

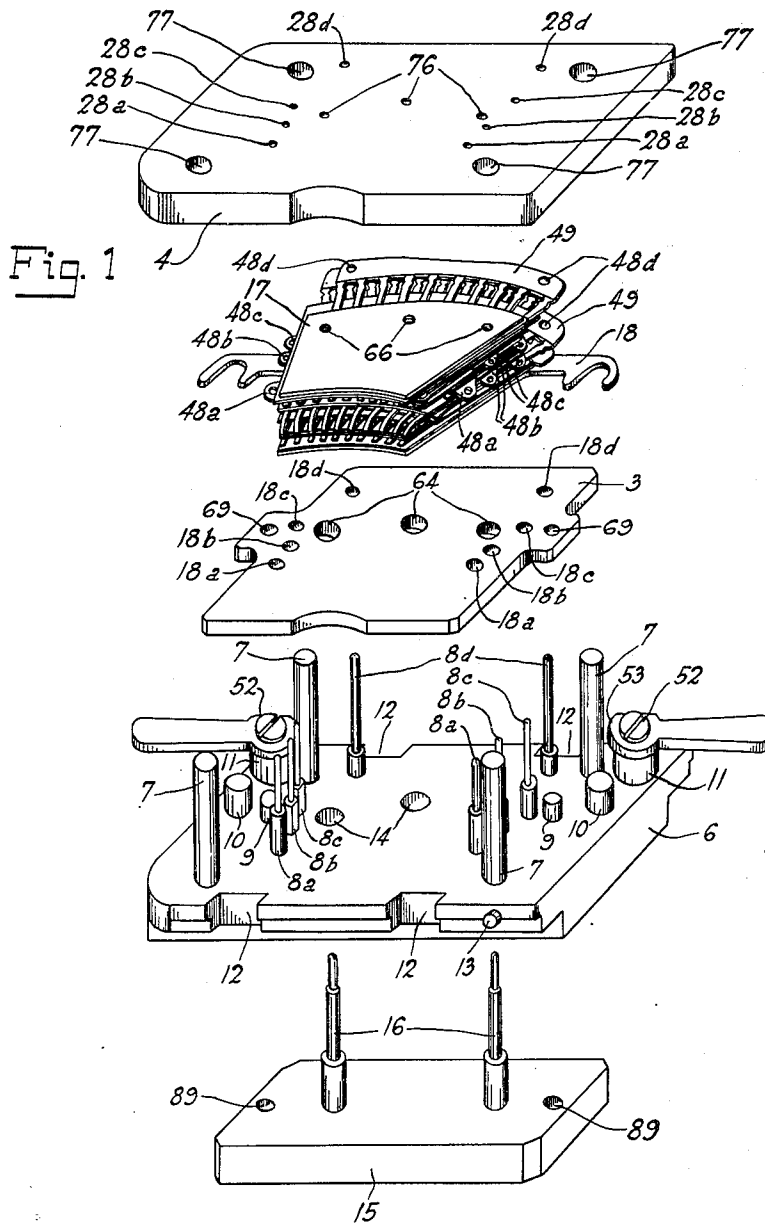
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ASSEMBLING MACHINE AND JIG

Original Filed June 27, 1928 3 Sheets-Sheet 1



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ASSEMBLING MACHINE AND JIG

Original Filed June 27, 1928 3 Sheets-Sheet 2

Fig. 3

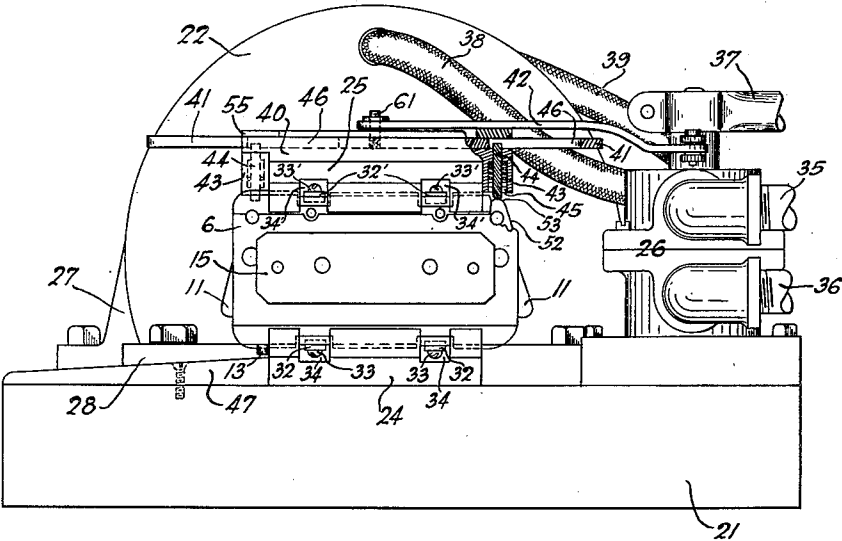
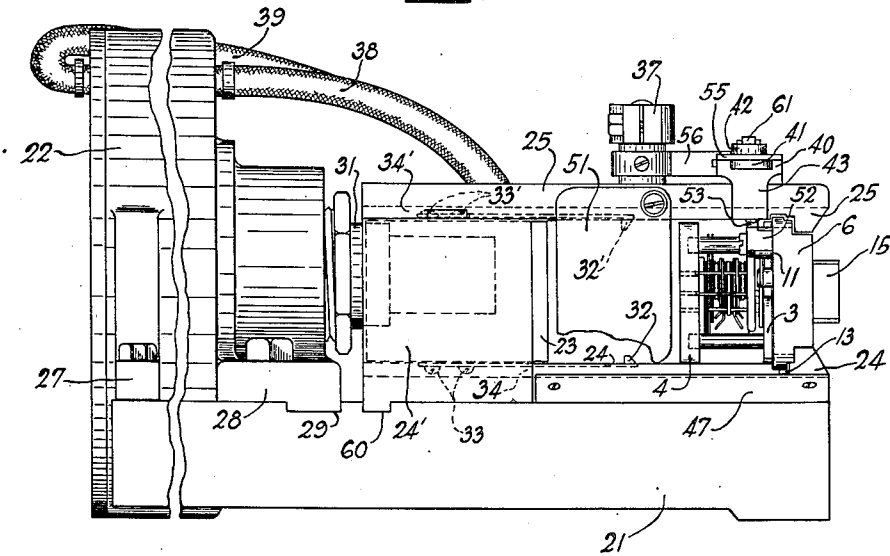


Fig. 2



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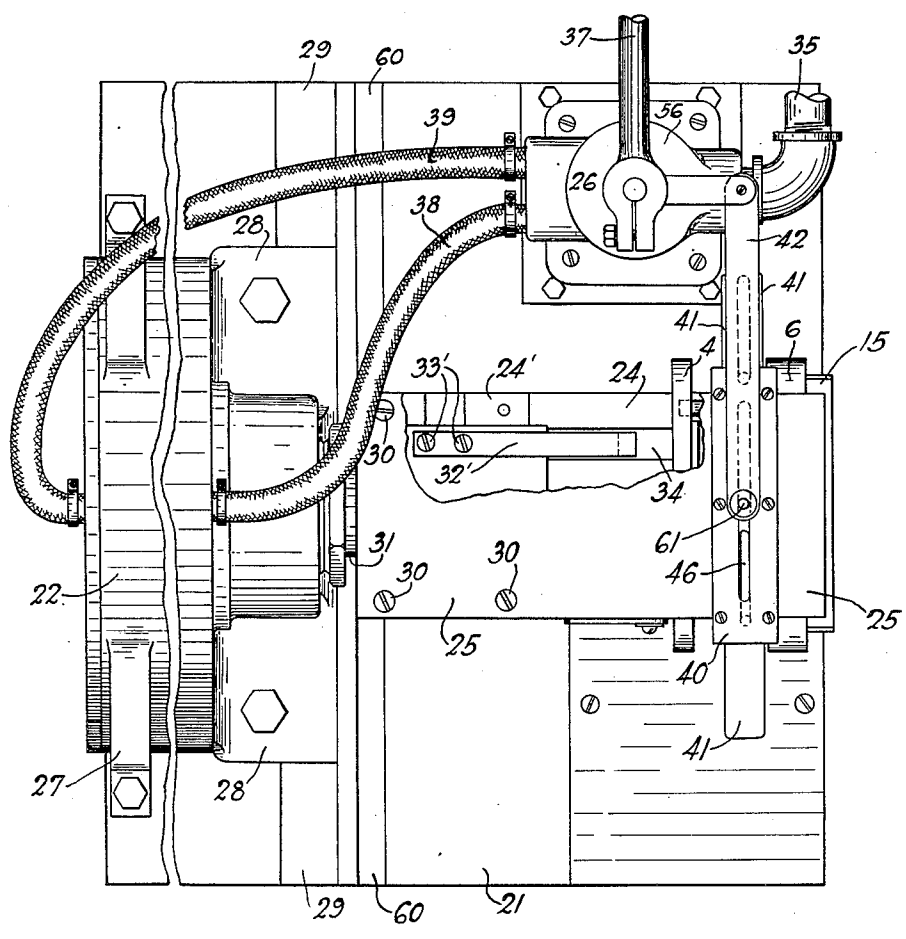
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Original Filed June 27, 1928 3 Sheets-Sheet 3

Fig. 4



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UNITED STATES PATENT OFFICE

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ASSEMBLING MACHINE AND JIG

Original application filed June 27, 1928, Serial No. 288,601. Divided and this application filed November 21, 1931. Serial No. 576,453.

This invention pertains to assembling machines and jigs in general, but more particularly to machines and jigs for use in assembling articles comprising a relatively large number of separate parts held together by clamping members.

This application is a division of my co-pending application, Serial No. 288,601, filed June 27, 1928.

The object of this invention is the production of means by which such articles may be assembled in such a manner that greater uniformity of results are obtained with a less expenditure of manual labor and with greater rapidity than is obtainable with present machines and methods.

Machines of this kind find particular utility in the manufacture of bank contact assemblies for automatic switches such as are used, for example, in automatic telephone systems. The invention has therefore been illustrated in the accompanying drawings in the form of a machine and jig for assembling bank contact assemblies for switches known in the telephone art as plunger type line switches. The invention, however, lends itself to many modifications without departing from the scope thereof, and many other uses will suggest themselves to those skilled in the art. For example, a machine and jig of this kind with certain modifications may be used in the assembling of contact springs on relays.

The construction of the machine and jig is illustrated in the accompanying drawings comprising Figs. 1 to 4. Fig. 1 is an exploded view of the jig and its associated parts in their respective relative positions. A plunger type line switch bank assembly is also shown. Fig. 2 is a side view of the pneumatic compressor with the jig in position just before the compression operation. Fig. 3 is a front view of the compressor with the jig in position, with certain hidden parts shown in section for better illustration. Fig. 4 is a plan view of the compressor with the jig in position.

The jig shown in Fig. 1 comprises an assembling base, an insulator liner, a stripping plate, and a compressing plate. The assembling

base consists of a base plate 6 into which the compressing plate liner pins 7, the bank assembly locating pins 8a, 8b, 8c, and 8d, the stripping plate positioning pins 9, the bottom bracket locking pins 10, and the locking cams 11 are mounted. Four notches 12 are cut in the base plate 6, the purpose of which will be described later. The underside of the base plate is suitably shaped to fit in between the jaws of the compressor, as is shown in Fig. 2. A stop pin 13 is also provided to properly position the jig in the compressor. In the base plate 6 three screw holes 14 are provided (one being hidden). These holes are large enough to pass the heads of the screws that are used to clamp the bank assembly together.

The insulator liner consists of a bottom plate 15 into which two insulator locating pins 16 are mounted. These pins are located so they will pass through the two outer holes 14 in the assembling base. Holes 89 are provided into which extensions of the positioning pins 9, extending through the bottom of the base plate 6, fit to properly position the insulator liner when a jig is assembled. It may be explained that the pins 9 pass clear through the plate 6 and project out on the under side about the same amount as they do on the upper side, and it is these extensions on the under side of the plate 6 that fit into holes 89.

The stripping plate 3 is a single flat plate having the holes 18a, 18b, 18c, 18d, 69, and 64. The holes 18a, 18b, 18c, 18d, and 69 are of the proper size and location so that the stripping plate may be placed on the assembling base over the locating pins 8a, 8b, 8c, 8d, and positioning pins 9, respectively. Holes 64 line up with and are of the same size as holes 14 in the base plate 6.

The compressing plate 4 is a single plate having holes 77, 28a, 28b, 28c, 28d, and 76. The size and location of the holes 77 is such that the compressing plate may be placed down over the liner pins 7, the fit of the pins in these holes being an easy sliding one. The holes 28a, 28b, 28c, 28d are provided to pass the locating pins 8a, 8b, 8c, and 8d, respectively. The two outside holes 76 not only

pass the ends of pins 16 but all three holes 76 are large enough to receive the ends of the screws which are used to clamp the bank assembly together as will be described more in detail.

The bank assembly for which the locating pin arrangement of the jig is particularly adapted comprises a bottom bracket 18, a top bracket 17, four rows of multiple contacts, four rows of individual contacts (when completed), a plunger guide, and suitable insulators and spacers. The whole assembly is secured by three screws passing through the bottom bracket 18 through the assembly and threading into the three holes 66 in the top bracket 17. The particular construction of the bank assembly itself forms no part of this invention, so no further description or drawing of it is thought necessary.

The pneumatic compressor, shown in Figs. 2, 3, and 4, comprises essentially a base 21, a double-ended cylinder 22 in which a piston moves either forward or backwards depending on in which end compressor air is conducted, a plunger 23 controlled by the piston, a lower jaw 24, and an upper jaw 25 adapted to receive the jig, and a two-way valve 26 for directing compressed air in either end of the cylinder 22.

The cylinder 22 rests in a recess in the base 21, and is secured thereto by means of bolts passing through the lugs 27 and 28 of the cylinder and into the base 21. The base has a groove 29 into which a projection on the lower side of the lugs 28 fits to give added strength.

The bottom jaw 24 is suitably secured to the base 21 directly in front of the cylinder. A projection on the lower side of the jaw fits into the groove 60 in the base 21 and adds to the strength of the union of the two. At the end nearest the cylinder, the jaw 24 has two side walls 24' of about the same thickness as the jaw itself. These walls project upward to form a three-sided enclosure. On the top of these two walls, the upper jaw 25 is fastened by means of four screws 30, thereby forming an inclosure in which the square-faced plunger 23 slides, the plunger 23 being suitably fastened to the end of the piston rod 31. The working ends of the two jaws are suitably shaped to accommodate the jig of Fig. 1 in the position shown in Fig. 2.

On the under side of the plunger 23 two spring hook members 32 are fastened by means of screws 33. Two grooves 34 are provided in the lower jaw which extend the full length of the jaw to accommodate the spring-hooks 32. Similar spring-hook members 32' are fastened by means of screws 33' to the upper side of the plunger 23. Two grooves 34' are also provided in the upper jaw to accommodate the spring-hooks 32'.

A guard plate 51 is rotatably mounted on the side of the upper jaw 25 in such a posi-

tion that after the jig is placed in position between the two jaws, the operator cannot place his hand in the space between the plunger and the compressing plate 4 without deliberately rotating the plate 51 out of position. This safe-guards the operator against having his hand crushed between the plunger 23 and the compressing plate 4.

A beveled plate 47 is fastened to the base 21 by two screws. This plate butts against the side of the lower jaw and forms an inclined surface which facilitates the sliding of the jig into position between the jaws.

The two-way valve 26, which may be of any suitable type, is bolted to the base 21. Hose connections 38 and 39 are provided from the valve to the two ends of the cylinder 22. The two pipe fittings 35 and 36 are intake and exhaust pipe, respectively. In the drawings, the valve is shown in its neutral position. Turning the control lever 37 clockwise through a small angle causes air to be conducted into the rear end of the cylinder through the hose connection 39; turning it counter-clockwise through a small angle causes air to be conducted into the front end of the cylinder through the hose connection 38.

A valve locking mechanism is provided, by which the control lever is prevented from being turned in a counter-clockwise direction past its neutral position when the so doing would cause damage to a bank assembly. This mechanism comprises a U-shaped member 40 which fits over the end of the upper jaw 25, and which has a groove along the top in which the sliding member 41 slides. The sliding member 41 is connected to, and is controlled by, the valve lever 37 by means of the connecting link 42, which is pivoted to the extension arm 56 fastened to the valve stem. A slotted member 55 fits over the top of the U-shaped member 40 to hold the sliding member 41 in the groove. The slot in the top plate 55 is of sufficient dimensions to allow the free play of the pin 61 connecting the connecting link 42 with the sliding member 41.

In each of the side arms 43 of the U-shaped member 40 a locking pin 44 is positioned in a recess provided for the purpose. Each pin has a small flange which under the tension of a small spring normally bears against the upper side of the stop screw 45 threaded into the bottom of the recess. The stop screw has a hole in the center through which the lower end of the pin 44 passes. In their normal position, the upper ends of the pins are flush with the bottom of the groove in the U-shaped member 40, in which case the sliding member 41 may slide over these pins unrestrained.

When the pins 44 are forced upward (by the insertion of the jig between the jaws, as will be described later), the upper end of each pin projects up into a slot 46, one such slot

being provided in each end of the sliding member 41. When the pins 44 are in this position the valve lever 37 may be turned in a clockwise direction until the pin 44 strikes the right-hand end wall (locking at Fig. 3) of the slot 46, but it cannot be turned in a counter-clockwise direction past its neutral position by reason of the pins 44 striking against the left-hand end wall of the slot 46.

The procedure in assembling a bank contact assembly with the aid of the jig and compressor is as follows:

The assembling base is placed over the insulator liner, the lower projection of the pins 9 fitting into the holes 89, and the locating pins 16 projecting through the two outer screw holes 14. The stripping plate 3 is then placed on the assembling base, the pins 9 fitting into holes 69, and the locating pins 8a, 8b, 8c, 8d, and 16 passing through the holes 18a, 18b, 18c, 18d, and 64. The jig is now ready to receive the various parts constituting the bank assembly. The bottom bracket 18 is first placed on top of the stripping plate, the two supporting forks of the bracket hooking around the locking pins 10. This bracket is then clamped into position against the locking pins 10 by rotating the two locking cams downward (to the position shown in Figs. 2 and 3), these cams being slightly eccentric for this purpose.

The various insulators, bank contact strips, separators, etc., are next placed on top of the bottom bracket over the proper locating pins and in their proper order. The perforated projections, such as projections 48b and 48c on each end of the multiplied contact strips which later on will serve as terminals to which connections are made, now function as the means for properly locating these strips in the assembly. The strips having the projections 48b and those having the projections 48c are located by the pins 8b and 8c, respectively. The plunger guide has a perforated projection 48a at each end and is located by the pins 8a. The contact strips (which become rows of individual contacts when the waste material 49 is broken off after the bank is completely assembled) are located by means of the pins 8d passing into the holes 48d. The position of the insulators and separators is determined by the pins 16, these pins passing through the screw holes in these parts. The top bracket 17 is the last piece of the assembly and its position is also determined by the pins 16, the ends of which pass through the two outer threaded screw holes 66. The middle section of the pins 16, however, is considerably larger than the hole 66, being the size of the screw holes in the insulators and separators, so the bracket 17 will rest on the shoulder between the end and middle sections.

The compressing plate 4 is now placed on

top of the assembly over the liner pins 7, and the whole jig is then slid in between the two jaws 24 and 25 in the position shown in Figs. 2, 3, and 4. Its proper lateral position is determined by the stop pin 13, the jig being slid in from the left, looking at Fig. 3, until the pin 13 strikes the side of the jaw 24.

When the jig is slid into position between the jaws as described, the pins 44 of the valve locking mechanism ride up on top of the raised portion 53 of the locking cams 11. The top end of the pins are then pushed up into the slots 46 in the position shown in Fig. 3.

The jig is now in position ready for the compression operation. The valve lever 37 is now turned in a clockwise direction. This causes air to be conducted into the rear end of the cylinder 22, which forces the plunger 23 against the compressing plate 4, sliding the compressing plate 4 further over the pins 7 and pressing the bank assembly together. By this operation the insulator liner is forced part way out by reason of the bracket 17 bearing against the shoulder between the end and middle sections of the pins 16. Furthermore, when the plunger 23 moves forward, the spring hooks 32 which are fastened to the under side of the plunger 23 and the spring hook 32', which are fastened to the upper side of the plunger, are also forced past the compressing plate 4 and past the stripping plate 3, coming to rest behind the latter in the recesses 12 in the base 6 of the assembling base.

The operator now pulls the insulator liner out the rest of the way and inserts a screw into each of the three holes 14, pushing them through the compressed bank assembly, and then tightens them with a screw driver into the threaded holes 66 in the top bracket 17.

The operator now unlocks the bank assembly from the jig by rotating the two locking cams 11 to a horizontal position, the position indicated in Fig. 1. Sections 52 of the clamping cams 11 are flattened. These sections come up on top and permit the pins 44 to recede to their normal position when the cams 11 are rotated to a horizontal position which is the unlocked position.

It is now possible for the valve lever 37 to be rotated counter-clockwise past its neutral position to cause air to be conducted into the front end of the cylinder 22. When this is done, the plunger 23 is forced back to its initial position. The spring hooks 32 and 32' which were hooked behind the stripping plate 3 pull the stripping plate 3, the bank assembly, and the compressing plate 4 free from the assembling base, after which the completed bank assembly and the jig parts may be removed from the compressor.

Considering the results which are accomplished when the plunger 23 is forced back to its initial position, the detrimental results

which would occur if it were possible to cause this operation before the bank assembly were unlocked from the assembling base and such were done, are apparent; but such detrimental results are prevented by making it impossible to cause the plunger 23 to be forced to its normal position until the bank assembly has been unlocked from the assembling base.

10 In the description of the operation of the jig and compressor, the use of only one jig was considered. In actual practice, however, it is much more economical and a greater speed in the operation is obtainable when
15 eight or ten of these jigs are provided for each compressor and when six or more persons are employed to progressively assemble the bank parts. In such case, the first assembler continually receives empty jigs from
20 the operator of the machine, places the first several parts of the bank assembly on each jig as he receives it, and then passes it on to the next person in line, who places the next several parts on the jig, and passes it
25 on to the next in line. The operator of the compressor continually receives the jigs from the last assembler in line with the completed assemblies thereon, and as he receives one he places the compressing plate on top and then
30 inserts the jig into the compressor and performs the compressing operation. By employing the proper number of assemblers, the assemblers and also the compressor operator can be kept busy continually, thereby obtaining
35 more speed than has heretofore been obtainable.

What is claimed is:

1. The process of assembling parts by means of a plurality of jigs and a compressor
40 which consists in passing the jigs down a line of operators each of whom places one or more parts on each jig, in passing the jigs in turn to the compressor, the operator of which compresses the parts, permanently secures
45 them together, and removes the complete assemblies from the jigs, and in returning the empty jigs to the beginning of the line.

2. The process of forming assemblies each composed of a plurality of individual parts
50 which consists in passing a plurality of jigs down a line of operators each of whom places one or more parts on each jig, in positioning the jigs one after another in a compressor, in compressing the parts and applying permanent retaining means to each assembly
55 while its parts are under compression, in removing the completed assemblies and jigs from the compressor, and in returning the empty jigs to the beginning of the line.

60 3. The process of assembling parts by means of a plurality of jigs and a compressor, which consists in passing the jigs successively through a plurality of working positions, in placing one or more parts loosely on each
65 jig at each position, in passing each jig with

the parts loosely assembled thereon to the compressor, in temporarily clamping the parts together by means of the compressor, in applying permanent retaining means to hold said parts in fixed relation, in separating each complete assembly of parts from the associated jig, and in returning each empty jig to the first working position.

In witness whereof, I hereunto subscribe my name this 16th day of November, 1931.

FREDERICK W. DOYLE.