating and blank so that tendency of the blank to curl is eliminated.

It will also be seen that the rolls 36, 32, 33 and 13 are co-operatively arranged to guide the belt one from another, without intermediate guides between them, at the same time the belt 11 makes substantially a half turn on the rolls 32, 33, to insure the necessary reverse curling action on the blanks. This arrangement serves to reduce the number of parts to a minimum.

43 indicates an auxiliary means associated with the roll 33 and belt 11, which is shown herein in a form whereby it is capable of performing three functions, namely,—(1) effecting discharge of static electricity, which due to friction between the blanks and guides or the belt, may accumulate on the blanks and thus prevent their uniform discharge from the final pass or belt 11, (2) of guiding the blanks from the pass 33' outwardly and (3) regulating or controlling the degree of reverse curl as each blank leaves the final pass 33'.

The auxiliary device 43 preferably comprises a metallic roll 43', having a length substantially equal to the width of the belt 11, and removably

resting by its own weight on the roll 33 and adjacent portion of the belt 11 as it runs around the driven guide roll 13. In this position, the roll 43' contacts with each blank as it leaves the roll 33 and neutralizes or causes the discharge of any electric charge thereon, so that tendency of the blank to be attracted to adjacent portions of the frame or mechanism is relieved. The position of the roll 43' also enables it to direct the blanks outwardly to insure their delivery into the receiver 42.

While the correlated rolls have a predetermined relation, the resulting curl imparted to the blanks when passed through the mechanism will depend upon atmospheric conditions, so that on days having a dry atmosphere the resulting curl of the blanks is greater than on days when the atmosphere is damp. To control or regulate the curling of the blanks under these variable conditions we provide rolls 43' having different diameters any one of which may be positioned as shown in Fig. 2 to compensate for atmospheric conditions. It will be noted that a roll 43' of relatively small diameter will engage the roll 33 and belt 11 nearer to the plane cutting the axes of the rolls 33 and 13 than a roll having a relatively large diameter, so that contact of a roll 43' of large diameter with the blank will be at a greater distance from the point of tangency at which the belt leaves the roll 33 as compared to a roll 43' of smaller diameter. Accordingly, reverse curling effect is reduced by increasing the diameter of the roll 43', so that by a substitution of the roll 43', varying degrees of reverse curvature may be secured or such curvature may be regulated to compensate for atmospheric action.

The mechanism herein disclosed has been successfully used by us for straightening photographic prints, which have a coating on one surface, but in the use of the term "blank" herein we comprehend sheets, cards and the like which are coated, devoid of coatings or which may be treated or conditioned for purposes other than for photographic use. The side walls 3, 4, may be spaced any desired distance to increase the capacity of the mechanism. By preference, the several rolls are supported so that their peripheries may occupy substantially the entire space between the walls, 3, 4, thereby providing a belt of maximum width; also, anti-friction bearings for supporting the pulley hub and rolls may be of a type to take end thrusts.

44 indicates a guard disposed below the return run of the belt 11 adjacent its discharge end. The guard 44 consists of a vertical sheet metal wall having on its lower edge lateral wings which are secured to the base 2 by the feet 7.

45 indicates as an entirety means for applying heat to the blanks to prevent cracking of any coating thereon during straightening. Such heating means have been found to be particularly applicable for use for straightening blanks, one surface of which has a coating of emulsion, for example photographic prints, and by reason of atmospheric conditions—that is, where the atmosphere is substantially dry—the coating has become brittle.

Instead of applying water or vapor to the print or either surface thereof, we have discovered that by applying a limited amount of heat to the surface of the emulsion on each blank, such surface may be softened sufficiently to prevent cracking thereof, as the print makes the passes already described, without affecting the appearance of the picture or view fixed in the emulsion.

The heat is preferably applied to the driven belt 11, which absorbs the heat and in turn applies it to the emulsion surface by contact of such surface with the belt, as the latter conveys the print through the mechanism. It will thus be seen that the heat is applied indirectly to the coating of emulsion on each print, which method provides a simplified form of construction since the prints or blanks are delivered to the endless belt and move therewith with their coated faces thereon.

In the preferred arrangement we mount the heating means 45 above the bottom member 2 and below the return run of the belt 11 adjacent the receiving end and apply the heat radiating from such means to the belt 11. As the belt is driven, all portions thereof become heated uniformly and the belt in turn transmits heat to the rollers 32 and 33, and other parts, so that heat is applied to both surfaces of the blank. In practical operation of machines of the construction shown in the accompanying drawings, the application of the heat to the coated blank as just described has no effect upon the appearance of the picture in the coat on the blank and insures straightening thereof without danger of cracking of the coating. The heating means preferably comprises an electrical heating unit, such as a lamp bulb 46, which may have a carbon filament. The plug 30 of the bulb 46 is mounted in a socket 47, which is secured to a nipple 48 threaded through the wall 3. The leads for the lamp bulb are connected to the lead cable 10, so that the switch 9 will supply current to it and the motor. The bulb 35 is independently controlled by the switch key 49. The socket 47 supports a collar 50 having a reflector 51 to direct the radiant heat toward the belt. The heating means may be applied to the entire belt 11 by a plurality of heating elements or a single element, but in practical use we have found that a single unit disposed substantially centrally and extending transversely across a large area of the belt will provide ample heat to soften the surface of the emulsion on each print without changing, altering or affecting the view fixed therein.

By applying the heat to a material which is non-hygroscopic and capable of absorbing heat units, and moving such material past the heat source, the heat is uniformly distributed therein. As all heat absorbed by the rolls is derived by contact with the belt, it will be seen that there is but slight difference in temperature, if any, between any of the parts. The collar 50 is removable from the socket 47 and it is also rotatable thereon to permit of adjustment of the deflector 51.

To those skilled in the art to which our invention relates, many changes in construction and widely differing embodiments and applications of the invention will suggest themselves without departing from the spirit and scope of the invention. Our disclosures and the description herein are purely illustrative and not intended to be in any sense limiting.

What we claim is:

1. In a machine for straightening blanks provided with a coated surface, the combination of a plurality of spaced passes arranged to curl blanks in the same direction, said passes comprising pairs of related rolls and an endless belt engaging therewith, and means between said passes for flexing the blanks in the opposite direction, said means comprising a relatively large roll over which said belt travels and a stationary guide extending concentrically to said belt.

2. In mechanism for straightening blanks provided with a coated surface, the combination of an endless belt, front and rear guide rolls for said belt, spaced rolls arranged between said guide rolls and around which said belt runs and respectively co-operating with said guide rolls to give blanks a preliminary curl and a final curl in the same direction, means for guiding the belt and blank to each said curling roll, and means associated with the final curling roll and adjacent guide roll for engaging each blank as it is delivered from said curling roll for modifying the curl imparted to the blanks by said final curling roll.

3. In mechanism for straightening blanks provided with a coated surface, the combination of an endless belt, front and rear guide rolls for said belt, spaced rolls arranged between said guide rolls and around which said belt runs and respectively co-operating with said guide rolls to give blanks a preliminary curl and a final curl in the same direction, means for guiding the belt and blank to each said curling roll, and a changeable device removably engaging with the final curling roll and belt as it is guided to the adjacent guide roll and arranged to engage each blank as it is delivered from said curling roll for modifying the curl imparted to the blanks by said final curling roll.

4. In mechanism for straightening blanks provided with a coated surface, the combination of an endless belt, front and rear guide rolls for said belt, spaced rolls arranged between said guide rolls and around which said belt runs and respectively co-operating with said guide rolls to give blanks a preliminary curl and a final curl in the same direction, means for guiding the belt and blank to each said curling roll, and a metallic roll resting on the final curling roll and belt as it is guided to the adjacent guide roll and rotated by said curling roll and belt and arranged to engage each blank as it is delivered from said curling roll for dissipating electrical charges generated on the blanks during curling thereof.

5. In mechanism for straightening blanks provided with a coated surface, the combination of spaced pairs of co-operating rolls and an endless belt engaging therewith and adapted to convey blanks successively to said pairs of rolls to curl them reversely to their normal curling tendency and to discharge them from the last pair of rolls, and means associated with the last pair of rolls for neutralizing electric charges on the blanks.

6. In a machine for straightening blanks provided with a coated surface, the combination of front and rear guide rolls disposed in spaced relation, a co-operating roll disposed adjacent each of said guide rolls, related guide devices between the last mentioned rolls, an endless belt engaging said front guide roll, the adjacent co-operating roll, one of said guide devices, the other co-operating roll and said rear guide roll and arranged to convey the blanks first around said co-operating roll adjacent said front guide roll, then relative to said guide devices and finally around the other co-operating roll, and means for driving said belt, said co-operating rolls and belt serving to curl the blanks reversely to their normal curling tendency.

7. In a machine for straightening blanks provided with a coated surface, the combination of front and rear guide rolls disposed in spaced relation, a co-operating roll disposed adjacent each of said guide rolls, related guide devices between

the last mentioned rolls, an endless belt engaging said front guide roll, the adjacent co-operating roll, one of said guide devices, the other co-operating roll and said rear guide roll, and arranged to convey the blanks first around the co-operating roll adjacent said front guide, then relative to said guide devices and finally around the other co-operating roll, means for driving said belt, and a roll engaging the last referred to co-operating roll and adjacent portion of the belt and arranged to engage said blank as it disengages said co-operating roll.

8. In a machine for straightening blanks provided with a coated surface, the combination of front and rear guide rolls disposed in spaced relation, a co-operating roll disposed adjacent each of said guide rolls, related guide devices between the last mentioned rolls, an endless belt engaging said front guide roll, the adjacent co-operating roll, one of said guide devices, the other co-operating roll and said rear guide roll and arranged to convey the blanks first around said co-operating roll adjacent said front guide roll, then relative to said guide devices and finally around the other co-operating roll, said co-operating rolls and belt serving to curl the blanks reversely to their normal curling tendency, means for driving said belt, and means co-operating with the rear guide roll and the adjacent co-operating roll for regulating the curl of the blanks effected by said co-operating roll.

9. In a machine for straightening blanks provided with a coated surface, the combination of front and rear guide rolls disposed in spaced relation, a co-operating roll disposed adjacent each of said guide rolls, related guide devices between the last mentioned rolls, an endless belt engaging said front guide roll, the adjacent co-operating roll, one of said guide devices, the other co-operating roll and said rear guide roll and arranged to convey the blanks first around said co-operating roll adjacent said front guide roll, then relative to said guide devices and finally around the other co-operating roll, said co-operating rolls and belt serving to curl the blanks reversely to their normal curling tendency, means for driving said belt, and means operating without impregnating the blanks or the coat thereon with moisture to prevent cracking of the coated surface on each blank as it is conveyed by said belt.

10. In a machine for straightening blanks provided with a coated surface, the combination of front and rear guide rolls disposed in spaced relation, a co-operating roll disposed adjacent each of said guide rolls, related guide devices between the last mentioned rolls, an endless belt engaging said front guide roll, the adjacent co-operating roll, one of said guide devices, the other co-operating roll and said rear guide roll and arranged to convey the blanks first around said co-operating roll adjacent said front guide roll, then relative to said guide devices and finally around the other co-operating roll, said co-operating rolls and belt serving to curl the blanks reversely to their normal curling tendency, means for driving said belt, and means for preventing cracking of the coated surface on each blank as it is conveyed by said belt, the last said means comprising a source of heat supply arranged to heat said belt while being driven.

11. In a machine for straightening blanks provided with a coated surface, the combination of front and rear guide rolls disposed in spaced

relation, a co-operating roll disposed adjacent each of said guide rolls, related guide devices between the last mentioned rolls, an endless belt engaging said front guide roll, the adjacent co-operating roll, one of said guide devices, the other co-operating roll and said rear guide roll and arranged to convey the blanks first around said co-operating roll adjacent said front guide roll, then relative to said guide devices and finally around the other co-operating roll, and means for driving said belt, said co-operating rolls and belt serving to curl the blanks reversely to their normal curling tendency and said related guide devices comprising spaced, concentrically disposed curvilinear walls arranged to curl the blanks in a direction opposite to the curling effected by the co-operating rolls.

12. In a machine for straightening blanks provided with a coated surface, the combination of front and rear guide rolls disposed in spaced relation, a co-operating roll disposed adjacent each of said guide rolls, related guide devices between the last mentioned rolls, an endless belt engaging said front guide roll, the adjacent co-operating roll, one of said guide devices, the other co-operating roll and said rear guide roll and arranged to convey the blanks first around said co-operating roll adjacent said front guide roll, then relative to said guide devices and finally around the other co-operating roll, and means for driving said belt, said co-operating rolls and belt serving to curl the blanks reversely to their normal curling tendency, said related guide devices consisting of a drum around which the belt travels and a stationary, curvilinear wall disposed concentrically to the periphery of said drum, said drum and wall co-operating, as the blanks are conveyed by said belt, to curl them in a direction opposite to the curling effected by said co-operating rolls.

13. In a machine for straightening blanks provided with a coated surface, the combination of front and rear guide rolls disposed in spaced relation, a co-operating roll disposed adjacent each of said guide rolls, related guide devices between the last mentioned rolls, an endless belt engaging said front guide roll, the adjacent co-operating roll, one of said guide devices, the other co-operating roll and said rear guide roll and arranged to convey the blanks first around said co-operating roll adjacent said front guide roll, then relative to said guide devices and finally around the other co-operating roll, and means for driving said belt, said co-operating rolls and belt serving to curl the blanks reversely to their normal curling tendency, said related guide devices comprising spaced, concentrically disposed curvilinear walls struck on radii greater than the radii of said co-operating rolls and arranged to curl the blanks in a direction opposite to the direction of curling effected by said co-operating rolls.

14. In a machine for straightening blanks provided with a coated surface, the combination of front and rear guide rolls disposed in spaced relation, a co-operating roll disposed adjacent each of said guide rolls, related guide devices between the last mentioned rolls, an endless belt formed of elastic non-hygroscopic material engaging said front guide roll, the adjacent co-operating roll, one of said guide devices, the other co-operating roll and said rear guide roll and arranged to convey the blanks first around said co-operating roll adjacent said front guide roll, then relative to said guide devices and finally around the other

co-operating roll, and means for driving said belt, said co-operating rolls and belt serving to curl the blanks reversely to their normal curling tendency.

5 15. In a machine for straighten blanks provided with a coated surface, the combination of front and rear guide rolls disposed in spaced relation, a co-operating roll disposed adjacent
10 each of said guide rolls, related guide devices between the last mentioned rolls, an endless belt formed of elastic, non-hydrosopic material engaging said front guide roll, the adjacent co-

operating roll, one of said guide devices, the other co-operating roll and said rear guide roll and arranged to convey the blanks first around said co-operating roll adjacent said front guide roll, then relative to said guide devices and finally
5 around the other co-operating roll, means for applying heat to the belt, and means for driving said belt, said co-operating rolls and belt serving to curl the blanks reversely to their normal curling tendency.

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