Sept. 8, 1931. C. O. KNUUTI ET AL 1,822,441

ASSEMBLING APPARATUS

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Fig. 1.

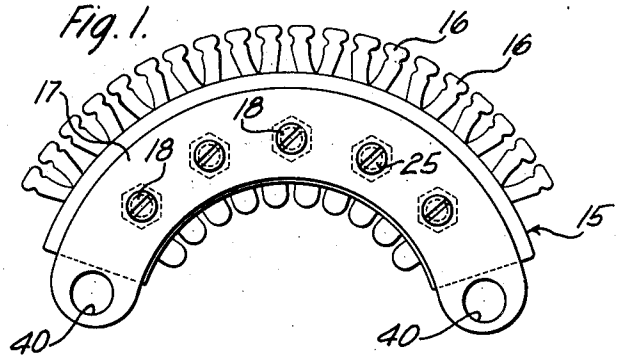


Fig. 2.

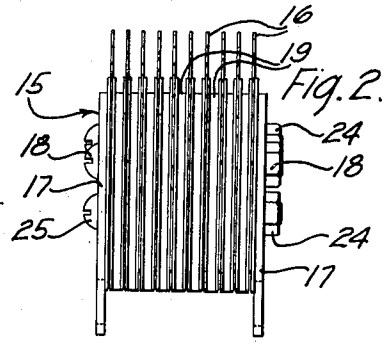
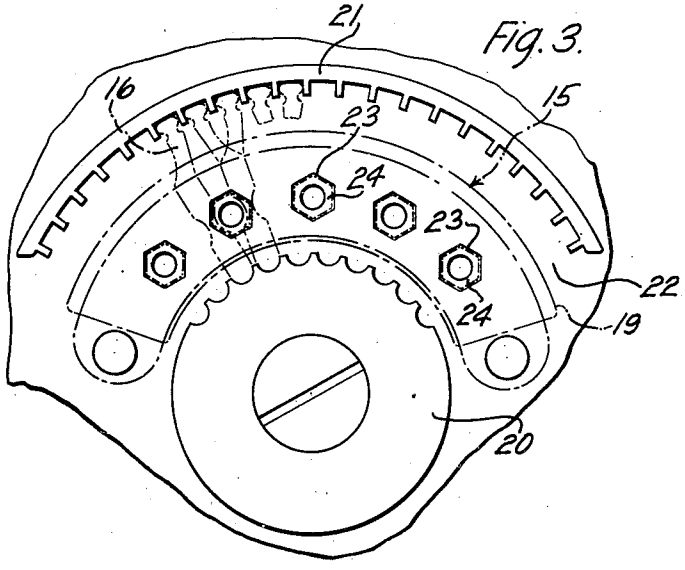


Fig. 3.

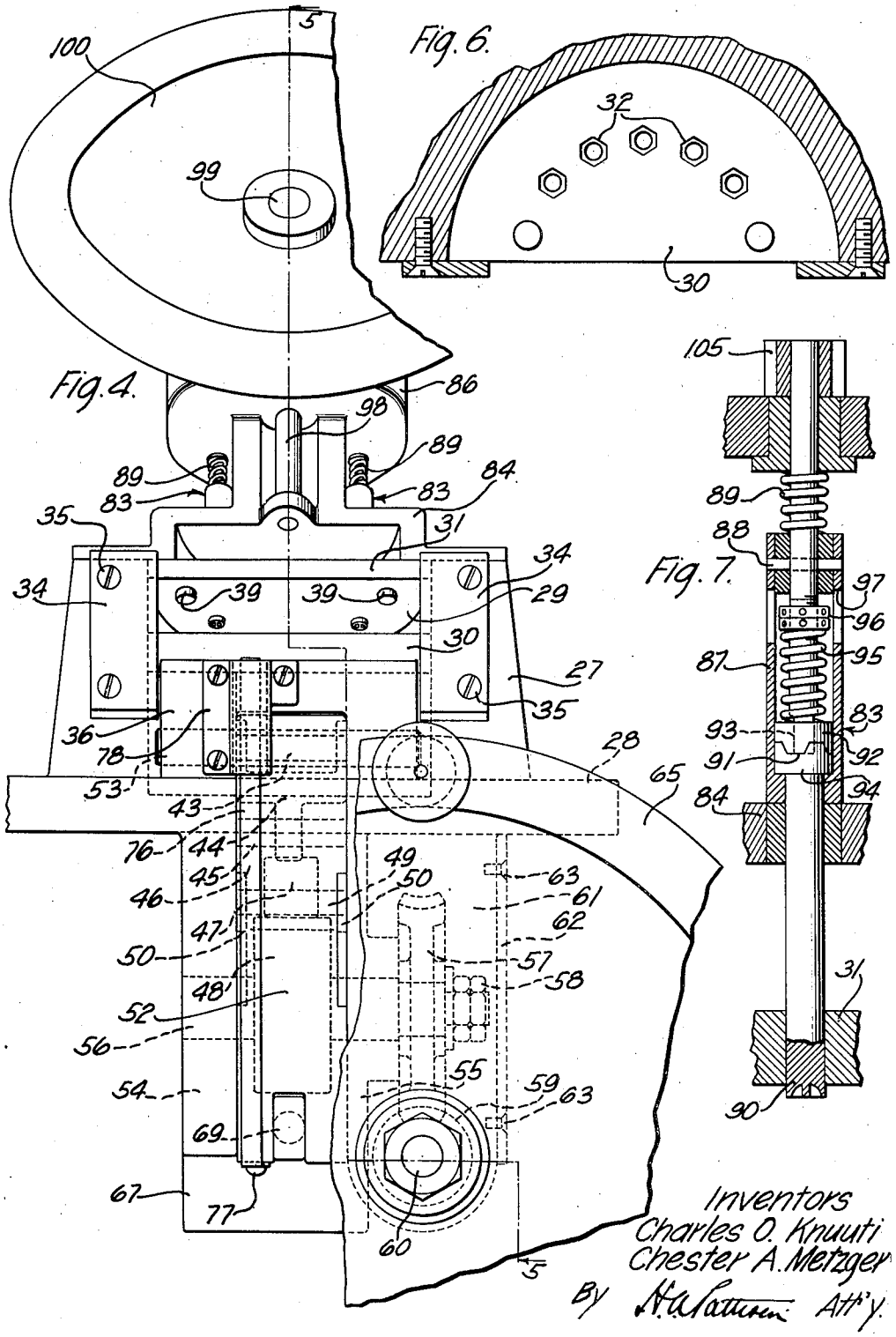


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Fig. 8.

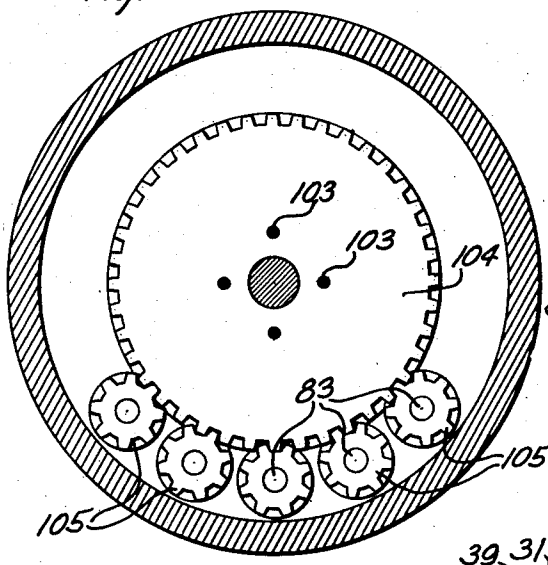


Fig. 5.

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UNITED STATES PATENT OFFICE

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ASSEMBLING APPARATUS

Application filed March 9, 1929. Serial No. 345,721.

This invention relates to assembling apparatus, and more particularly to apparatus for assembling a plurality of similar parts in close juxtaposition to each other.

In the assembling of parts into a unit, there are a number of instances where it is necessary that the parts be thoroughly compressed and firmly secured to each other before the unit is ready for use. Thus, in the manufacture of step by step type telephone terminal banks the terminals are secured between strips of insulation and the bank is tightly compressed and securely bolted together in order to keep the terminals in position. In compressing such assemblies it is of course desirous that the compressing and bolting action be accomplished in the minimum amount of time in order to reduce the production cost.

An object of this invention is to provide an economical and efficient apparatus for assembling parts.

In accordance with this object one embodiment of the invention consists of a plunger and block for compressing parts constituting an assembly while a plurality of screw drivers, operated simultaneously by a common hand wheel, tighten the bolts thereof to produce a rigid assembly. The plunger is actuated by a plural lobed cam and toggle device which requires the minimum number of movements of another hand wheel to effect the compression, and a resilient member is connected to the toggle apparatus to prevent excessive compression.

These and other objects of the invention will become apparent from the following description of one embodiment thereof when taken in connection with the accompanying drawings, wherein—

Fig. 1 is a plan view of the step by step type telephone terminal bank which the structure is constructed to assemble;

Fig. 2 is an end view of the same bank;

Fig. 3 is a fragmentary plan view of a structure for preliminarily assembling the bank of Figs. 1 and 2;

Fig. 4 is an elevational, front view of the assembling apparatus;

Fig. 5 is a sectional view of the same apparatus, taken on the line 5—5 of Fig. 4;

Fig. 6 is a plan view of the plunger shown in Fig. 5, and taken on the line 6—6 thereof;

Fig. 7 is an enlarged longitudinal section of the screw driver shown in Fig. 5, and

Fig. 8 is an enlarged, cross-sectional view taken on the line 8—8 in the structure of Fig. 5 to show the gears for driving the screw drivers.

Referring now to the drawings in which like numerals designate similar parts in the several figures, there is disclosed in Figs. 1 and 2 a step by step type telephone terminal bank 15, which the structure is designed to assemble. The terminal bank 15 consists of a plurality of separated metallic terminals 16 arranged in rows and held between metal plates 17 by the compression afforded by bolts 18 extending through the bank, strips of insulation 19 being interposed between the rows. The bank 15 is preliminarily assembled in the structure shown in Fig. 3 which consists of slotted hub and rim members 20 and 21, respectively, for predeterminedly positioning the terminals 16 during the initial assembling of the bank. A base 22 of this apparatus contains recesses 23 for retaining nuts 24 of the bolts 18 while the bolts are preliminarily tightened by any suitable screw driver engaging the slots of the screw heads 25. This preliminary assembly leaves the bank 15 loosely held together by the bolts 18, and it is the purpose of the final assembling structure to compress the bank and tighten the bolts 18 to produce a compact and rigid unit.

The assembling apparatus, shown in Figs. 4 to 8, consists of a semi-cylindrical, inclined block 27 which has a horizontally extending support 28 that may be attached to the top of a working table, not shown. A semi-cylindrical chamber 29 is provided in the front of the block 27 for receiving the preliminarily assembled terminal bank 15, and a plunger 30 is slidably mounted within the chamber 29 for compressing the bank 15 upwardly against a head piece 31 at the top of the chamber. It will be noted in Fig. 6 that the plunger 30 has nut shaped recesses 32 suitably positioned for receiving the nuts

24 of the bolts 18, and it is also to be noted here, as shown in Fig. 5, that these recesses have concentric depressions 33 for receiving the projecting threaded ends of the bolts 18 in order that the bolts may be tightened considerably by screw drivers during the time that they are being compressed by the plunger 30. The plunger 30 is held within the chamber 29 by a pair of straps 34 secured by screws 35 to the edges of the chamber, and also, by a triangular block 36 secured to the horizontal support 28 by screws 37 (Fig. 5) and having a diagonal surface 38 adjacent the plunger. Four knobs 39 project from the outer edges of the plunger 30 and the head piece 31 to receive apertures 40 (Fig. 1) in the plates 17 of the bank 15.

In order to actuate the plunger 30 there is provided a cam and toggle device as follows: The lower side of the plunger 30 is connected by a pin 43 to a Y-shaped link 44 (Figs. 4 and 5) of the toggle, and a pin 45 connects the other end of the link 44 to a U-shaped link 46 that has a roller 47 pinned thereto for engaging a three-lobed cam 48. The link 46 is secured by a pin 49 to a pair of side straps 50 that are secured by screws 51 (Fig. 5) to a hinge 52 pinned at 53, to the aforementioned triangular guide block 36. Thus it is to be noticed that there is provided a toggle device consisting of two links 44 and 46 which toggle of its own accord rests upon the three-lobed cam 48 through the roller 47. The hinge 52 supporting the lower end of this toggle arrangement is retained at its lower end as appears below.

A pair of parellel walls 54 and 55 depend from the block 27 and are positioned in close proximity to the sides of the aforedescribed toggle device to prevent possible sidewise movement of the links and pins thereof, and also to journal a shaft 56 for mounting the three-lobed cam 48. The right end (Fig. 4) of the shaft 56 has a spiral gear 57 secured thereto by nuts 58, and a worm gear 59 engages this gear and is keyed to a shaft 60 that is journalled in the lower end of a box shaped housing 61 (Fig. 4) that depends from the block 27 for that purpose. A plate 62 secured by screws 63 encloses the right side of the housing 61. Threaded onto the right end of the shaft 60 are nuts 64 (Fig. 5) which prevent the shaft from moving longitudinally relative to the housing 61, and on the left end of the shaft there is keyed a solid hand wheel 65 locked thereon by nuts 66. At the back of the walls 54 and 55 there is secured a plate 67 having an aperture 68 through which extends a shaft 69 pinned at 70 to the lower end of the aforementioned hinge 52. The right hand end of the shaft 69 (Fig. 5) has a boss 71 on the left side of the aperture 68 to prevent the shaft from being drawn therethrough, and on the right side a helical spring 72 compressed by nuts 73 threaded to the shaft. A shield 74 encloses the projecting end of shaft 69.

A short description of the compressing operation of the bank now follows. The bank is placed in the compressing chamber 29 with the two apertures 40 of the lower plate 17 of the bank engaging the two positioning knobs 39 of the plunger 30, and the nuts 24 and threaded ends of the bolts 18 engaging the nut depressions 32 and concentric recesses 33 in the plunger, respectively. The operator then rotates the hand wheel 65 in a clockwise direction (Fig. 4) to rotate the gears 59 and 57 (Fig. 4), the shaft 56, and the three-lobed cam 48 keyed thereto in a clockwise direction. It will be noted here that as the cam has three similar lobes it will be necessary to rotate the shaft 56 only one-third of a revolution in order to actuate the toggle links 46 and 44 to accomplish the desired compression by means of the plunger 30, and thus the provision of three similar lobes on the cam effects a considerable saving of time. Furthermore, these lobes are curved, as will be seen in Fig. 5, so that they at first actuate the plunger rapidly to quickly engage the bank, and then when the compression is started they act slowly so as to allow the operator an opportunity to gauge the bank, and thereafter abruptly and quickly allowing the plunger to drop in order to receive the next bank. It will also be noted that the cam 48 is continually rotatable in the same direction, and thus the hand wheel 65 is continually rotatable in the same direction and no reversal is necessary. By continuing the rotation of the hand wheel 65 in a clockwise direction the toggle links will become extended almost in a straight line, as shown in Fig. 5, and at this stage the bank 15 within the compression chamber will be almost completely compressed and the toggle links will react against the hinge 52 and rotate it clockwise (Fig. 5) against the resilient, resisting force of the spring 72. The spring 72 may be adjusted to regulate the amount of compression to which the bank 15 is subjected. In order to indicate to the operator that the complete compression stage is reached so that he may gauge the bank to insure correct results, there is provided a resilient indicating rod 76 that is secured by screws 77 at its lower end to the lower end of the hinge 52. The top end of the rod is enclosed by a housing 78 that is secured to the block 36, and the lower middle portion of the rod 76 upon its right side is normally engaged by a stationary rod 79 (Fig. 5) extending at one end through an aperture 80 in the hinge 52 and threaded into the plate 67 at its opposite end so that when the hinge 52

moves outwardly during compression of the plunger 30 the top of the rod 76 moves inwardly as it leaves the stationary rod 79 due to its resiliency to indicate to the operator that the bank 15 is being compressed. The operator then applies a hand gauge to the bank and proceeds with the compression until the bank is of the desired thickness. When the hinge 52 moves inwardly after the compression of the bank or when the parts are in a normal position the lower end of the resilient rod 76 again engages the left end of the rod 79 and moves the top of the rod 76 outwardly to the dotted outline position thereof (Fig. 5). With the compression thus completed it is necessary at the same time to tighten the bolts 18 in order to retain the compression, and the screw driver structure for performing this tightening will now be described. However, from the foregoing explanation it will be understood that the hand wheel 65 and the cam and toggle structure provide a great amount of leverage and a high degree of compression in a limited amount of time.

The screw driver structure for tightening the bolts 18 consists of a plurality of suitably arranged shafts denoted generally by the numeral 83, which are journalled within a semi-cylindrical support 84 that is secured by screws 85 (only one of which is shown) to the upper surface of the block 27, which shafts are also journalled within a cylindrical housing 86 that is mounted on the upper end of the support 84. A sleeve 87 (Figs. 7 and 5) is pinned at 88 to each shaft 83, and between the top of this sleeve and the lower surface of the housing 84 there is interposed a helical spring 89 which serves to resiliently force the shaft 83 downwardly through apertures provided in the head piece 31 so that the lower screw driver end 90 of the shaft 83 resiliently engages the slot in the screw head of the bolt 18. This downward movement of the shaft 83 is limited by the fact that the sleeve 87 rests upon an upper surface of the support 84. Within the sleeve 87 the shaft 86 is split at 91 and a slidable collar 92 mounted on a diminished portion 93 of the shaft is resiliently held in engagement with a roughened collar 94 on the lower portion of the shaft by means of a helical spring 95 that is adjusted by nuts 96 that may be reached through an aperture 97. Thus it will be understood that the slidable collar 92 remains in engagement with the collar 94 integral with the lower portion of the shaft 83 until sufficient resisting torque is produced by the bolt 18 being tightened to slide the collar 92 upwardly against the resistance of the spring 95 and out of engagement with the lower portion of the screw driver.

Within the housing 86 there are journalled an inclined shaft 98, which is also retained within the support 84, and a transverse shaft 99. The shaft 99 has a hand wheel 100 keyed to the outer end thereof and a bevel gear 101 to the other end which meshes with a large bevel gear 102 that is keyed to the shaft 98. Screws 103 secure a spiral gear 104 to the under side of the bevel gear 102, and this spiral gear meshes with a plurality of spiral gears 105 (Fig. 8) that are secured to each screw driver shaft 83. The gears 104 and 105 being of the spiral type assist the springs 89 to maintain the screw driver in contact with the bolts 18 and this downward thrust is absolutely required when the bolts have been tightened to quite an extent.

The operation of the screw driving structure is apparent from the above description. The operator rotates the hand wheel 100 in a clockwise direction (Fig. 4) to rotate the bevel gears 101 and 102 and thus rotate the spiral gears 104 and 105 to actuate the various screw drivers in one operation. Thus while the bank 15 is held under compression by the plunger 30 the screw driver shafts 83 simultaneously and in one operation tighten the bolts 18 to preserve the compression. It is therefore apparent that the above described structure efficiently compresses and tightens the bank 15, in a minimum amount of time and in the least number of operations and that the resulting product is a compact and rigid unit.

Although the structure is here described and illustrated for compressing telephone terminal banks it will of course be understood that it may be used for compressing other stacked parts and that the invention is to be limited only by the scope of the appended claims.

What is claimed is:

1. In an apparatus for assembling parts, means for retaining the parts, means cooperating therewith for compressing the parts, toggle means connected to the compressing means for actuating the compressing means, and a cam member for actuating the toggle means, said cam member having a plurality of similar lobes for effecting the actuation.

2. In an apparatus for assembling parts, means for retaining the parts, means cooperating therewith for compressing the parts, toggle means connected to the compressing means for actuating the compressing means, and resilient means connected therewith for limiting the movement thereof.

3. In an apparatus for assembling parts, means for retaining the parts, means cooperating therewith for compressing the parts, toggle means connected to the compressing means for actuating the compressing means, a hinged member suspended from the retaining means for securing the toggle means, and resilient means connected to the hinged

member for limiting the movement of the toggle means.

4. In an apparatus for assembling parts, means for securing the parts, means mounted adjacent to the securing means for compressing the parts, toggle means connected to the compressing means for actuating the compressing means, and means continually operable in the same direction for actuating the toggle means.

5. In an apparatus for assembling bolted parts, a block having a chamber for receiving the parts, a plunger slidably mounted within the chamber for compressing the parts, said plunger having suitable apertures for engaging the nuts of the bolts, a plurality of screw drivers mounted at the end of the chamber opposite the plunger for engaging the bolt heads to tighten the bolts, a cam member for actuating the plunger, and a common gear member for actuating the screw drivers while the parts are under compression.

6. In an apparatus for assembling parts, means for retaining the parts, comprising movable and stationary members engageable with opposite portions thereof, a plurality of connected links, one of the links operatively connected to the movable member, and rotatable means operatively associated with another of the links for causing an actuation of the links to compress the parts.

7. In an apparatus for assembling bolted parts, means for retaining the bolted parts, comprising movable and stationary members engageable with opposite portions thereof, a plurality of links operatively connected with the movable member for compressing the bolted parts, and means for tightening the bolts of the parts while the parts are under compression.

In witness whereof, we hereunto subscribe our names this 27th day of February, A. D. 1929.

CHARLES OTTO KNUUTI.
CHESTER ALLISON METZGER.