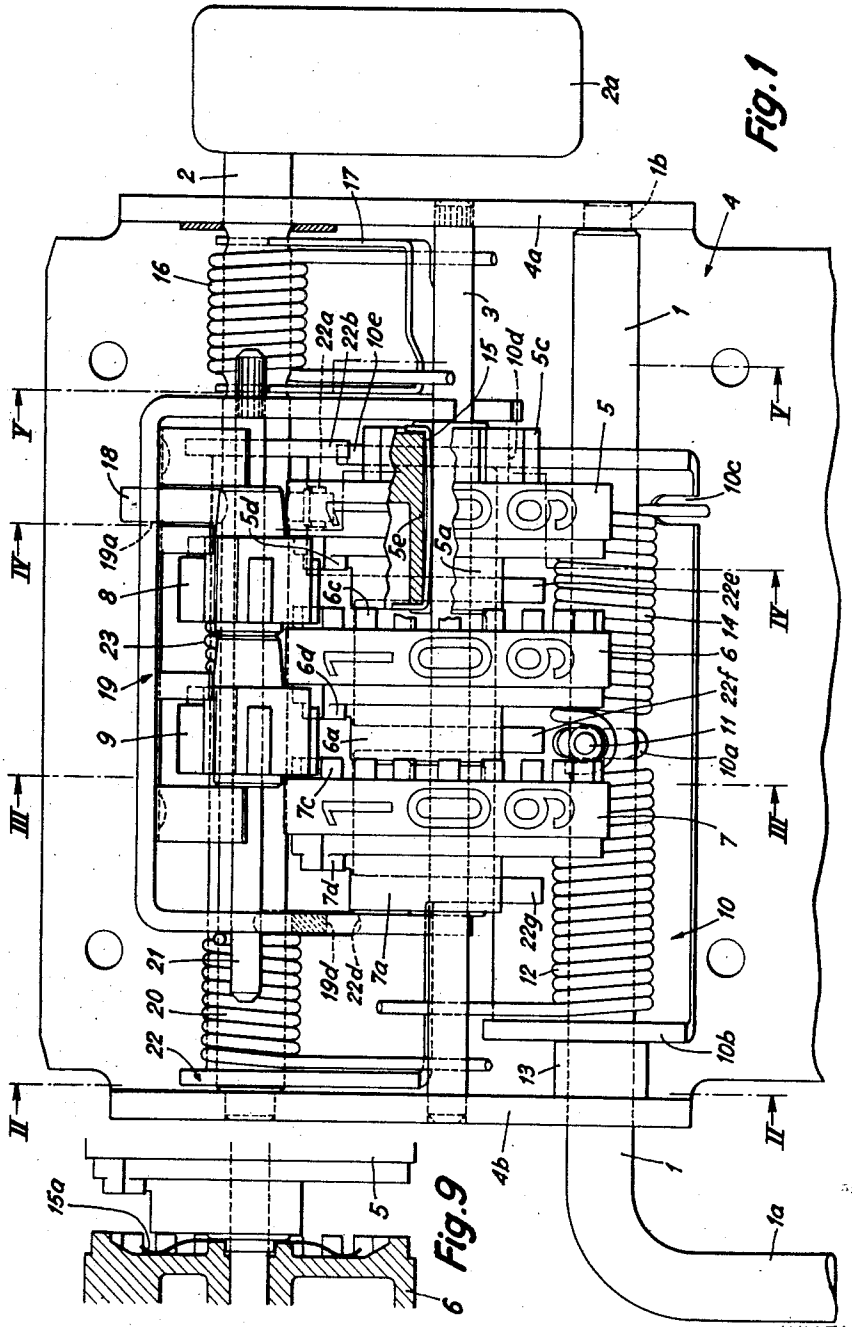
June 26, 1962 W. BRÄM 3,040,981

STROKE COUNTER

Filed May 1, 1957 4 Sheets-Sheet 1



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STROKE COUNTER

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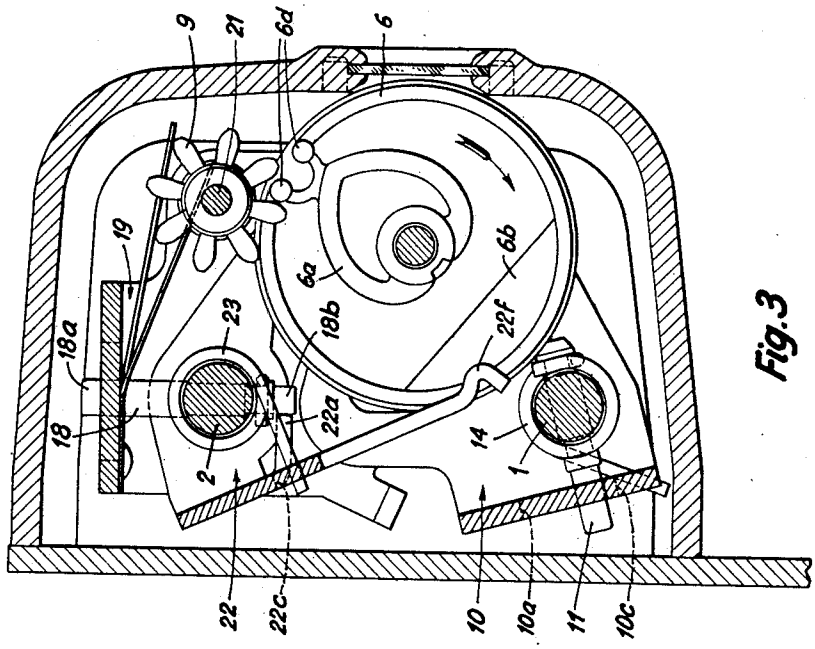

Fig.3

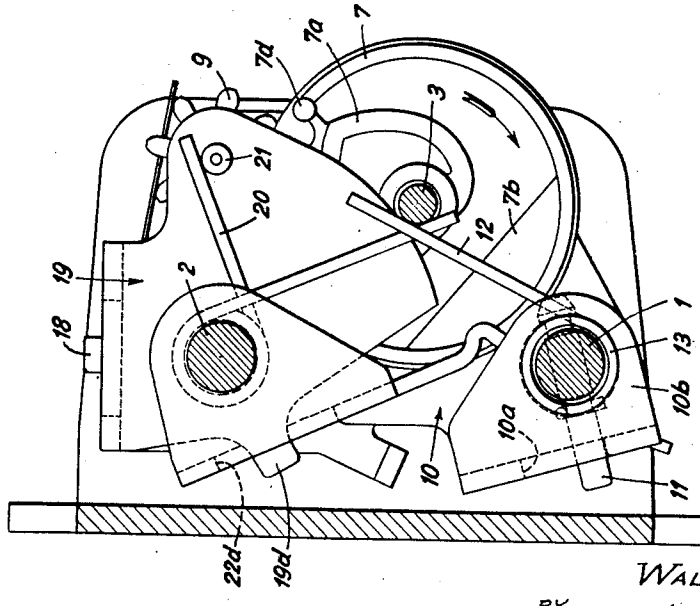

Fig.2

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STROKE COUNTER

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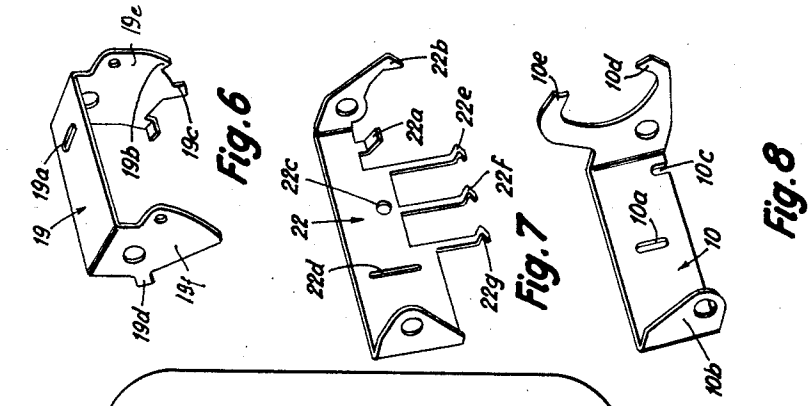

Fig. 6 Fig. 7 Fig. 8

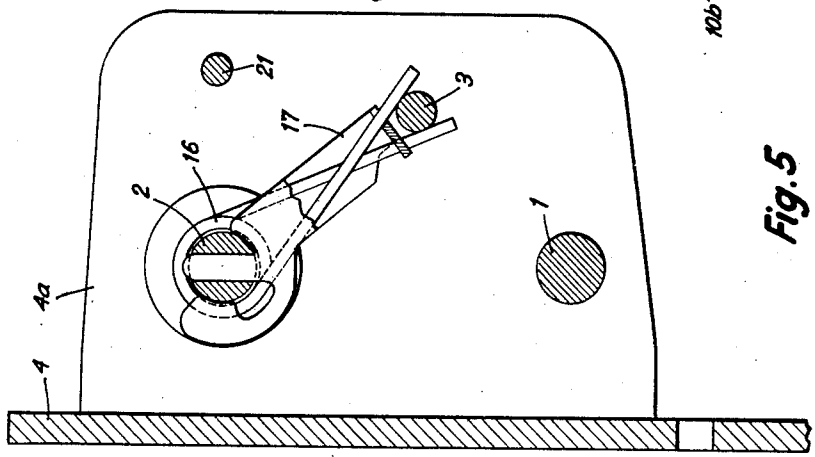

Fig. 5

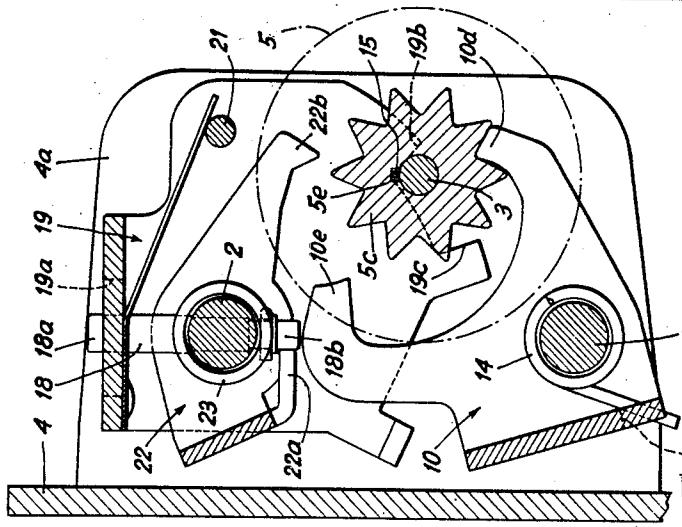

Fig. 4

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STROKE COUNTER

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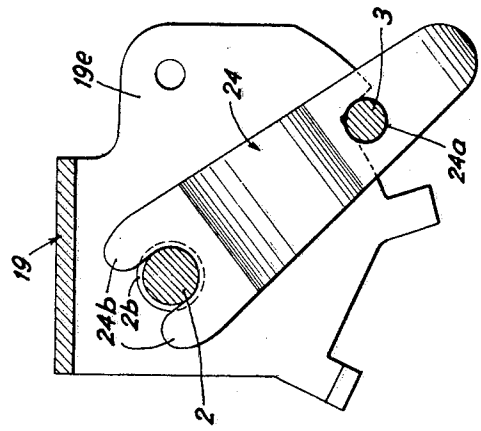

Fig. 11

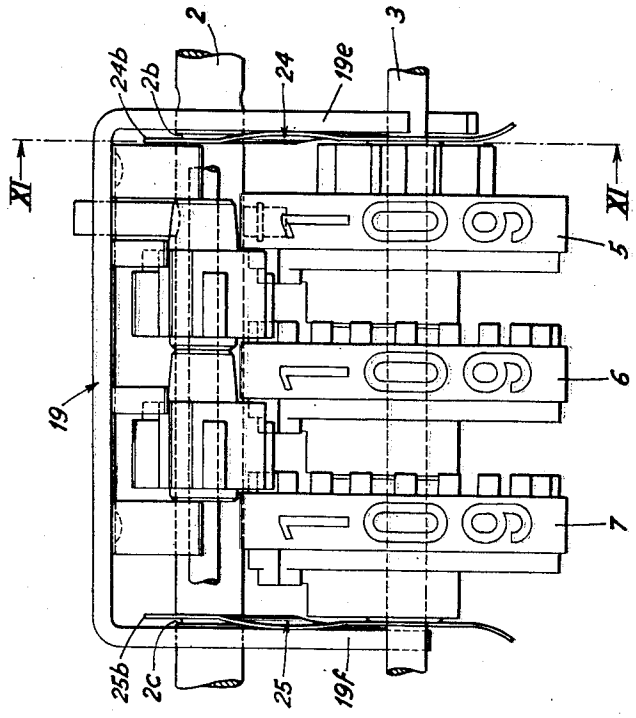

Fig. 10

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3,040,981

STROKE COUNTER

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Claims priority, application Switzerland Dec. 19, 1956
9 Claims. (Cl. 235—91)

The present invention relates to a stroke counter.

Stroke counters are used in connection with a great variety of machines for counting recurrent operations. Conventional stroke counters are usually provided with a counting roller for each decimal, the numerals 0 to 9 being applied to the cylinder surface of the roller. Adjacent rollers are so connected by means of suitable pinions or Geneva gears that a full revolution of a counting roller produces one tenth of a revolution of the adjacent roller. Several devices are known for simultaneously returning all counting rollers to zero position. Particularly simple is a device in which each roller is provided with a cardioid cam, a set back finger being associated with each cam. Stroke counters are known which include a subtracting mechanism which is actuated either by the regular actuating lever or by a special subtracting lever. Counters having actuating slides for advancing or reversing the counting rollers are also known.

The conventional stroke counters have several disadvantages. All conventional counters are composed of a great number of parts and are, therefore, expensive. The great number of parts must be made very accurate which further increases the cost. The required accuracy does not last very long because of wear.

The stroke counter according to the invention includes a counting roller provided with a cardioid cam for setting the counter back to zero and with a ten-point control star, a drive element associated with the star for advancing the counting roller, a device for reversing rotation of the counting roller which device is connected with a device for actuating the cardioid cam for setting the counter back to zero so that both devices can be actuated by a single lever. This lever actuates the device for setting the stroke counter to zero position when the lever is swung from a middle position in one direction, and actuates the device for reversing rotation of the counting roller when the lever is swung from its middle position in the opposite direction. Provisions are made for yieldingly holding the lever in its middle position.

Additional counting rollers may be associated with the counting roller described in the paragraph next above, in the conventional manner, so that a full revolution of the first roller produces one tenth of a revolution of the second roller.

The novel features which are considered characteristic of the invention are set forth with particularity in the appended claims. The invention itself, however, and additional objects and advantages thereof will best be understood from the following description of embodiments thereof when read in connection with the accompanying drawing in which:

FIG. 1 is a part sectional front view of the stroke counter according to the invention;

FIGS. 2 to 5 are cross sectional views of the stroke counter, the sections being made along lines II—II, III—III, IV—IV, and V—V in FIG. 1;

FIGS. 6 to 8 are perspective illustrations of three different parts of the stroke counter;

FIG. 9 is a part sectional side view of a modified portion of the mechanism shown in FIG. 1;

FIG. 10 is a front view of another modification of a part of the mechanism shown in FIG. 1;

FIG. 11 is a cross sectional view taken along line XI—XI in FIG. 10.

Like parts are designated by like numerals in different figures of the drawing.

Referring more particularly to the drawing, numeral **4** designates a U-shaped frame rotatably supporting three shafts **1**, **2**, and **3**. The shaft **1** is the drive shaft. It has a rectangularly bent portion **1***a* on which may act the element whose strokes must be counted. The shaft **2** serves for setting the counter back to zero and is provided with a handle **2***a*. The shaft **3** freely rotatably supports three conventional counting rollers **5**, **6**, and **7**. On the cylindrical surfaces of the rollers the numerals 0 to 9 are inscribed. Each roller is provided with a cardioid or heart or reset cam **5***a*, **6***a*, and **7***a*, respectively, and a counter weight **5***b*, **6***b*, and **7***b*, respectively, the weights **6***b* and **7***b* only being visible in FIGS. 2 and 3. The counterweights are provided for placing the center of gravity of the rollers to coincide with the center of the rollers. Claws or teeth **6***c* and **7***c* extend laterally from the rollers **6** and **7**, respectively, for driving the rollers. The roller **5** is provided with a star element **5***c* (FIG. 4), having ten points or teeth. Each of the rollers **5** and **6** is provided with two laterally projecting pins **5***d* and **6***d*, respectively, which serve for actuating pinions **8** and **9**, respectively. The pinions **8** and **9** engage the claws **6***c* and **7***c*, respectively.

A driving bracket **10** is rotatably supported by the drive shaft **1**. A pin **11** extends from the shaft **1** and into a slot **10***a* in the bracket **10**, preventing axial movement of the latter. Displacement of the shaft **1** to the right in FIG. 1 is prevented by the provision of a pin **1***b* at the right end of the shaft which pin has a smaller diameter than the shaft and extends into a leg **4***a* of the frame **4**. Displacement of the shaft **1** to the left is prevented by a spacer sleeve **13** on hte shaft **1**, the sleeve being interposed between a leg **10***b* of the bracket **10** and a leg **4***b* of the frame **4**. Two coil springs **12** and **14** are wound around the shaft **1**. One end of each spring is connected with the pin **11**. The other end of the spring **12** abuts against the roller shaft **3**, tending to turn the drive shaft **1** in counterclockwise direction (FIG. 2). The outer end of the spring **14** rests in a recess **10***c* in the drive bracket **10**, tending to swing the latter so that the lower end of the slot **10***a* engages the pin **11** (FIGS. 3 and 8). The end of the drive bracket which is opposite the leg or flap **10***b* is provided with prongs **10***d* and **10***e* of which the former is pressed onto the star **5***c* and is received in a recess between two ponits of the star when the device is in the position shown in FIG. 4.

If a force acts on the arm **1***a* of the shaft **1**, tending to revolve the shaft **1** in clockwise direction (FIGS. 2 to 4) against the action of the spring **12**, the spring **14** moves the bracket **10** until the prong **10***e* enters a gap between two points of the star **5***c*. Upon continued rotation of the shaft **1** the bracket **10** is not moved while the pin **11** moves in the slot **10***a*. The prong or nose **10***e* is so arranged and shaped that the star **5***c* and the counting roller **5** are revolved through an angle amounting to somewhat more than one half of the spacing of the points of the start, during the aforedescribed swinging of the drive bracket. When the force acting on the arm **1***a* is discontinued the drive bracket **10** and the shaft **1** are returned to their initial positions by the spring **12**. However, since the counting roller has been turned corresponding to one half of the spacing of the points of the star **5***c*, the prong or nose **10***d* enters into a consecutive gap of the star and completes one tenth of a revolution of the star.

When the shaft **1** is in a certain angular position none of the noses **10***d* and **10***e* engages the star **5***c*. A brake is provided preventing undesired rotation of the roller **5**. As shown in FIGS. 1 and 4, the central bore of the

roller 5 has a rectangular axial groove 5*e* in which rests a brake spring 15 which presses against the shaft 3.

FIG. 9 illustrates a modified brake. A star-shaped plate spring 15*a* is interposed between the rollers 5 and 6. The central annular portion of the spring 15*a* is pressed against the roller 5 by the action of the curved spring arms which abut against the roller 6. The friction caused thereby produces the necessary brake force.

A third modification of the brake is shown in FIGS. 10 and 11. A curved plate spring 24 is interposed between the counting roller 5 and a leg 19*e* of a pinion supporting bracket 19, the spring having a bore 24*a* through which the roller shaft 3 extends. The spring has an end 24*b* which is inserted in an annular groove 2*b* of the set back shaft 2. A similar plate spring 25 is inserted between the leg 19*f* of the pinion support bracket 19 and the counting roller 7. The end 25*b* of this spring is inserted in an annular groove 2*c* of the shaft 2. The springs 24 and 25 are so bent that the counting rollers 5, 6, and 7 are pressed against each other and maintained in their relative position by the springs whose location is defined by the shafts 2 and 3.

A handle 2*a* is rigidly connected with the shaft 2 for setting back the roller 5 by one unit. The shaft 2 is yieldingly held in a middle position by a retaining spring 16 and a bracket 17 which is mounted on the shaft 2. The shaft 2 may be oscillated in two directions against the action of the spring 16. If the handle 2*a* in FIG. 1 is pressed backward, i.e., if the shaft 2 in FIGS. 2 and 4 is revolved in clockwise direction until the end 18*a* of a pin 18 traversing the shaft 2 abuts against the end of a slot 19*a* in the pinion carrier 19, a set back bracket 22 is swung by the lower end 18*b* of the pin 18. As seen in FIG. 4, the bracket 22 is provided with a nose 22*a* which is engaged by the pin 18. The pinion carrier 19 is freely rotatably supported by the set back shaft 2 and is swung in clockwise direction (FIG. 2) by a spring 20, one end of which rests on the roller shaft 3 and the other end of which abuts against a pinion shaft 21 which is supported by the pinion carrier 19. The pinion carrier 19 swings in clockwise direction until its abutment 19*b* reaches the roller shaft 3. When the set back bracket 22 is oscillated, its set back nose 22*b* engages the points of the star 5*c* and turns the latter back for a little more than one half the spacing between two points of the star which thereby moves in counterclockwise direction, as seen in FIG. 4. The nose 10*d* of the drive bracket 10 which is pressed by the spring 12 against the star 5*c* retreats and snaps into the subsequent tooth gap completing one tenth of a revolution of the counting roller 5, upon release of the star 5*c* by the nose 22*b* of the bracket 22.

If it is desired to return the whole counter to zero position the handle 2*a* is pulled forward in FIG. 1, i.e., the shaft 2 is turned counterclockwise in FIGS. 2 to 5 against the action of the spring 16. A spring 23 one end of which abuts against the pin 18 and the other end of which is inserted in a hole 22*c* of the bracket 22 (FIGS. 3 and 7) tends to turn the bracket 22 so that its nose 22*a* abuts against the lower end 18*b* of the pin 18, swinging the bracket 22 in counterclockwise direction. When the upper end of the slot 22*d* abuts against the nose 19*d* of the pinion carrier 19 which nose extends into the slot 22*d*, the pinion carrier is swung counterclockwise against the action of the spring 20 until the abutment 19*c* reaches the roller shaft 3. At this movement of the pinion carrier 19 the pinions 8 and 9 which are carried by the shaft 21 are disengaged from the claws 6*c* and 7*c* of the counting rollers 6 and 7, respectively, so that the counting rollers can be returned to zero position by fingers 22*e*, 22*f*, and 22*g* of the set back bracket 22, the fingers engaging the heart cams 5*a*, 6*a*, and 7*a*, respectively.

As is obvious from the foregoing description and from the drawing, the counter according to the invention is made of relatively very few parts. In addition to a counting roller for each decimal and a pinion for transmitting movement of one counting roller to the next counting roller only four brackets, four shafts, and five coil springs are needed for a stroke counter which is suited for many uses and which can be conveniently advanced and reversed and set back to zero position. The counter, which comprises very few parts, can be improved by providing one or two brake springs. The individual parts need not be made very accurately and can be mass-produced at little expense and are very durable. An essential advantage of the described device is that it requires no screws or rivets whereby the manufacturing costs are further reduced and breakdowns are avoided.

What is claimed is:

1. A stroke counter, including at least one counting roller, said counting roller being provided with a star-shaped part coaxial of said roller and having ten points corresponding to numerals 0 to 9 inscribed on said counting roller, a heart cam rigidly connected with said counting roller, drive means adapted to engage said star-shaped part at each stroke to be counted for advancing said counting roller by one numeral, an element having a first portion adapted to engage said star-shaped part, and having a second portion adapted to engage said heart cam, and a shaft operatively connected with said element for effecting engagement of said first portion with said star-shaped part upon rotation of said shaft in one direction for rotating said counting roller in reverse direction, said shaft, upon rotation in the opposite direction, effecting engagement of said second portion with said heart cam for returning said counting roller to zero position.

2. A stroke counter as defined in claim 1, including means for yieldingly holding said shaft in neutral position.

3. A stroke counter comprising a frame, a first shaft supported by said frame, at least one counting roller rotatably supported by said first shaft, said counting roller being provided with a star-shaped part coaxial of said roller and having ten points corresponding to numerals 0 to 9 inscribed on said counting roller, a heart cam rigidly connected with said counting roller, a second shaft rotatably supported by said frame, a driving bracket swingable on said second shaft, a first spring having an end connected to said second shaft and being coiled around the latter and having a second end resting against said first shaft and tending to hold said second shaft in a predetermined angular position relatively to said frame, and a second spring having an end connected to said second shaft and being coiled around the latter and having a second end resting against said bracket and tending to turn the latter relatively to said second shaft, said bracket having a first and a second nose, said first nose engaging said star-shaped part when said second shaft and said bracket are in the positions determined by said springs, said second nose engaging said star-shaped part and said first nose disengaging said star-shaped part when said second shaft is oscillated against the action of said first spring, thereby advancing said star-shaped part by a little more than one half of the spacing between said points, said first nose reengaging said star-shaped part and said second nose disengaging said star-shaped part due to the action of said first spring upon release of said second shaft, thereby farther advancing said star-shaped part by a little less than one half of the spacing between said points.

4. A stroke counter comprising a frame, a first shaft supported by said frame, at least one counting roller rotatably supported by said first shaft, said counting roller being provided with a star-shaped part coaxial of said roller and having ten points corresponding to numerals 0 to 9 inscribed on said counting roller, a heart cam rigidly connected with said counting roller, a second shaft rotatably supported by said frame, a driving bracket swingable on said second shaft, a first spring resiliently

connecting said second shaft with said frame and tending to hold said second shaft in a predetermined angular position relatively to said frame, a second spring resiliently connecting said second shaft with said bracket and tending to turn the latter relatively to said second shaft, said bracket having a first and a second nose, said first nose engaging said star-shaped part when said second shaft and said bracket are in the positions determined by said springs, said second nose engaging said star-shaped part and said first nose disengaging said star-shaped part when said second shaft is oscillated against the action of said first spring, thereby advancing said star-shaped part by a little more than one half of the spacing between said points, said first nose reengaging said star-shaped part and said second nose disengaging said star-shaped part due to the action of said first spring upon release of said second shaft, thereby farther advancing said star-shaped part by a little less than one half of the spacing between said points, a third shaft rotatably supported in said frame, and an element operatively connected with said third shaft and having a first portion adapted to engage said star-shaped part, said element having a second portion adapted to engage said heart cam, rotation of said third shaft in one direction effecting engagement of said first portion and said star-shaped part and rotation of said counting roller in reverse direction, rotation of said third shaft in the opposite direction effecting engagement of said second portion and said heart cam for returning said counting roller to zero position.

5. A stroke counter comprising at least one counting roller, said counting roller being provided with a rachet means coaxial of said roller, said ratchet means having a plurality of points corresponding to predetermined positions on said counting roller, drive means adapted to engage said ratchet means with each movement thereof to advance said counting roller by one of said predetermined positions, a reset cam rigidly connected with said counting roller, a unit including a first portion adapted to engage said ratchet means and a second portion adapted to engage said reset cam, and a single means operatively connected with said unit for effecting engagement of said first portion with the ratchet means upon movement of said single means in one direction for rotating said counting roller in a reverse direction, and said single means on movement in the opposite direction, effecting engagement of said second portion with said reset cam for returning said counting roller to the starting position thereof.

6. A stroke advancing device comprising a frame, a first shaft supported by said frame, at least one roller rotatably supported by said first shaft, said roller being provided with ratchet means coaxial of said roller, said ratchet means having a plurality of points corresponding to predetermined positions on said roller, a reset cam rigidly connected with said roller, a second shaft rotatably supported by said frame, a driving bracket swingable on said second shaft, a first spring having an end connected to said second shaft and being coiled around the latter and having a second end bearing against said first shaft and tending to hold said second shaft in a predetermined angular position relative to said frame, a second spring having an end connected to said second shaft and being coiled around the latter and having a second end resting against said bracket and tending to turn the latter relative to said second shaft, said bracket having a first and a second nose, said first nose engaging said ratchet means when said second shaft and said bracket are in the positions determined by said springs, said second nose engaging said ratchet means and said first nose disengaging said ratchet means when said second shaft is oscillated against the action of said first spring, thereby advancing said roller by at least a portion of the distance between two of said predetermined positions, said first nose re-engaging said ratchet means and said second nose engaging said ratchet

means due to the action of said first spring upon release of said second shaft to thereby finish the advancement of said roller by the distance between said two predetermined positions, a third shaft rotatably supported in said frame, and a unit operatively connected with said third shaft and having a first portion adapted to engage said ratchet means and having a second portion adapted to engage said reset cam, rotation of said third shaft in one direction effecting engagement of said first portion and said ratchet means and also rotation of said roller in reverse direction the distance between two of said predetermined positions, rotation of said third shaft in the opposite direction effecting engagement of said second portion and said reset cam and return of said roller to the starting position.

7. A stroke advancing device as claimed in claim 6, wherein rotation of said third shaft in said one direction effects engagement of said first portion of said unit and said ratchet means to effect retreat of said first nose from said ratchet means and rotation of said roller in reverse direction by at least a portion of the distance between two of said predetermined positions, said first nose upon release of said third shaft thereafter completing the advancement of said roller through the distance between said two predetermined positions due to the action of said springs.

8. A stroke counter comprising a frame, a first shaft supported by said frame, at least one counting roller rotatably supported by said first shaft, said counting roller being provided with a ratchet means coaxial of said roller and having a plurality of points corresponding to predetermined positions on said counting roller, a reset cam rigidly connected with said counting roller, a second shaft rotatably supported by said frame, a driving bracket swingable on said second shaft, a first spring resiliently connecting said second shaft with said frame and tending to hold said second shaft in a predetermined angular position relative to said frame, a second spring resiliently connecting said second shaft with said bracket and tending to turn the latter relative to said second shaft, a driving bracket swingable on said second shaft, said bracket having a first and a second nose, said first nose engaging said ratchet means when said second shaft and said bracket are in the positions determined by said springs, said second nose engaging said ratchet means and said first nose disengaging said ratchet means when said second shaft is oscillated against the action of said first spring, thereby advancing said counting roller by at least a portion of the distance between two offset predetermined positions, said first nose re-engaging said ratchet means and said second nose disengaging said ratchet means due to the action of said first spring upon release of said second shaft, thereby completing the advancement of said ratchet means by the distance between said two predetermined positions, a third shaft rotatably supported in said frame, and a unit operatively connected with said third shaft and having a first portion adapted to engage said ratchet means and a second portion adapted to engage said reset cam, rotation of said third shaft in one direction effecting engagement of said first portion and said ratchet means and effecting retreat of said first nose from said ratchet means and rotation of said counting roller in a reverse direction for at least a portion of the distance between two of said predetermined positions, release of said third shaft allowing re-engagement of said first nose and said ratchet means to complete the advancement of said ratchet means by the distance between said two predetermined positions, rotation of said third shaft in the opposite direction effecting engagement of said second portion and said reset cam and return of said counting roller to zero position.

9. A stroke counter as claimed in claim 8, including said one counting roller and at least one other counting roller rotatably mounted on said first shaft, said other counting roller having a plurality of predetermined positions there-

on corresponding to said positions on said one counting roller, said other counting roller having a toothed peripheral portion, a pinion adapted to engage said toothed portion, said one counting roller and said pinion being provided with operating means for rotating said pinion through a distance equal to the spacing between two of said predetermined positions on said other counting roller at every revolution of said one counting roller, a fourth shaft supporting said pinion, a carrier for said fourth shaft, said carrier being swingably supported by said third shaft, and a spring associated with said carrier and with said third shaft and tending to maintain said carrier in a position in which said pinion engages said toothed portion.

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