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PATENT SPECIFICATION 656,601

Date of Application and filing Complete Specification :
Dec. 31, 1947. No. 35027/47.

Application made in Germany on April 12, 1939.

Complete Specification Published : Aug. 29, 1951.

(Under Section 6 (1) (a) of the Patents &c. (Emergency) Act, 1939, the proviso to Section 91 (4) of the Patents and Designs Acts, 1907 to 1946, became operative on Dec. 31, 1947.)

Index at Acceptance :—Class 106(i), B2e2b2c.

COMPLETE SPECIFICATION.

Calculating Machine.

I, CURT HERZSTARK, Austrian Citizen, of Mauren, Liechtenstein, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement ;—

The present invention relates to a calculating machine with a single stepped toothed drum.

Calculating machines of circular construction have been known for a long time, in which the transfer and totalising elements are arranged around a central stepped drum. In these calculating machines the entering wheels and tens transfer wheels driven by the stepped drum, generally embody ten teeth.

If entering wheels with ten teeth are used the pitch diameter thereof cannot be made very small if a satisfactory arrangement of teeth, operating satisfactorily under working conditions, is to be obtained. For this reason the entering wheels occupy a comparatively large space when arranged around the stepped drum. The size of this circular calculating machine must therefore be comparatively large and moreover the number of positions available is comparatively small.

The present invention is concerned with the problem of producing a circular calculating machine of pocket size in which the largest possible number of totalising elements are provided in the result and revolution counting groups. For this purpose the spindles of the entering wheels must be disposed very close one to the other. This small angular distribution requires setting wheels of very small diameter. In order to obtain a size of tooth which operates satisfactorily when using such small entering wheels, these wheels are, according to the invention, provided with less than ten teeth, conveniently with five teeth. In carrying out the invention this requires that, in the transmission between the entering wheels and the number wheels, a reduction drive be included which ensures that the number wheels effect one tenth of a complete revolution for each tooth of the stepped drum as is required for correct calculation. A further advantage of the arrangement according to the invention lies in the fact that also the pitch circle diameter of the stepped drum is reduced. Thereby the mass of the rotating parts of the whole driving mechanism is considerably reduced which moreover has for its result less inertia and easier and better stoppage properties of the working parts.

In order that the invention can be better understood reference will be made to the accompanying drawings illustrating one form thereof by way of example and in which :

Fig. 1 shows the calculating machine in elevation and partly in section, and

Fig. 2 is a partial section on the line II—II of Fig. 1.

A stepped toothed drum 3 is mounted on a shaft 1 rotatably supported in the body of the machine and can be rotated by a crank 2. The totalising elements are arranged in a circle around the drum, only the elements of the result mechanism being shown on the drawing. The entering wheels 4 are longitudinally slidable on suitably profiled spindles 5 and are adjusted by setting slides 6 guided on pillars 7 and retained by means of a spring loaded ball 9 engaging notches 8 in the pillar 7 at adjusted values corresponding from 0 to 9. On the upper ends of the spindles 5 are the transmission wheels 10 which engage the pinions 11 which are each rigid with a tens transfer actuator 12 and with a number wheel 13. They are freely rotatable on pins 14 inserted at right angles to the shaft 5 in the radial bores 15 in the rotatably mounted totaliser body 16.

The drive of the number wheels 13 includes reduction mechanism relative to the entering wheels, conveniently in the ratio 1 : 2 in the construction of the invention shown. For this purpose the transmission wheels 10 have 5 teeth and the pinions 11 have 10 teeth. This arrangement permits that the dimensions of the transmission wheels 10 can be reduced to a very low value. The small dimensions of the wheels 10 make the use of the bevel

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wheels very disadvantageous or even impossible in practice. Therefore according to a subsidiary feature of the invention, these wheels 10 are formed with teeth on their end faces, for example as pin wheels which engage the normally toothed pinions 11. The number wheels 13 are retained in their correct positions by the fact that spring pressed balls c engage the teeth of the pinions 11 fixed to the wheels 13.

The entering wheels 4 and the tens transfer wheels 18 referred to below are provided with the lowest possible number of teeth 30 to secure satisfactory working conditions, namely 5. Satisfactory operating conditions with such five-toothed wheels in engagement with the stepped drum 3 is permitted by the fact that both the teeth of the stepped drum, and those of the entering and transfer wheels are asymmetrically formed. In external form the teeth resemble ratchet teeth. The stepped drum rotates only in one direction which is advantageous for the operation of the small-size calculating machines.

The tens transfer mechanism forms no part of the present invention and will therefore be only shortly described. The tens transfer wheel 18 and the locking wheel 17 associated with the spindle 5 concerned, with the five teeth of each relatively offset, are rigidly fastened together and arranged on the spindle 5 in such a way as to rotate therewith. This unit 17, 18 is axially adjustable on the grooved spindle 5 by means of forks 20 in known manner. The forks 20 in turn are supported by means of vertically disposed pins 20^1 in a stationary carrier 21 and are retained by a spiral spring 28 coiled around the body 21, and engaging notches 29 in the pins 20^1. A locking disc 26 co-operates with the locking wheels 17 and rotates with the shaft of the stepped drum 3. A tens transfer tooth 22 co-operates with the tens transfer wheel 18, which tooth is provided on a disc 24 freely rotatable on the shaft 1 but connected to the locking disc 26 and coupled by a pin 27 with the stepped drum 3 so as to rotate therewith.

METHOD OF OPERATION.

The operation of the calculating machine according to the invention is briefly as follows: on each revolution of the crank 2 the numeral value selected by the setting slide 6 is transmitted through the entering wheels 4 from the stepped drum 3 and is transmitted through the wheels 10 to the number wheels 13, the corresponding numbers of which appear through sight apertures 31. When the tens transfer is required the actuator 12 of the number roller 13 for example, passing from 9 to 0, depresses by means of the pin 20^1 and the fork 20, the tens transfer wheel 18 of the next higher digit position into the path of the tens transfer tooth 22. Also in this lower position of the units 17, 18 a second locking disc not shown operates on the locking wheel 17 which secures the spindle 5 after the rotation of the tens transfer wheel 18 has been effected. After the tens transfer has been effected, the inclined cam 25 of the disc 24 operates on the extension 20^{111} of the fork 20 and returns the fork and also the unit 17, 18 to the starting position ready for a new transfer.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:

1. A compact calculating machine with a single stepped toothed drum and transfer and totalising elements arranged in a circle round it, characterised in that the entering wheels and tens transfer wheels are provided with less than ten teeth and preferably with five teeth, and in the drive between the entering wheels and the number wheels a reduction drive is provided so that the number wheels make one tenth of a revolution for each tooth of the stepped drum.

2. A calculating machine according to Claim 1 characterised in that the number wheels are supported at an angle to the axes of the entering wheels and one of the two transmission wheels comprises a wheel having teeth on its end face.

3. A compact calculating machine substantially as herein described and illustrated by the accompanying drawings.

Dated this 31st day of December, 1947.

BROMHEAD & CO.,
Chartered Patent Agents.
229/230 Strand, London, W.C.2.

Abingdon: Printed for His Majesty's Stationery Office, by Burgess & Son (Abingdon), Ltd.—1951.
Published at The Patent Office, 25, Southampton Buildings, London, W.C.2, from which copies, price 2s. per copy; by post 2s. 1d. may be obtained.

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Fig.1

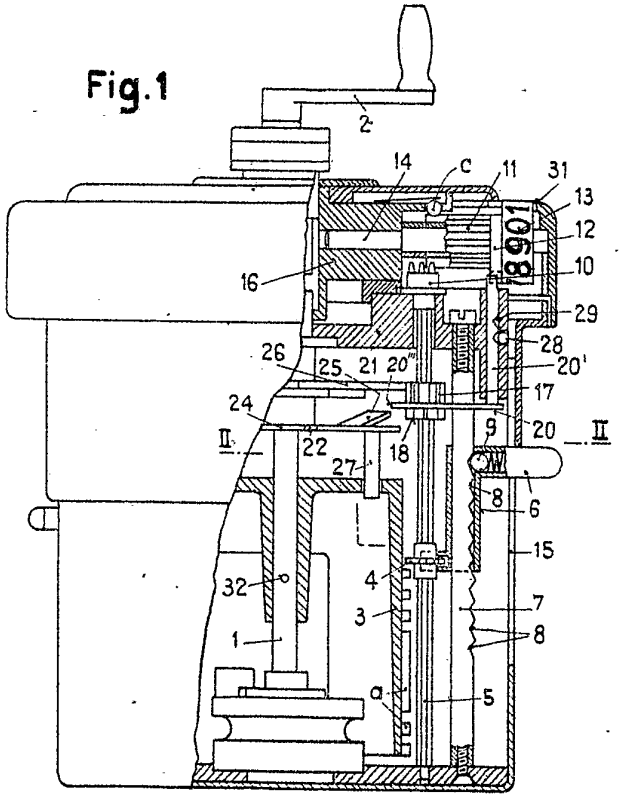
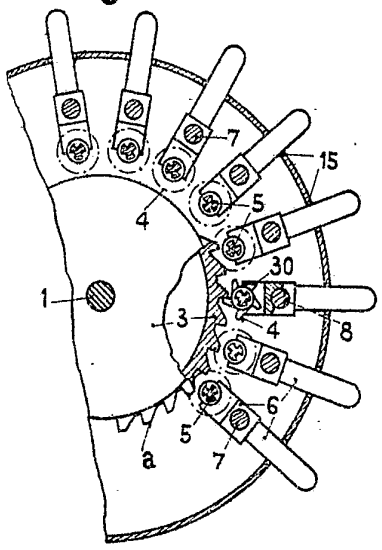


Fig. 2



H.M.S.O. (M.F.P.)