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2,653,766

TENS-TRANSFER MECHANISM OF THE DIFFERENTIAL TYPE

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Fig. 1

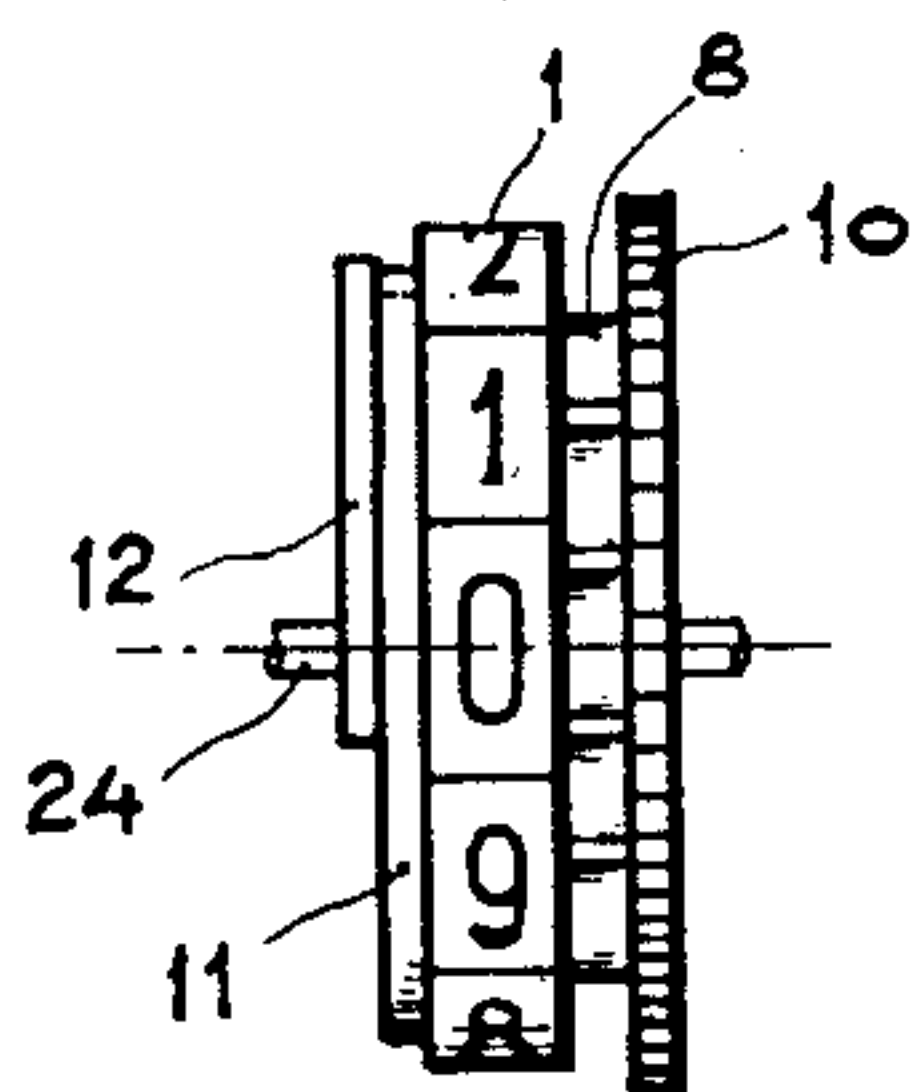


Fig. 2

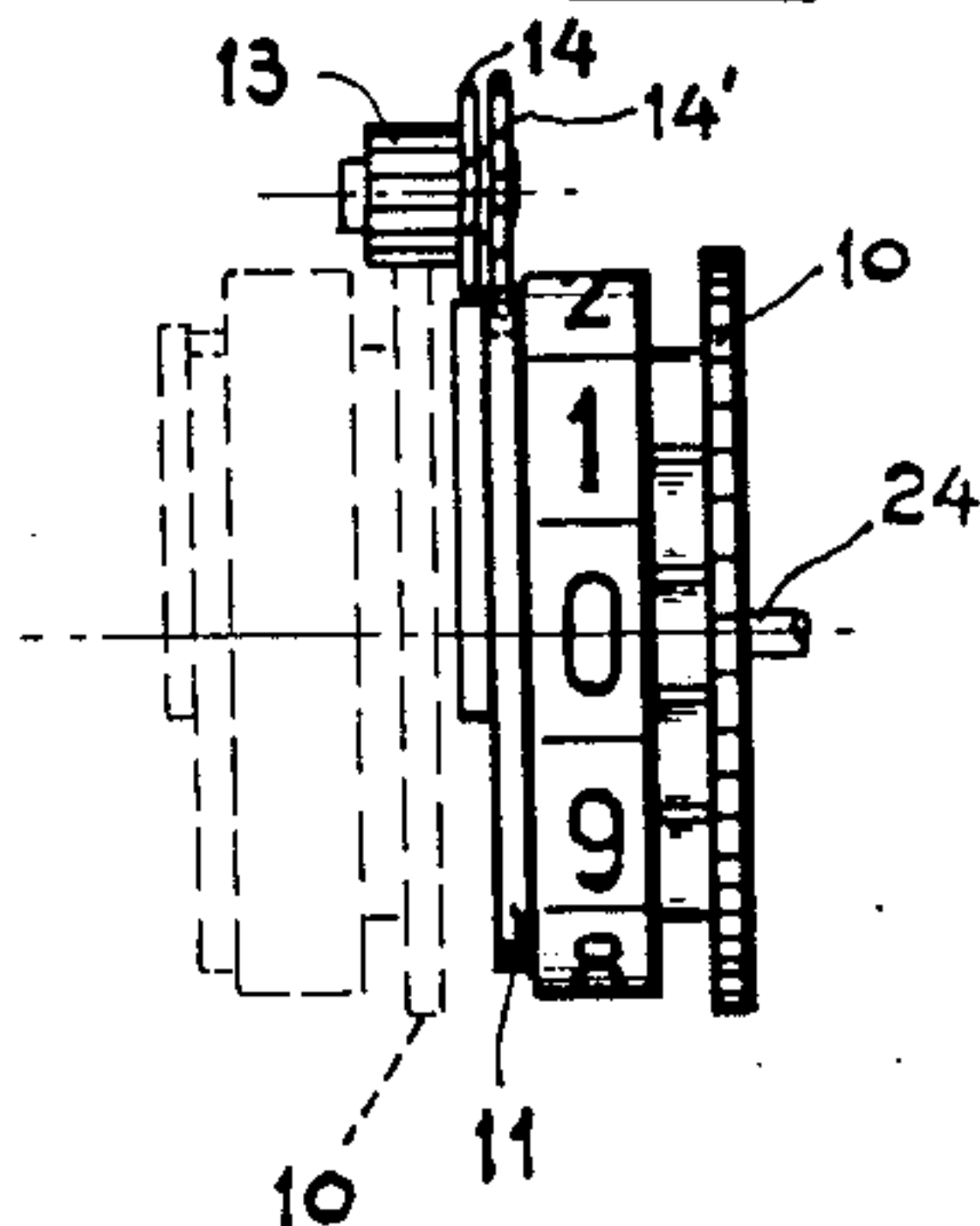


Fig. 3

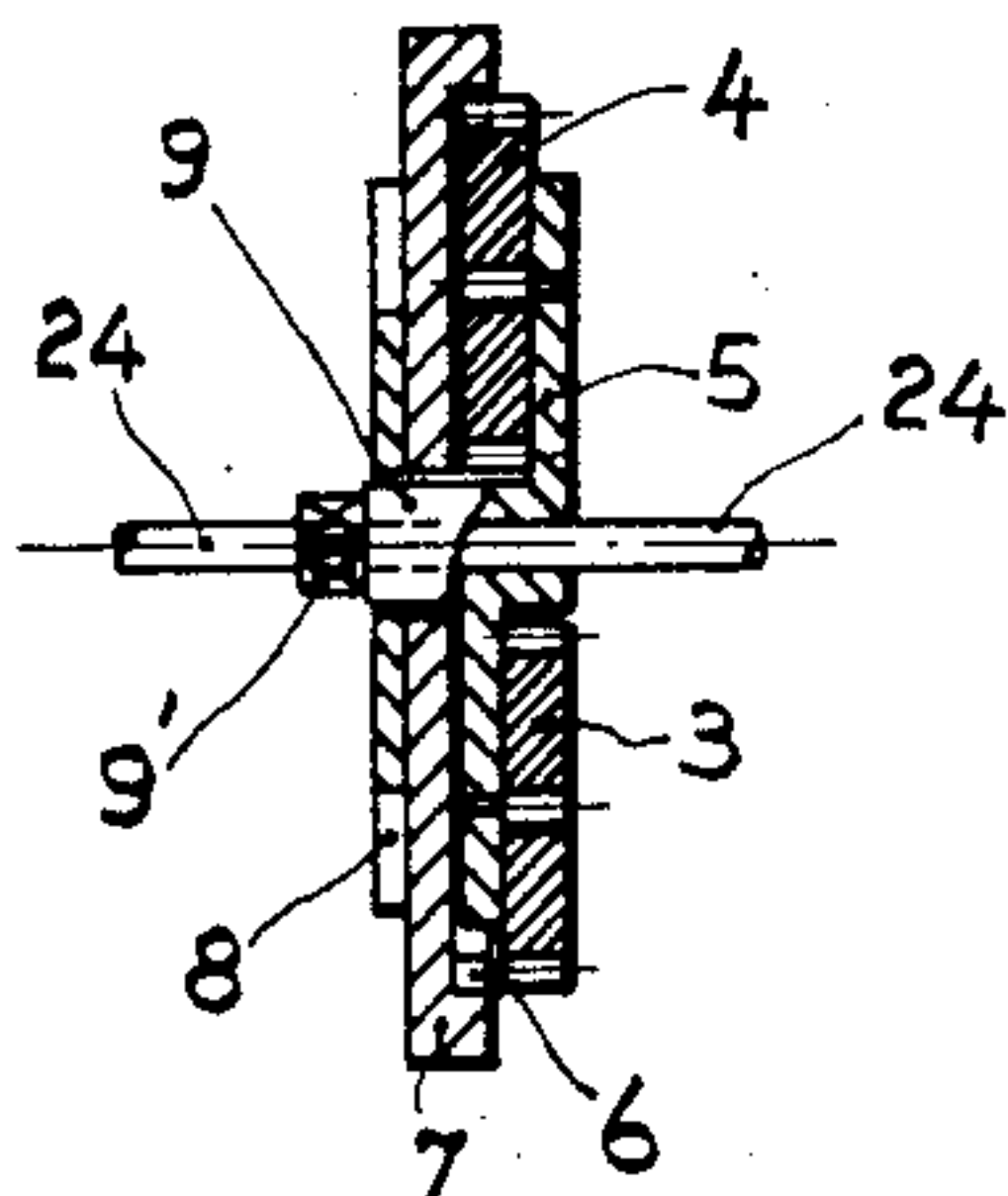


Fig. 4

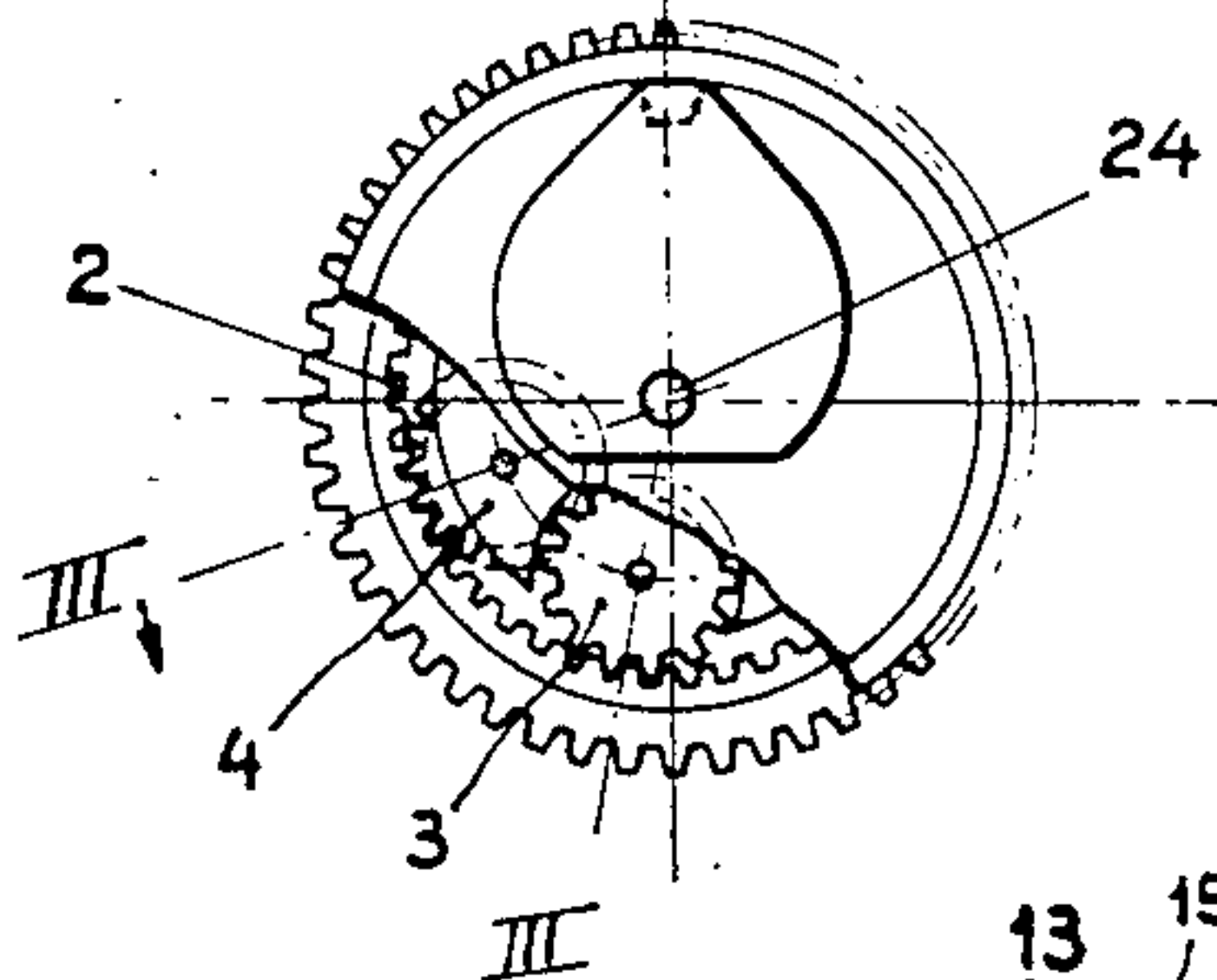


Fig. 5

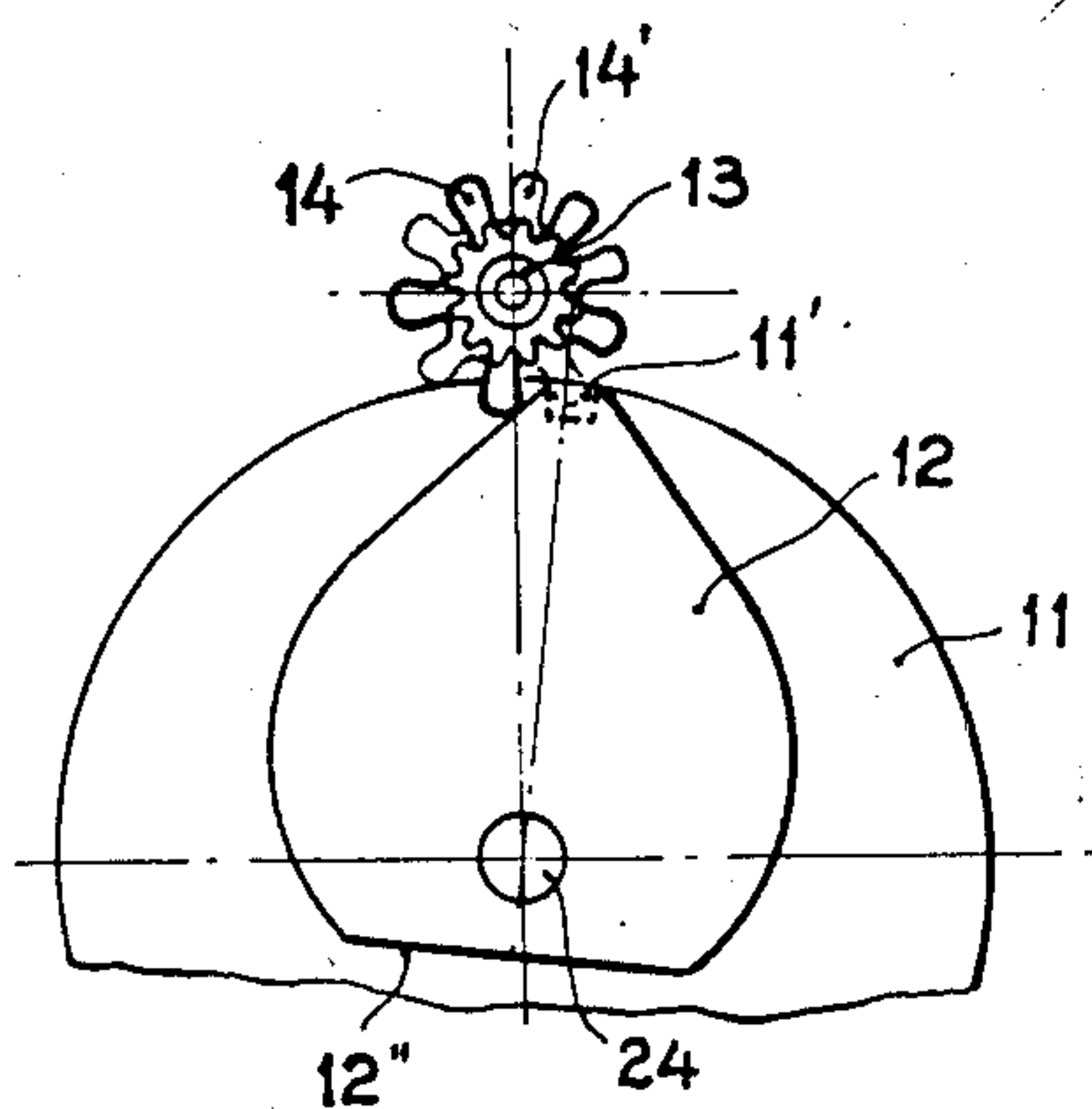
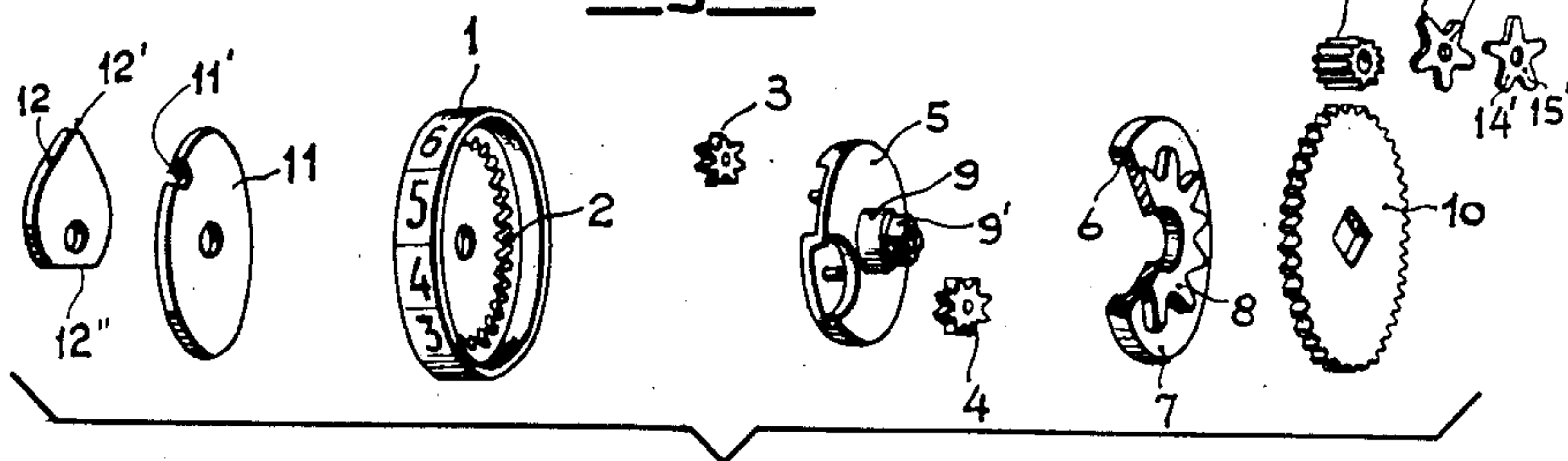
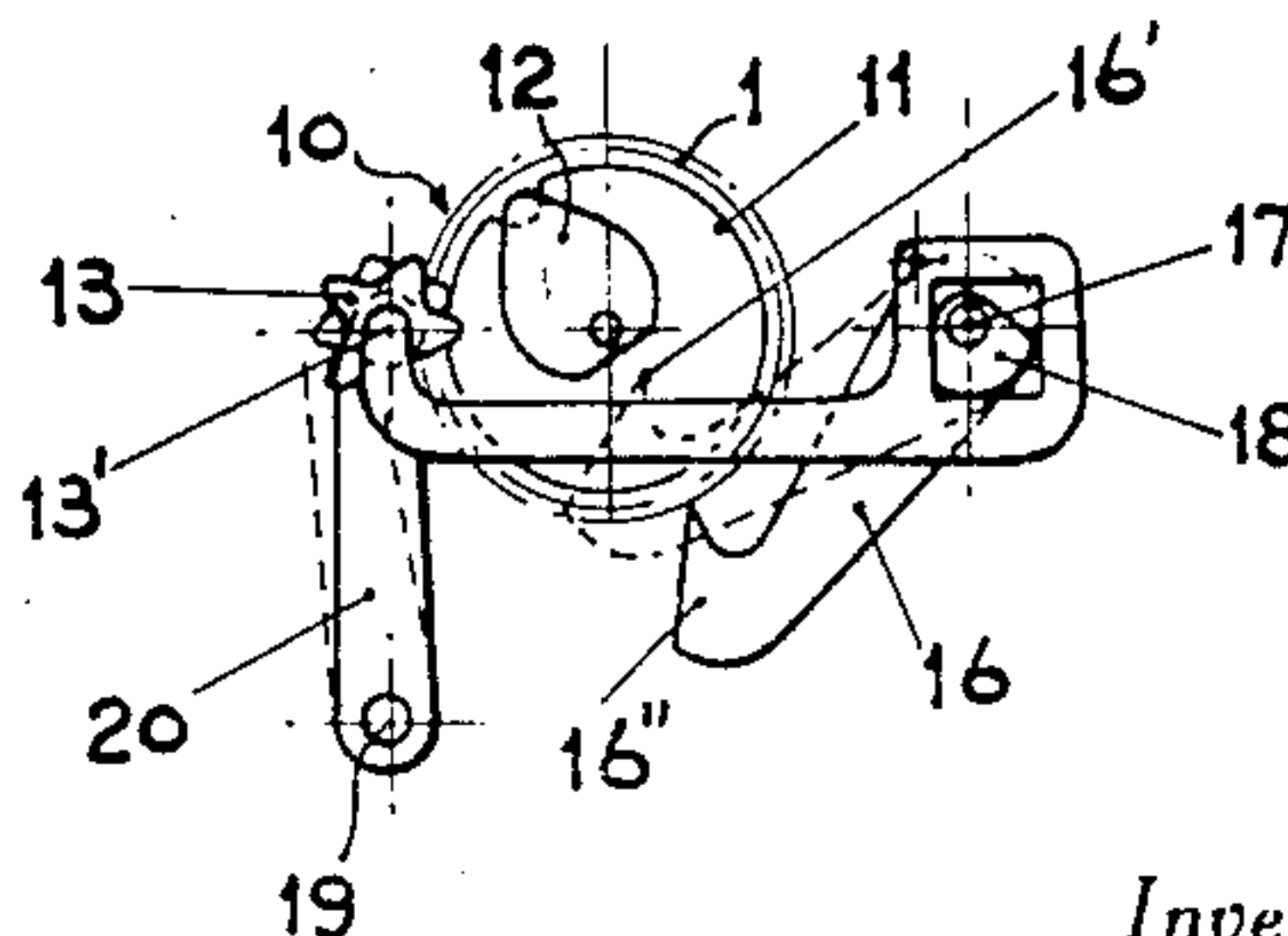


Fig. 6

Fig. 7



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TENS-TRANSFER MECHANISM OF THE
DIFFERENTIAL TYPERiccardo Buzzi, Milan, Italy, assignor to
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6 Claims. (Cl. 235—136)

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The present invention relates to an accumulating numerator for totalizers of calculating machines which has been particularly studied in view of its application to calculating machines with a direct operating mechanism of the totalizer or register, of the type forming object of my co-pending U. S. patent application Ser. No. 205,071, filed January 9, 1951.

It may, however, be applied also to machines differing from the one described in said patent application, and also to machines with indirectly operated totalizer or register.

In machines of the known type the tens-transfer from one to another of the elements of the totalizer is usually effected at a stage subsequent to that of accumulation and generally with the intervention of auxiliary means interposed between the setting mechanism and the mechanism for transferring the numerical values to the totalizer or register, which constitute mechanisms distinct from one another, which fact very much complicates the construction, and at any rate, lengthens the duration of the operation.

These drawbacks are entirely eliminated in the register according to the present invention, substantially characterized by the fact that between each register wheel and its associated operating gear is interposed, for the positive transmission of the movement of rotation, a differential planetary group, the planets of which are borne by a carrier rotatably mounted in respect to the shaft common both to the gear and the register wheel and rigidly connected with a gear meshing with a pinion operated upon at each turn of the adjacent register wheel of a lower order, by a cam fixed to said last mentioned register wheel, which causes the first mentioned register wheel to run forward one step in its normal sense of rotation.

According to a preferred embodiment of the invention, the differential planetary group is constituted by two planet pinions in mesh with each other, mounted excentrically loose upon a rotatable drum and meshing each one in its turn with one of two internal gears fixed respectively to the register wheel and to its relative operating gear, co-axially mounted, but free to turn around the pivot of said drum, with which rotates the gear for the tens-transfer. The pinions driving said gears are loosely mounted on a common shaft parallel to the shaft of the register wheels, and each one of them is fastened to a couple of star-shaped wheels, one of which is set ahead of the other one by half a pitch, co-operating with two distinct elements of a cam fixed to the register wheels.

The invention also provides means for zeroizing the register, the action of which is preceded by the release of the gears driving pinions for the tens-transfer, from said latter gears, by means of a displacement of the pinion shaft parallel to its own axis.

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The details of the invention will be better understood by the following description when read in connection to the annexed drawing, which illustrates in exemplifying and not limiting way one embodiment of the invention, and in which:

Fig. 1 is an elevational view of one of the elements of the register, of which

Fig. 2 is a plan view showing also the pinion for the tens-transfer,

Fig. 3 is a diametral section on an enlarged scale of said element, following line III—III of Fig. 4, which passes through the centre of the two planets and through the axis of said element;

Fig. 4 is a side view of said element seen from the side of the cam,

Fig. 5 is an exploded perspective view on an enlarged scale, of the several parts constituting said element, set apart one from another, following the sequence of their mounting,

Fig. 6 illustrates the way by which the cams fixed to each register wheel co-operate with the means operating the tens-transfer, and

Fig. 7 shows the working of the mechanism for zeroizing the register.

As it appears from the drawing, each element of the register is composed of a register wheel 1 on the periphery of which are engraved or represented in any known way the numerals from 0 to 9; said register wheel has an internal set of gear teeth 2, which is in mesh with, and driven by a planet pinion 3 meshing with another planet pinion 4, both of them being loose on a short cylinder or carrier 5, the axis of which coincides with that of register wheel 1. The short cylinder 5 is loosely mounted on a shaft 24. Planet pinion 4 meshes with an internal gear 6 cut in a disc or coupling member 7 to which is fixed a transmission gear 8, driven in any known way, by the mechanism for the transfer of the numerical values into the register; in case of the calculating machines according to the copending patent application Ser. No. 205,071 this mechanism comprises the double reciprocating rack disclosed in the latter. Disc 7 is loosely mounted on a hub 9 integral with the short cylinder 5, on the right hand end of which is mounted a tens-transfer gear 10 fixed to said hub 9 by means of a square coupling. The register wheel is loosely mounted on the shaft 24 passing through the center bore of the short cylinder 5 and carrying the latter. With register wheel 1 to which they are fastened, rotate the two elements of a cam operating the tens-transfer means, consisting in a disc 11 having a notch 11' and a heart-shaped element 12 having a flattened portion 12'' on the side opposite to its apex 12'.

The tens-transfer gear 10 is in mesh with a tens-transfer pinion 13 to which are fastened small star-shaped wheels 14, 14' having on their periphery a number of points 15, 15' so positioned

that points 15 are located exactly at the middle of the intervals between points 15'; usually the cam-shaped disc 11 turns, during the accumulation of the numerical values, with its periphery in contact with two of points 15', thus holding the pinion 13 and consequently also the short cylinder 5 in their positions; when, due to the rotation imparted to disc 11 by the series of gears 8, 6, 4, 3 and 2 the disc has accomplished a complete turn, one of the points 15' comes into engagement with the notch 11' of disc 11, while point 12' of the heart-shaped element 12 enters the space between the two points 15 of wheel 14 in order to disengage wheel 14' from notch 11' of disc 11, after a rotation of a pre-established amplitude of the two small wheels; said amplitude is determined by the number of teeth of the small wheels and is so proportioned that the rotation of gears 13 fixed to them shall determine a rotation of drum 5, corresponding to the passage of one numeral to the following one of the register wheel i. For the zeroizing of the various register wheels of the register is provided the mechanism diagrammatically represented in Fig. 7. Said mechanism consists, essentially, in a lever 16 pivoted at a point 17 of the frame of the machine and controlled by a crank, not shown; the free end 16'' of the lever 16 has a shoe-like form so shaped that when coming in contact with the periphery of the heart-shaped element 12 of the cam fixed to the register wheel, no matter what is the point where contact is established, it causes said element 12 to rotate in one direction or in the opposite one through such an angle that, at the end of the movement of the crank, the flattened portion 12'' of the heart-shaped element comes to co-incide with the lower straight part 16'' of lever 16. To this position of the heart-shaped element corresponds the zero position of the register wheels; in order that this may be possible, however, pinions 13 must be disengaged from their respective gears 10; to this end, shaft 13' common to all the pinions of the register, is mounted on the frame in such a way that it can be displaced parallel to its axis by a cam 19 integral with lever 16, which acts upon pin 13' oscillately mounted on a shaft 19 by means of an arm 20 before lever 16 comes in contact with the heart-shaped element.

It is understood that the invention is not limited to the form of mechanism hereinbefore represented and described only by way of example, which can be realised under varying forms of construction, still remaining within the range of the invention.

What I claim is:

1. A register for use in an adding or calculating machine having actuating means for transferring numerical values from a setting mechanism into a register, said register comprising in combination: a series of denominational order elements, each of said denominational order elements including a rotatable register wheel, said register wheel having numerals from 0 to 9 at its circumference and having a first internal sun gear, a rotatable carrier coaxial with said register wheel, a coupling member rotatably mounted on said carrier, said coupling member having a second internal sun gear, a transmission gear arranged for operative engagement with the actuating means of the adding or calculating machine and rigidly connected with said coupling member, a first planetary pinion rotatably mounted on

said carrier and in mesh with said first sun gear of the register wheel, a second planetary pinion rotatably mounted on said carrier, said second planetary pinion being in mesh with said first planetary pinion and with said second sun gear of the coupling member, a rotatable tens-transfer gear rigidly connected with said carrier, a rotatable tens-transfer pinion in mesh with said tens-transfer gear, and tens-transfer actuating means including a first means and a second means cooperating with each other, said first means being connected with said tens-transfer pinion, and said second means being connected with the register wheel of the next lower order and being arranged for actuating said first means upon a passage of said last mentioned register wheel from its 9-position into its 0-position for causing an advance of the first mentioned register wheel from one numeral position into the next higher numeral position.

2. In a register as claimed in claim 1, a shaft, said carrier and said register wheel being rotatably mounted on said shaft.

3. In a register as claimed in claim 1, said coupling member being in the shape of a disc having a laterally projecting flange, and said second internal sun gear being arranged on the flange of said disc.

4. In a register as claimed in claim 1, said first planetary pinion being arranged at one side of said carrier, and said second planetary pinion being arranged at the opposite side of said carrier.

5. In a register as claimed in claim 1, said coupling member being in the shape of a disc having a laterally projecting flange, said second internal sun gear being arranged on the flange of said disc, said carrier being substantially in the shape of a short cylinder carrying said first planetary pinion at one of its sides and said second planetary pinion at its other side, and said register wheel being substantially in the shape of a casing enclosing said planetary group including the carrier, planetary pinions and coupling member.

6. In a register as claimed in claim 1, said first means of the tens-transfer actuating means including a pair of star-shaped wheels rigidly connected with said tens-transfer pinion, and said second means of the tens-transfer actuating means including cam means rigidly connected with the register wheel of the next lower order, said star-shaped wheels having an equal number of arms with equal pitch and being angularly displaced relative to each other by one-half of a pitch, said cam means including a disc having a notch for cooperation with an arm of one of said star-shaped wheels and a tooth-like element for cooperation with teeth of the other star-shaped wheel.

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