May 6, 1958 W. E. WHITNEY 2,833,091

AUTOMATIC INSERTION OF PINS, ETC., IN HOLES

Filed Nov. 21, 1955 2 Sheets-Sheet 1

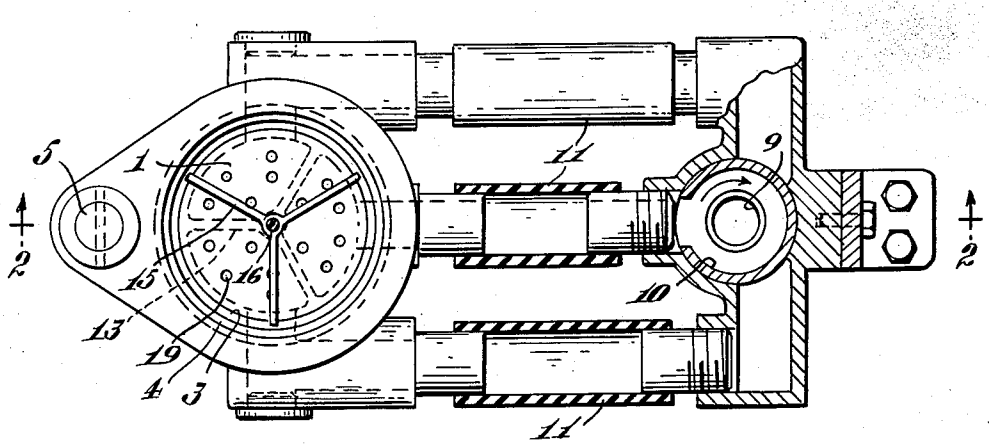


Fig. 1

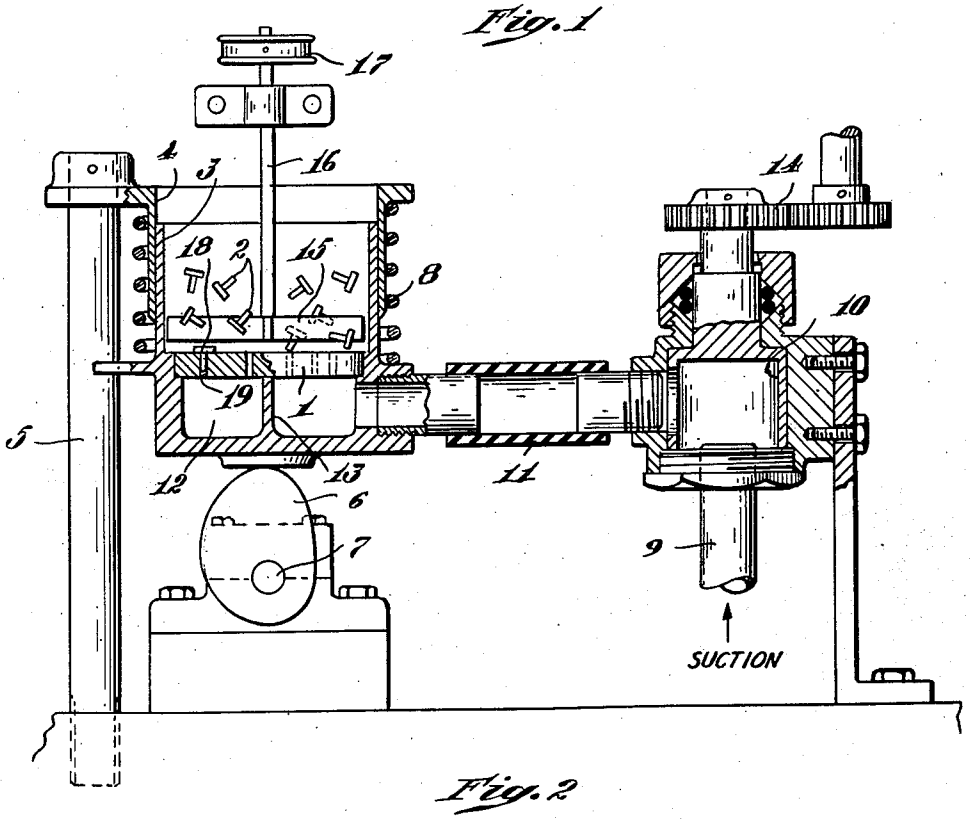


Fig. 2

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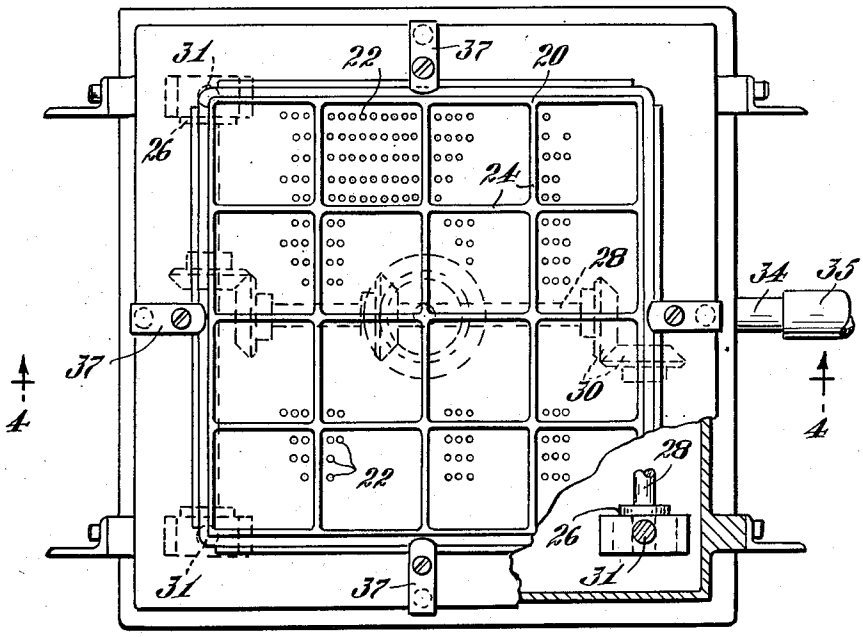


Fig. 3

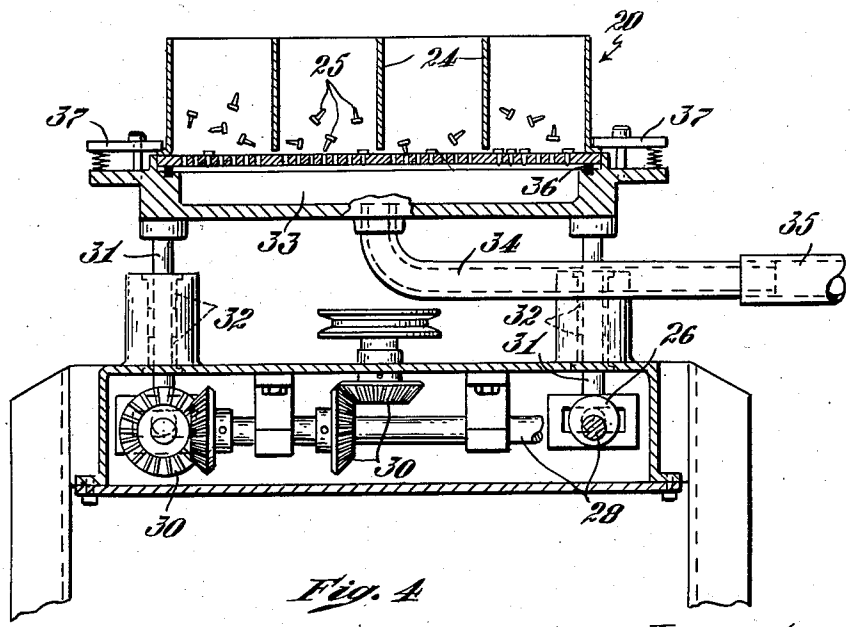


Fig. 4

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AUTOMATIC INSERTION OF PINS, ETC., IN HOLES

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3 Claims. (Cl. 53—142)

This invention deals with automatic insertion of pins, tacks, rivets, screws, or the like in holes. More specifically, it presents a method of and means for filling a number of spaced holes, as in a plate, with tacks or other small parts having a smaller cross-section than the holes, in such a way that each hole contains one such part.

Such a device is particularly useful in the manufacture of cushioning bumpers of various sizes for attachment to the ends of furniture legs as gliders, to the underside of toilet seats, etc., where the head of the tack or pin is embedded in rubber or other resilient material constituting the bumper. For efficient manufacture, such small articles must be vulcanized in large multiples; and it has heretofore been usual for operators to insert pins or tacks by hand into each of a large number of holes in a plate, after which a soft rubber-mix is applied with pressure in a suitable multiplex die to the head side of the plate and vulcanized in place, after which the rubber-covered pins are separated and sold. The hand labor required has represented a large fraction of cost of such articles.

The chief purpose of my invention is to accomplish this multiple insertion of pins in holes without the need for hand labor, and therefore at lower cost. A further purpose is to reduce the time required, increasing the output of the equipment.

I find that when tacks, rivets, screws, nails, pegs or the like, hollow or solid, with or without heads, or any other item that is shape-maintaining and fits into a hole herein collectively called pins, are agitated on the top of a perforated plate, as by oscillating the plate up and down, they may occasionally fall point-first into the holes, but such action unaided is very slow and unsatisfactory. However, if I apply suction to the under side of the agitated plate, the entry and retention of the pins is greatly improved, and particularly in the case of pins with heads if the suction is intermittent.

Air pressure applied above the plate of course has a similar effect, and in special cases a flow of water or other liquid could of course be used. If the pins are ferromagnetic and the perforated plate non-magnetic, magnetic downpull may be substituted for the pneumatic method in several ways, as by magnetizing the pins at random and placing a soft iron plate under the non-ferrous perforated plate, or by magnetizing the pins with a definite polarity and placing under the perforated plate a number of small magnet-poles (preferably one below each hole) of the polarity needed to attract the points of the pins. The magnets may be either electromagnets, or they may be steel or Alnico permanent magnets. If desired intermittency may be obtained by turning off the current or by motion of the magnets relative to the plate. For example, the magnets may be moved in turn close to the holes and then away from the holes.

I find that an equally-timed rise and fall of the plate is not always the very best motion that can be given it, although it works well and is convenient to apply. Rather,

a quicker down-drop, or a rapid transition from upward to downward motion, seems in some cases to throw the pins clear of the plate to better advantage than a uniform cycle.

Intermittency of the suction is very advantageous for allowing the pins which have been caught by the suction in wrong position, either head-down or sidewise, to be thrown clear and thus unblock the hole to permit a pin to enter it. I have had good results by turning the suction off for several motion-cycles, then on for a number of cycles, but this varies with the size and shape of the pins, as does the best frequency of oscillation to use. Generally, however, with harmonic motion and a one-inch throw, from 300 to 350 cycles per minute is very good for a variety of pin sizes and shapes.

The clearance between the pin and the hole can be quite small, of the order of .002" or less; but the speed of filling the plate is roughly proportional to the square of said clearance, other factors being equal.

While the greatest utility of this invention is in connection with headed fasteners such as tacks and screws, the device is also applicable to headless rivets and other parts having no heads. In this case, and also where it is desired to keep heads spaced away from the plate (as for vulcanizing), free passage of a pin through the entire hole may be blocked without shutting off the air flow by having the lower portion of the hole smaller than the upper, or by other obstructing means. The pins and/or holes may be tapered, and may have non-circular cross-sections, which may however, cause slower filling.

It is sometimes helpful to assist the placement of the pins by sweeping the unplaced pins back and forth or around and around on the plate, as by air-blast or sweeping knife; the latter is particularly effective in removing pins with heads for the head-down position which both blocks the hole and immobilizes the pin. The sweeper may be flexible, as of rubber, to avoid destructive contact with partly-inserted pins. Alternatively, the plate surface may be subdivided by partitions, to prevent segregation of excess pins where the holes are already filled.

The air pressure or suction may be applied intensively to portions of the plate in succession, rather than spread less strongly over all at once. Indeed the intermittency may consist of alternate application to two or more portions. Alternatively, the suction may advantageously be applied when the pins are to contact the plate, and turned off when they are to be thrown clear.

The up-and-down motion may have also a sidewise component to assist in the lateral distribution of the pins.

For the purpose of illustration typical embodiments of the invention are shown in the accompanying drawings in which—

Fig. 1 is a plan view of one embodiment;

Fig. 2 is a section on line 2—2 of Fig. 1;

Fig. 3 is a plan view of another embodiment; and

Fig. 4 is a section on line 4—4 of Fig. 3.

In the particular embodiment of the invention illustrated in Figs. 1 and 2 a perforated round plate **1**, which may be removed, is surmounted by an ample number of pins **2** kept from falling off by surrounding walls **3** guided by a fitting cylinder **4** and an auxiliary guide-rod **5**. The plate is raised at short intervals by a cam **6** on rotating shaft **7**, and returned downward by a spring **8**.

Suction is applied to the bottom of the plate from a suction-main **9** via a rotating valve **10** and three flexible hose-connections **11**, leading to three compartments **12** into which the underside of the plate is divided by partitions **13**. The valve is rotated by a gear **14** in synchronism with the cam. A flexible rotating sweeper **15** actuated by rod **16** and pulley **17**, is located just far enough above the plate to clear the heads of pins such as **18** already located in holes **19**.

The operation of the device shown in Figs. 1 and 2 it as follows: The pins **2** are placed on the plate **1**, which is raised and lowered by cam **6** and spring **8**. Intermittent suction from main **9** is applied by rotating valve **10** through flexible connections **11** consecutively to compartments **12** below the plate. This intermittency, as previously explained, is effective in removing inverted pins from blocking holes. Also, if desired a flexible sweeper **15** may be located above the plate and rotated to assist in dislodging misplaced pins so that further agitation and suction will bring them into holes **19**.

In some cases, for example in the case of headless pins, it may be advantageous to dispense with both the intermittent suction and the flexible sweeper, using only agitation and continuous suction to bring the pins into the holes.

In Figs. 3 and 4 a large rectangular plate **20** perforated with many holes **22** is surmounted by partitions **24** forming compartments within which pins **25** are kept localized on the plate, which is oscillated rapidly up and down by cranks **26** driven by shafts **28** and bevel-gears **30**. The plate is kept level during raising and lowering by guide-rods **31** sliding in bushings **32**. Under the plate a suction-chamber **33** is evacuated through suction-pipe **34** and flexible connection **35**. The intermittent suction is retained by soft gasket **36** on which the plate rests. Plate and partitions are removably held in place by clamps **37**.

I claim:

1. Device for automatic insertion of pins having heads and a non-head portion which is smaller in circumference than said head into an array of holes, comprising a plate perforated with a multiplicity of holes larger than said non-head portions of said pins but smaller than said heads, a means for oscillating said plate up and down, and means for intermittently applying a greater atmosperic pressure above said plate than below it.

2. Device for automatic insertion of pins into a battery of holes, comprising a plate perforated with holes larger than said pins, a means for oscillating said plate rapidly up and down, and intermittent means for urging said pins downward in said holes.

3. Device for automatic insertion of pins into a battery of holes, comprising a plate perforated with holes larger at top and smaller at bottom than the shanks of said pins, a means for oscillating said plate rapidly up and down, and intermittent means for urging said pins downward in said holes.

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