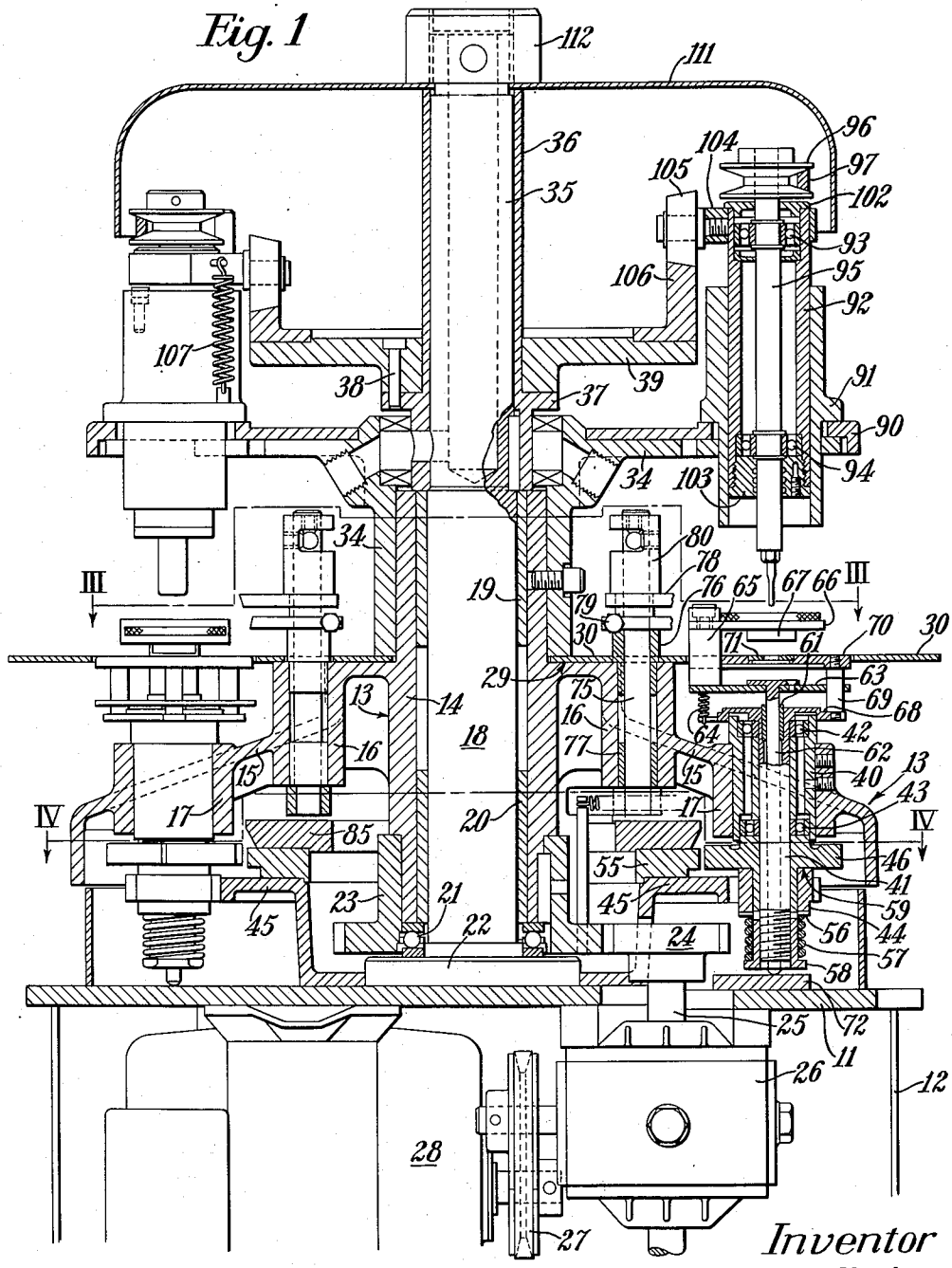
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BUTTON DRILLING MACHINE

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Fig. 1



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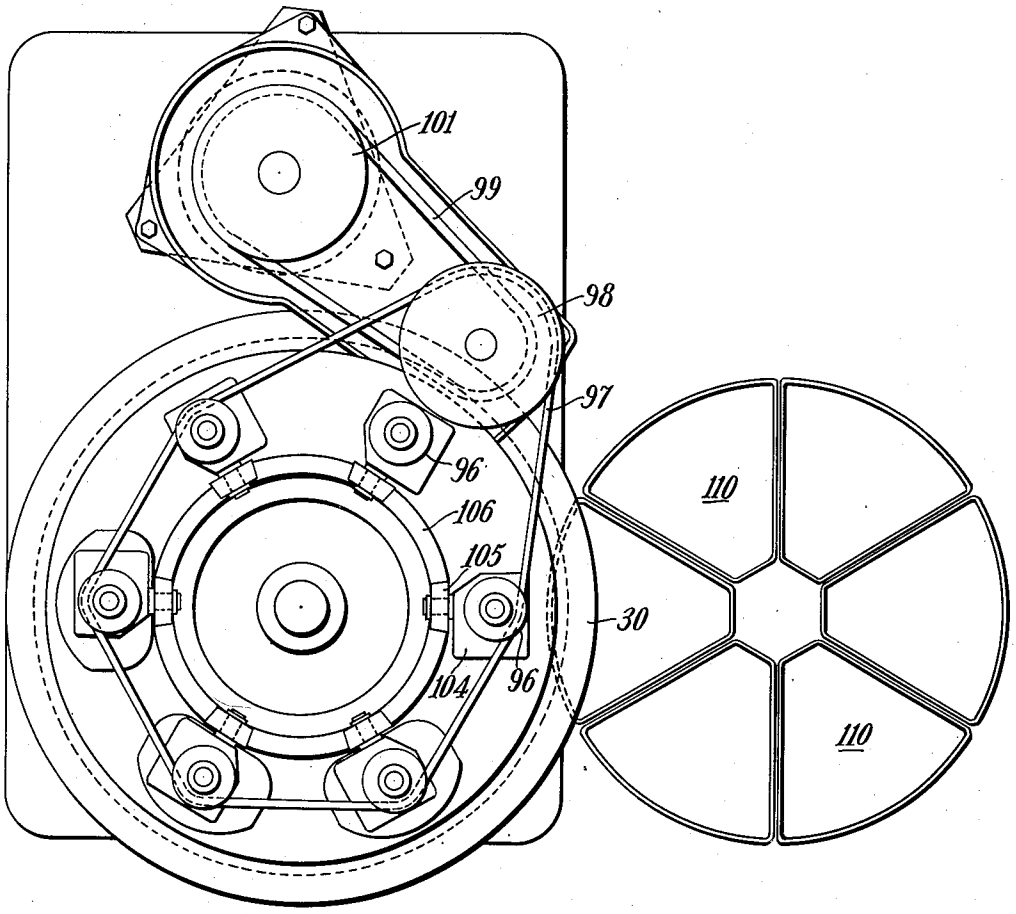
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Fig. 2



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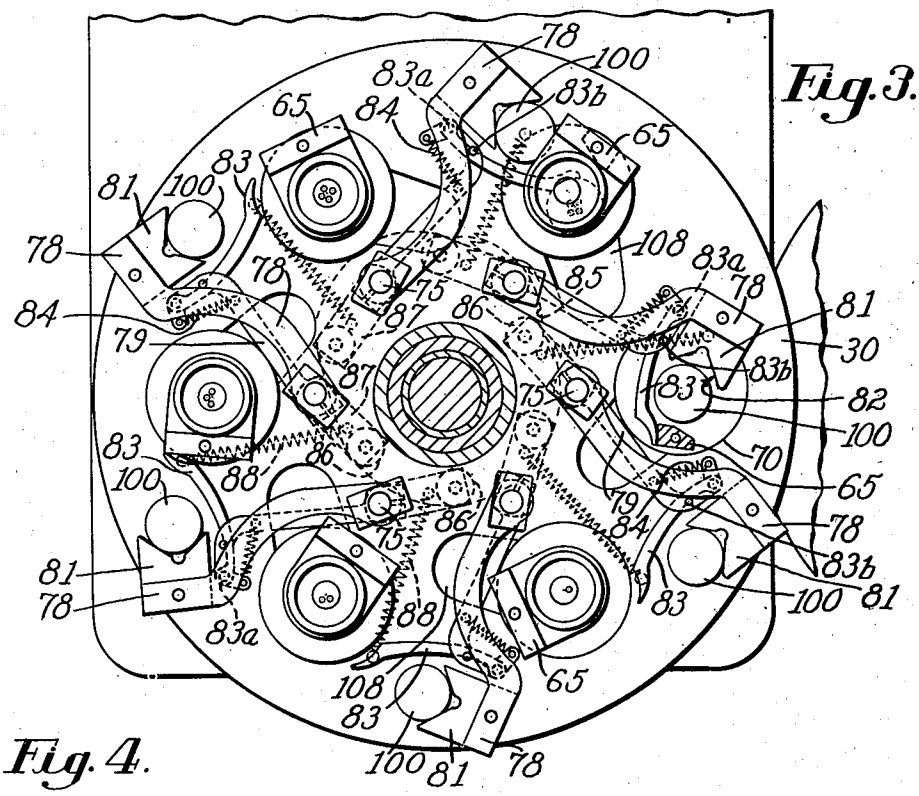
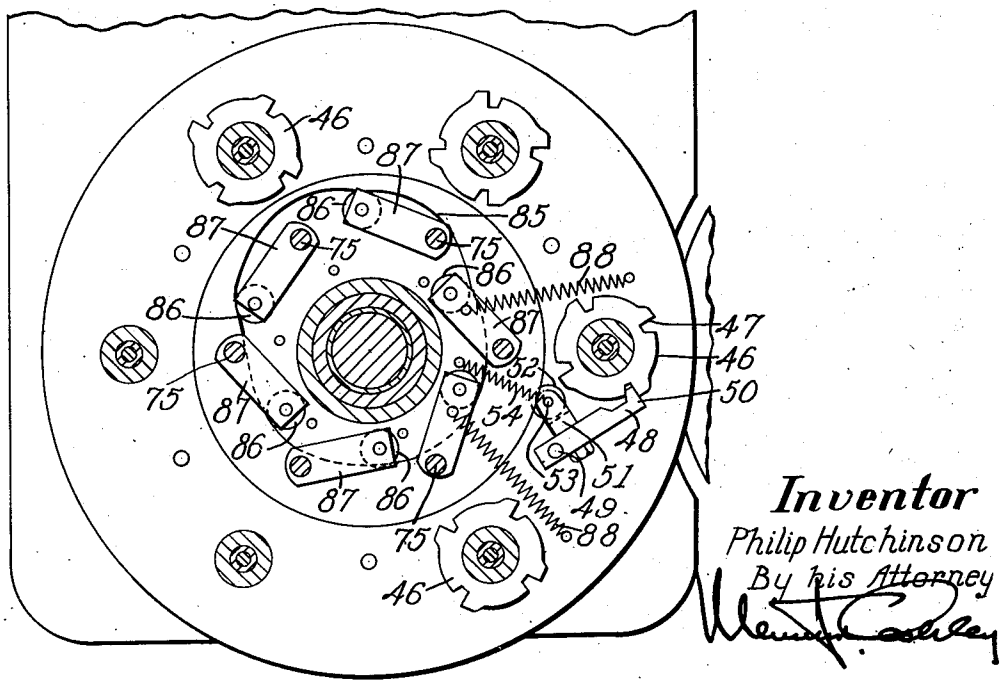


Fig. 3.

Fig. 4.



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BUTTON DRILLING MACHINE

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5 Claims. (Cl. 79—12)

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The present invention relates to drilling machines and concerns particularly a multi-spindle machine for the purpose of drilling buttons or like articles, and its aim is to provide a simple and robust machine, which is capable of drilling accurately more buttons in a given time than any existing machine.

An illustrative multi-spindle drilling machine embodying the present invention comprises a plurality of turret units arranged around a table preferably adapted to be rotated continuously, each said turret unit including means to hold an article to be drilled, e. g. a button or a button blank, and having associated therewith, in vertical alinement or slightly offset therefrom, a rotatable drill spindle unit, the spindle of which is movable vertically with respect to the turret unit but moves as one therewith on the rotatable table.

Means are provided to ensure a full or partial rotation of the turret unit on its own axis simultaneously with its rotation with the table, so that by repeated operation of the drill spindle during one revolution of the table, a plurality of spaced holes may be drilled in the button or button blank.

The drill spindles may be arranged with their axes in alinement with, or parallel with, or inclined at a slight angle with respect to, the axes of the turret spindles.

The invention is illustrated by way of example in the accompanying drawings, of which,

Fig. 1 is a central vertical section through the machine;

Fig. 2 is a plan;

Fig. 3 is a diagrammatic plan view of certain parts of the machine as seen from the plane indicated by the line 3—3 of Fig. 1; and

Fig. 4 is a similar view from the plane indicated by the line 4—4 of Fig. 1.

The illustrated machine has a main stationary table 11 (Fig. 1) which is carried by pedestal supports 12.

A table 13, rotating in a clockwise direction, as viewed from above, comprises a central column 14 and a depending skirt 15 which is formed with an inner and an outer series of columns or bearings 16 and 17 respectively, arranged in concentric circles around the column 14, the number of such columns 16 and 17 corresponding with the number of drilling stations, which in the case of the machine illustrated is six.

The column 14 is mounted on a central shaft 18 through the intermediary of upper and lower sleeves 19 and 20 and, with the lower sleeve, rests

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on a thrust bearing 21 carried on a center plate 22 mounted on the table 11.

The table 13 is rotated on the shaft 18 by means of a pinion 23 keyed to the lower end of the column 14 and meshing with a gear wheel 24 secured to a shaft 25 projecting downward through the table 11 and driven through a reduction gear box 26 and belt 27 by an electric motor 28.

The table 13 is formed with an annular flat surface 29 on which rests a button plate 30 apertured in two concentric rings corresponding with the columns or bearings 16 and 17 for a purpose which will become apparent as the description proceeds.

Secured to the upper part of the column 14 is a drill support platform 34 and to an extension 35 of the shaft 18 is keyed a sleeve 36 having a flange 37 to which is bolted at 38 a cam support platform 39.

Each of the outer series of columns or bearings 17 of the skirt 15 carries a fixed sleeve 40 within which is mounted a turret spindle 41 on upper and lower ball-races 42 and 43, such spindles being rotatable or partially rotatable about their own axes. A pinion 44 on the lower end of the spindle is in meshing engagement with a stationary gear ring 45, secured to the main table 11.

A locking disk 46 is keyed on the turret spindle 41 and has formed in its periphery a number of notches 47 (see Fig. 4) corresponding with the number of holes to be drilled in each button.

A locking lever 48, pivoted at 49 upon the table 13, is formed with a nose 50 to engage the notches 47 and carries an arm 51 having a cam roller 52, rotatable on a stud 53, said cam roller co-acting, under the influence of a spring 54, with a cam 55 (Fig. 1) carried by the gear ring 45.

The lower end of the spindle 41 carries, in addition to the pinion 44, a friction washer 56, a spring 57 and locknuts 58.

When the locking lever 48 is moved by the cam 55 to cause the nose 50 to disengage from the notch 47, rotation of the spindle 41 is effected by the frictional engagement of the upper face 59 of the pinion 44 with the disk 46 and this rotation will continue until the nose 50 engages the next succeeding notch 47. The spindle 41 will thus make in each instance one quarter of a revolution i. e. in the case where four holes are to be drilled through one button.

Passing up through the center of the turret spindle 41, and bearing in a sleeve 61 (Fig. 1), is a rod 62 to the upper end of which is riveted a

plate 63 normally urged downwardly by a spring 64 anchored to the spindle.

Upstanding from the plate 63 is a post 65 which supports a holder 66 for a button locating cup 67. Secured to a flange 68 of the spindle 41 by three spaced posts 69 is a plate 70 disposed in the outer ring of apertures formed in the button plate 30. In its lower position the cup 67 holds or clamps a button to be drilled against the plate 70 in register with a drill disk 71.

The rod 62 is moved upward and hence the cup 67 lifted clear, to release the button, by a fixed cam plate 72 mounted on the table 11.

The button feeding and ejecting mechanism at each station consists of a spindle 75 bearing in upper and lower sleeves 76 and 77 in the inner series of columns 16 of the table 13, said spindle supporting a feed arm 78 (Fig. 3) and an ejector arm 79. The feed arm 78, angularly adjustable by means of a block 80 (Fig. 1), carries a feed block 81 formed with faces 82 to engage the periphery of a button 100 and the arm 79 has pivoted thereto at 83a an ejector finger 83 biased by a spring 84 normally to lie against a pin 83b on the arm 79.

Oscillation of the arms 78 and 79 is effected by a stationary cam 85 (Figs. 1 and 4) co-acting with a roller 86 journaled on a cam lever 87 biased by a spring 88, the lever 87 being keyed on the spindle 75.

The drill units are carried by the platform 34 and correspond with, and are in vertical alinement with, the turret units or slightly offset therefrom.

A flanged plate 90 (Fig. 1) on the platform 34 supports columns or bearings 91 for drill sleeves 92. Each drill sleeve carries, in upper and lower ball-races 93 and 94, a drill spindle 95 having a driving pulley 96 at its upper end, all the pulleys being rotated by a common belt 97 (Fig. 2) driven by a pulley 98, which in turn is driven by a belt 99 and motor 101. The drill sleeve 92 is closed by upper and lower sleeve caps 102 and 103, and at its upper end supports a lifting block 104 on which is journaled a lifting roller 105.

The roller 105 runs on a circular edge cam 106 carried by the platform 39. The contour of this cam is so coordinated with that of the cam plate 72 that the drill sleeve and drill spindle are raised as a unit, against the pull of a spring 107, four times to one raising of the cup 67.

After the buttons have been drilled, they are removed by the finger 83 and fall through an opening 108 (Fig. 3) in the plate 30 to pass down a chute (not shown) or to one of a series of collecting and sorting boxes 110 (Fig. 2).

The machine is covered at the top by a canopy 111 (Fig. 1) held on the sleeve 36 by a fixing block 112.

Buttons or button blanks may be fed to the button plate 30 by hand or automatically by appropriate means (not shown).

In operation, the rotating table 13 is first set in motion and a button or button blank is placed on the plate 30 adjacent to the plate 70 and within the shaped surface of the feed block 81, which at the appropriate moment is moved by the feed arm 78 to slide the button into alinement with the cup 67. The feed block 81 is then withdrawn and simultaneously the finger 83 is moved against the pull of its spring 84 past the button by a dog 185 (Fig. 3), or, the cup 67, or, the outer periphery of the button. On reverse movement of the feed arm 78 later the finger 83 sweeps the previously drilled button into the opening 108. After register of the button with the cup 67 and clamping of the button by the cup, the spindle 95 is lowered, a hole is drilled and the spindle is raised again, by the cam 106. After raising the spindle the turret unit is rotated on its own axis as already described and then the spindle is lowered again to drill another hole, this operation being repeated until the requisite number of holes is drilled, after which the raising of the drill spindle coincides with the action of the cam plate 72 to lift the cup 67 clear of the drilled button. The arms 78 and 79 then move in unison to cause the finger 83 to sweep the drilled button to the collecting chute or a sorting box 110 and to place another button in position to be drilled.

As the table rotates a button is fed once per revolution thereof to each of the turret units, so that for each revolution as many buttons as there are turret units are drilled, each with a plurality of holes.

Having now described my invention, what I claim as new and desire to secure by Letters Patent of the United States is:

1. In a drilling machine, a movable table, a turret unit supported on the table for rotary motion with relation to the table, work supporting and work clamping means on said turret unit, a drill also mounted on said table substantially in alinement with the turret unit, the drill being mounted for movement with relation to the turret unit and for movement in unison with the turret unit as a result of the movement of the table, and combined work positioning and work ejecting means also mounted on the table and operative in one continuous motion to eject a drilled work piece from the turret unit and to present a new work piece thereto.

2. In a drilling machine, a rotatable table comprising a central column and a depending skirt, annularly spaced and concentrically arranged bearings on the skirt, a plurality of work supporting turret units mounted in said bearings, a plurality of drilling units mounted on said table each unit being in register with or slightly offset from a turret unit, a second series of annularly spaced and concentrically arranged bearings on the skirt, a series of combined work positioning and ejecting means mounted in the last mentioned bearings, one of said work positioning and ejecting means being arranged to co-operate with one of said turret units.

3. In a drilling machine, a rotatable table, a series of work supporting turret units concentrically arranged in spaced relation on the table, friction driving means operative as a result of the rotation of the table to rotate each turret unit about its own axis, locking means associated with each turret unit for intermittently stopping the rotation of that turret unit, a series of drilling means also supported on the table and located substantially in register with the turret units, and means operative in time relation to the operation of said locking means to cause relative movement between the associated turret unit and the corresponding drill.

4. In a drilling machine, a rotatable table, a series of work supporting turret units concentrically arranged in spaced relation on the table, friction driving means operative as a result of the rotation of the table to rotate each turret unit about its own axis, locking means associated with each turret unit for intermittently stopping the rotation of that turret unit, a series of drilling means also supported on the table and located substantially in register with the turret units,

means operative in time relation to the operation of said locking means to cause relative movement between the associated turret unit and the corresponding drill, and work positioning and ejecting devices mounted on the table, each of such devices being adapted to co-operate with one of said turret units to eject a drilled work piece from the turret unit and to present a new work piece thereto.

5. In a drilling machine, a rotatable table, a series of work supporting turret units concentrically arranged in spaced relation on the table, friction driving means operative as a result of the rotation of the table to rotate each turret unit about its own axis, locking means associated with each turret unit for intermittently stopping the rotation of that turret unit, a series of drilling means also supported on the table and located substantially in register with the turret units, means operative in time relation to the operation of said locking means to cause relative movement between the associated turret unit and the corresponding drill, work positioning and ejecting devices mounted on the table, each of such devices being adapted to co-operate with one of said turret units to eject a drilled work piece from the turret unit and to present a new work piece thereto, and work clamping means provided on each turret unit and adapted to clamp the work in time relation to said relative movement between the turret unit and the drill.

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