April 13, 1954 T. F. SCHLICKSUPP 2,674,755

HOPPER DISCHARGE FOR ELONGATED RODS

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FIG. 1

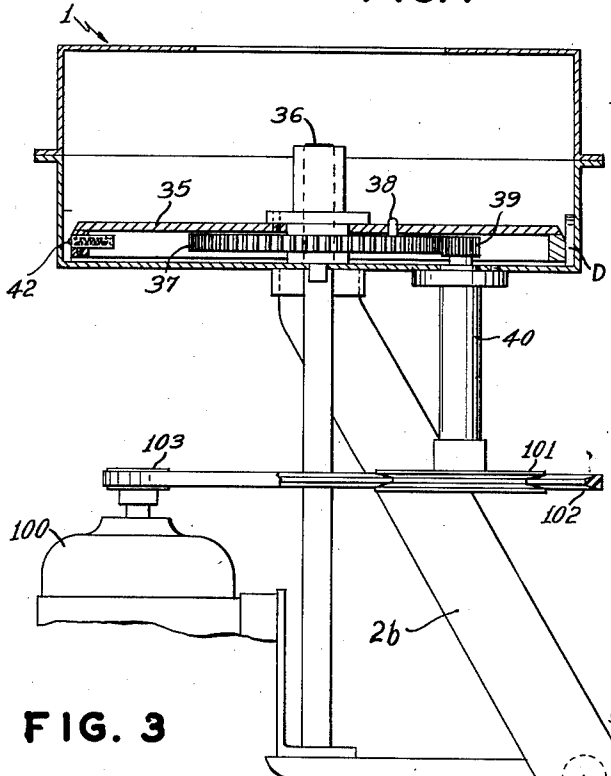


FIG. 2

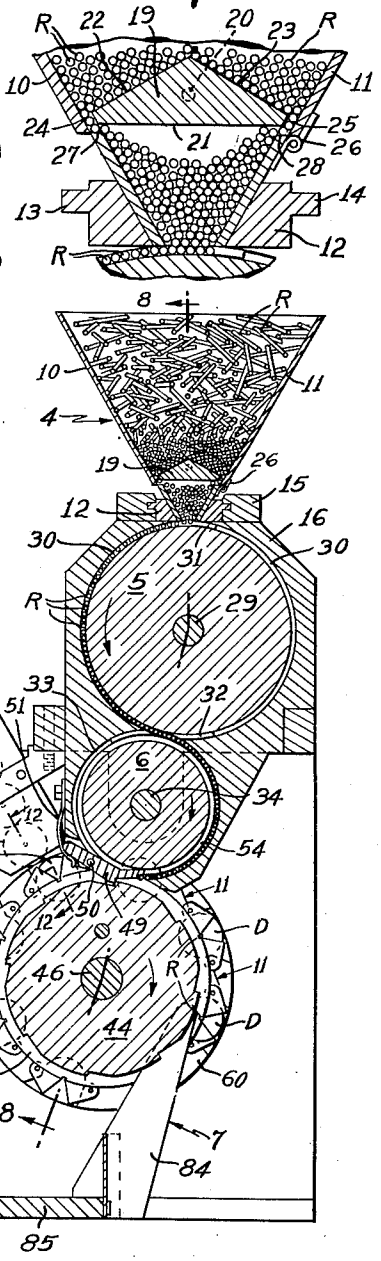


FIG. 3

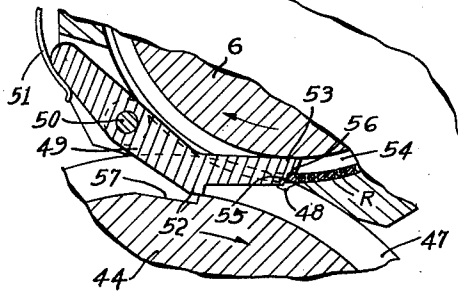
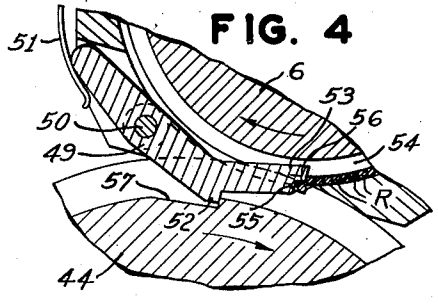


FIG. 4



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FIG. 5

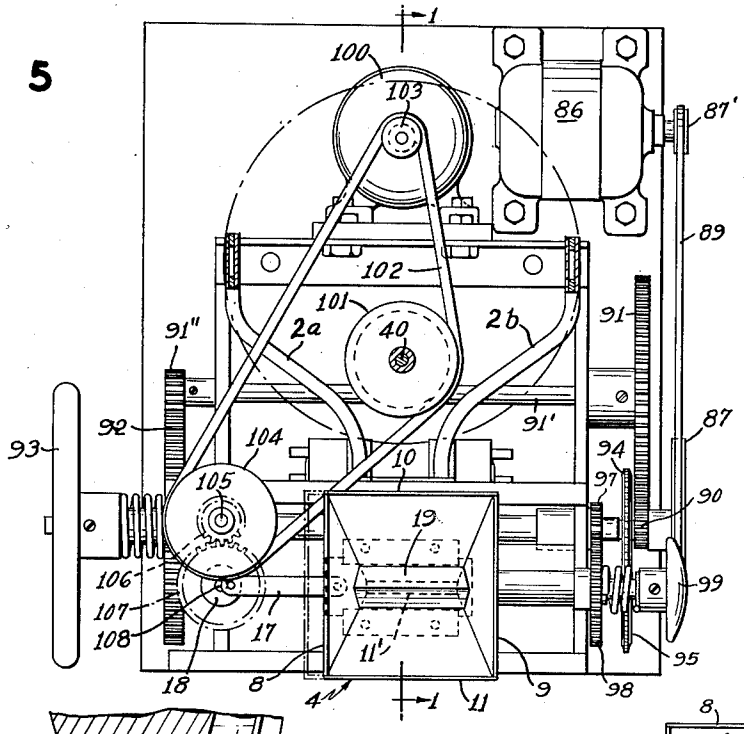
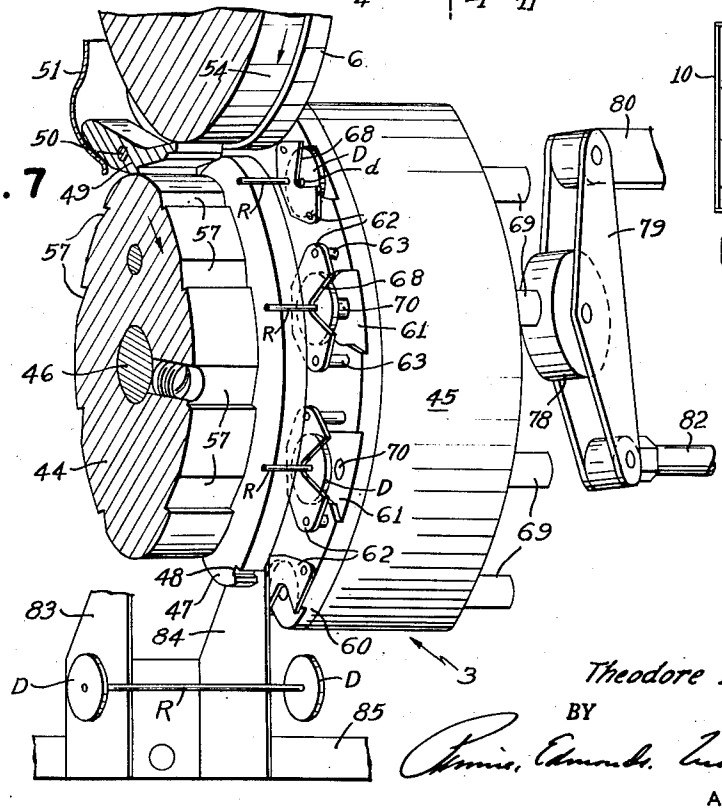


FIG. 7



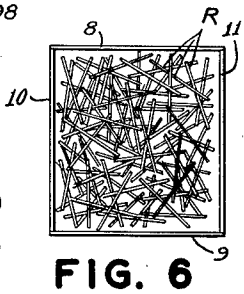


FIG. 6

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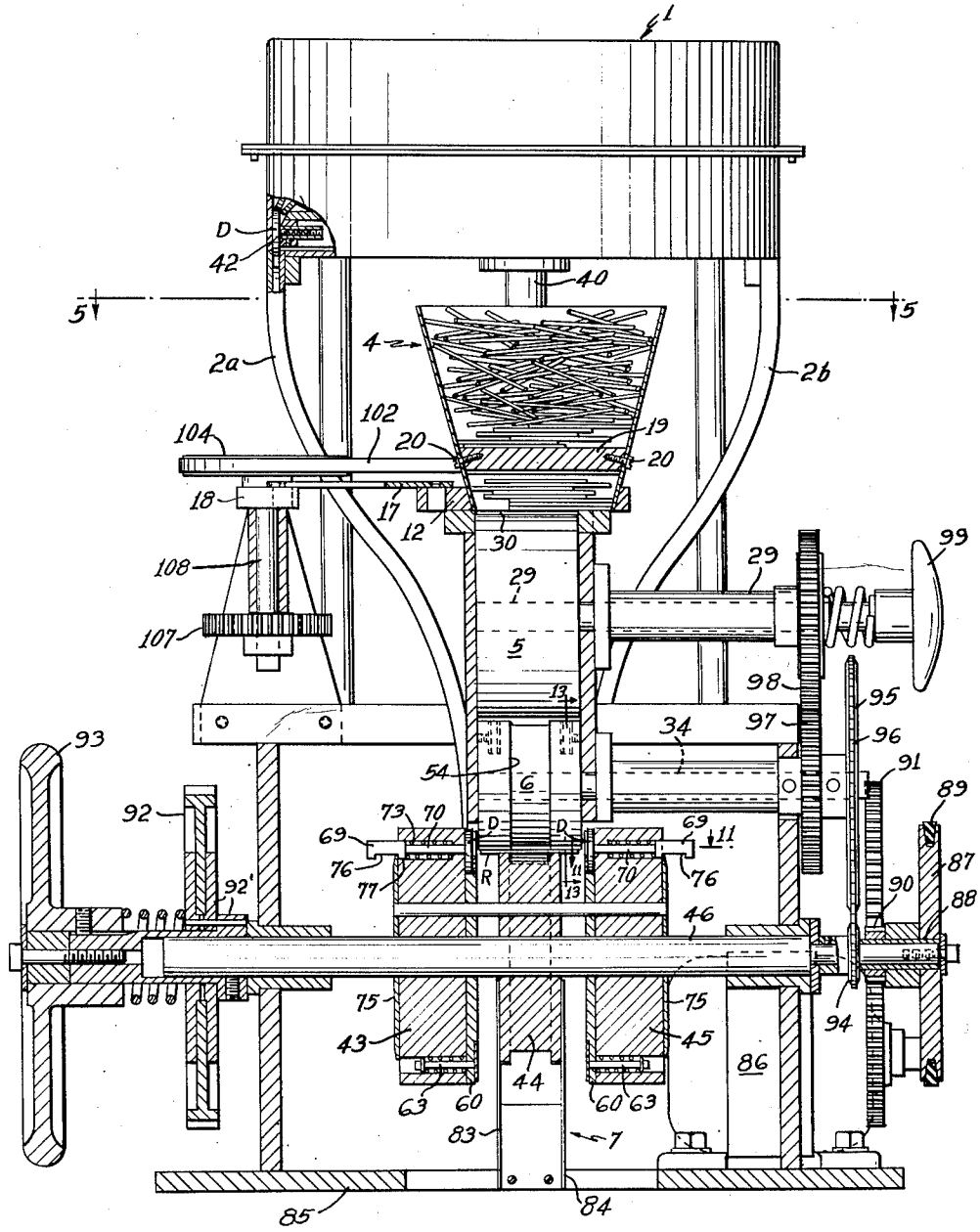
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HOPPER DISCHARGE FOR ELONGATED RODS

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FIG. 8



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HOPPER DISCHARGE FOR ELONGATED RODS

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FIG. 9

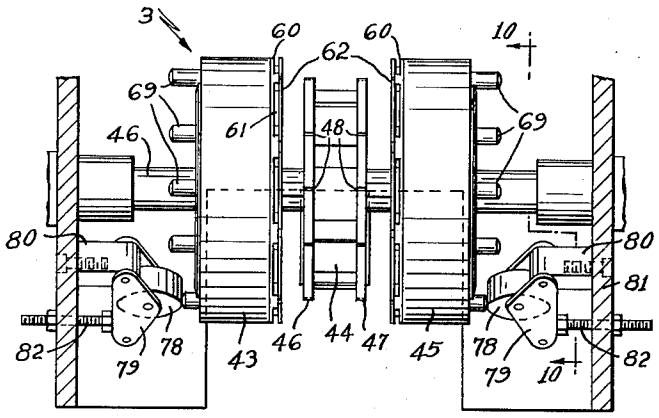


FIG. 10

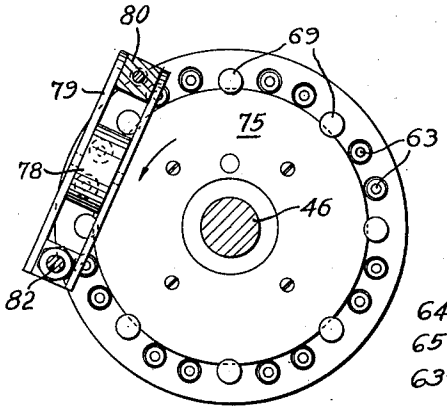


FIG. 11

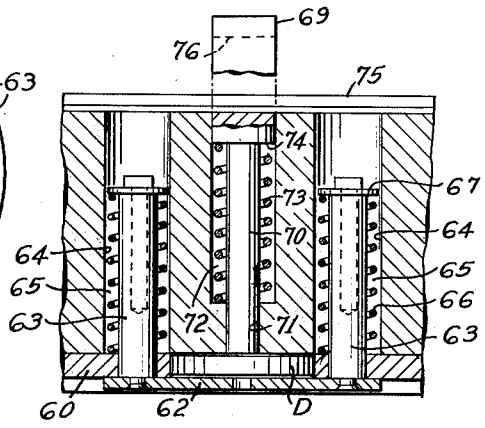


FIG. 13

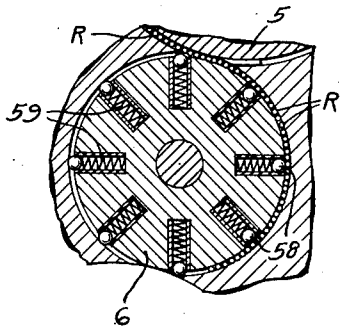
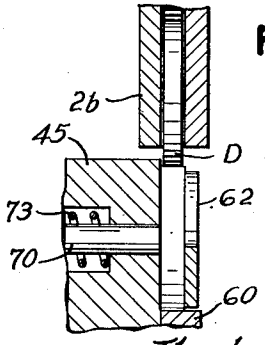


FIG. 12



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2,674,755

UNITED STATES PATENT OFFICE

2,674,755

HOPPER DISCHARGE FOR ELONGATED RODS

Theodore F. Schlicksupp, Long Island City, N. Y.

Application February 4, 1949, Serial No. 74,678

5 Claims. (Cl. 10—162)

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This invention relates to machines for assembling discs on the ends of rods. More particularly it relates to a machine for making wheel and axle assemblies suitable for use in the manufacture of wheeled toys.

Many wheeled toys are made by mounting the body portion of the toy on wheel and axle assemblies each of which usually comprises a stiff wire or rod constituting the axle on each end of which a small wheel having a central opening is positioned with a force fit. The wheels are sometimes simple buttons or discs of a molded thermoplastic material, each of which has a small central opening to receive an end of the rod or axle. The machine to which the invention relates is adapted to assemble discs and rods to produce wheel and axle assemblies of the general kind just described, the principal object of the invention being to provide a machine which is capable of assembling from a supply of discs placed indiscriminately in one hopper and a supply of rods placed indiscriminately in another hopper a large number of the assemblies in a short time, say around 100 per minute.

An assembling machine embodying the invention is illustrated in the accompanying drawings, in which:

Figure 1 is a vertical transverse section showing the principal parts of the machine, the section being taken approximately on the line 1—1 of Fig. 5;

Fig. 2 is a vertical section of the lower portion of the rod hopper drawn to an enlarged scale;

Figs. 3 and 4 are fragmentary vertical sections illustrating the operation of the transfer member that transfers the rods from the second feed cylinder to the assembling drum;

Fig. 5 is a horizontal section taken on the line 5—5 of Fig. 8, all parts of the machine below the disc hopper being shown in plan view.

Fig. 6 is a plan view of the rod hopper alone showing the indiscriminate arrangement of the rods when they are placed in the hopper;

Fig. 7 is a perspective view of the right half of the assembling drum;

Fig. 8 is a vertical longitudinal section of the machine taken on the line 8—8 of Fig. 1;

Fig. 9 is a plan view of the assembling drum and the cam rolls that actuate the plungers which force the discs on the ends of the rods;

Fig. 10 is a vertical section taken on the line 10—10 of Fig. 9;

Fig. 11 is a fragmentary section taken on the line 11—11 of Fig. 8 (or the line 11—11 of Fig. 1);

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Fig. 12 is a fragmentary vertical section taken on the line 12—12 of Fig. 1; and

Fig. 13 is a vertical section taken on the line 13—13 of Fig. 8.

Referring first to Figures 1 and 2, the principal parts of the machine are a feed hopper 1 for the discs; two chutes 2a and 2b leading therefrom to an assembling drum 3; a feed hopper 4 for the rods; a first feed cylinder 5 for receiving the rods from the hopper 4; a second feed cylinder 6 to which the rods are transferred by the first feed cylinder and which delivers them to the assembling drum; and an ejector 7 which removes the disc and rod assemblies from the assembling drum.

The rod hopper 4 in plan view is rectangular in shape as shown in Figs. 5 and 6 and has end walls 8 and 9 and side walls 10 and 11. The end walls 8 and 9 of the hopper may, if desired, lie in parallel vertical planes, but they preferably slightly converge toward the bottom of the hopper as shown in the drawings. The side walls 10 and 11 converge toward the bottom of the hopper where they form with the end walls an elongated rectangular discharge opening, best shown at 11' in Fig. 5. In other words, the side walls 10 and 11 converge to the long sides of the discharge opening of the hopper. The hopper is mounted so that it can be reciprocated in a direction parallel to the planes of its side walls 10 and 11, i. e., so that it can reciprocate in a right and left-hand direction in Figs. 5 and 8 and toward and away from the reader in Fig. 1.

The hopper may be mounted in any suitable way so that it can reciprocate in this fashion, but in the particular machine illustrated in the drawings it is supported on a slide 12 (Figs. 1 and 2) having flanges 13 and 14 (Fig. 2) which slidably fit in corresponding grooves formed in a guide member 15 secured to the top of a housing 16 in which the feed cylinders 5 and 6 rotate as hereinafter described. One end of the slide 12 is pivotally connected to one end of a pitman 17 (Figs. 5 and 8). The other end of the pitman is pivotally connected eccentrically to a rotary member 18 which, when rotated in the manner hereinafter described, imparts the desired reciprocatory motion to the hopper.

The rods, designated R in the drawings, are placed indiscriminately in the hopper as best shown in Figs. 1, 6 and 8, and when the hopper is reciprocated in a direction parallel to the planes of the side walls 10 and 11 they are shifted back and forth in this direction, and any rod that is not already properly oriented so that it will

pass through the elongated discharge opening 11 in a horizontal position will have its opposite ends acted upon by the inclined side walls 10 and 11 in such a way that as it approaches the discharge opening it will be gradually turned and re-positioned such that when it reaches the discharge opening it will lie substantially horizontal and parallel to the long axis of the discharge opening. The discharge opening of the hopper is slightly longer than the rods which the machine is designed to handle and reciprocates longitudinally of itself and transversely across a rod-receiving annular space located between the feed cylinder 5 and the arcuate wall of the housing 16 as hereinafter described.

It has been found desirable to position in the lower portion of the hopper a bridge member 19 (Figs. 1, 2, 5 and 8) which extends from one end wall of the hopper to the other and is secured to the end walls by means of screws 20 (Fig. 8). In cross-section the bridge member 19 is generally triangular in shape as shown in Figs. 1 and 2 so that it has a lower surface 21 (Fig. 2) located slightly above and facing the discharge opening of the hopper, and two upper surfaces 22 and 23 each of which slopes downwardly and outwardly toward one of the side walls of the hopper. The longitudinal edges of the bridge member 19 are spaced a short distance from the side walls of the hopper to provide spaces 24 and 25 which are just wide enough to permit rods to pass singly through them to the portion of the hopper below the bridge member as clearly shown in Fig. 2. The bridge member serves to relieve the rods in the lower portion of the hopper below it, most of which have been properly oriented by the reciprocation of the hopper, from the weight of the rods supported above the bridge member and thereby facilitates feeding of the rods through the discharge opening of the hopper.

The upper and lower portions of the hopper are preferably made in two parts and connected by a hinge 26, so that the upper portion including the bridge member 19 can be swung back about the axis of the hinge to give access to the lower portion of the hopper below the bridge member for inspection purposes or in case one of the rods should become jammed therein. At the joint between the upper and lower portions of the hopper it has been found desirable to make the lower portion of slightly less width than the upper portion to provide ledges 27 and 28 which lie in the path of the rods passing downwardly through the spaces 24 and 25 at the sides of the bridge member 19.

The main purpose of these ledges is to arrest the downward feeding of any rod which may not have been oriented to the proper horizontal position to pass through one of the spaces 24 and 25 and therefore tends to pass through it endwise while leaning against one of the side walls of the hopper. Any such rod will rest at its lower end on one of the ledges 27 and 28 and will eventually be moved to a horizontal position by the reciprocation of the hopper and will then pass down into the lower portion of the hopper in proper oriented position. If it were not for the ledges 27 and 28 any rod tending to move endwise through one of the spaces 24 and 25 might reach the discharge opening of the hopper while still in this position and its lower end might interfere with proper feeding of the rods through the discharge opening of the hopper or with the reciprocation of the hopper.

For the best results the side walls 10 and 11 of the rod hopper should have an inclination such that the included angle between them is approximately 60°. If the included angle is much greater than this so that the walls have a too gradual inclination they do not have the proper action on the rods to orient them in the desired manner. For a machine speed that will produce around 100 rod and disc assemblies per minute the hopper should be reciprocated at the rate of about 550 reciprocations per minute to properly orient and feed the rods.

The feed cylinder 5 to which the rods are fed by the hopper 4 is secured to a rotary horizontal shaft 29 (Fig. 1) and rotates in a cylindrical opening in the above-mentioned housing 16. The diameter of the cylindrical opening in the housing is enough greater than the diameter of the feed cylinder 5 to form between the surface of the feed cylinder and the inner cylindrical surface of the housing an annular space 30 whose width is only slightly greater than the diameter of the rods which the machine is designed to handle. The length of the annular space 30 measured in the direction of the axis of the cylinder 5 is only slightly greater than the length of the rods fed to the machine.

As previously stated, the distance between the end walls of the hopper at the discharge opening thereof is somewhat greater than the length of the rods and is therefore greater than the axial length of the annular space 30 around the feed cylinder 5 as best shown in Fig. 8. The length of the stroke of the reciprocating hopper is equal to the difference between the length of the elongated discharge opening at the bottom of the hopper and the length of the rods or the axial length of the annular space 30 around the feed cylinder 5. Thus, as the hopper reciprocates, the rods in the lower portion of the hopper are pushed back and forth lengthwise and at each stroke of the hopper some of the rods are moved lengthwise into registry with the annular space 30 surrounding the feed cylinder 5 and pass through an opening in the upper portion of the housing 16 into this annular space.

The feed cylinder 5 is rotated continuously in the direction of the arrow (Fig. 1) and therefore the rods are fed successively from the hopper to the annular space surrounding the feed cylinder and move in a continuous series toward the lower portion of the feed cylinder as shown in Fig. 1. The movement of the rods in the annular space surrounding the feed cylinder is due partly to gravity and partly to their being rolled along between the outer surface of the feed cylinder and the inner surface of the housing 16.

A plate 31 adjacent the right side of the discharge opening of the hopper as viewed in Fig. 1 forms a continuation of the hopper side wall 11 to close off the right side of the annular space 30 around the feed cylinder 5 and directs the rods around the left side only of the cylinder. A plate 32 at the lower portion of the annular space 30 around the feed cylinder 5 directs the rods into a second annular space 33 surrounding the previously mentioned second or lower feed cylinder 6. This second feed cylinder is mounted on a shaft 34 to rotate in a cylindrical opening in the lower portion of the housing 16.

As in the case of the first feed cylinder 5, the surface of the second feed cylinder is spaced from the cylindrical wall of the housing-opening in which the cylinder rotates by a distance which is only slightly greater than the diameter of the rods fed to the machine. The second feed cylin-

der 6 is rotated in the direction indicated by the arrow in Fig. 1 so that the rods passing downwardly around the left side of the feed cylinder 5 as viewed in Fig. 1, upon reaching the stop plate 32, are transferred to the annular space surrounding the second feed cylinder 6 and then pass downwardly around the right side of this cylinder, as viewed in Fig. 1. When the rods reach the lower portion of the second feed cylinder 6 they are successively transferred to the assembling drum as hereinafter described.

One advantage of employing a second feed cylinder instead of transferring the rods directly from the first feed cylinder to the assembling drum is that it is desirable to have a relatively large feed cylinder to receive the rods from the rod hopper, but at the same time it is advantageous that the feed cylinder from which the rods are transferred to the assembling drum be relatively small in diameter so that the cylindrical surface of this feed cylinder will form a relatively wide angle with the cylindrical surface of the assembling drum which picks up the rods. This facilitates the transfer of the rods to the assembling drum by the mechanism hereinafter described and prevents jamming of the rods at this point.

As the rods travel through the cylindrical spaces around the feed cylinders 5 and 6 they cannot tilt to any great extent out of their horizontal position and are therefore brought by the second feed cylinder 6 to the assembling drum while they are still horizontally disposed.

The discs, designated D in the drawings, to be fed to the assembling drum are placed indiscriminately in the disc hopper 1 (Fig. 1). The particular construction of this hopper forms no part of the invention and will therefore not be described in much detail. It is sufficient to note that when the discs are in the hopper they rest on a plate 35 rotatable in the lower part of the hopper about the axis of a pin 36. At the under side of the plate 35 there is a gear 37 which also rotates about the axis of the pin 36 and which is operatively connected to the plate 35 by means of a pin 38. The gear is rotated by a pinion 39 carried by the upper end of a shaft 40 driven in a manner hereinafter described.

The plate 35 is slightly smaller in diameter than the inside diameter of the disc hopper to leave a space at the periphery of the plate the width of which is only slightly greater than the thickness of the discs which the machine is designed to handle. During operation of the machine the discs resting on the rotating plate 35 are thrown outwardly and drop edgewise into the space at the periphery of the plate. In Figs. 1 and 8 one of the discs D is shown in this position. At the periphery of the plate 35 there are a number of balls that are spaced circumferentially around the plate and that are spring-pressed outwardly. One of these balls appears at 42 in Figs. 1 and 8. As the plate 35 rotates, the balls 32 engage the discs standing edgewise in the space at the periphery of the plate and move them along in a circular path. As soon as one of the discs reaches one of the feed chutes 2a and 2b (Figs. 1 and 8) it drops down into the chute. Thus the rotating plate 35 distributes the discs to the two chutes which deliver them by gravity to the assembling drum.

The assembling drum, as best shown in Fig. 9, is made up of three cylindrical members 43, 44 and 45 secured to a rotary shaft 46. The member 44 lies between the members 43 and 45 and receives and supports the rods while the discs are being forced on the ends of them as hereinafter described. The members 43 and 45 support the discs while they are being forced on the ends of the rods. The member 44 will therefore hereinafter be called the rod carrier and the members 43 and 45 will hereinafter be called the disc carriers. The rod carrier 44 has a pair of flanges 46 and 47 which are spaced apart longitudinally of the rod carrier. Each of these flanges is provided at its periphery with a series of notches or recesses 48 equally spaced around the flange, each notch in one flange being aligned with a corresponding notch in the other flange longitudinally of the assembling drum.

The assembling drum is continuously rotated in the direction of the arrow in Fig. 1, and as each pair of notches 48 in the rod carrier comes under an opening in the lower portion of the housing 16, one of the rods is transferred from the annular space surrounding the second feed cylinder 6 (Fig. 1) to such pair of notches. The flanges 46 and 47 on the rod carrier 44 of the assembling drum are spaced apart such a distance, and the disc carriers 43 and 45 of the assembling drum are so spaced from the flanges 46 and 47 of the rod carrier that when one of the rods is supported in a pair of the notches 48 on the rod carrier 44 the opposite ends of the rod project beyond the flanges 46 and 47 toward the disc carriers 43 and 45. It is on these free projecting ends of the rods that the discs are forced as will hereinafter appear.

Because of the high speed at which the machine operates, it has been found desirable to provide means for positively transferring the rods from the annular space around the feed cylinder 6 to the notches in the rod carrier 44 of the assembling drum rather than permit them to drop into the notches by gravity. The machine therefore includes a transfer member or dog, shown at 49 in Fig. 1, which is pivoted intermediate its ends to swing about the axis of a pivot pin 50 supported by the lower portion of the housing 16. This dog is so positioned that it can operate in the space between the two flanges 46 and 47 on the rod carrier 44 of the assembling drum.

A leaf-spring 51 secured at one end to the housing 16 bears at its other end against the left end of the dog as viewed in Fig. 1 and therefore biases the right end of the dog downwardly. Figs. 3 and 4 show the dog drawn to an enlarged scale and illustrate its mode of operation. Although the spring 51 biases the right end of the dog downwardly, this end of the dog is normally held in a raised position because a projection 52 at the lower side of the dog rides on that portion of the cylindrical surface of the rod carrier 44 which is located between the two flanges 46 and 47. When the dog is in its normal position the upper portion 53 of the extreme right end of the dog is accommodated by a circumferential groove 54 provided in the periphery of the feed cylinder 6.

The right end of the dog is notched at its lower corner to provide a stop surface 55 which, in the normal position of the dog, lies in the path of the column of rods being fed through the cylindrical space around the feed cylinder 6. In other words, the lowermost rod of the column abuts against this surface. The notch in the end of the dog also provides a surface 56 which is just long enough to project over the lowermost rod only of the column of rods when it is abutting against

the surface 55. When a pair of the notches 48 in the flanges of the rod carrier 44 reach a position under the lowermost rod abutting against the stop surface 55 of the dog, one of a series of notches 57 formed in that portion of the cylindrical surface of the rod carrier between the flanges 46 and 47 reaches a position under the projection 52 on the dog and thereby permits the right end of the dog to be moved downwardly by the spring 51.

The surface 56 on the dog which projects over the lowermost rod then positively forces this rod downwardly into the pair of notches 48 in the flanges of the rod carrier. This action is clearly illustrated in Figs. 3 and 4. In Fig. 3 the dog is shown in its normal position and one of the notches 57 in the rod carrier has almost reached a position which will permit the right end of the dog to move downwardly. In Fig. 4 the notch 57 has permitted the projection 52 on the dog to fall into the notch, thereby allowing the right end of the dog to move downwardly and transfer the lowermost rod into its pair of rod-receiving notches on the rod carrier of the assembling drum.

To assist the feed cylinder 6 in feeding the column of rods against the stop surface 55 on the dog 49 it has been found desirable, especially when the machine is operated at high speed, to provide on this feed cylinder a plurality of balls 58 (Fig. 13) which are spring-pressed radially outward by springs 59 so that they yieldingly contact with the rods in the cylindrical space around the feed cylinder 6 as the cylinder rotates. The balls rotating with the cylinder lightly engage the rods but produce enough feeding action on them to keep all of the rods of the column in close contact and to insure that a rod is always in position to be transferred by the dog into a pair of the notches 48 in the rod carrier. If desired the first feed cylinder 5 may also be provided with balls like those just described to act in a similar way on the rods fed through the annular space surrounding this cylinder.

While the rods are being fed into the notches in the rod carrier of the assembling drum, the discs to be forced onto the ends of the rods are being fed by the chutes 2*a* and 2*b* into the disc-receiving pockets formed on the disc carriers 43 and 45 (Fig. 9) of the assembling drum in the manner which will now be described.

Each of the two disc carriers has an inner facing plate 60 (Figs. 8 and 9) each of which is provided with a series of recesses 61. These recesses are best shown in Fig. 7 which is a perspective view of the right half only of the assembling drum. As will be seen from this figure, each of the recesses 61 is so shaped that it can receive one of the discs edgewise, the recesses 61 being equally spaced around the disc carriers and positioned so that when a disc is in one of the recesses it is in coaxial relation with one of the rods held by a pair of the notches 48 in the rod carrier. In Fig. 7 the uppermost one of the recesses 61 is thus holding one of the discs D in coaxial relation with one of the rods R that has been transferred to the rod carrier by the dog 49.

At the inner side of each recess 61 there is positioned a small movable plate 62 which forms an inner wall for the recess and retains the disc in the recess until it is forced laterally onto the end of the corresponding rod as hereinafter described. Each plate 62 is mounted on the corresponding disc carrier by a pair of pins 63 which slide in the disc carrier longitudinally of its axis. As best shown in Fig. 11 the two pins 63 pass through the facing plate 60 of the disc carrier and project into openings 64 having a larger diameter than the diameter of the pins to provide a space 65 around each pin. A coil spring 66 surrounds each pin and bears at its outer end against a shoulder 67 on the pin and at its inner end against the facing plate 60.

Thus the coil springs 66 yieldingly retain the plate 62 in a position in which it contacts with the inner surface of the facing plate 60, as shown in Fig. 11 and at the upper portion of Fig. 7, to form a disc-receiving pocket which is adapted to receive one of the discs edgewise and hold it with considerable lateral restraint, and yet when the discs are moved laterally inward by the plungers hereinafter described the plates 62 yield and permit them to so move. Each of the plates 62 is provided with a V-shaped cut-out portion 68 (Fig. 7) which is deep enough to expose the central perforation *d* in the disc so that when the disc is moved inwardly the end of the corresponding rod on the rod carrier will be received by the perforation.

It will be understood that the arrangement of disc pockets just described is duplicated at the inner side of the other disc carrier 43. In each disc carrier there is a series of plungers the outer ends of which project beyond the ends of the assembling drum and appear at 69 in Fig. 9. One of these plungers is associated with each disc pocket in each disc carrier and is in coaxial relation with it. As best shown in Figs. 8 and 11 each plunger has a portion 70 of reduced diameter, the inner end of which slides in and is guided by a drilling 71 (Fig. 11) in the body of the disc carrier.

This drilling has an enlarged portion in which a part of the relatively large end 69 of the plunger is guided and in which there is positioned a coil spring 73 that surrounds the small-diameter portion 70 of the plunger. This spring reacts at its outer end against the shoulder 74, formed at the juncture of the large-diameter and small-diameter portions of the plunger, and at its inner end against the end of the enlarged portion 72 of the drilling in the body of the disc carrier. Thus the coil spring 73 urges the plunger outwardly. Secured to the outer side of each disc carrier there is a circular plate 75 having a diameter just sufficient to cause the outer edge of the plate to slightly overlap each of the enlarged drillings 72 in which the end portions 69 of the plungers slide.

The under side of the end 69 of each plunger is recessed as shown at 76 in Fig. 8 to accommodate the edge portion of the plate 75 and to provide on each plunger a shoulder 77 which is adapted to limit the outward movement of the plunger by engagement with the projecting edge portion of the plate 75. When each plunger is held in its outward position by its coil spring 73 the inner end of the plunger does not project into the corresponding disc pocket but is substantially flush with the outer wall of the pocket.

During rotation of the assembling drum the outwardly projecting ends of the plungers on each disc carrier come successively into engagement with a cam roll 78 (Figs. 7, 9 and 10). This cam roll is rotatable in a frame 79 which is pivoted at one end to a block 80 secured to a side wall 81 of the main frame of the machine. The other end of the frame 79 can be adjusted by turning a screw 82 to adjust the spacing between the cam

roll and the corresponding end of the assembling drum.

The two cam rolls 78 are so positioned that after a rod has been transferred to the rod carrier, and the two corresponding discs to be positioned on the opposite ends of such rod have been deposited in their respective pockets on the disc carriers, the outer ends of the two corresponding plungers will be engaged by the cam rolls to simultaneously move the two plungers inwardly. The discs at opposite ends of the rod will thereby be moved laterally inward out of their recesses 61 on the disc carriers and will be forced onto the corresponding projecting ends of the rod. Since the two discs are forced simultaneously onto the opposite ends of the rod this operation does not materially shift the rod lengthwise in either direction.

When each disc is thus moved inwardly by the corresponding plunger the retaining plate 62 forming the inner wall of the disc-receiving recess 61 yields and moves with the disc, the cut-out portion 68 in the plate permitting the end of the rod to enter the central perforation of the disc. This action is depicted in Fig. 7 at the disc pocket that is shown in alignment with the cam roll 78. When each plunger passes beyond the corresponding cam roll 78 it is returned to its normal position by its spring but the two discs which have now been forced on the opposite ends of an intervening rod retain the two corresponding yielding plates 62 in their inward position, i. e., the position to which they have been moved by the plungers.

As each rod and the two discs which have been forced onto it reach a position substantially at the lowest point in the rotation of the assembling drum, the rod comes into engagement with the previously-mentioned ejector 7 (Figs. 1, 7 and 8) which dislodges the completed assembly from the assembling drum. As best shown in Fig. 7 this ejector may comprise two upstanding arms 83 and 84 mounted on the base member 85 of the main frame of the machine and projecting up into the spaces between the rod carrier 44 and the two disc carriers 43 and 45. The yielding plates 62 of the pair of disc pockets which were held in their inward position by the discs forced on the opposite ends of the rod return to normal position as soon as the assembly is ejected from the assembling drum.

The assembling drum and the two feed cylinders 5 and 6 are driven from an electric motor shown at 86 in Figs. 5 and 8. A pulley 87 secured to a sleeve 88 (Fig. 8) which turns loosely on the end of the assembling drum shaft 46 is driven from the motor 86 by a belt 89 which passes around this pulley and a pulley 87' on the shaft of the motor 86 (Fig. 5). The sleeve 88 also has secured to it a pinion 90 (Fig. 8) which meshes with a gear 91. The gear 91 is mounted on one end of a rotary shaft 91' (Fig. 5) which extends transversely across the machine in parallel relation to the assembling drum shaft 46. The other end of this shaft carries a pinion 91'' which meshes with a gear 92 at the corresponding end of the assembling drum shaft 46.

The gear 92 is connected to the assembling drum shaft 46 by a friction coupling 92' (Fig. 8) such that when this gear is driven from the electric motor 86 by the connections just described it will rotate the shaft 46 and the assembling drum, but the shaft 46 and the assembling drum can be rotated by hand when the machine is not running by turning a hand wheel 93 while the gear 92 and the driving connections back to the electric motor remain stationary. The hand wheel 93, and the friction coupling between the gear 92 and the assembling drum shaft, afford means for turning the assembling drum by hand whenever this should become necessary, as for instance should one of the assemblies or its parts become jammed in the assembling drum and it is desired to turn the assembling drum far enough to permit their removal.

The shaft 34 on which the second feed cylinder 6 is mounted is rotated from the assembling drum shaft 46 by a sprocket 94 (Fig. 8) secured to the assembling drum shaft, a sprocket 95 secured to the shaft 34 of the feed cylinder, and a sprocket chain 96 which passes around these two sprockets. The shaft 29 of the first feed cylinder 5 is driven from the shaft 34 by meshing gears 97 and 98. The gear 98 is connected to the shaft 29 of the feed cylinder 5 by a friction coupling of the kind by which the gear 92 is connected to the assembling drum shaft 46. This permits the feed cylinder 5 to be turned by hand whenever desired when the machine is not running by turning a knob 99 secured to its shaft 29.

The rod hopper 4 is reciprocated, and the plate 35 in the disc hopper is rotated, from a separate electric motor shown at 100 in Figs. 1 and 5. The shaft 40 (Fig. 1) which drives the plate 35 in the disc hopper carries a pulley 101 at its lower end. As best shown in Fig. 5, a belt 102 passes around this pulley and around a pulley 103 on the shaft of the motor 100. Therefore rotation of the motor is imparted to the plate 35 by this belt. The belt 102 also passes around a third pulley 104 mounted at the upper end of a short vertical shaft 105 (Fig. 5). The lower end of this shaft carries a pinion 106 (see also Fig. 8) which meshes with a gear 107 carried by the lower end of a second short shaft 108 positioned adjacent and parallel to the shaft 105. The previously-described disc 18 is mounted on the upper end of this shaft 108 and its rotation reciprocates the rod hopper by means of the pitman 17.

It will now be seen that it is only necessary to start the machine and to supply the hopper 1 with discs and the hopper 4 with rods without exercising any care as to how the discs and rods are arranged in their respective hoppers, and despite the indiscriminate arrangement of the discs and rods in the hoppers, the disc-feeding means will automatically supply discs to the assembling drum and the rod-feeding means will automatically supply rods thereto, and the discs will be assembled on the rods at a rapid rate so long as there is maintained a supply of discs in the disc hopper and a supply of rods in the rod hopper. The machine is fully automatic and, as above stated, is capable of producing around 100 of the assemblies per minute.

While the machine was designed primarily for making rod and disc assemblies suitable for use as wheel and axle assemblies for toys, it may of course be used for making disc and rod assemblies suitable for other uses.

I claim:

1. In an assembling machine or the like for handling rods, feeding means for the rods comprising a hopper having an elongated horizontal opening for discharging the rods sidewise, and inclined side walls converging to the long sides of the discharge opening, a barrier disposed above the discharge opening, said barrier being wider than said opening and extending substantially

the full length of said opening to prevent lengthwise discharge of the rods through said opening, mounting means for the hopper permitting it to reciprocate horizontally and in a direction lengthwise of the elongated discharge opening and means for reciprocating the hopper in said lengthwise direction whereby rods placed indiscriminately in the hopper become oriented as they reach the discharge opening of the hopper and pass sidewise therethrough with their axes parallel to the planes of the inclined side walls of the hopper.

2. In an assembling machine or the like for handling rods, feeding means for the rods comprising a hopper having an elongated discharge opening constructed to discharge the rod sidewise, and inclined side walls converging to the long sides of the discharge opening, mounting means for the hopper permitting it to reciprocate in a direction parallel to the planes of the side walls of the hopper, means for reciprocating the hopper whereby rods placed indiscriminately in the hopper become oriented as they reach the discharge opening of the hopper and pass therethrough with their axes parallel to the planes of the inclined side walls of the hopper, and a bridge member in the hopper located above the discharge opening to form a lower compartment in the hopper, the side edges of the bridge member being spaced from the inclined side walls of the hopper by a distance only slightly greater than the diameter of the rods which the machine is designed to handle to provide elongated openings through which the rods pass singly into the lower compartment of the hopper, the bridge member having upper surfaces which slope downwardly and outwardly from the median plane of the bridge member toward the side walls of the hopper.

3. In an assembling machine or the like for handling rods, feeding mechanism for the rods including a hopper having an elongated discharge opening constructed to discharge the rods sidewise, a barrier disposed above the discharge opening, said barrier being wider than said opening and extending substantially the full length of said opening to prevent lengthwise discharge of the rods through said opening, means forming a rod-receiving space under said discharge opening having side walls spaced apart only slightly more than the length of the rods which the machine is designed to handle, mounting means for the hopper permitting it to be horizontally reciprocated transversely of said rod-receiving space and in the lengthwise direction of the discharge opening of the hopper, the hopper having inclined side walls converging to the long sides of the discharge opening and having end walls which are spaced apart at the discharge opening a greater distance than the length of the rods and also more than the distance between the side walls of the rod-receiving space below the hopper, and means for reciprocating the hopper lengthwise of the discharge opening of the hopper and transversely of the rod-receiving space with an amplitude of movement that will bring the end walls of the hopper alternately into substantial registry with the side walls of the rod-receiving space whereby rods placed indiscriminately in the hopper will be oriented by the inclined side walls of the hopper by the time they reach the elongated discharge opening thereof so that they will pass sidewise therethrough and whereby the end walls of the hopper will move rods at the bottom of the hopper into registry with the rod-receiving space below the hopper.

4. A machine as set forth in claim 3 wherein the rod receiving space is an annular channel formed between the arcuate wall of a housing member and the smooth surface of a cylindrical drum continuously rotating in said housing, the sides of the annular channel being formed by the parallel sides of the housing.

5. A machine as set forth in claim 4 in which one side wall of the hopper extends into the annular channel to cooperate with the surface of the cylindrical drum in directing the rods along said annular channel.

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