

Oct. 13, 1942.

D. G. BLATTNER

2,298,273

REGISTERING DEVICES

Filed Jan. 1, 1942

2 Sheets-Sheet 1

FIG. 1

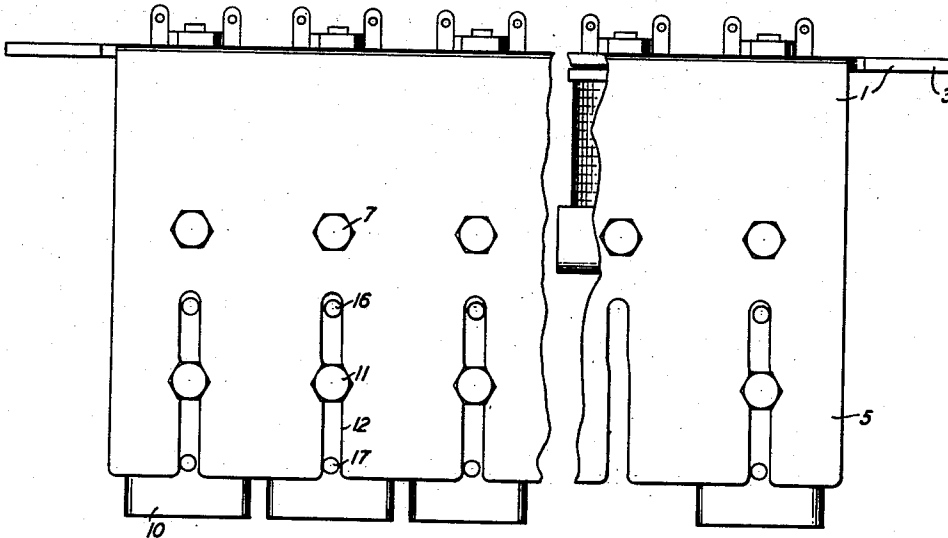


FIG. 2

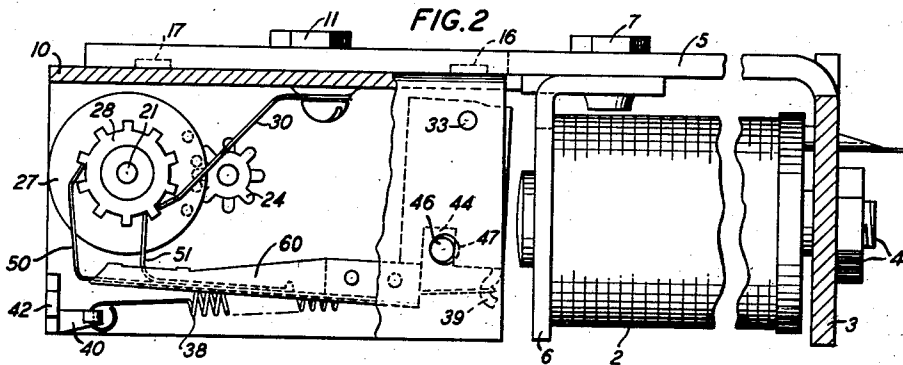
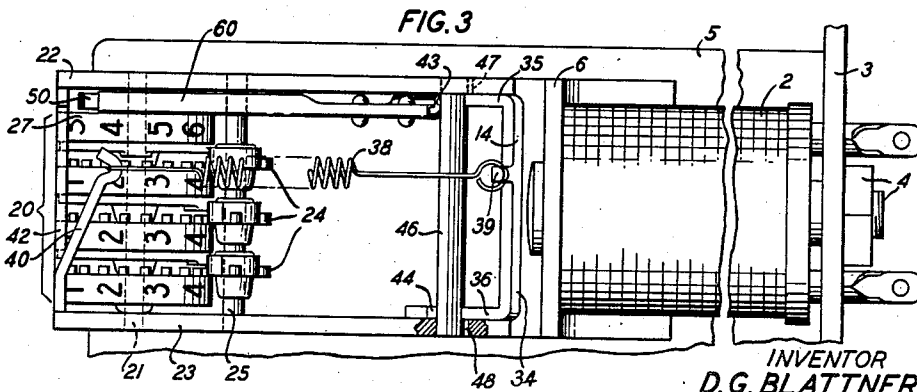


FIG. 3



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FIG. 4

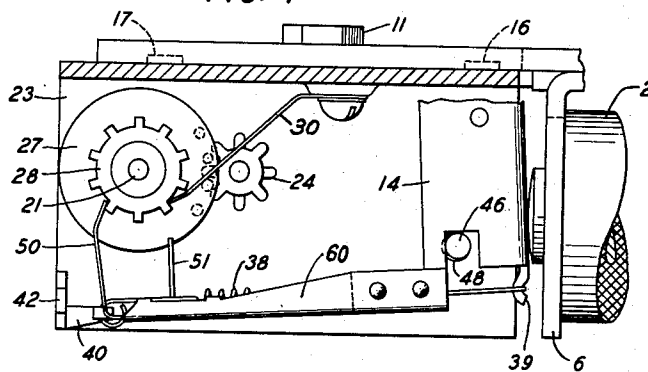


FIG. 5

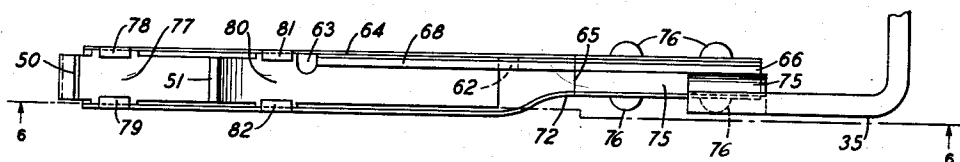
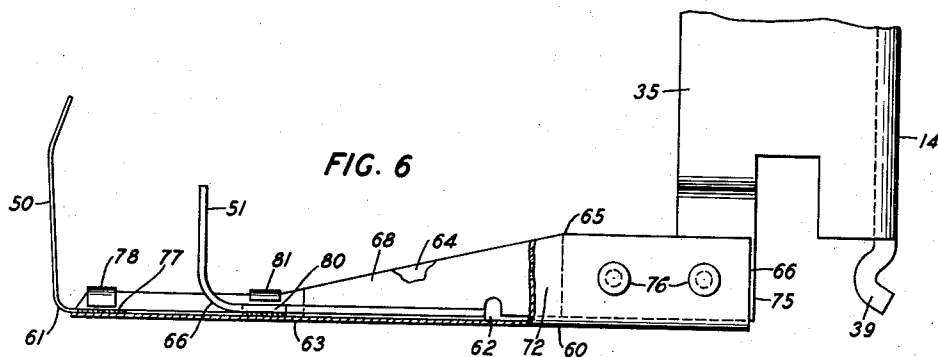


FIG. 6



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2,298,273

REGISTERING DEVICE

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Application January 1, 1942, Serial No. 425,279

9 Claims. (Cl. 74-142)

This invention relates to registering devices and particularly to improvements in such devices as are electrically controlled and employed in telephone systems.

Objects of this invention are to provide simplified inexpensive registers for this purpose which are of light construction, improved operating characteristics and prolonged service endurance.

Heretofore registers for this purpose were provided with ratchet mechanisms controlled by a magnet through an armature to advance the counting wheels one step for each operation of the magnet. The ratchet mechanism consisted of an operating pawl which engaged the ratchet wheel once for each operation of the magnet to rotate it one step and a holding pawl for engaging the ratchet wheel to hold it in the advanced position. The operating pawl and holding pawl may in some instances be combined in a single member as shown for example in the patent to D. H. Gleason 2,097,151 of October 26, 1937, where the pawl is bifurcated, one branch engaging a tooth in the ratchet wheel to advance it one-half step when the armature pulls up and the other branch engaging another tooth to advance the wheel one-half step on release of the armature. Thus one or the other of the two branches of the pawl advances and holds the wheel.

It is in connection with registering devices of these types that the applicant's invention is concerned and a feature thereof is a ratchet mechanism comprising a rigid member attached to the armature, a flexible driving pawl secured at one end to said member and to the armature, a flexible stop pawl secured at one end to said member and to the armature, with projections on said member for pivotally holding said pawls near their free ends to permit the pawls to flex on both sides of said pivotal projections when coming in contact with the teeth of the ratchet wheel. An advantage of this arrangement is that the strains set up in the pawls during their functioning are distributed over considerable portions of their lengths thereby preventing the stresses from exceeding the elastic limit of the material and thus prolonging the life of said pawls. Furthermore, this arrangement enables the pawl mechanism to be made of comparatively light construction to permit high operating speed without impairing other operating characteristics nor the service endurance of the register.

It is another feature of the invention to provide a stop arrangement for the forward and backward strokes of the armature comprising a round

pin located in a slot in the armature. The forward and backward motion of the armature is stopped when the edges of the slot, which is somewhat wider than the pin, strike the pin. The pin is mounted in apertures in the frame members of the register mounting, and these apertures are also somewhat larger than the pin. By this arrangement each time the armature is released or operated, the pin will be slightly rotated and thereby cause wear of the pin to be equally distributed around its periphery and thus the accurate functioning of the register is not impaired for a long period of time.

The invention has been illustrated in the accompanying drawings in which Fig. 1 shows the top view of a mounting plate for a plurality of register units. Fig. 2 shows a side view partly in section of a complete register unit and mounting. Fig. 3 is a bottom view of the system shown in Fig. 2. Fig. 4 is similar to Fig. 2 except that it relates mainly to the cyclometer portion. Fig. 5 is a top view of the pawl and armature assembly in accordance with the applicant's invention; and Fig. 6 is a side view of this pawl and armature assembly.

A plurality of registers in accordance with the applicant's invention may be mounted on a common mounting angle plate 1 in a row so that the numerals on succeeding registers may be observed from a common point. It will be clear from Fig. 2 that the mounting plate 1 serves as a common return path for the magnetic flux from all the magnets of the registers mounted thereon. The operating magnet 2 for each register is mounted on the vertical portion 3 of plate 1 by means of an extension on the core and the nut as shown at 4 and on the horizontal portion 5 of the plate 1 by means of a bracket 6 serving as a spoolhead and bent at an angle and secured to the portion 5 by means of a screw 7. The remaining parts of each register are mounted on the portion 5 by means of a U-shaped mounting frame 10 and a screw 11 passing through a slot such as 12 in the portion 5 to align these parts of the registering mechanism in proper relation to the operating magnet. That is, the armature 14 must be in proper relation to the core of the magnet 2 and for this purpose the frame 10 is provided with lugs such as 16 and 17 that extend into the slot 12. These parts are of such design that when lug 17 engages the left-hand side of the slot 12 and lug 16 engages the right-hand side of slot 12, the register mechanism is accurately located as far as armature alignment is concerned. With this orientation the frame 10 with lugs 16 and 17

may be shifted forward or backward along the slot 12 to adjust the distance between the armature and the core of magnet 2 whereupon the frame 10 may be secured permanently to the portion 5 by screw 11.

The register mechanism mounted in frame 10 consists of the usual cyclometer wheels 20 preferably moulded from an insulation material, mounted on a shaft 21 through side members 22 and 23 of frame 10 and the intermediate pinions 24 moulded of the same material similarly mounted on a shaft 25. Advantages of using molded cyclometer wheels of some plastic material rather than metal are a reduction in wear and greater operating speeds. Associated or molded with the units wheel 27 is a ratchet wheel 28 for advancing of the different cyclometer wheels in steps. A spring-holding pawl 30 secured to the bottom portion of frame 10 engages a tooth in the ratchet wheel 28 to prevent it from rotating in a backward direction. Between the side members 22 and 23 of frame 10 is also mounted the operating mechanism for the ratchet wheel 28 consisting of the armature 14 of magnetic material pivoted on shaft 33 and the pawl mechanism shown most clearly in Fig. 6. Armature 14 is U-shaped and consists therefore of the bottom portion 34, side portion 35 and side portion 36 and is held in non-operated position by a spring 38 connected at one end to the hook 39 on the bottom portion 34 of the armature 14 and at the other end to a hook 40 extending from a cross member 42 between the side members 22 and 23 of the frame 10.

To adjust or limit the forward and backward strokes of the armature when it is attracted or released by the magnet, the side portions 35 and 36 are provided with apertures or slots 43 and 44 in which a round pin 46 is located. This pin is mounted in circular holes 47 and 48 in the side members 22 and 23 but the diameter of these holes is greater than the diameter of the pin 46 so that whereas under its own influence the pin 46 would tend to rest in the lower side of the holes 47 and 48, the armature in the released position causes said pin to move to the left, looking at Fig. 2, to engage the left-hand side of these holes. That is, when the pin is moved from the lower position to this left-hand position, it will be given a rotary motion around its own axis. Similarly when the armature is attracted by the magnet, the pin 46 will be released to return to the lower portion of the holes 47 and 48 and then when the left-hand side of the slots 43 and 44 touch the pin 46, it will be moved in the holes 47 and 48 and be given a rotary motion around its axis, until finally it is pressed against the right-hand side of the holes. These rotary movements of the pin 46 cause the wear and tear of the pin when pounded by the sides of the slots 44 and 45 to be distributed around the circumference of the pin and not at one point as would happen if the pin were held stationary. The wear on the pin is also materially reduced by making it of hard rubber or other similar material rather than metal. By this arrangement, therefore, the backward and forward strokes of the armature will remain constant. In fact the armature may be operated and released several million times without requiring attention with regard to adjustments of the strokes due to the wear of the pin 46, the holes 47 and 48 or sides of slots 43 and 44.

To rotate the ratchet wheel 28 one step each time the armature 14 is released after having been operated, an operating pawl 50 is associated with

the armature and to prevent overthrow of the ratchet wheel a stop pawl 51 is also associated with the armature. This pawl 51, together with holding pawl 30 and the driving pawl 50, insure that the ratchet wheel 28 will advance one position per operation of the magnet and one position only. When the armature is attracted by the magnet 2, the pawl 51 leaves the inter-tooth space of ratchet wheel 28 but the holding pawl 30 tends to retain the ratchet wheel in its normal position while the driving pawl moves to engage the next succeeding tooth. Fig. 4 shows the operative positions of the pawls 50 and 51 when the armature is attracted by the magnet 2. The operating pawl 50 is shown engaging a tooth on the left-hand side position while the holding pawl 30 prevents it from moving in the backward direction and pawl 51 is shown completely withdrawn. When the armature is released the pawl 50 advances the ratchet wheel one step and all these pawls 50, 51, and 30 then hold the wheel in the advanced position. However, the holding pawl 30 serves one additional function in that while the free end resting behind a tooth of the ratchet wheel effectively prevents backward rotation and the stop pawl 51 prevents free forward rotation of the ratchet wheel, it would still be possible for the latter to assume an intermediate position wherein the numerals on the cyclometer units wheel as viewed from in front would not be in alignment with the numerals on the other cyclometer wheels. To prevent this the holding pawl 30 is so shaped that it rests against the tooth behind the one engaging the end of said pawl. The applicant accomplishes these operations in a register of considerably reduced size and lightly constructed parts, such as an armature and pawl mechanism including pawls of light flexible springs, without impairing the efficiency and reliability of operation of the register and with the added advantage that the reduced size of the registers permits them to be mounted closer together in more confined spaces. Ordinarily such light construction of the armature and pawl mechanism with the pawls in the form of light flexible springs would soon cause the mechanism to get out of adjustment or the spring pawls would soon break due to the repeated strains received by them in operation of the ratchet wheel. However, the applicant has overcome these difficulties by constructing the armature and pawl mechanism as shown in enlargements in Figs. 5 and 6. It should be noted that the thin flexible operating pawl 50 and the somewhat heavier but still quite flexible holding pawl 51 are mounted with a U-shaped member 60 to the armature 14. The operating pawl 50 is bent at practically a right-angle at 61 and extends along the bottom portion of the U-shaped member 60 from the point 61 to a point 62. Between the point 62 and a point 63, this pawl is provided with an upward angular extension 64 that widens out from the point 63 to a point 65 where it is of uniform width from this point to its end at 66. Similarly the stop pawl 51 is bent at practically right-angles at point 66 and extends along the bottom of the U-shaped member 60 and between points 62 and 63 is provided with an angular upward extension 68 of the same shape as the corresponding section 64 of pawl 50. The side members of the U-shaped member 60 also increase in width to take the same shapes as the extensions 64 and 68 between the points 62 and 66. The portions of the operating pawl 50 and the holding pawl 51 between points 66 and 63 lie

shugly one on top of the other on the bottom portion of the U-shaped member 60. At point 72 one of the side members of the U-shaped member 60 is formed to close in on the other side member as shown in Fig. 5 and between one of these side members and the extensions 64 and 68 on the one hand and the other side member on the other hand, an angular projection 75 on the side portion 35 of armature 14 is placed and all of these parts are riveted together by means of bolts or rivets 76.

It should now be observed that the pawl 50 is slightly enlarged in width at the point 77 to fit snugly between the side members of member 60. At this point these side members are provided with lugs 78 and 79 which are bent over the pawl 50. However, these lugs are so shaped as to loosely clamp the pawl 50 against the bottom surface of the member 60 only at the point 77. This insures that the pawl member 50 as a whole will move with the channel member 60 under the influence of the armature 14 but that in flexing the pawl 50 as it engages one ratchet tooth after another the whole portion between the free end and the point 63 is free to flex with a pivotal point located at the point 77 where lugs 78 and 79 are in contact with pawl 50. The advantage of this is that in flexing pawl 50 as it moves to engage a ratchet wheel, the strains and therefore the fibre stresses are reduced to such an extent that no failures of the pawl 50 occur in millions of operations of the register whereas in rigidly clamping that portion of pawl 50 in Fig. 6 to the right of the lugs 78 and 79 failures occurred consistently in less than 100,000 operations. The same general scheme is used in holding the stop pawl member 51 to the channel member 60 and with the same result as described in connection with pawl 50. In this case, however, the lugs of the member 60 are 81 and 82 and of course clamp both pawl 50 and pawl 51.

What is claimed is:

1. In a step-by-step mechanism, a magnet, an armature therefor, a ratchet wheel, a pawl mechanism comprising a rigid member secured to said armature, a flexible driving pawl secured at one end to said member and to the armature, a flexible stop pawl secured at one end to said member and to the armature, projections on said member for pivotally holding said pawls near their free ends to permit said pawls to flex on both sides of said pivotal projections to distribute the strain due to flexing of the pawls over a large portion of their lengths.

2. In a step-by-step mechanism, a magnet, an armature therefor, a ratchet wheel, a pawl mechanism comprising a rigid member secured to said armature, a flexible driving pawl secured at one end to said member and to the armature, a flexible stop pawl secured at one end to said member and to the armature, and means on said rigid member for confining the movement of said pawls in relation to said rigid member to very close limits, but permitting the flexing of said pawls over a large portion of their lengths to absorb the shock of impact with teeth on said ratchet wheel when the armature is released to advance the ratchet wheel.

3. In a step-by-step mechanism, a magnet, an armature therefor, a ratchet wheel, a pawl mechanism comprising a rigid member secured to said armature, a flexible driving pawl secured at one end to said member and to the armature, a flexible stop pawl secured at one end to said member and to the armature, and means on said rigid

member for permitting the absorption by the entire free flexible portions of said pawls of the shock of impact of said pawls against teeth in said ratchet wheel when the magnet is released.

4. In a step-by-step mechanism, a magnet, an armature therefor, a ratchet wheel, a pawl mechanism comprising a rigid member attached to said armature, a flexible driving pawl secured at one end to said rigid member, a flexible stop pawl secured at one end to said rigid member, projections from said rigid member arranged to pivotally hold said pawls near their free ends against said rigid member when moved by said armature and rigid member to rotate and hold said ratchet wheel in an advanced position, so that said pawls may flex on both sides of their pivotal points when coming in contact with teeth in said ratchet wheel to distribute the strain due to said flexing of the pawls over large portions thereof.

5. In a step-by-step mechanism, a magnet, an armature therefor, a ratchet wheel, a pawl mechanism comprising a U-shaped rigid member attached to said armature, a thin flexible driving pawl arranged to lie flat in the bottom of said U-shaped member and having one end secured to said member and having its other free end bent at right angles upwardly out of said U-shaped member, a flexible stop pawl arranged to lie flat on top of the driving pawl to cover a portion thereof and having one end secured to the U-shaped member and having its other free end bent at right angles upwardly out of said U-shaped member, projections on the side members of said U-shaped member bent inwardly to engage the upward surface of the flexible driving pawl near the bent-up portion thereof to hold said driving pawl at one pivotal point in said U-shaped member, projections of the side members of said U-shaped member bent inwardly to engage the upper surface of the stop pawl near the bent-up portion thereof to hold said pawl at one pivotal point in said U-shaped member when the armature is actuated to cause said bent-up portions of said pawls to engage the teeth in said ratchet wheel to rotate it one step, said pawls being thereby free to flex around said pivotal points when engaging the teeth to distribute the strain due to said flexing over a large area of the two pawls on both sides of the pivotal points.

6. In a step-by-step mechanism, a magnet, an armature therefor, a ratchet wheel, a pawl mechanism comprising a rigid member, a driving pawl and a stop pawl secured together on said armature at one point and held loosely at another point by said rigid member, said rigid member arranged to cooperate with said pawls to guide them when the armature is actuated to engage the teeth in said ratchet wheel to advance it one step and to pivot said pawls to flex on both sides of the points where said pawls are held loosely by said rigid member to distribute the strain due to the shock of the impact of said pawls against the teeth of said ratchet wheel over a large area of said pawls.

7. In a step-by-step mechanism, a frame, a magnet, an armature therefor, a ratchet wheel, a pawl mechanism comprising a driving pawl and a stop pawl secured to said armature for actuating said ratchet wheel to take one step and a round stop member mounted in apertures in said frame of a larger diameter than the stop member, said stop member being located in relation to the armature to limit the forward and backward strokes of the armature.

8. In a step-by-step mechanism, a frame, a magnet, an armature therefor, a ratchet wheel, a pawl mechanism comprising a driving pawl and a stop pawl secured to said armature for actuating said ratchet wheel to take one step and a round hard rubber pin mounted in apertures in said frame of a larger diameter than the stop member, said stop member being located in relation to the armature and the apertures to limit the forward and backward strokes of the armature.

9. In a step-by-step mechanism, a frame, a

magnet, an armature therefor, a ratchet wheel, a pawl mechanism controlled by said armature to advance said ratchet wheel one step on the back stroke of the armature, a single stop member associated with said armature to limit the forward and backward strokes of the armature and mounting means in said frame for said stop member to cause the rotation of said stop member when the armature strikes it on the forward and the backward strokes.

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