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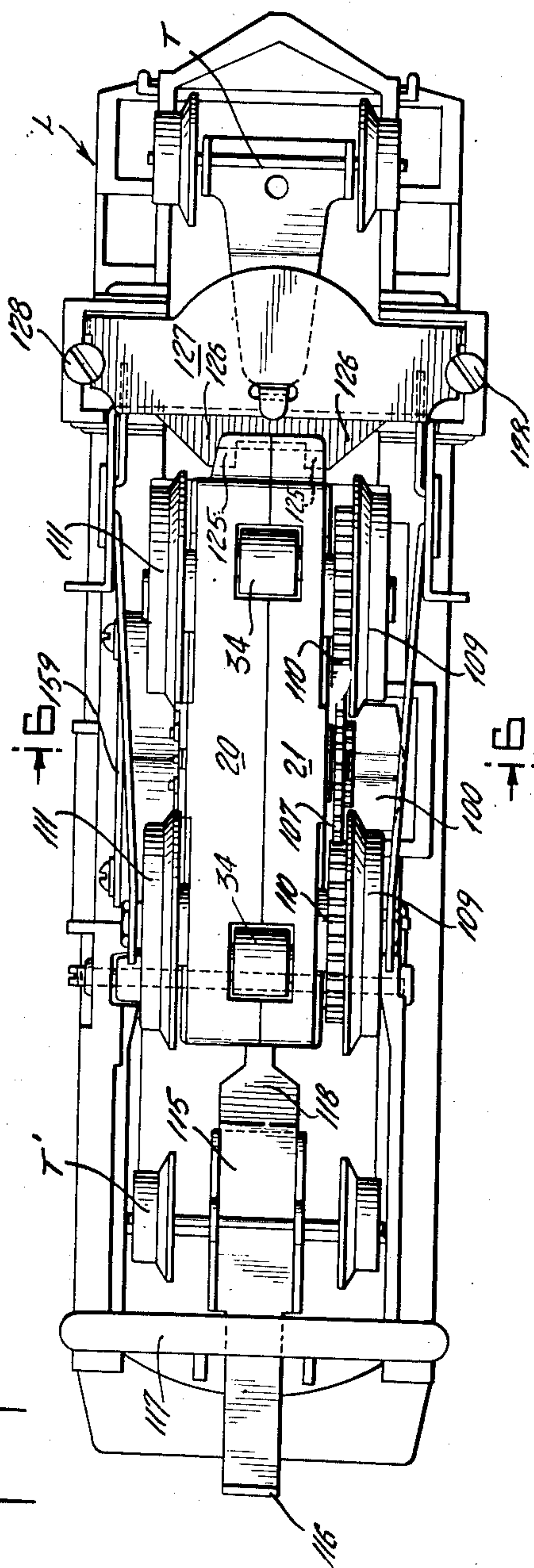
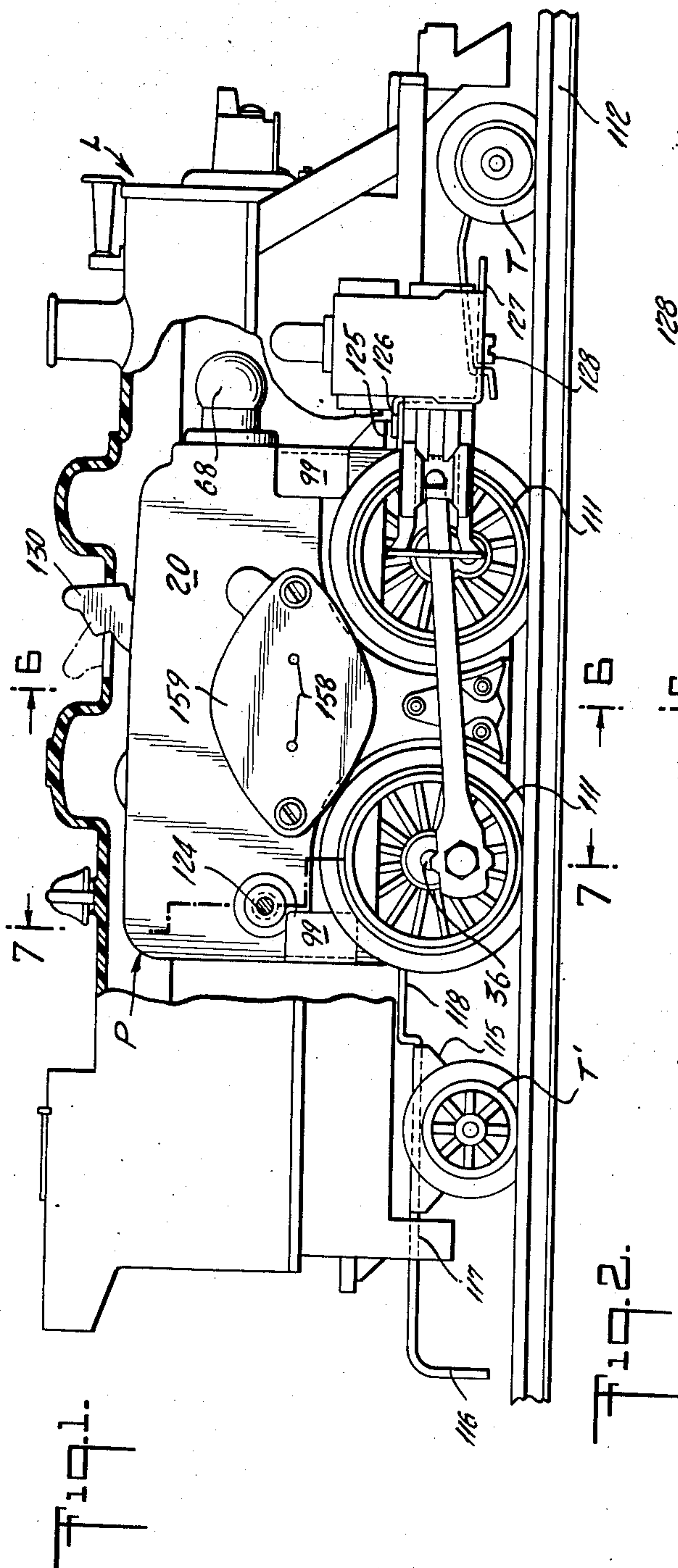
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TOY LOCOMOTIVE

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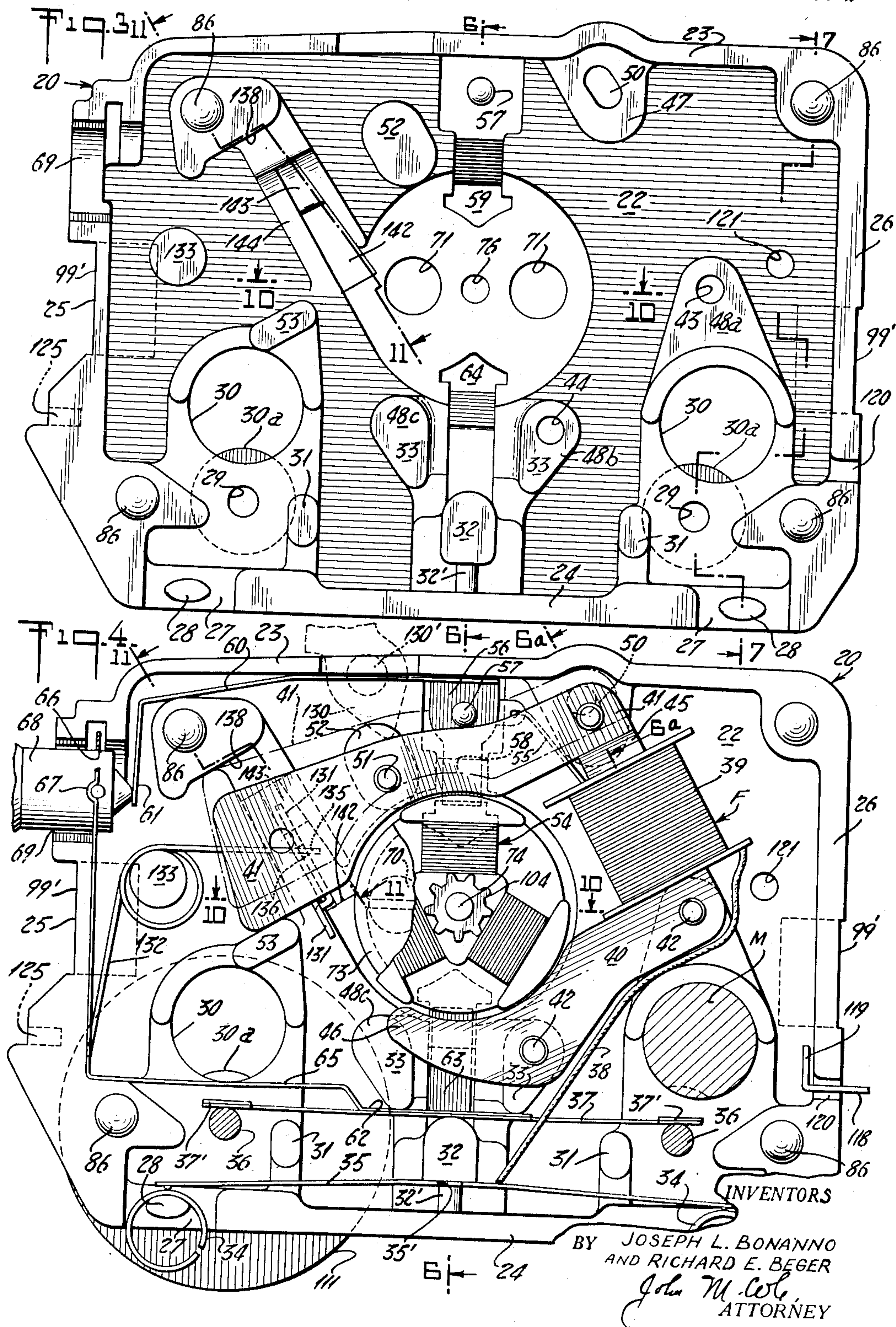
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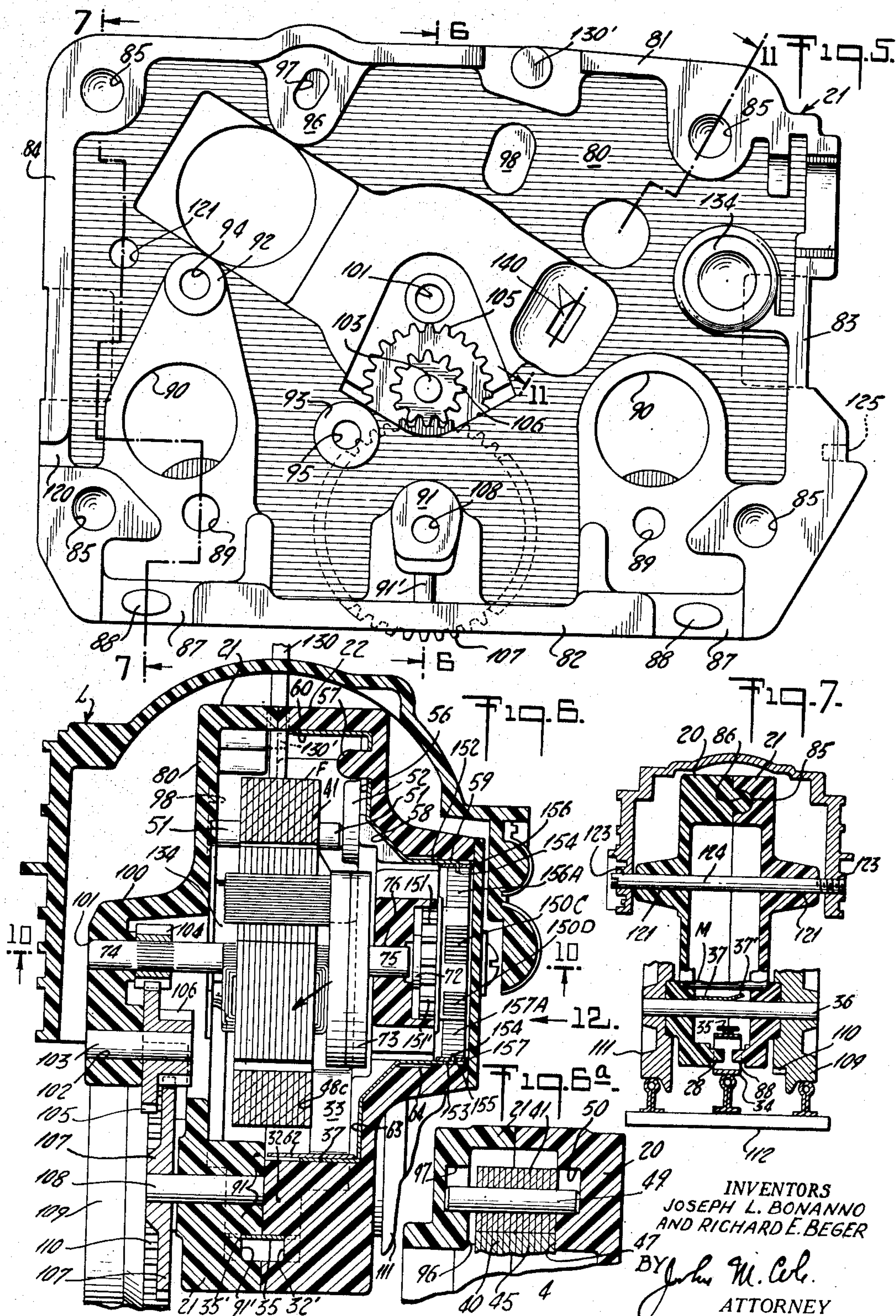
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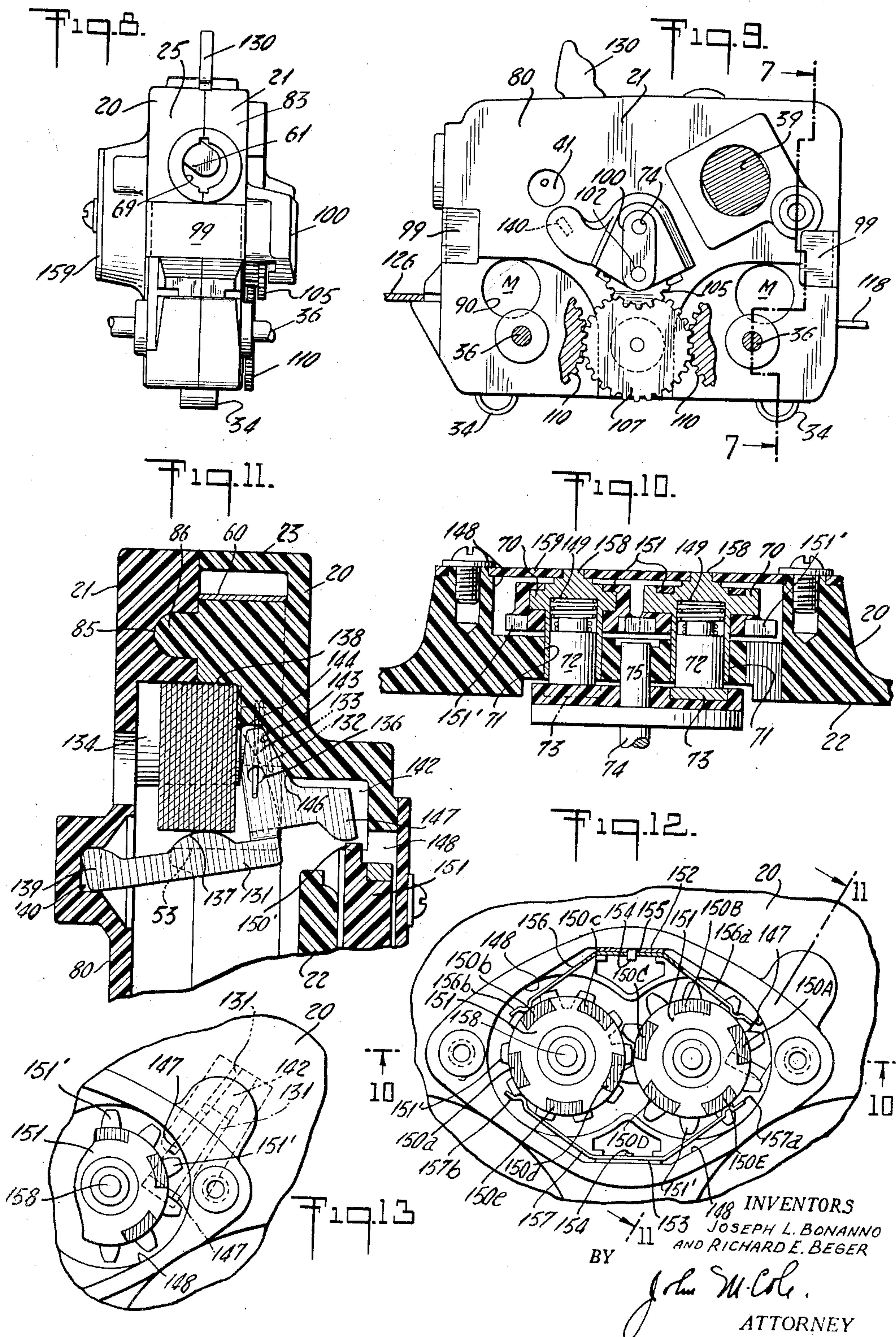
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4 Sheets-Sheet 3



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4 Sheets-Sheet 4



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UNITED STATES PATENT OFFICE

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TOY LOCOMOTIVE

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10 Claims. (Cl. 105—49)

1

The present invention relates to toy locomotives and is more particularly directed toward toy locomotives having completely preassembled propulsion units adapted for securement in the body of the locomotive and employing a molded plastic housing.

According to the present invention, a two part molded plastic housing accommodates the propulsion motor, and carries the current collectors, the running gear and all electric connections between these parts, also preferably the headlight. The present invention contemplates the employment of a two-part housing structure, one part carrying all the electrical parts of the motor and current carrying parts for supplying the motor and the headlight (where used), the other part carrying the driving gears adapted to interconnect the motor shaft with the driving wheels of the locomotive, and arranged so that it acts as a cover for the first mentioned housing part to hold all the pieces and parts in proper assembled relation.

Structural embodiments of the present invention are characterized by a minimum of soldering connections and by use of preassembled units and parts adapted to be fitted into the housing parts without the use of tools, screws and other securing devices. The locomotive contemplated by the present invention is one suitable for low priced manufacturing cost and yet has all the necessary parts to provide for all normal operations of a toy electric locomotive.

The present application is directed more particularly toward the toy locomotive propulsion unit as an entity. The structure shown herein includes a reversing switch mechanism and current collecting mechanism which form the subject-matter of other applications filed concurrently herewith as Serial No. 121,495 and Serial No. 121,496.

Other and further objects will appear as the description proceeds.

The accompanying drawings show, for purposes of illustrating the present invention, one embodiment in which the invention may take form, it being understood that the drawings are illustrative of the invention rather than limiting the same.

In these drawings:

Figure 1 is a side elevational view of a complete toy locomotive taken from the right-hand side, parts being broken away to illustrate the propulsion unit;

Figure 2 is an inverted plan of the locomotive;

Figures 3 and 4 are side elevational views of the right housing part looking at it from the inside, showing respectively the housing part alone, with current conductors and motor parts normally carried by it, the movable part of the motor field being in full lines in running position

2

and in dot and dash lines in the released position for operating an automobile reversing switch;

Figure 5 is an inside elevational view of the left housing part with assembled gearing inside;

Figure 6 is a transverse sectional view through the locomotive housing and the propulsion unit taken in the direction of the arrows 6—6 of Figs. 1 to 5 inclusive;

Figure 6a is a fragmentary section on the line 6a—6a of Figure 4;

Figure 7 is a vertical sectional view taken on the broken line 7—7 of Figs. 1, 3, 5 and 9;

Figure 8 is a front end view of the propulsion unit;

Figure 9 is an outer side elevational view of the left side of the propulsion unit;

Figure 10 is a fragmentary sectional view on the lines 10—10 of Figs. 3, 4, 6 and 12 to show the reversing switch;

Figure 11 is a fragmentary sectional view on the lines 11—11 of Figs. 3, 4, 5 and 12, showing the motor field and reversing switch interconnections, the field being in the released position in full lines and in the attracted position in dotted lines;

Figure 12 is a fragmentary elevational view of the reversing switch, with the cover removed, and taken in the direction of the arrow 12 of Fig. 6; and Figure 13 is a fragmentary diagrammatic view of the same.

In the drawings, the reference character L designates generally the locomotive body. This is a single piece of molded insulating or die cast material hollow from underneath and having the external configuration of a steam type locomotive. It is adapted to receive the propulsion unit designated generally as P and carry front pilot truck T and a rear pilot truck T'. The propulsion unit P has a housing composed of two plastic moldings designated generally as 20 for the right housing and 21 for the left housing. These housings are of generally rectangular shape.

The right housing part 20 has a vertical side wall 22, top wall 23, bottom wall 24, front wall 25 and rear wall 26, all terminating in a common plane. The bottom wall 24 is recessed as indicated at 27, 27 and centrally of these recesses carries lugs 28, 28. Slightly higher up the side wall 22 are openings 29, 29 for the axle shafts, and above these axle shafts are large openings 30, 30 for magnetic loading weights M. Stops 30a, 30a keep these weights in place. Adjacent the holes 29, 29 are forwardly or away from the bottom extending lugs 31, 31 and intermediate these lugs is another forwardly extending lug 32. Above and laterally of the lug 32 are two forwardly extending lugs 33, 33.

The recesses 27, 27 and lugs 28, 28 are adapted

3

to receive current collecting rollers 34, 34. Conducting strap 35 bears on these rollers and is held in place by the lug 32 and a rib 32' below the lug 32 entering notch 35'. The strap 35 is resilient and yields when the rollers are on the third rail. The holes 29 receive the wheel axles 36, 36. A resilient conducting strip 37 bears on the axles 36, 36 and extends between the upper face of lug 32 and the lower faces of lugs 33, 33, so that current can be carried from the power and wheel bearing rails into the locomotive housing. When the axles are out, the contact strip 37 bears on top of lugs 31. These ends are bent up as indicated at 37' to facilitate inserting the axles. The conducting strip 35 is connected by a wire 38 with the coil 39 carried on one part 40 of a motor field F having a separate movable part 41. The motor field part 40 is held in place in the housing part 20 by locating pins 42, 42 projecting from the field structure 40 and entering recesses 43, 44 in the molded piece 20. The ends 45, 45 of the field structure rest on raised bearing surfaces indicated at 47 and 48a, 48b, 48c, Fig. 3, so that the field structure 40 carrying the coil 39 is definitely aligned with respect to the housing part 20.

The other laminated part of the field, namely, the part 41, has pin 49 which enters an elongated recess 50 in the elevated portion 47 of the housing part 20 and another pin 51 which bears against an elevated area 52 in the housing part 20. The motor field part 41 is in the position indicated in full lines in Figure 4 when the motor is in operation and is held against a stop 53 projecting forwardly from the side wall 22 of the housing part 20. The field part 41 may be locked in this position or it may be brought to this position when current is applied to energize the motor because the magnetic field set up by the coil 39 through the field structure 40, 41 and the armature indicated generally at 54 will attract the movable field piece to this position.

The field coil 39 is connected by a wire 55 with a conducting strip 56 having a hole to fit about a pin 57, an extension 58 passing through a hole 59 in the housing part 20, and a forward extension 60 downwardly bent as indicated at 61 to form a center contact for a headlamp. The grounded strap 37 has extension 63 passing through a hole 64 in the housing part 20 and between it and the lugs 33 is a strap 62 having a forward extension 65 apertured at 66 and offset at 67 to form the other contact for the headlamp 68. The contacts 61 and 67 are opposite a semi-cylindrical recess 69 in the housing part 20. The lamp bulb is therefore in series with the field winding. The ends of the straps 56 and 63 which project through holes 59 and 64 are connected to reversing switch mechanism to be described. This mechanism includes brush boxes 70, 70 received in holes 71 and carrying spring pressed brushes 72 bearing on the disk type commutator 73 carried on the armature shaft 74 and connected to armature windings as usual. The end 75 of the armature shaft is received in bearing hole 76.

The left housing part 21 shown in Figures 5, 6 and 7 has a vertical side wall 80, top wall 81, bottom wall 82, front wall 83 and rear wall 84 of the same configuration as the walls 23 to 26 of the outer housing part and adapted to meet it. It is provided with recesses 85 to meet dowel-like pins 86 extending forwardly from the housing part 20.

The housing part 21 is recessed as indicated at

4

87, 87 and provided with lugs 88, 88 opposite the recesses 27 and lugs 28 of the housing part 20 so as to keep the contact rollers 34 in place. It has axle openings 89 opposite axle openings 29 and magnet receiving openings 90 similar to and opposite the magnet receiving openings 30. It has a lug 91 opposite to but higher than lug 32 and rib 91' opposite the rib 32' to hold the strips 35 and 62 in place. The housing part 21 has raised areas at 92 and 93 with pin receiving recesses 94, 95 to accommodate the other ends of pins 42, 42 on the fixed field element 40 and hold them securely in place when the housing parts are secured together. The housing part 21 has raised areas 96 carrying an elongated recess 97 to accommodate the other end of pin 49 and a recess 98 to accommodate the other end of pin 51. The housing parts are secured together by spring clips 99 received in notches 99' in the front and rear ends of the propulsion unit housing parts 20 and 21.

The housing part 21 carries a lateral offset gear bracket element indicated at 100. It has a shaft opening 101 for the end of the armature shaft 74 and an opening 102 for a shaft 103. The armature shaft carries a pinion 104 in mesh with a gear 105 on the shaft 103 and this gear 105 carries a pinion 106 in mesh with a gear 107 carried on a shaft 108 mounted in the housing part 21.

The axles 36, 36 carry wheels 109, 109 provided with gear teeth 110, 110 in mesh with the gear 107 and on the other side of the propulsion unit wheels 111, 111 so that the propulsion unit or the locomotive to which it is attached can be carried along the usual toy railroad track indicated at 112. The wheels are made of magnetic material, so as to form, with the track, usually plated steel, and the magnet M, a magnetic circuit whereby magnetic loading of the locomotive is made possible. Such loading has been found to triple the tractive effort available.

The rear pilot truck T' has a truck body 115 with a coupler hook 116 extending past a cross bar 117 formed in the locomotive molding. The truck 115 has a forward extension 118 with an upwardly bent end 119 (see Fig. 4), which enters into notches 120, 120 in the housing parts 20 and 21. After the pilot truck has been thus connected to the locomotive propulsion unit housing, the housing is passed upwardly into the locomotive molding L to bring the aligned openings 121, 121 of the housing parts 20, 21 opposite holes 123, 123 in the locomotive molding and a bolt 124 is passed through these aligned holes so as to secure the rear end of the propulsion unit in place. The parts 21, 22 forming the propulsion unit housing are notched as indicated at 125 to receive ears 126, 126 carried by a cross strap 127 secured to the locomotive body L by screws 128. This cross strap carries the front pilot truck T.

The reversing switch

The reversing switch and its operation form the subject-matter of application Serial No. 121,495 filed concurrently herewith and is here described to show the completion of the connections for the motor.

When it is desired to operate the locomotive in but one direction, the movable element 41 of the field structure is locked in the position shown in full lines by a lever 130 pivoted on a post 130' provided in the housing part 21 and projecting up through the locomotive body as

indicated in Figure 1. This lever holds the field part 41 against the stop 53 and against the field 40 and the motor will turn in the same direction on repeated applications of current.

When the lever 130 is shifted to the dot and dash line position of Fig. 1, the nose of the lever is away from the field structure 41 so that the field structure is free to move about the pivot 49. This movement is accomplished by a pawl 131 under the influence of a coiled spring 132. This spring is wound about a post 133 and is held against slipping off the post by a mating post 134 carried by the housing part 21. The free end 135 of the spring 132 is behind the movable field part, as viewed in Figure 4, and passes through a hole 136 in the pawl 131 and tends to shift this pawl upwardly as viewed in Figures 4 and 11. The pawl has a hump portion 137 which engages the field 41. The pawl engages the lower face of the movable field part and shifts it to the full line position shown in Figure 11, bringing it against a stop member 138 carried by the housing part 20.

The pivot end 139 of the pawl 131 is received in a recess 140 formed in the housing part 21 and the other end of the pawl 131 passes through a slot 142 in the housing part 20. This slot is considerably wider than the pawl 131 to allow the pawl to have a lateral as well as back and forth movement. The housing part 20 has a sloping surface 143 leading to the slot 142. The casing also has a sloping surface 144 along which the end 136 of the spring rides. The pawl 131 as it shifts back and forth due to the movement of the field 41, has a swinging movement about the end 139 and also has a slight back and forth movement due to the camming action of the surface 146 of the pawl against the surface 143 of the casing. As a result, the nose 147 of the pawl moves transversely as well as in a generally vertical direction. Owing to the size of the slot 142 it is also possible for the pawl to swing from the full line position of Figure 4 to the dot and dash line position which is above and to the right of the full line position.

The pawl is actuated each time the lever 130 is shifted, also each time the current is supplied to the motor. The nose 147 of the pawl 131 projects into an outwardly opening recess 148 formed in the housing part 20 so that it is available for operating the reversing switch mechanism carried in this recess.

The brush boxes 70, 70 are in the form of metal turnings having brush receiving recesses 149. The large diameter portions of the brush boxes are broached to form, as here shown, five conducting segments marked 150A, B, C, D, and E and 150a, b, c, d and e, respectively. The diameter of these segments is less than half the distance separating the centers of the brush boxes so that the segments themselves are out of contact. The broached turnings having the brush receiving openings and the conducting segments are used as inserts for a body 151 of molded insulation having gear teeth 151' twice as numerous as the conducting segments. The teeth 151' on the right-hand gear box (Fig. 12) are lined up with the segments 150A, etc., while the teeth on the other brush box are spanned by the segments 150a, etc.

The outwardly projecting ends 152 of field connected contact strip 58 and 153 of grounded contact 63 have offset prongs 154, 154 (Fig. 12) which enter holes 155 in contact springs 156 and 157, respectively. These springs have ends 156a 75

and 156b, 157a, 157b, which bear on the cylindrical surface of the brush box. The parts are so proportioned that when one conducting segment on one box contacts one end of one spring, the other end of the other spring contacts a conducting segment on the other brush box, and current flows in one direction. Turning the boxes one-tenth of a revolution changes the contact relation so that current flows in the other direction and the motor direction is reversed. The brush boxes 70 have reduced ends 158 and are held in place by a cover plate 159 secured over the recess 148.

The pawl 131 is utilized to effect the step by step advance of the gears and brush box segments. The nose 147 of the pawl is above and behind a tooth as indicated in full lines in Figure 13. As it moves down, it engages the gear tooth 151' in front of it and turns the gear clockwise. At the same time, it shifts laterally to the dotted line position of Figure 13, the gear being advanced one-tenth of a turn. When current supply to the motor is interrupted, or one manually releases the field by moving the lever 130, the spring 132 retracts the pawl causing it to pass up by the adjacent tooth and snap back to the full line position of Figure 13.

Since it is obvious that the invention may be embodied in other forms and constructions within the scope of the claims, we wish it to be understood that the particular form shown is but one of these forms, and various modifications and changes being possible, we do not otherwise limit ourselves in any way with respect thereto.

What is claimed is:

1. A toy electric locomotive propulsion unit comprising mating body and cover members made of molded insulating material and secured together to form a motor housing, the members having aligned axle bearing holes and aligned motor shaft bearing openings, wheel carrying axles passing through the axle holes and provided with driving gears, an armature shaft mounted in the shaft bearing openings and carrying a pinion, an armature and a disc-type commutator, the commutator being near one housing member and facing the same and the pinion being near the other housing member, reduction gearing carried by the latter housing member and connecting the pinion and wheel driving gears, a wound motor field core intermediate the housing members, and brush rigging carried by the housing member adjacent the commutator and including conducting tubes parallel with the shaft axis and extending through openings in said housing member and brushes in the tubes and bearing on the face of the commutator.

2. A toy electric locomotive propulsion unit, comprising mating body and cover members made of molded insulating material and secured together to form a motor housing, the members having aligned axle bearing holes and aligned motor shaft bearing openings, wheel carrying axles passing through the axle holes and provided with driving gears, an armature shaft mounted in the shaft bearing openings and carrying a pinion, an armature and a commutator, the commutator being near one housing member and the pinion near the other housing member, reduction gearing carried by the latter housing member and connecting the pinion and wheel driving gears, a wound motor field core intermediate the housing members, brush rigging carried by the housing member adjacent the commutator and including brushes extending through openings in

said housing member and bearing on the commutator, current collectors carried by the housing members and projecting below the same to contact a power rail, a spring strap in the housing, bearing on the current collectors to press them downwardly and held in place and under tension by the housing members, a second housing received spring strap bearing on the axles and held in place by the housing members, a lead secured to one strap and to the winding of the motor field, a lead from the other strap to the brush rigging, and a lead from the brush rigging to the field winding.

3. A toy electric locomotive propulsion unit comprising two internally recessed, mating body and cover members made of insulating material secured together to form a motor housing, the body member having an armature shaft bearing opening and brush box openings, brush rigging carried on the outside of the body member, conducting straps supported by the body member and extending through holes therein and forming leads to the brush rigging, a motor field structure carried by the body member and having a field winding connected to one of said conducting straps, the body member having axle openings, a resilient conducting strap received in the body member and having ends opposite the axle openings and connected to the other brush rigging conducting strap, current collectors carried by the body member, a second resilient conducting strap having ends bearing on the current collectors and connected by a lead to the field winding, an armature unit having a shaft end in the shaft bearing opening, a pinion on the other end and a commutator adjacent the brush boxes, brushes in the brush boxes, the cover bearing against the resilient conducting straps and the field structure to hold them in place and having a shaft bearing to receive the armature shaft and axle openings opposite the first mentioned axle openings, axles in the axle openings, wheels on the axles and provided with driving gears, and gearing carried by the cover member and connecting the pinion and the driving gears.

4. A toy electric locomotive propulsion unit as claimed in claim 3, wherein the faces of the housing members are recessed to form a lamp bulb receiving opening and the straps connected to the brush rigging have extensions fitted in the body member and terminating opposite one another and the opening, and forming a socket to receive a lamp bulb so that the lamp may be in series with the field winding.

5. A toy electric locomotive propulsion unit comprising an insulating housing having two mating pieces of molded insulating material side by side, one carrying brush rigging and brushes, the other carrying reduction gearing, vertically movable current collectors loosely carried by the housing and extending downwardly therefrom for contact with a power rail, housing carried axles having geared drive wheels in mesh with the gearing, a motor having a wound field and a rotor in the housing, the rotor having a commutator cooperable with the brushes and a pinion in mesh with the reduction gearing, two conducting straps one bearing on the axles and the other on the current collectors, one connected to the motor field, the mating pieces of the housing having opposed cavities which receive the said straps and opposed abutments which hold them in place, the other to the brush rigging, and a third conducting strap carried by one of the housing pieces and connected to the

other side of the field winding and to the brush rigging.

6. A toy electric locomotive propulsion unit comprising a two-part molded housing, each part having normally vertical side walls and inwardly facing top, bottom and end walls which meet to form a substantially closed housing, the parts having pairs of aligned axle openings through the vertical walls, pairs of registering current collector openings in the bottom walls, axles in the axle openings, current collectors in the collector openings, a housing-received resilient conducting strap bearing on the axles, a housing-received resilient conducting strap bearing on the current collectors, the housing parts having lugs engaging the straps to hold them in place and under tension, the housing parts having aligned shaft bearings, an armature shaft carried in the shaft bearings and carrying a commutator adjacent one housing part and a pinion adjacent the other housing part, the vertical wall of the housing part adjacent the commutator having brush openings and brush lead openings, brush boxes in the brush openings carrying brushes bearing on the commutator, brush leads including straps passing through the corresponding openings and connected to one of the resilient straps, a motor field structure having studs entering recesses in the housing part to secure it in place and a field winding, wires connecting the field winding to the other lead strap and the other resilient strap and means to secure the housing parts together.

7. A toy electric locomotive propulsion unit as claimed in claim 6, wherein the vertical wall of the said other housing part is offset about the shaft bearing and has a downwardly opening gear space, an idler shaft below the armature shaft, a pair of gears carried by the idler shaft one of which is in mesh with the pinion on the armature shaft and projects through the gear space, an additional shaft carried below the other shafts, and a gear meshing with one of the latter mentioned gears and drivingly connected with the axles.

8. A toy electric locomotive propulsion unit comprising mating body and cover members made of molded insulating material and secured together to form a motor housing, the members having aligned axle bearing holes and aligned motor shaft bearing openings, wheel carrying axles passing through the axle holes and provided with driving gears, an armature shaft mounted in the shaft bearing openings and carrying a pinion, an armature and a commutator, the commutator being near one housing member and the pinion near the other housing member, the bearing opening in said other housing member being in an offset bracket providing a downwardly opening gear space, reduction gearing carried by the bracket below the pinion connecting the pinion and wheel driving gears, a motor field intermediate the housing members, and brush rigging carried by the housing member adjacent the commutator and including brushes extending through openings in said housing member and bearing on the commutator.

9. A toy electric locomotive propulsion unit comprising two insulating internally recessed housing parts meeting on a longitudinal vertical plane and clamped together, a motor field structure held in place between and by the housing parts and having a field winding, a rotor having a horizontal armature shaft mounted on the housing parts, a disk commutator and a driving

9

pinion, brush rigging carried by the housing part adjacent the commutator, axles passing through the housing parts and carrying driving wheels exterior to the housing, gearing connecting the pinion and the driving wheels, a plurality of sheet metal conducting strips, one bearing on the current collectors, a second on the axles, a third bearing on the second and connected to one side of the brush rigging, and a fourth connected to the other side of the brush rigging, the housing parts having conductor strip locating and supporting elements whereby all the strips are definitely located, flexible field leads secured to one of the first two strips and to the fourth strip.

10. A toy electric locomotive propulsion unit as claimed in claim 9, wherein the brush rigging extends through openings in said housing part to be externally accessible and the brush connected strips extend through other openings in said housing part.

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10

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