Aug. 24, 1943. D. G. REMPEL 2,327,668

APPARATUS FOR STENCILING ARTICLES

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FIG. 1

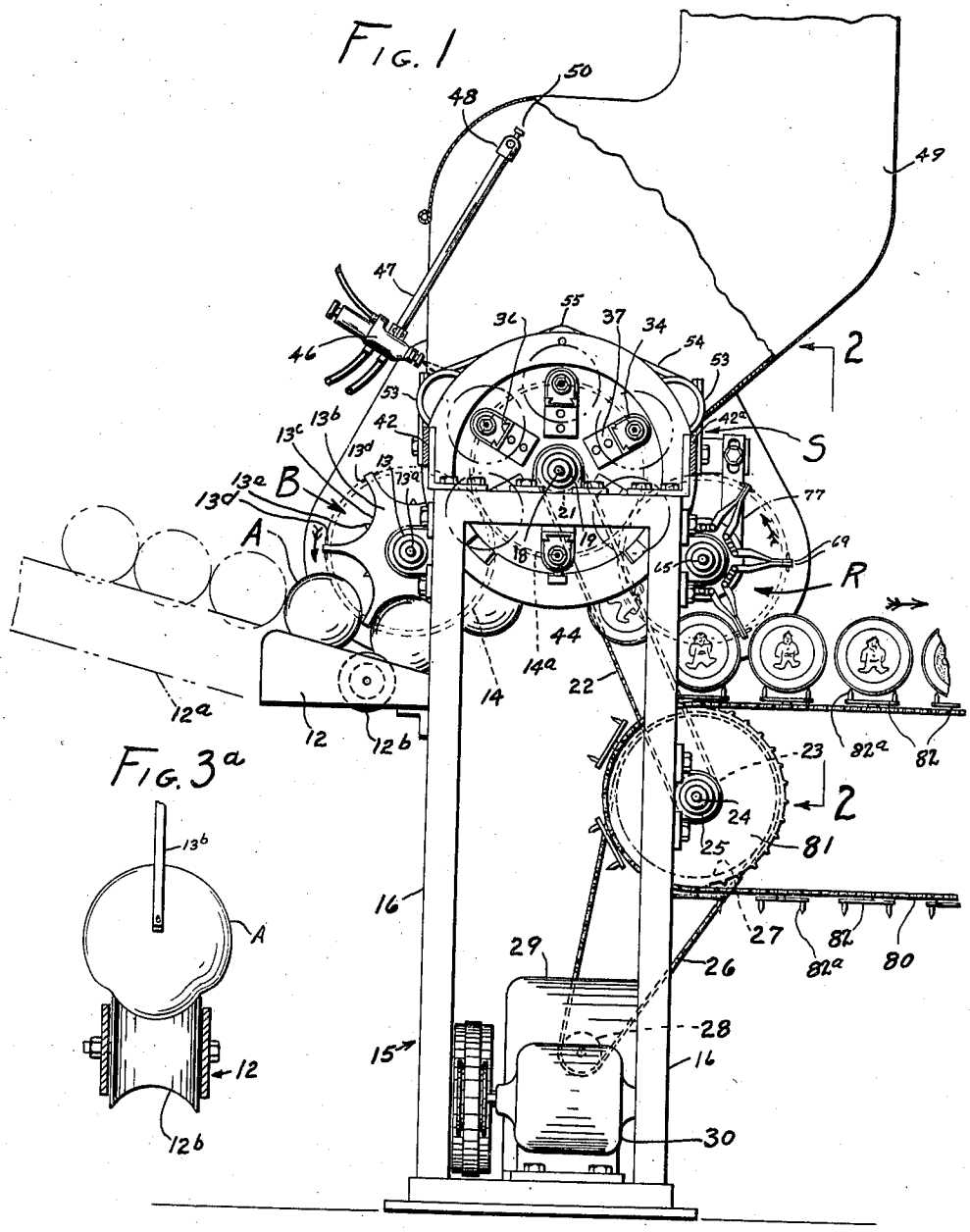


FIG. 3a

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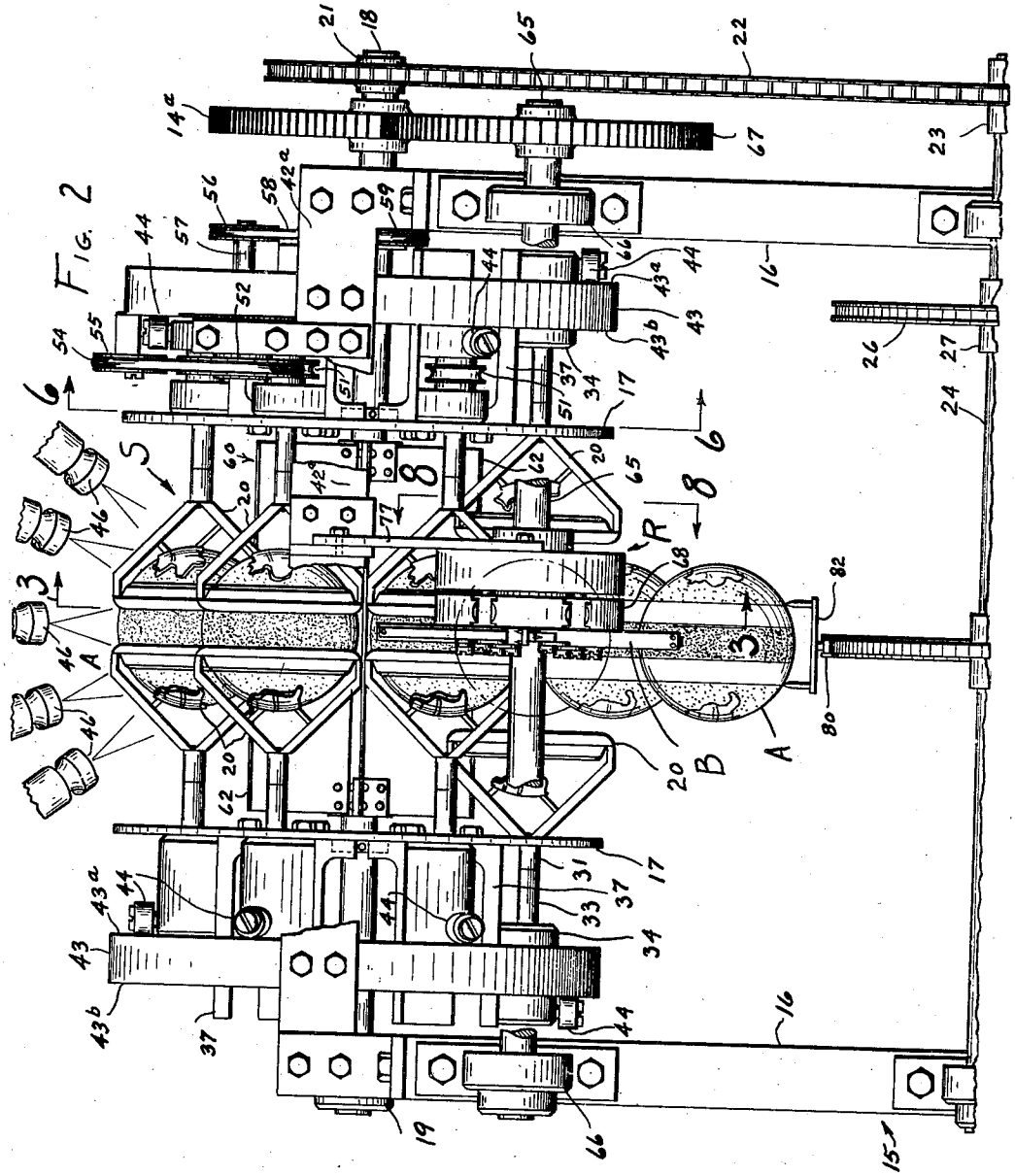
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APPARATUS FOR STENCILING ARTICLES

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FIG. 2



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APPARATUS FOR STENCILING ARTICLES

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FIG. 3

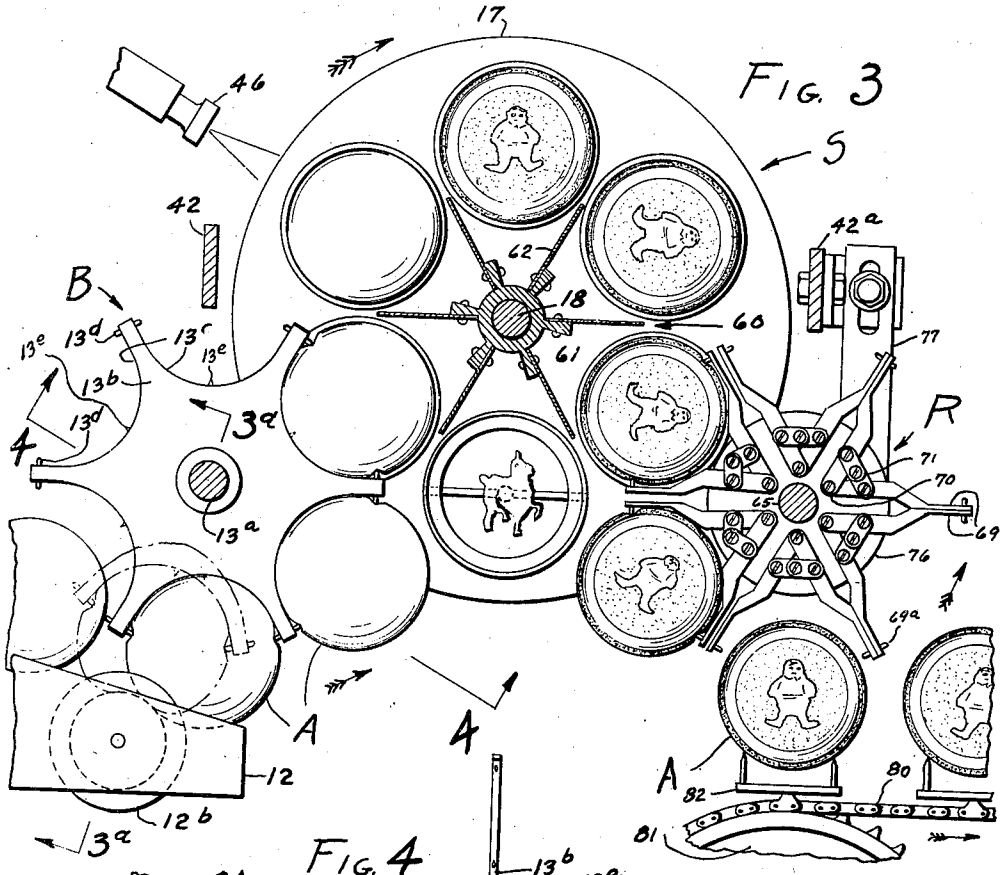


FIG. 4

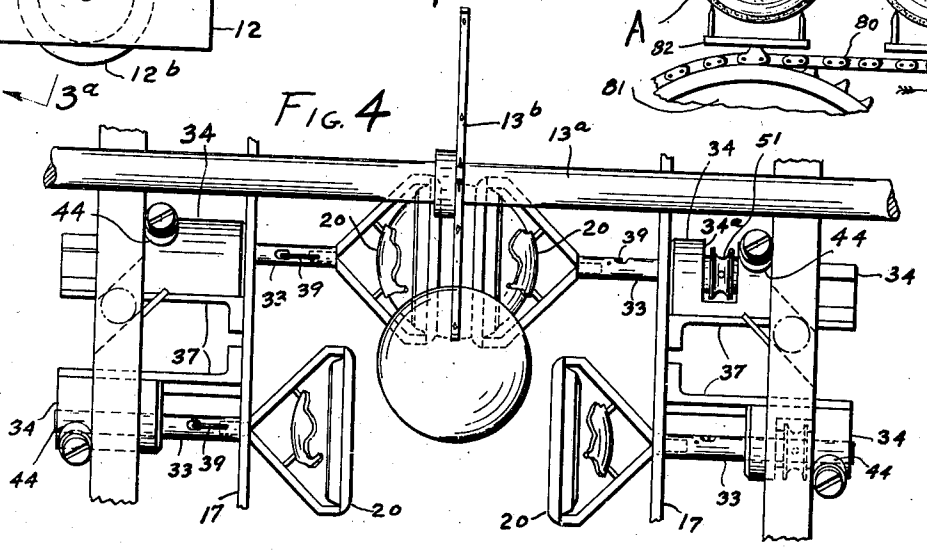
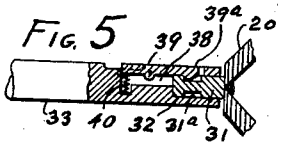


FIG. 5



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FIG. 6

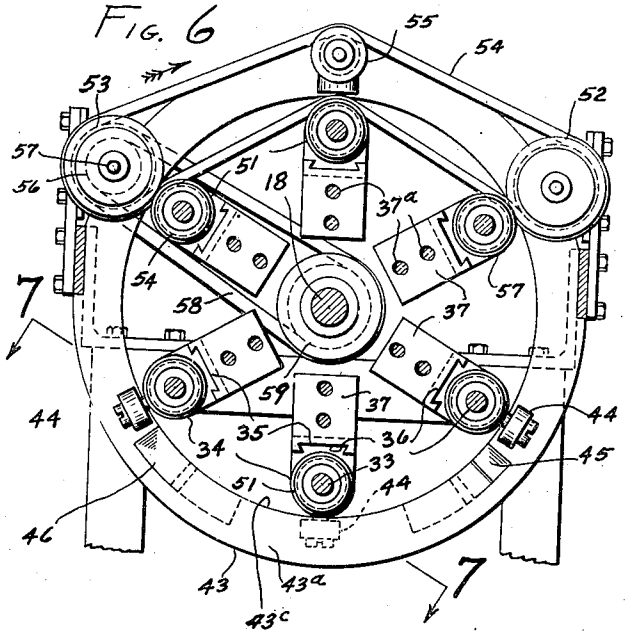


FIG. 9

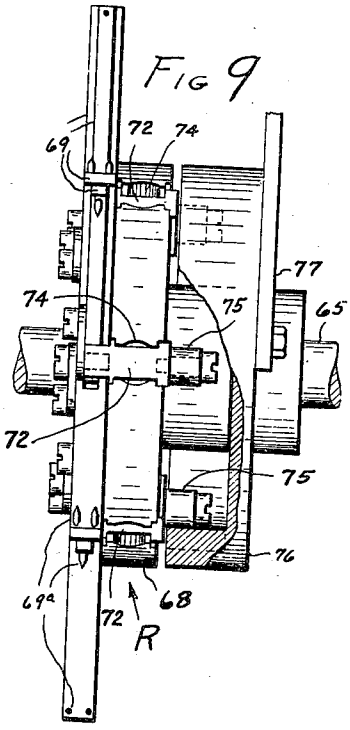


FIG. 7

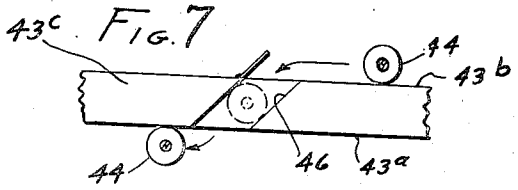


FIG. 8

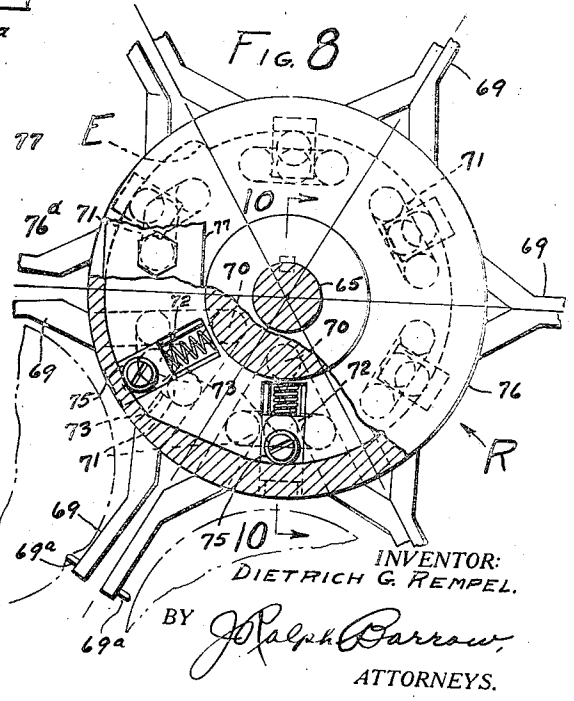
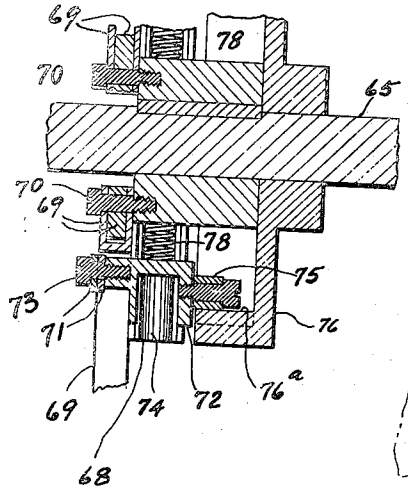


FIG. 10



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Patented Aug. 24, 1943 2,327,668

UNITED STATES PATENT OFFICE

2,327,668

APPARATUS FOR STENCILING ARTICLES

Dietrich G. Rempel, Barberton, Ohio, assignor to The Sun Rubber Company, Barberton, Ohio, a corporation of Ohio

Application March 15, 1940, Serial No. 324,128

13 Claims. (Cl. 101—114)

This invention relates to apparatus for painting articles, and in particular relates to apparatus for stenciling rubber balls or the like with paint spray.

An object of this invention is to provide apparatus for progressively painting rubber balls or like articles, from a continuous source of supply.

Another object of the invention is to provide simple, efficient, continuous apparatus for spray-painting articles, such as rubber balls, one or more colors, with a minimum of waste due to smearing the articles in handling.

Another object of the invention is to provide in apparatus of the character described, simple, efficient mechanism for progressively handling or moving articles, such as rubber balls, between stations of operation.

These and other objects of the invention will be manifest from the following brief description and the accompanying drawings.

Of the accompanying drawings:

Figure 1 is a side elevation of a continuous machine for paint-spraying rubber balls, as embodied in the invention.

Figure 2 is a cross-section, on a larger scale, and partly broken away, taken on line 2—2 of Figure 1.

Figure 3 is a cross-section, on an enlarged scale, and partly broken away, taken substantially on line 3—3 of Figure 2.

Figure 3a is a cross-section taken on line 3a—3a of Figure 3, in the chain-dotted line position thereof.

Figure 4 is a cross-section, partly broken away, taken substantially on line 4—4 of Figure 3.

Figure 5 is an enlarged fragmentary detail view, partly broken away and in section, of the means for releasably securing the mating mask sections in the holders therefor.

Figure 6 is a cross-section taken on line 6—6 of Figure 2, illustrating the cam mechanism for moving the mask sections toward and from mating relation.

Figure 7 is a fragmentary view taken substantially along line 7—7 of Figure 6.

Figure 8 is an enlarged cross-section, partly broken away and in section, taken substantially at line 8—8 of Figure 2, illustrating the mechanism for removing the spray-painted balls from the stenciling masks.

Figure 9 is an end elevation of the mechanism shown in Figure 8, as viewed from the left thereof.

Figure 10 is a cross-section taken on line 10—10 of Figure 8.

Referring to the drawings, the numeral 15 designates a frame having spaced uprights 16, 16 for supporting ball-supplying, ball-spraying, and ball-removing mechanisms, indicated generally at B, S, and R, respectively.

Referring particularly to Figures 1, 3, 3a, and 4, the ball-feeding mechanism B may comprise a chute 12, supported between the uprights 16 and inclining downwardly toward the same. The balls A may be progressively placed on the chute 12, or supplied thereto from a continuous source of supply (not shown) by means of a conveyor, indicated in chain-dotted lines at 12a. A concave idler roller 12b may be mounted in the chute 12 so that a portion thereof projects upwardly in the path of the balls for purposes to be described.

Journalled in bearings 13, 13 on uprights 16 may be a shaft 13a on which is keyed a relatively thin wheel or disc 13b. Wheel 13b is provided with a series of circumferentially spaced recesses 13c of substantially the same curvature as the balls A, each recess having a pair of spaced pins 13d, 13d adapted yieldingly to engage a ball at substantially diametrically opposite points thereof as the wheel is rotated in counterclockwise direction (see Figures 1 and 3), the balls progressively rolling down chute 12 into cooperating relation with recesses 13c in wheel 13b. Intermediate the spaced pins 13d in each recess may be a similar pin 13e, which yieldingly engages the balls to prevent the same from turning on pins 13d. The rotating wheel 13b yieldingly urges the balls past roller 12b to force the balls into firm engagement with pins 13d and 13e in the respective recesses. The pins 13d may be arranged to engage the balls A at opposite points inwardly of the diameters thereof so as to provide just enough gripping action on the balls to support little more than the weight thereof, but being readily releasable by means to be described in connection with the spray-painting mechanism S.

The ball-feeding wheel 13 is driven in synchronism with the orbital movement of the spray-painting masks in mechanism S, by means of a gear 14 on shaft 13a meshing with a gear 14a on a constantly driven shaft 18 journalled in bearings 19, 19 on the uprights 16.

In the ball-spraying mechanism S, a pair of discs or plates 17, 17 may be secured in transversely spaced relation on shaft 18. Each disc 17 may carry a plurality of rotatable mask-sections 20, 20 arranged in a circle concentrically

about shaft 18, and adapted to be moved from and toward mating relation with similar mask-sections on the other disc 17.

For rotating the discs 17, shaft 18 has a sprocket 21 fixed thereon, driven by a chain 22 engaging a sprocket 23 on a shaft 24, which is journalled in bearings 25, 25 mounted on uprights 16, this shaft 24 in turn being driven by a chain 26 engaging between a sprocket 27 thereon and a sprocket 28 on a reduction gearing 29, driven by a suitable motor 30.

As best shown in Figures 2, 4, 5 and 6, for moving the mask-sections 20 toward and from mating relation, each may be provided with a stem 31, for fitting in bores 32 in the ends of stub shafts or supports 33, 33 journalled in non-rotatable holders 34, 34 (see Figure 6). These holders may have tongue portions 35 to be slidable axially of shaft 18 in slideways 36 of supports 37, secured to the discs 17 as by means of bolts 37a, 37a. Shafts 33, carried by holders 34 are freely slidable through suitable openings in discs 17.

The mask-sections 20 are arranged to be removable and replaceable on the holder-shafts 33 by means of a quickly operable interlocking device. To this end, the shafts 33 may have slots 38 for receiving pivoted latches 39, preferably flush with the surface of the shafts so as not to interfere with the sliding and rotational movements of the shafts in the openings in discs 17 (see Figure 5). Springs 40 normally urge the latch to engage fingers 39a thereof with edge portions of an annular groove 31a in the stems 31 of the respective mask-sections. The mask-sections thereby may be releasably interlocked on shafts 33 by inserting the stems 31 thereof in the bores 32 of the shafts until fingers 39a yieldingly engage in grooves 31a, and similarly are quickly removable by pressing the latch against the yielding action of springs 40 to disengage the fingers 39a from the stems 31. The arrangement, for example, permits rapid removal of the mask-sections for cleaning the paint therefrom, which is usually necessary at frequent intervals during paint-spraying operations.

The oppositely disposed pairs of mask-sections 20, on the rotatable discs 17, are arranged to be moved from and toward mating relation with each other, about balls which are progressively fed between by the ball-feeding wheel 13b. For this purpose, a pair of spaced cross-bars 42, 42a, extending longitudinally of shaft 18, are supported on the uprights 16. Non-rotatably secured between these cross-bars, and located outwardly of discs 17, may be a pair of spaced annular members 43, 43 which are concentric with shaft 18. Members 43 may be rectangular in cross-section to provide flat inner and outer track surfaces 43a and 43b, respectively, for a guide roller 44 mounted on each of the holders 34. As best shown in Figures 6 and 7, the radially inner faces 43c of each member 43, adjacent the bottoms thereof, may be provided with two circumferentially spaced cam grooves 45 and 45a, extending in opposite angular directions from side to side of the member, the arrangement being such that pairs of rollers 44 traveling in clockwise direction on the inner surfaces 43a of both members 43, upon rotation of shaft 18, carrying discs 17, will first enter cam grooves 45 of the respective members and continue their orbital movement on the outer track-surfaces 43b. This shifting of the pairs of rollers from the inner to the outer track surfaces moves the holders 34 thereof outwardly to shift the mating mask sections, carried by the holders 34, from mating relation about finished balls discharged from the mask at station R, as will subsequently be described. This opening movement of the mask sections is clearly shown in Figure 4.

The mating mask sections while continuing the orbital movements thereof are thus held apart a sufficient length of time to permit the rubber balls A to be progressively positioned between the same by the ball-supplying wheel 13b. As the balls are progressively positioned between successive mask-sections the rollers 44 successively enter cam grooves 45a of the two members 43, as shown in Figure 7, and are thereby guided from the outer to the inner track surfaces 43b and 43a, respectively. This inward movement of rollers 44 shifts the respective pairs of holders 34 inwardly on the supports 37, carried by rotating discs 17, thereby moving the mating mask sections into mating relation about the balls. Continued orbital movement of the mating mask sections readily separates the balls from the ball-supplying wheel 13b.

As best shown in Figures 1, 2 and 3, a series of paint-spraying guns 46, 46 may be arranged transversely of the orbital path of the masks, each gun 46 being fixed on an arm 47, pivotally and slidably mounted on a cross-shaft 48, which is supported by a ventilator conduit 49 which connects suitable suction means (not shown) to carry away excess spray from the spray guns 46. Adjusting means 50 is provided on the end of each arm 47 for engaging shaft 48 to adjust the positions of the spraying-gun as desired.

In order that the balls will receive uniform coatings of paint the mating mask sections are rotated in their holders 34 as the balls are carried past the spray-guns 46. For this purpose, each holder 34 at the rear side of the machine may have a cut-out portion 34a (see Figure 4) for receiving a pulley 51 keyed to the shaft 33, which is rotatable in the holder. Mounted on the inner side of rear member 43, across the top thereof, may be spaced pulleys 52 and 53 about which is engaged a pulley belt 54, the upper length of the belt being guided by an idler pulley 55. The belt 54 may be constantly driven through a pulley 56 on the shaft 57 of the pulley 53 so that the lower length thereof will travel in the opposite direction to the orbital movement of the masks, the pulley 53 being driven by a belt 58, in turn driven by a pulley 59 on the driven shaft 18. The arrangement is such that the balls A are rotated at a relatively high rate of speed as the successive pulleys 51 are translated in frictional engagement with the lower length of belt 54, the mask sections 20 at the near side of the machine being driven by frictional engagement thereof with the balls.

In the present apparatus the mask-sections 20, when in full mating relation with each other about the balls A, are spaced apart at the central portions of the balls so as to expose an annular strip of the ball to a central spray gun 46, whereby bands of one color may be painted around the periphery of the balls, the outer spray-guns being utilized to spray into openings of predetermined design in the respective mating mask sections, to form corresponding designs in various colors on opposite sides of the balls. In order that the balls will be accurately centered in the spraying mechanism S, the holders 34 may be so constructed that the inner ends thereof will be in abutment with the plates or discs 17 when the mask-sections are in mating relation.

As best illustrated in Figures 2 and 3, shielding means 60 is provided to prevent the paint from the spraying guns 46 from reaching balls A which have already been spray-painted. This shielding means may comprise a hub 61, keyed on shaft 18 to rotate therewith, and having a series of flat blades 62, 62 extending radially between the adjacent mask sections.

Referring particularly to Figures 1, 2 and 3, the continued rotational movement of shaft 18 carries the mask units from the spraying gun 46 toward the ball-removing mechanism R, the pulleys 51 disengaging the belt 54 to stop rotational movement of the mask sections at a point intermediate the spray guns and the ball-removing mechanism.

Because the balls may have wet paint on them after they leave the paint-spraying device, the ball-removing mechanism R must necessarily handle the balls in such a manner that the wet paint on them will not be smeared. To this end, a shaft 65, journalled in bearings 66 on the uprights 16 at the discharge end of the apparatus, is driven by a gear 67 thereon engaging the continuously driven gear 14a on shaft 18. Keyed on driven shaft 65 may be a cylindrical hub 68 having a series of pairs of ball-grasping fingers 69, 69 extending radially therefrom, each pair of fingers being pivotally connected at 70 to the hub 68 (see Figures 8, 9 and 10) so as to be shiftable from and toward each other. Connecting the fingers 69 to each pair thereof, adjacent the pivot 70, may be a toggle-joint 71, there being a slide-block 72 pivotally connected to the knee 73 of the toggle-joint, for sliding movement in a radially extending slideway 74 in hub 68. Mounted on the slide-blocks 72, are rollers 75, 75 for rolling engagement with an inside cam surface 76a of a suitable cam 76, the latter being fixedly supported around shaft 18 by means of a bracket 77 secured to the cross-bar 42a. Compression springs 78, 78, engaged between the inner ends of slideways 74 of blocks 72 urge rollers 75 into yielding engagement with the cam surface 76a of the fixed cam. As hub 68 is rotated in counter-clockwise direction (Figures 1, 3 and 8), cam 76 yieldingly moves successive rollers 75 radially outwardly at point E, to collapse toggle-joints 71, thereby swinging the fingers 69 of the pairs thereof toward each other to engage pins 69a in the ends of the fingers at oppositely disposed points on a finished ball A held between a pair of mating mask sections 20, the balls being carried between the pairs of fingers, downwardly toward a chain conveyor 80, the latter being driven by a sprocket 81 on the driven shaft 24. The pins 69a may be positioned to engage the balls at opposite points radially inwardly of the diameter of the same, so that the balls will be readily releasable.

The rotation of hub 68 is so synchronized with conveyor 80 that when each pair of fingers 69 is directly over one of a series of spaced ball holders 82, 82, carried by conveyor 80, cam 76 will operate to straighten the toggle-joint 71, thereby spreading the fingers apart to release the ball. The ball may then drop a relatively short distance by gravity to be supported on four pins 82a, 82a on the cooperating holder 82, these pins being pointed so as not to smear the fresh paint on the balls. As the conveyor 80 progressively carries the balls supported on holders 82 toward a suitable inspection, packing, or like, station, the pairs of fingers 69 swing upwardly out of contact with the balls.

In the operation of the apparatus with motor 29 continuously driving ball-supplying, ball-spraying, and ball-removing mechanisms B, S, and R, respectively, and also conveyor 80, rubber playing balls A are manually placed, or otherwise continuously supplied on chute 12, the leading balls successively moving into cooperating relation with ball-supplying wheel 13b, to be urged into yielding engagement with pins 13d and 13e in the recesses 13c by the roller 12b. Balls having an annular flash line thereon are positioned with said flash lines centered in the machine in any suitable manner. The continuously driven ball-feeding wheel 13b progressively picks up the leading balls and moves the same into positions between the pairs of mating mask sections 20, which have been momentarily separated by movement of rollers 44 passing outwardly through cam slots 45 in cams 43, the rollers 44 then passing inwardly through cam slots 46 to close the mask sections firmly about said balls. In such case the pins 13d in the ball-receiving recesses 13c readily disengage or release the balls as they are carried away by the orbital movement of the mask-section.

The balls A in being carried from the ball-supplying mechanism to the ball-removing mechanism R, pass the spray-guns 46, the balls being rotated by frictional engagement of the pulleys 51 engaging the driven pulley belt 54. At this stage the balls may have one or more different colors of paint sprayed thereon through the design openings in the mask sections 20 (see Figures 2 and 3). When it is desirable to paint the balls in a single color, the mask sections 20 may be in the form of holders adapted to engage the balls at spaced points, to expose substantially the entire surfaces of the balls to the spray-guns 46 as the holders are rotated in the manner described.

As the balls approach the ball-removing mechanism R, the mating sections are separated by action of rollers 44 moving outwardly through cam slots 45 in members 43. While the mask sections are thus initially opened, the ball-removing mechanism R is rotated progressively to move the pairs of fingers 69 into cooperating relation with the balls, the toggle joints 71 being collapsed yieldingly to retain the balls between the pairs of pins 69a of the fingers, to be carried downwardly toward conveyor 80. The balls A, upon reaching the lowermost point of swing are then in cooperating relation above the ball holders 82. At the last-named point, toggle-joint 71 is straightened by action of rollers 75 to open up the pairs of fingers 69, allowing the balls gripped thereby progressively to drop freely by gravity, onto four pointed pins 82a on cooperating holder 82. The balls may be carried a sufficient distance along conveyor 80 to permit the balls to dry before being inspected and packed.

Thus has been provided simple, efficient, and relatively inexpensive mechanism for spray-painting rubber balls, in one color, or a plurality of different colors. The apparatus may readily be adapted for spray-painting other articles besides balls.

Modifications of the invention may be resorted to without departing from the spirit thereof or the scope of the appended claims.

What is claimed is:

1. Apparatus for stenciling articles comprising a unit including a pair of relatively movable mating-mask sections, means for moving said mask sections toward and from mating relation

about an article to be stenciled, means for inserting articles between the sections to be held thereby upon the same moving toward mating relation, and means for removing the articles from between the sections upon the same moving from mating relation.

2. Apparatus for stenciling articles comprising a pair of spaced supporting members rotatable about an axis, means for rotating said members in unison, a plurality of mask sections carried by each of said members and adapted to be in mating relation with corresponding mask sections carried by the other of said members, means for relatively moving said corresponding mask sections toward and from mating relation about articles to be stenciled, and means for spray-painting articles held in said masks as said members are rotated by said rotating means thereof.

3. Apparatus for stenciling articles comprising a pair of spaced supporting members rotatable about an axis, means for rotating said members, a plurality of mask sections carried by each of said members and adapted to be in mating relation with corresponding mask sections carried by the other of said members, means for relatively moving said mating mask sections toward and from mating relation about articles to be stenciled, means for spray-painting articles received between said mating mask sections as said members are rotated by said rotating means thereof, and means movable with said members as they are rotated for shielding each mating pair of mask sections from the paint spray while the others are being sprayed.

4. Apparatus for stenciling articles comprising a plurality of mask units for receiving articles to be stenciled, means for paint-spraying articles in the mask units through openings therein, means for moving said mask units in succession past said spraying means to stencil articles received in the units, and means movable with said units for shielding each of said units from paint spray while the others are being sprayed.

5. Apparatus for stenciling articles comprising a pair of spaced supporting members rotatable about an axis, means for rotating said members, a plurality of mask sections on each of said members adapted to be in mating relation with mask sections on the other of said members, means for relatively moving said mating mask sections toward and from mating relation about articles to be stenciled, means for spray-painting articles received between the pairs of mating mask sections, and means for rotating said mask sections as the articles retained therein are sprayed.

6. Apparatus for stenciling articles comprising a plurality of mask units for receiving articles to be stenciled, means for paint-spraying articles in the mask units through openings therein, means for moving said mask units in succession past said spraying means, and means for rotating said mask sections as the articles retained therein are sprayed by said spraying means.

7. Apparatus for stenciling articles comprising a paint-spraying device, mask units for containing articles to be stenciled, means for conveying said units past said spraying device in succession, and means for rotating said units as they pass said spraying device, said articles thereby being sprayed through openings in the masks.

8. Apparatus for stenciling articles, comprising a paint-spraying device, a shiftable support, a mask unit rotatably mounted on said support for containing an article to be stenciled, said mask unit having stenciling openings therein, means for shifting said support to move said unit past said spraying device, and means for rotating said unit on said support as it passes said spraying device, said articles in said unit thereby being sprayed through said openings in the mask unit.

9. Apparatus for stenciling articles, comprising a pair of relatively movable members, mating mask sections adapted to be supported on said movable members, spring-pressed means for releasably and replaceably securing said mask sections on said members, and means for moving said members to shift said mask sections toward and from mating relation about an article to be stenciled.

10. Apparatus for stenciling articles comprising a unit including a pair of relatively movable mating mask sections, means for moving said mask sections toward and from mating relation about an article to be stenciled, feeding means for holding an article, and means operable in synchronism with the opening and closing of said mask sections for actuating said feeding means to position an article held therein between the sections in open position thereof.

11. Apparatus for stenciling articles comprising a unit including a pair of relatively movable mating mask sections, means for moving said mask sections toward and from mating relation about an article to be stenciled, feeding means for releasably holding an article, means operable in synchronism with the opening and closing of said mask sections for actuating said feeding means to position an article therein between the sections in open position thereof, and means operable in synchronism with the opening and closing of said mask sections for removing the article from between the sections in open position thereof.

12. Apparatus for stenciling articles comprising a unit including a pair of relatively movable mating mask sections, means for moving said mask sections toward and from mating relation about an article to be stenciled, feeding means for releasably holding an article, and means for actuating said feeding means to position an article held thereby between the sections in open position thereof, whereby the mask-sections are movable into said mating relation about said positioned article.

13. Apparatus for spray-painting or like treatment of articles comprising a pair of relatively movable supporting members, means for relatively moving said supporting members toward and from supporting engagement about articles to be painted, means for releasably gripping an article and operable toward and from said supporting members in synchronism with said relative movement thereof for releasing the article between the members to be supported thereby upon the same being moved toward each other, and means shiftable toward and from said members in synchronism with said relative movement thereof for gripping and removing the articles from between the members.

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