The present invention relates to a printing numbering device operable in ascending or descending sequence.

Known numbering devices operable in ascending and descending sequence have a number of disadvantages, whereof the principal ones involve the need for manual operations when it is intended to change the direction of rotation of the numerator discs from the ascending to the descending sequence or inversely, and the difficulty of operation of the mechanism preventing the printing of unwanted zeros.

In conventional numbering devices, the operation of the numerator discs in ascending or descending sequence is in practice achieved by means of one or the other of two pawls engaging a ratchet fixed on the shaft carrying the numerator discs. Movement of one pawl away from, and of the other close to, the ratchet is accomplished by the tightening of one screw or the slackening of another screw within a control plunger, by means of suitable tools. This operation requires patience, care, and exact synchronization between the two operations to prevent the numbering device from jamming. The lowering of the zeros to non-printing position in conventional devices is carried out manually and separately for each zero. In order to prevent obstruction of the numbering device during operation in descending sequence, by reason of the movable zeros, owing to their toothed outline, dropping into a recess provided in the shaft, minute retaining springs are provided which have a short life and easily become clogged. Other known movable zeros having a toothless profile function even less efficiently, since in order to allow printing they have to be adjusted by means of a very small pin passing transversely through each and mounted on the end of a small loading spring adapted to push it into a cavity in the lateral wall of a recess provided in the numerator disc. Thus, whenever lowering of the zero is required, the operator is forced to displace the small pin by means of an appropriate tool, with the accuracy and care of a watchmaker.

The printing numbering device of the present invention has been provided to overcome such drawbacks by employing a simply set cam for selective ascending or descending sequence operation, and a presettable control for lowering the zeros.

It is a main object of the present invention to provide a printing numbering device which substantially reduces or entirely overcomes these disadvantages.

Other objects and the nature and advantages of the present invention will become apparent from a consideration of the following description when taken in conjunction with the drawings forming a part thereof, wherein:

In drawings:

FIGURE 1 is a longitudinal section of a numerator according to the invention taken substantially on the plane line 1—1 of FIGURE 2;

FIGURE 2 is an end elevation looking from right to left at FIGURE 1;

FIGURE 3 is a vertical section taken substantially on the plane of line 3—3 of FIGURE 1;

FIGURE 4 is a vertical section, taken substantially on the plane of line 4—4 of FIGURE 6, similar to a portion of FIGURE 1 and showing the plunger or plunger removed from the numerator with the direction-selector cam also removed;

FIGURE 5 is a side elevation of the direction-selector cam normally mounted in the presser or plunger of FIGURES 1 and 4;

FIGURE 6 is a vertical section taken substantially on the plane of line 6—6 of FIGURE 4 and showing a direction-selector detent spring in its relative operating position;

FIGURE 7 is an end view of the direction-selector cam of FIGURE 5;

FIGURE 8 is a top plan view of FIGURES 1 and 2;

FIGURE 9 is a vertical section taken substantially on the plane of line 9—9 of FIGURE 8, showing details of the zero-depress selector wheel or disk and how it is fixed on the numbering wheel-shaft;

FIGURE 10 is a vertical section taken substantially on the plane of line 10—10 of FIGURE 6, showing details of a numbering wheel or disk in relation to a unit disk or wheel;

FIGURE 11 is a plan view of the numbering-wheel or disk shaft removed from the numerator, with the zero-depress selector wheel or disk thereon;

FIGURES 12, 12a, 12b, 12c and 12d are vertical sections taken on lines 12—12, 12a—12a, 12b—12b, 12c—12c, and 12d—12d, respectively, of FIGURE 11, showing the relative positions of the drop-zero recesses on the numbering-wheel shaft;

FIGURE 13 is a vertical section of the numbering disk or wheel closest to the plunger or presser, removed from the numerator, and illustrating the manner in which the zero-number type is retained in an operative printing position; and

FIGURE 14 is a view similar to FIGURE 13, illustrating the manner in which the zero-number type may be dropped to an inoperative position.

As seen in the drawings, the numbering device according to the invention comprises a housing 1 having two compartments 1a and 1b.

In the end walls of compartment 1a, there are provided two aligned upper holes 1f, 1f, and two aligned smaller lower holes 1g, 1g. The first pair of holes 1f, 1f, serves to mount a shaft 2 (FIGURE 1), which has in its surface recesses depressions 2e longitudinally spaced apart, each having a different number of faces or flats (FIGURES 12—12d). The second pair of holes 1g, 1g, serves to mount a spindle or shaft 3 which carries, in addition to five driving gears 4 whereof one, indicated at 4e, is fixed on the spindle 5 by means of a setscrew 4e, a toothed or ratchet wheel 6 fixed at one end integral with the spindle and disposed in compartment 1b (FIGURES 1, 3). Each gear 4 comprises a wheel having ten teeth 4d, a spacing hub 4b, and a second gear 4c having a single tooth 4d which engages with the ten teeth of an adjacent gear 4 (FIGURE 4). Each gear 4, its spacer hub 4b, and gear 4c are integrally formed, or secured together by bolts or the like to act as a unit, as illustrated.
Six numerator disks 6 and 6' each having ten faces 6a with the digits 0 to 9, are rotatably mounted on the shaft 2, to which is securely fixed as by means of a setscrew 7a, a notched drop zero selector or control disk 7 which serves to lower the zeros.

Integral with or secured to each disk 6 is a gear-like hub 6b (FIGURES 1 and 9) having ten teeth 6c engaging with the teeth of gears 4 and 4c. The hub 6a of the first of units disk 6' engages only with the teeth 4a of the associated gear 4', as shown at the left in FIGURE 1, this gear being fixed on the shaft 2 as by the setscrew 4c, the other gears 4-4c being freely rotatable on the shaft. The disk 6' farthest from the units disk and corresponding to the highest place digits, in this case the sixth disk, has its hub 6b engaged only with the single-toothed gear 4c of the fifth gear 4, as shown at the extreme right in FIGURE 1. Each of the other toothed hubs 6b engages with the teeth 4a of one gear 4 and with gear 4e of the next adjacent gear 4.

Each numerator disk 6 has engaged with its toothed hub 6b an arresting pawl 8, successively received in the spaces between the teeth, and the control disk 7 engages with a holding pawl 9; the disk 7 having six peripheral notches 7b for successively receiving the pawl 9. The arresting pawls 8 as well as the holding pawl 9 are pivotally mounted a small spindle 8d passing through the respective holes 8a and 9a, and are held in engagement with the corresponding numerator disk 6 or the control disk 7 by means of respective springs 10 and 11 fittedly received in laterally opening bores 10' and 11' in the housing 1.

The numerator disk 6', the units disk, has a fixed zero similar to the other digit faces 6a, while the other disks have a replaceable or drop zero provided by a block 12 in the form of a parallelepiped having on its outer face a raised face 12a in the form of a zero, similar to faces 6a. The block has a concave inner face 12b (FIGURES 13, 14) in order to fit freely against the circular surface of the shaft 2 and thus better withstand the thrust of the printing machine. The movable zero block 12 is disposed in an appropriate radial recess 6d in the numerator disks 6 open to the shaft 2 at its radially inner end also open at its outer end. The block 12 is formed with a cavity 12c in which is engaged a pin 13 fixed to the disk 6 which allows the zero to be moved radially without danger of its dropping out.

The end wall of compartment 1b of the housing 1 (FIGURES 1 and 2) is provided with a transverse arcade opening or slot h at the top and a transverse hole k at the bottom. The slot h permits shifting externally of a cam 14 journaled in a conforming bore 15 (FIGURES 4 and 6) in a plunger 15 (FIGURES 1, 4 and 6). The cam 14 is held in position in the plunger by a lateral detent spring 16 and detent small ball 17 housed in a lateral bore 17' in the plunger 15. The ball is engageable in one of the detent or orienting recesses 18 and 19 formed in the cam shaft 14 (FIGURES 2, 5).

The following operation is carried out when it is desired to change the movement from ascending to descending sequence or vice versa of the numbering disks of the numerator:

The cam 14 includes an annular flange 14' which includes a small hole 14f formed in the annular flanged end face 14h and allowing it to be turned by engagement of a suitable tool therein through arcuate slot h. The shaft 14' of the cam includes two sets faces 14g and 14h at right angles to each other (FIGURES 3 and 4), permitting opposed numbering disk reversing pawls 18 and 19 to alternatively engage the ratchet wheel 5.

The pawls 18, 19 are pivoted on lateral pins 18p and 19p, respectively, which are fixed to plunger 15 and undercut portion 15' on opposite sides of faces 14g and 14h. The pawls 18, 19 are biased toward ratchet wheel 5 and each other by means of an expansion spring 20 housed in a bore m in the plunger 15 from which its ends protrude. A stop screw 21 is threaded in the plunger 15 and extends into the hole k to limit reciprocating movement of the plunger. The plunger has on its top a raised portion 15b bearing the abbreviation "No." (FIGURE 8). The plunger 15 has opening into the bottom thereof two vertically extending bores 22 and 23 which react against the lower surface of compartment 16.

The recessed portion 15' of the plunger 15 accommodates the ratchet wheel 5 and permits relative movement of the pawls 18 and 19, and the plunger includes a lower pair of guide projections 25a and 25b attached to its bottom bearing on the partition dividing compartments 14a and 14b. (FIGURES 3).

The operation of the numbering device thus described is as follows:

The plunger 15, upon receiving a downward thrust of a printing machine (not shown), operates to cause partial rotation of the spindle 3 (FIGURE 3), and is returned to its original position, by the springs 22, 23. During the downward movement, depending on the orientation of cam faces 14g and 14h, one of the two pawls 18, 19, i.e., fingers 18' or 19', engages with the ratchet 5, which therefore turns the spindle 3 and the gear 4' fixed on the spindle 3. The gear 4' turns the engaged disk hub 6a of disk 6' and the first numerator disk 6 is moved by one step or digit. After nine steps or partial rotations of the shaft-fixed gear 4', the gear 4c of the gear 4' by engagement of its single tooth 4d with the toothed hub 6b of the second or numerator disk 6 adjacent 6' causes the disk to be rotated one step to present the next digit or numeral face 6a in printing position. Through toothed hub 6b, the gear 4c of fixed gear 4 also rotates the next adjacent gear adjacent gear 4 by one step or tooth, which after nine step rotations causes one step of the third disk, and so on.

In order to reverse the operation from ascending to descending sequence or reversely, the other one of the two pawls 18, 19 is actuated, by rotating the cam 14 through the opening r by means of the small hole 14f to reorient cam faces 14g and 14h. Lowering of one or more zeros is accomplished by manual setting of the control disk 7, which has six projections or faces 7c defined between the pawl-receiving notches 7b, on which are legibly printed the numerals 0 to 5 (FIGURE 8). By turning disk 7 against the force of holding pawl 9, the shaft 2 is rotated to dispose the zero-lowering recesses with the several faces or flats 2 thereof in the desired position. The number 5 on disk 7 is arranged so that the flats 2z on shaft 2 will be disposed beneath all the blocks 12 of numbering disks 6.

From a comparison of FIGURES 12 to 12d, inclusive, it will be apparent that the recess for the movable zero block 12 of the second numerator disk 6 has one face or flat 2z, and that the recesses for the blocks of the other four disks having movable blocks have each one more such flat than the recess for the preceding disk, the sixth disk 6 having five faces 2c. Each succeeding recess has flats corresponding to all of the flats 2c of the preceding recess in extent and chordal relation to the shaft axis. Thus, the rotation of the shaft to provide for lowering of the zero of any of the five disks having the blocks 12 automatically positions one of the flats 2c of all the succeeding disks to provide for lowering of the associated disk zero blocks, but does not make such provision relative to the preceding disks. This will be ap-
parent from FIGURES 13 and 14, in which two positions of the sixth numerator disk 6 are shown. In FIGURE 13, the shaft 2 is turned to the position in which all of the movable blocks 12 are held in raised or pivotless position, the accurately conical radially inner face 12a of each bearing on an unscratched cylindrical surface portion of the shaft which, as will be seen from FIGURES 12 to 12d, is common to all five recesses. This corresponds to the position of control disk 7 presenting the "0" numeral face 7c to view, indicating that none of the recesses will be turned to non-printing position. In FIGURE 14, the shaft 2 has been turned to the position indicated by the "5" numeral face 7c of control disk 7. In this position of the shaft, it will be apparent from comparison with FIGURES 12 to 12d, that the flat 2c of the recess for the sixth disk is disposed under, or inwardly of, the movable block 12 corresponds to the single flat 2c of the second disk recess, and to the corresponding flaps of the recesses for the third, fourth, and fifth disks also. The block of each disk engages on this flat by downward or radially inward movement and thus has its raised printing face 12a disposed below the level at which it can print, and all five movable blocks 12 therefore are rendered inoperative for printing. If the shaft 2 were turned clockwise as viewed in FIGURE 14 to bring the next adjacent flat 2c of the sixth disk recess into position at the inner end of the block 12, the single flat of the shaft recess for the second disk would be shifted from beneath the associated block 12, which would then be supported by the curved shaft surface in radially projecting or raised printing position. The blocks of the three intermediate disks would be lowered, since the respective recesses would each present radially inwardly of the blocks a flat 2c corresponding to the operative one of the recesses for the sixth disk. Thus the zero block for the fourth place numerator disks 6 would be retracred. It will be understood that this position of the shaft 2 corresponds to the position of control disk 7 in which the numeral "4" is brought into view. Depression of the zero blocks 12 radially inwardly against the flats or faces 2c of recesses is accomplished by the action of gravity, or pressure from the printing machine. While I have illustrated and described what I regard to be the preferred embodiment of my invention, nevertheless, it will be understood that such is merely exemplary and that numerous modifications and rearrangements may be made therein without departing from the essence of the invention. I claim: 1. A progressively and regresively operable numbering machine comprising a housing including a pair of adjacent compartments, a shaft journaled across one of said compartments, a plurality of numerator disks rotatably mounted in longitudinally spaced relation on said shaft, each disk having consecutively arranged numerals on the periphery thereof, each of said disks except the one end disk farthest from said other compartment including a radial recess opening to the shaft, a block radially movable in each recess bearing one of said numerals on the outer face thereof and having an inner face engaging on the shaft, said shaft including integral, longitudinally spaced chordal recessed surface means for selective registration with said radial recesses to permit radially inward retraction of said blocks, a manually engageable control disk fixed on the shaft, and means for effecting selective registration, a spindle journaled in the housing parallel to and below the shaft, means for rotating said spindle step-by-step, and cooperative drive means on the spindle and each of the numerator disks for effecting partial rotation of said one end disk upon each partial rotation of the spindle. 2. A printing numbering device operable progressively or regresively by selective setting of cam means and having zeros retractable to non-printing position by a presettable control, comprising a manually rotatable cam, a reciprocable plunger in which said cam is journaled, a toothed wheel journaled on an axis of rotation below and parallel to that of said cam, a pair of paws journaled in depending relation on said plunger and alternately engageable with said toothed wheel by selective rotation of the cam, means biasing the paws toward engagement with the toothed wheel, a rotatably mounted shaft, a control wheel fixed on the shaft for rotatable adjustment of the shaft, means to maintain said adjustment, said shaft including axially spaced chordal depressions in angular relation circumferentially of the shaft, printing wheel means on the shaft including zero blocks movable radially and engageable with the shaft and including inner ends retractable in radially inwardly retractable position in said chordal depressions, and means operably connecting said printing wheel means to the toothed wheel for step-by-step rotation by said toothed wheel. 3. A progressively and regresively operable numbering device comprising a housing including adjacent compartments, a shaft mounted across one of said compartments of the housing, said shaft including chordally disposed surfaces, a plurality of numerator disks rotatably mounted on the shaft each having consecutively arranged numerals on the periphery thereof, a drive spindle journaled in the housing below and parallel to the shaft, means in said other compartment for incrementally rotating the spindle, cooperative means on the spindle and each of the numerator disks for effecting initial partial rotation of only an end disk farthest from said other compartment upon each partial rotation of each successive disk upon predetermined number of partial rotations of the disk preceding it, all by means of one of the numerator disks having a radial recess for communication with one of said chordally disposed surfaces, and a block radially movable in each recess bearing a numeral on the outer face thereof and having an inner face engageable alternatively either on the surface of the shaft or in one of said chordally disposed surfaces for radially inward retraction of the block, said chordally disposed surfaces permitting progressive, manually selected depression of said blocks from said end one of said disks. 4. A numbering device operable selectively in ascending and descending sequence, comprising a housing, printing wheel means in said housing movable step-by-step selectively in opposite directions, a rotatably mounted ratchet wheel, means operatively connecting said printing wheel means to said ratchet wheel for step-by-step movement thereof, a reciprocable member in said housing, a pair of paws pivotally mounted in dependent relation on said reciprocable member and alternatively engageable with said ratchet wheel for partially rotating the wheel in relation to reciprocation of said reciprocable member, and cam means comprising a cam member displaceably mounted on said reciprocable member and including adjacent camming faces at one end thereof defining the path of pivotal movement of said paws for selective engagement therewith to determine the direction of rotation
of said ratchet wheel, said cam member including an operating portion disposed at one side of said reciprocable member for manual engagement and displacement for determining the orientation of said cam faces, said housing including an opening in one side thereof and in alignment with and exposing said operating portion.

5. The structure of claim 4 in which said reciprocating member includes spring-urged displaceable abutment means thereon, said cam member including detent portions in oriented relation with respect to said cam faces and engageable with said spring-urged abutment means whereby said cam member is retained in an adjusted position.

References Cited in the file of this patent

UNITED STATES PATENTS

961,035 Smith ......................... June 7, 1910

FOREIGN PATENTS

183,706 Switzerland ................. Apr. 30, 1936
649,946 Germany ..................... May 5, 1936
1,014,237 France .................... May 28, 1952