# United States Patent

**Klingspor et al.**

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## [54] NUMBERING MECHANISM FOR AUTOMATIC PRINTING OF ORDER NUMBERS OR THE LIKE IN LETTERS


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[73] Assignee: **Esselte AB,** Stockholm, Sweden



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[30] **Foreign Application Priority Data**

June 27, 1968 Sweden.....8811/68

[52] **U.S. Cl.**.....**101/76**

[51] **Int. Cl.**.....**B41j 1/22,** B41j 1/60

[58] **Field of Search**.....101/76, 77, 91, 109, 368



[56] **References Cited**

UNITED STATES PATENTS

| | | | |
|---|---|---|---|
| 542,358 | 7/1895 | Carter | 101/76 |
| 1,821,360 | 9/1931 | Reinhardt | 101/76 |
| 2,516,721 | 7/1950 | Persson | 101/76 |
| 2,909,992 | 10/1959 | Rockefeller, Jr. | 101/76 |



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*Attorney*—Birch, Swindler McKie & Beckett



[57] **ABSTRACT**

A numbering mechanism for automatic printing of counterfeit-protecting statements of order numbers and the like in letter-written form on value prints, distinguished by comprising number wheels carrying on their periphery the respective numbers in letters, the first or units number wheel over the numerals in the series "one" to "nine" also carrying the numerals in the series "10" to "9" i.e. in total 19 numerals, while the 10s number wheel is provided with the eight numerals in the series "20" to "90" and a ninth numeral-free position at its periphery, said position preferably being filled by a counterfeit-protecting block or screen, all number wheels furthermore carrying a 10th numeral-free position at their periphery, said position also preferably being filled by a counterfeit-protecting block or screen.


**9 Claims, 8 Drawing Figures**

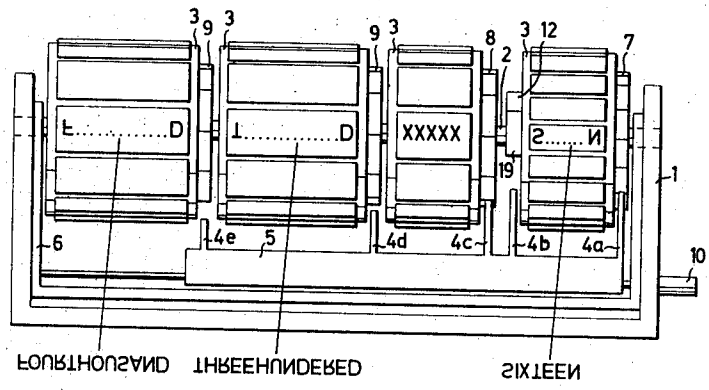


Fig.1

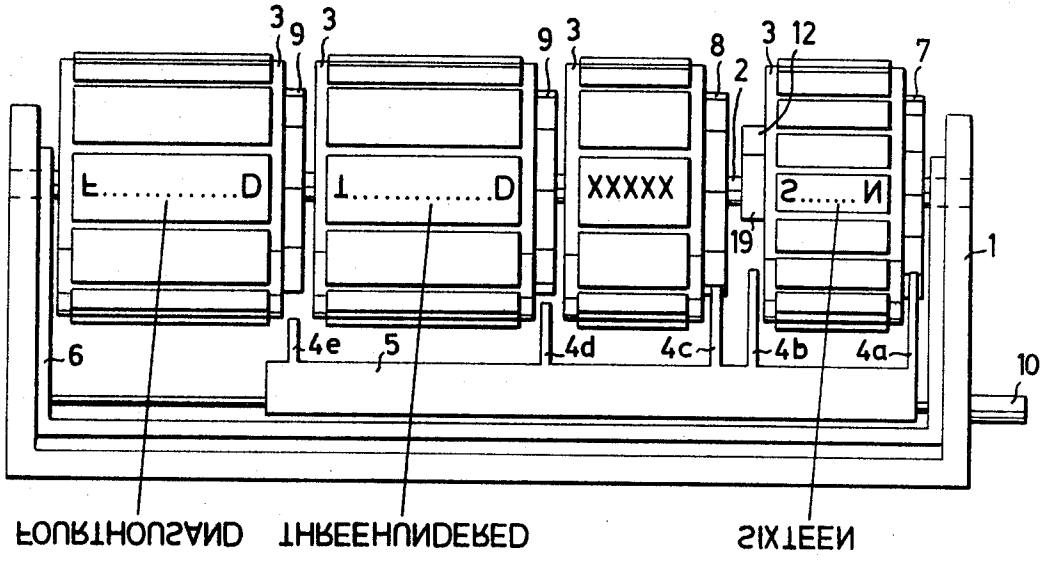

3
9
3
9
3
8
3
12
7
2
19
1
10
6
4e
5
4d
4c
4b
4a
FOURTHOUSAND
THREEHUNDERED
SIXTEEN

Fig. 2

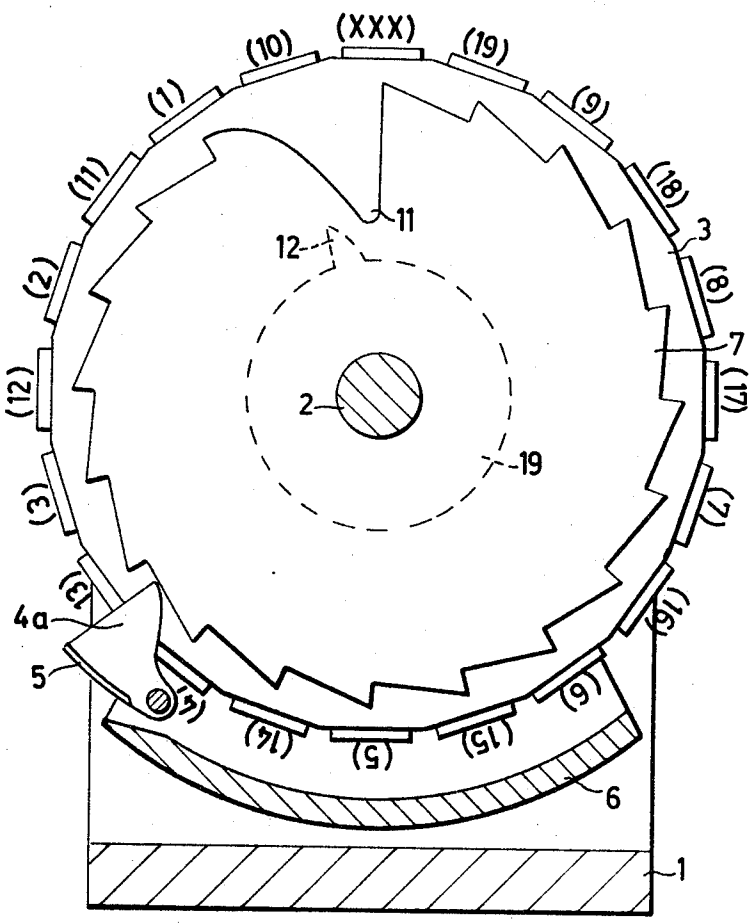


Fig. 3

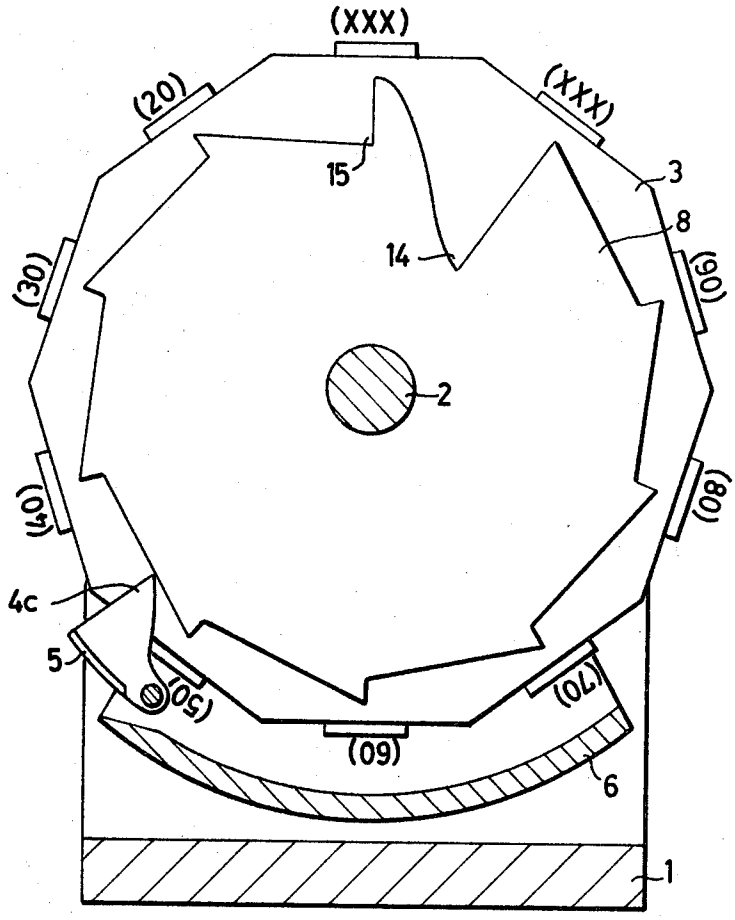


Fig.4

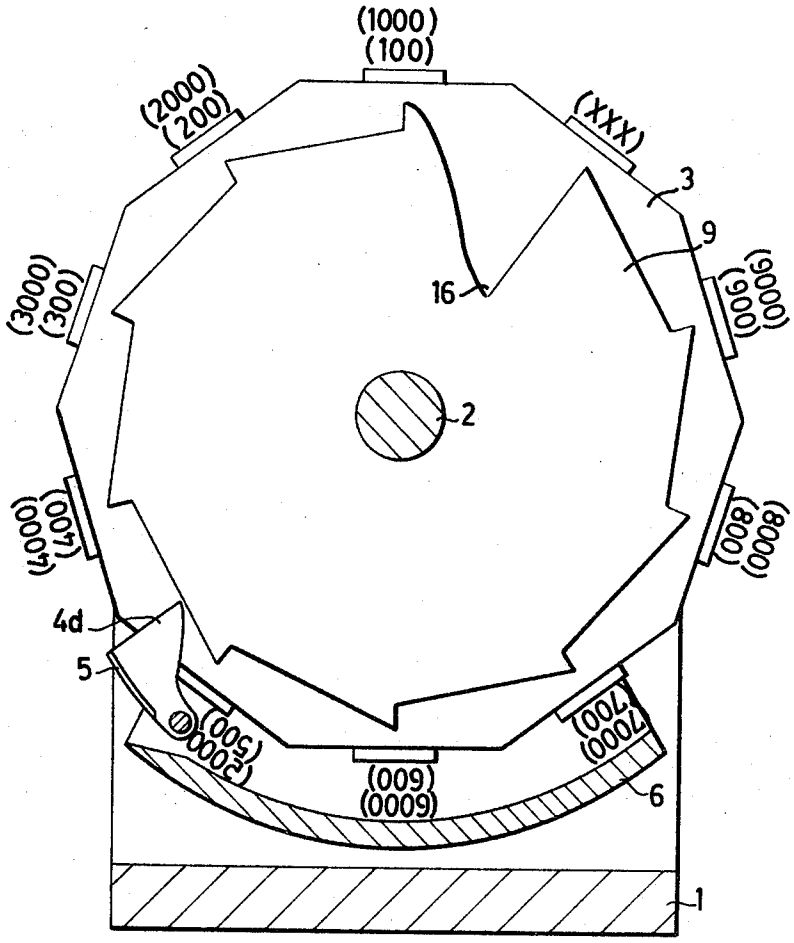

(1000)
(100)
(2000)
(200)
(XXX)
3
9
(3000)
(300)
16
(900)
(9000)
2
(4000)
(400)
(800)
(8000)
4d
5
(5000)
(500)
(7000)
(700)
(009)
(0009)
6
1

Fig.5

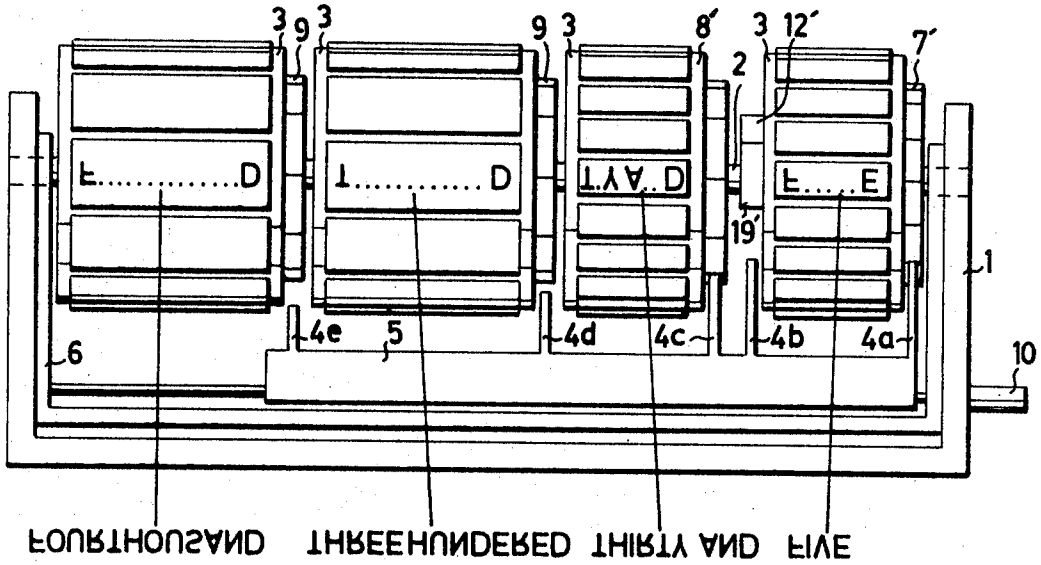

3
9
3
9
3
8'
3
12'
7'
2
19'
1
10
6
4e
5
4d
4c
4b
4a
FOUR THOUSAND
THREE HUNDERED
THIRTY AND
FIVE

Fig. 6

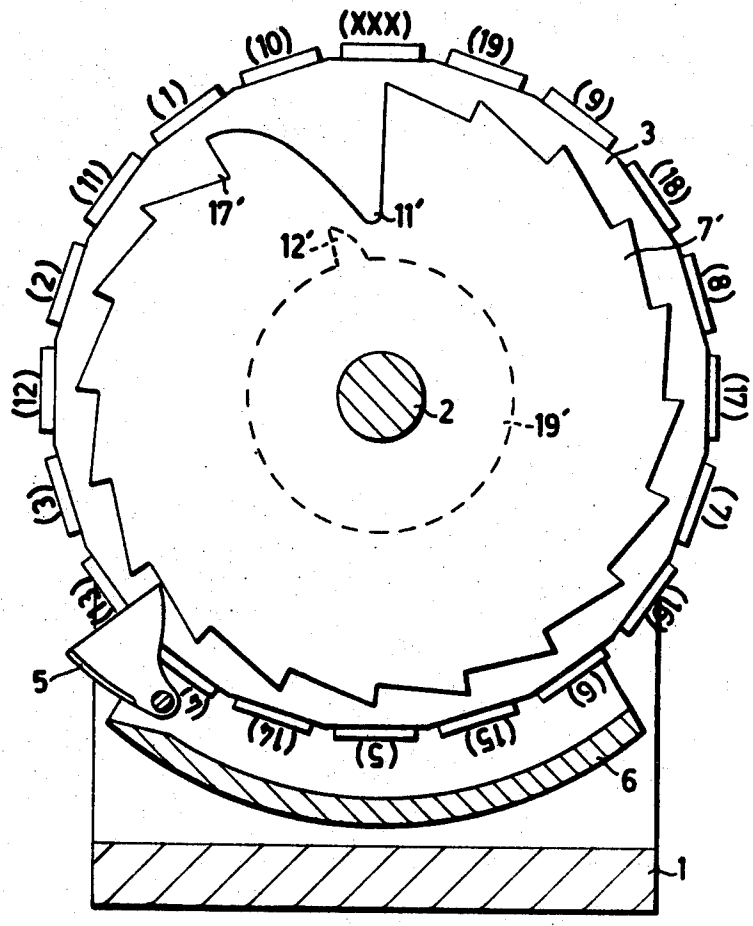


Fig. 7

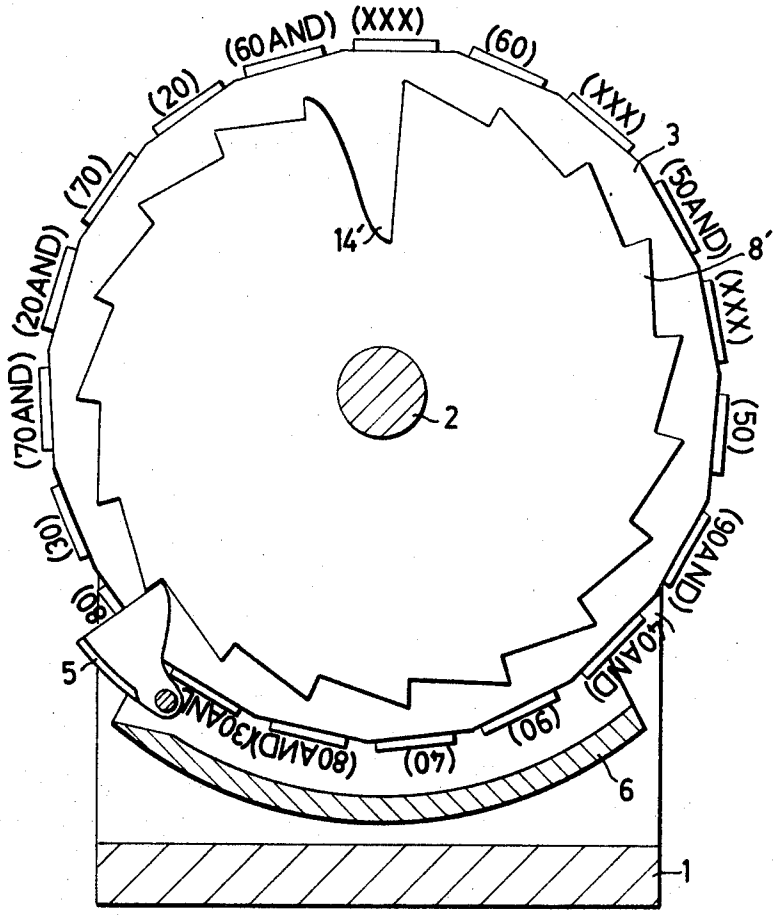
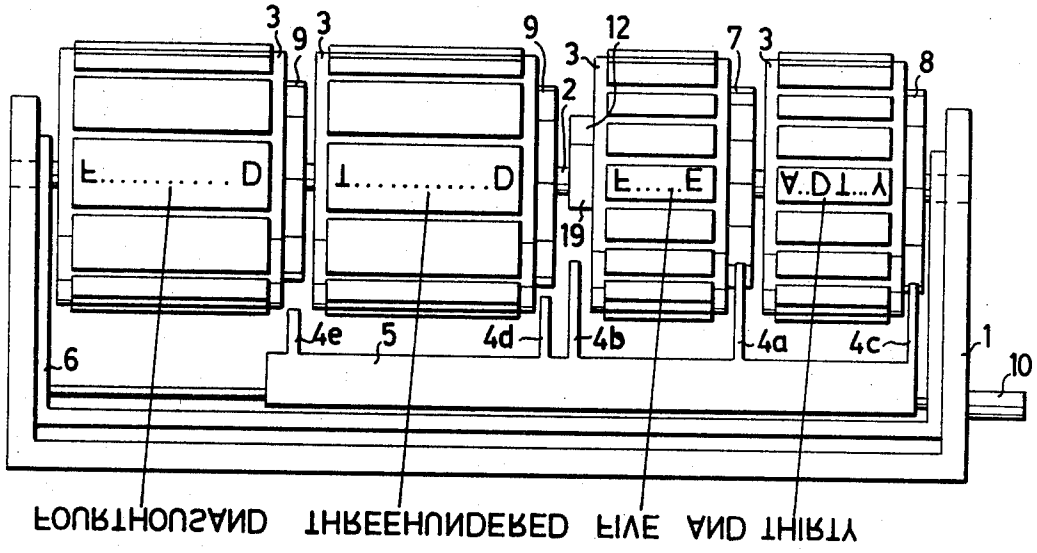

(60 AND)
(XXX)
(60)
(XXX)
3
(50AND)
8'
(XXX)
(50)
(90AND)
(40AND)
(90)
(40)
(80AND)X30AND
(80)
(30)
(70AND)
(20AND)
(70)
(20)
14'
2
5
6
1

Fig. 8


3
9
3
9
12
3
2
7
3
8
19
4e
5
4d
4b
4a
4c
6
1
10
FOUR THOUSAND
THREE HUNDERED
FIVE
AND
THIRTY

# NUMBERING MECHANISM FOR AUTOMATIC PRINTING OF ORDER NUMBERS OR THE LIKE IN LETTERS

The present invention refers to a numbering mechanism for automatic printing of counterfeit-protecting statements of order numbers, amounts and other counts and numerals in a form written by letters, particularly on lottery-tickets, bonds and similar value prints.

Since long it is known that the protection against counterfeits in numbered prints, such as bonds, lottery-tickets etc. is substantially improved if the number is printed both with numerals and letters, such as e.g., "No 1,234 Onethousandtwohundredthirtyfour". This counterfeit protection which is good per se has only had a rather exclusive application, however, due to the fact that the procedure of printing the numbers in letters must be made in a particular printing operation, which furthermore involves an extremely cumbersome manual assorting work in larger numeral series and editions. Therefore said procedure is very complicated and extremely expensive.

Thus there is a great demand for being able to facilitate and mechanize said letter-numbering of value prints but the major difficulty has been to provide a mechanical counter mechanism or similar device which can be brought to follow the linguistic way of stating counts and amounts in letters. Particularly a great difficulty has been caused by the numerals between 11 and 19 which disturb the regularity in the shifting of the numeral statements otherwise present.

Surprisingly, there has now been discovered a numbering mechanism for the above-stated purpose, said numbering mechanism eliminating in a very satisfying and simple manner the difficulties hitherto present in writing numbers or numerals in letter form. Thus the numbering mechanism according to the present invention distinguishes in that it comprises a number of number wheels corresponding to the optimum actual digit number and having at their periphery as known per se the respective numerals, however, expressed in letters, the units number wheel having over the numerals in the series "one" to "nine" also the numerals of the series "10" to "19" i.e., in total 19 numerals, while the tens number wheel is provided with the eight numerals in the series "20" to "90" and a ninth numeral-free position on the periphery, said position preferably being filled with a counterfeit-protecting block or screen, all number wheels furthermore carrying a tenth numeral-free position at their periphery, said position also preferably being filled with a counterfeit-protecting block or screen.

By the numbering mechanism according to the invention it is now possible to print in a fully automatic way and in one single printing operation sequential series of value prints with numbers etc. printed with letters. This does not only give a great saving of time but also a great saving of manual assorting work. The numbers etc. written with letters in this way also become an appearance which is very nice and not at all or only somewhat differs from common letter forms and the printed text versions hitherto made with a great quantity of manual work and several individual printing operations.

It has now further turned out that it is possible to adapt the present invention in a very simple way to most foreign languages. In an analysis of various foreign languages it can, namely, relatively easy be distinguished some few main groups as to their way of expressing numbers and counts in letters. In this respect, first of all there can be a difference in the statement of the units before the tens, but it can also concern the expression of the tens together with any preceeding or subsequent binding word such as "and". In the following description there will also be suggested various ways of adapting the invention also to said varying linguistic usages.

By way of example the invention will be further described in preferred embodiments with reference to the enclosed drawings in which FIG. 1 is a longitudinal principle sketch of a numbering mechanism according to the invention, FIG. 2 is a side elevational view of the units number wheel of the mechanism in FIG. 1, FIG. 3 is a side elevational view of the



10s number wheel of the same mechanism and FIG. 4 a side elevational view of the 100s number wheel which for the rest is equal to the 1000s number wheel and the wheels for subsequent positions of higher order. In FIG. 5 is illustrated a modified embodiment of the numbering mechanism according to FIG. 1 and said embodiment is adapted for use in a language where the numbers of the series "20" to "90" are accompanied by a binding word "and" when they are not alone not followed by a unit, FIG. 6 is a side elevational view of the units number wheel in said modified embodiment according to FIG. 5 and FIG. 7 is a side elevational view of the 10s number wheel in said last-mentioned embodiment. FIG. 8 finally illustrates another modified embodiment of the numbering mechanism according to FIGS. 5–7, where the mutual arrangements of the tens number wheel and the units number wheel is interchanged for the reason of linguistic usages.

In the drawings there is thus illustrated a numbering mechanism for automatic printing of numerals expressed in letters, said mechanism in principle being designed as known counter mechanisms. Thus the numbering mechanism is carried by a frame 1 supporting a shaft 2 on which are pivotally journalled a plurality of number wheels 3 corresponding to the optimum actual digit number, Said wheels are being indexed in the same way as in paging machines, namely each by means of an indexing member acting on an indexing or ratchet wheel connected to the respective number wheel 3. According to the invention said number wheels carry at their periphery the numerals expressed in letters and distributed according to the attached scheme A. From said scheme it is evident that the units number wheel not only carries the numerals in the series "one" to "nine" but also alternately therebetween the numerals of the series "10" to "19", i.e., in total 19 numerals. At its periphery the units number wheel has a numeral-free position which preferably is protected against counterfeit by being filled with a block, screen or the like. Thus the units number wheel is provided with other numerals than only the units and should correctly be denominated "the number wheel of the lowermost value position". For the case of simplicity, however, in the following description the denomination "units number wheel," has been maintained. The 10s number wheel carries the numerals in the series "20" to "90" and should correctly be denominated "20s number wheel" instead of the 10s number wheel.

For allowing the required proper decimal indexing of the tens number wheel said wheel has furthermore at its periphery a ninth numeral-free position, which preferably is counterfeit-protected similar to the units number wheel by means of a block or screen and standing as substitute for the 10th superfluous numeral on said 10s number wheel, and in common with the units number wheel and the number wheels of higher value positions a further tenth numeral-free position at its periphery, said position also preferably being filled in the same counterfeit-protecting way and in normal numeral counters corresponding to the numeral "nought". The hundreds number wheel and other wheels for higher value positions are then made in the same way as in a numeral counter and carry the numerals in the series "100" to "900" as to the hundreds number wheel, the numerals of the series "1000" to "9000" for the thousands number wheel etc. Furthermore said last-mentioned number wheel also carries a 10th numeral-free position at its periphery corresponding to the numeral "-nought" in numeral counters.

Said distribution of the numerals over the different number wheels also has required a particular arrangement of the indexing members and indexing wheels as to known counters. According to the invention the units number wheel is provided with two indexing or ratchet wheels 7 and 19, respectively, while the 10s number wheel has an indexing wheel 8 and the 100s number wheel and subsequent number wheels of higher order each have an indexing wheel 9, which, however, is similar to commonly known index wheels.

For providing the required predetermined stepwise indexing of the respective number wheels 3 the indexing wheels 7, 8

and 19 are formed with a particular shape and all indexing wheels are actuated by indexing members 4*a*, 4*b*, 4*c*, 4*d*, 4*e* etc. Said indexing members are rigidly secured to a common plate 5, which in its turn is pivotally journalled on a rocking member 6 mounted on the shaft 2 and springbiased towards the indexing teeth or notches on the respective indexing wheels. Two of the indexing members, viz. 4*a* and 4*b*, which are of the same length, are associated with the indexing wheels 7 and 19 of the unit number wheels, while the indexing wheels 8 and 9 each have an associated indexing member 4*c*, 4*d* etc., which are of a length decreasing in the direction towards the higher number orders as previously known for providing the required decimal transfer.

For latching the wheels in each indexed position each of them is provided with a resilient latch member (not illustrated) also of a kind known per se. For indexing the numbering mechanism the rocking member 6 is imparted a reciprocatory rocking movement from any suitable actuating member of the associated printing machine etc. in which the numbering mechanism is used, under the intermediation of a drive stud 10.

With reference to the above-stated description of the detail arrangement of the numbering mechanism according to the invention the following description of the indexing mechanism ought to be sufficient. While the number wheels of the numbering mechanism according to FIG. 1 as to the 100s number wheel and the number wheels of higher order have indexing wheels 9 with 10 indexing teeth or notches as usual, the shape of the indexing wheels 7, 8 and 19 of the units and 10s number wheel differs substantially from the first-mentioned. In FIG. 2 is illustrated a side elevational view of the units number wheel 3 with an indexing wheel 7 attached thereto and an indexing wheel 19 on the opposite side of same wheel 3 as indicated with broken lines. The indexing wheel 7 has at its periphery a number of teeth corresponding to the number of numerals around the periphery of said units number wheels, i.e., 19. Eighteen of said teeth have the same but relatively small height (or form notches of small depth) while the 19th tooth is made with a great height 11, extending from a rather deep point adjacent the center of the indexing wheel 7. The indexing wheel 19 mounted on the opposite side of the units number wheel 3 carries on its periphery only one single indexing tooth 12 which is located approximately in register with the tooth 11 of the indexing wheel 7.

In FIG. 3 it is illustrated a side elevational view of the tens number wheel 3 with an indexing wheel 8 attached thereto. Since the 10s number wheel around its periphery has 10 numeral positions, the indexing wheel 8 associated thereto has 10 teeth. Eight of said teeth (or notches) have the same relatively reduced height (or deep), while the ninth tooth 14 forms a great recess extending relatively deep inwardly towards the center of said indexing wheel, and the tenth notch 15 is deeper than the notches formed by the first-mentioned eight teeth but not as deep as the recess 14.

In FIG. 4 is illustrated a side view of a 100s number wheel 3 with an indexing wheel 9 attached thereto. It is to be pointed out that the number wheels for the hundreds and higher numeral orders are mutually equal and therefore it has been considered sufficient to describe in this connection only the 100s number wheel. Since said 100s number wheel around its periphery also has 10 numeral positions the indexing wheel 9 is provided with the same number of teeth or notches around its periphery. All said notches 9 are of the same relatively reduced deep while the 10th is made as a recess 16 which extends substantially deeper inwardly towards the center of the indexing wheel.

The operation of the above-described numbering mechanism is the following. When assuming that all number wheels are in the nought position, i.e., with the numeral-free position of the periphery in printing position, the first actuation of the numbering mechanism from the printing machine imparts an indexing of the numbering mechanism one numeral, i.e., to the numeral "one" on the units number wheel. Said and continued indexing then occurs by means of the indexing member 4*a* and involves an indexing over two normal index notches each time, since alternately between each numeral in this first series "one" to "nine" is arranged a numeral in the series "10" to "19", which must be passed over. In subsequent actuations of the numbering mechanism the same will be indexed one numeral at a time in said series up to the numeral "nine" when the indexing member 4*a* will move down into the recess 11 of the indexing wheel 7, the indexing member 4c of the 20s number wheel will rest in the shallow recess 15 of the indexing wheel 8 of the 20s number wheel. At the same time the indexing member 4*b* will be in operative position and engage the tooth 12 of the indexing wheel 19 whereby an indexing motion over three normal index notches will be achieved, so that a transfer occurs of the units number wheel and the first numeral "10" in the second alternate numeral series thereof instead will be brought into printing position. The step-wise indexing of the other numerals in said second series following thereto occurs, however, as before with two normal teeth or notches at a time.

When the numeral "19" on the units number wheel has been reached, the indexing member 4*a* will be introduced into the notch 11 of the indexing wheel 7 of the units number wheel. Said introduction is restricted, however, by the fact that the indexing member 4*c* will rest in a shallow index notch on the indexing wheel 8 of the 10s number wheel, and therefore the indexing member 4*b* will not come into operative position engaging the index tooth 12. By this the units number wheel only will be indexed one single index notch at the same time as the 20s number wheel will be indexed one numeral or step, i.e., one notch, for the reason that in this case the index wheel 8 only has one single set of 10 notches in the usual way. By this the numbering mechanism will be indexed for printing the number "xxxxx 20 xxxxx". In the next indexing only the units number wheel will be moved so that the mechanism is indexed to the number "xxxxx21".

Subsequent indexing will then lead to the number "xxxx 29"when a new indexing one step of the 10s number wheel will occur and again an indexing of the units number wheel two index notches whereby the number "xxxxx 30 xxxxx" will be reached, but the units number wheel then will continue to be indexed only on the series "one" to "nine" on this wheel. In similar way this will be repeated up to the number "xxxxx 99", when the indexing members of both the units and 10s number wheel simultaneously will be introduced in their recesses 11 and 14, respectively, whereby an indexing of the 100s number wheel one step will be achieved, to that the number "100 xxxxx xxxxx" will come into printing position. Further subsequent indexing then involves that only the units number wheel is indexed, first through the series "one" to "nine" and then - after a shifting as mentioned - through the series "10" to "19" so that finally the number "100 xxxx nineteen" will be reached. In the same way as stated above then an indexing of the 10s number wheel one notch or position occurs, while the units number wheel is rotated or indexed only one index notch, so that the mechanism will reach the number "120 xxxxx", after which the previously mentioned indexing operation will be repeated in cycle. (For the sake of shortness the above operation description has been restricted to a numbering mechanism having three digit positions while the numbering mechanism illustrated on the drawings has four digit positions.)

The whole preceding description made with reference to FIGS. 1–4 refers to an embodiment of the numbering mechanism particularly adapted for the English language. Most of the other languages can be devided into substantially two main groups of which one writes the numerals with the units first and the 10s following thereafter joined with a binding word "and" such as the case is in Danish, Norwegian, German or Dutch, i.e., "one and 20", "two and 20", etc. The other group, to which belong e.g., Spanish, Portuguese and Yugoslavian writes the numerals in similar although "straight ahead" way e.g., "20 and one", "20 and two", thus with the

10s first and the units thereafter connected by the binding word "and" or the like. However, the present numbering mechanism is so advantageous in its structural design that it can very easily be adapted to the alternative embodiments required for adaption to the two last-mentioned language groups. A first example of this is illustrated in FIGS. 5–7 of the drawings which illustrates an embodiment of the numbering mechanism according to the invention particularly adapted for use in connection with the last-mentioned language group to which belong Spanish, Portuguese and Yugoslavian and in which is stated the numerals in written from according to the example "20 and one", "20 and two" etc.

Said embodiment differs from the one previously described from a principle point of view only in one single respect, namely in that the "20s" number wheel over the numerals in the series "20 " to "90" alternately therebetween also carries a series numerals "20 and" to "90 and" , i.e., twice the number of numerals. This only involves a change of the indexing wheel 7′ of the units number wheel 3 in that the index notch 17′ lying closest adjacent the recess 11′ is made somewhat deeper for achieving the required shifting between "20" and "20 and " etc. The indexing wheel 1 19′ disposed in the opposite of the units number wheel carries unchanged one index tooth 12′ . Due to the fact that the 10s number wheel in this case carries twice the number of numerals also the associated index wheel 8′ will of course have twice as many index notches around it periphery, whereby the recess 14′ in this case will be substantially narrower but of substantially the same depth as in the embodiment according to FIG. 3. For the rest there are no differences as to this numbering mechanism when compared with the numbering mechanism according to FIG. 1–4.

In FIG. 8 there is finally illustrated a further modified embodiment of the numbering mechanism according to the invention, which embodiment is particularly adapted for use in connection with languages in the first-mentioned of the two latter groups, i.e., languages such as Danish, Norwegian, German and Dutch, where the units are written before the 10s with a binding word therebetween, thus "one and 20", "two and 20" etc. Said embodiment is very similar to the last-mentioned embodiment according to FIGS. 5–7 but differs in principle in a very important respect, namely in that the mutual arrangement of the units number wheel and the 10s number wheel has been interchanged. This involves in its turn an interchanging of the mutual arrangement of the indexing members *4a* and *4b* relative to the indexing member *4c* of the tens number wheel, but for the rest there are no structural differences in comparison with the embodiment according to FIGS. 5–7.

In the enclosed scheme B is illustrated the distribution of the numerals written in letters in the numbering mechanism according to FIGS. 5–7. For the embodiment according to FIG. 8 the same scheme B also can be applied, however, with mutual interchanging of the two right-most columns and with the addition of the binding work "and" before the actual tens.

The above-described embodiments and application of the present invention only have been made as non-limiting examples for illustrating the invention, but it is particularly to be pointed out that a great number of other applications of the invention also are possible as well as other embodiments and modifications which can be required for structural and/or linguistic reasons.

SCHEME A

[Distribution of letter-written numerals in the numbering mechanism according to FIGS. 1–4]

| XXXXXXX | XXXXXXXX | XXXXXXXX | XXXXXXX |
|---|---|---|---|
| | | | TEN |
| ONETHOUSAND | ONEHUNDRED | TWENTY | ONE |
| | | | ELEVEN |
| TWOTHOUSAND | TWOHUNDRED | THIRTY | TWO |
| | | | TWELVE |
| THREETHOUSAND | THREEHUNDRED | FOURTY | THREE |
| | | | THIRTEEN |
| FOURTHOUSAND | FOURHUNDRED | FIFTY | FOUR |
| | | | FOURTEEN |
| FIVETHOUSAND | FIVEHUNDRED | SIXTY | FIVE |
| | | | FIFTEEN |
| SIXTHOUSAND | SIXHUNDRED | SEVENTY | SIX |
| | | | SIXTEEN |
| SEVENTHOUSAND | SEVENHUNDRED | EIGHTY | SEVEN |
| | | | SEVENTEEN |
| EIGHTTHOUSAND | EIGHTHUNDRED | NINETY | EIGHT |
| | | | EIGHTEEN |
| NINETHOUSAND | NINEHUNDRED | XXXXXXX | NINE |
| | | | NINETEEN |

EXAMPLE: EIGHTTHOUSANDNINEHUNDRED XXXXXXX NINETEEN.

SCHEME B

[Distribution of letter-written numerals in the numbering mechanism according to FIGS. 5–7]

| XXXXXXXXX | XXXXXXXX | XXXXXXXX | XXXXXXXX |
|---|---|---|---|
| | | SIXTY AND | TEN |
| ONETHOUSAND | ONEHUNDRED | TWENTY | ONE |
| | | SEVENTY | ELEVEN |
| TWOTHOUSAND | TWOHUNDRED | TWENTY AND | TWO |
| | | SEVENTY AND | TWELVE |
| THREETHOUSAND | THREEHUNDRED | THIRTY | THREE |
| | | EIGHTY | THIRTEEN |
| FOURTHOUSAND | FOURHUNDRED | THIRTY AND | FOUR |
| | | EIGHTY AND | FOURTEEN |
| FIVETHOUSAND | FIVEHUNDRED | FOURTY | FIVE |
| | | NINETY | FIFTEEN |
| SIXTHOUSAND | SIXHUNDRED | FOURTY AND | SIX |
| | | NINETY AND | SIXTEEN |
| SEVENTHOUSAND | SEVENHUNDRED | FIFTY | SEVEN |
| | | XXXXXXXX | SEVENTEEN |
| EIGHTTHOUSAND | EIGHTHUNDRED | FIFTY AND | EIGHT |
| | | XXXXXXXX | EIGHTEEN |
| NINETHOUSAND | NINEHUNDRED | SIXTY | NINE |
| | | | NINETEEN |

EXAMPLE: EIGHTTHOUSANDTHREEHUNDREDSIXTY AND TWO.

We claim:

1. A mechanism for automatic printing of sequential numerical indicia which comprises

first and second numbering wheels having indicia on their periphery and cooperatively mounted to bring different combinations of the indicia on the different wheels into

alignment in an operative position,

the indicia on said first wheel being arranged in a first sequence including a plurality of "10s " indicia and at least one dummy indicia,

the indicia of said second wheel being arranged in second and third sequences,

said second sequence including a plurality of "units" indicia and at least one dummy indicia,

and third sequence including a plurality of "teens" indicia, and

indexing means to index said wheels through respective cycles with each cycle including a plurality of steps in which the respective indicia on each wheel are sequentially brought to said operative position, said indexing means moving said second wheel through a cycle while said first wheel is retained at a step,

said indexing **10**s including automatic means to select between said second and third sequences in different cycles of said second wheel to bring the "units" indicia sequentially into said operative position both when a dummy indicia and respective "10" indicia of said first wheel are in said operative position and to bring the "-teens" indicia sequentially into said operative position only when a dummy indicia of said first wheel is in said operative position.

**2**. A mechanism according to claim **1** wherein said "10s ", "units" and "teens" indicia are expressed in written letter form, said "10s " indicia including the multiples of 10 from "20" to "90" inclusive, said "units" indicia including the numbers "one" to "nine" inclusive, said "teens" indicia including the numbers "10" to "19" inclusive.

**3**. A mechanism according to claim **1** wherein said first wheel has two dummy indicia, different ones of which are at said operative position during respective cycles of said second wheel when said second and third sequences are brought to said operative position.

**4**. A mechanism according to claim **1** wherein each of said dummy indicia prints a counterfeit-protecting pattern.

**5**. A mechanism according to claim **1** wherein said sequences of "units " and "teens" indicia alternate with each other on said second wheel.

**6**. A mechanism according to claim **5** wherein said alternating sequence of "units" and "teens" begins with "one" and "11" adjacent one another and continue in alternating order therefrom, said dummy indicia being positioned between "19" and "10".

**7**. A mechanism according to claim **1** wherein said indexing means comprises a plurality of toothed wheels, each said toothed wheel being interconnected with one of said numbering wheels and pawl means for engaging said toothed wheels.

**8**. A mechanism according to claim **1** further comprising a third numbering wheel having indicia on its periphery and being cooperatively mounted with said first and second numbering wheels, said third numbering wheel having indicia of a fourth sequence including a plurality of "100s " indicia and at least one dummy indicia.

**9**. A mechanism according to claim **1** wherein said first wheel includes an additional sequence including a plurality of "10s and" or "and 10" indicia and wherein said indexing means automatically selects between said first sequence and said additional sequence on said first wheel to bring the "10s " indicia sequentially into said operative position only when a dummy indicia of said second wheel is in said operative position and to bring said "10s and" or "and 10s " indicia sequentially into said operating position only when said "units" indicia of said second wheel are in said operative position, whereby other linguistic arrangements can be accomodated by said mechanism

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