June 27, 1967 A. L. STAUFFER 3,327,941

APPARATUS FOR PRINTING ON SCREENING

Filed Oct. 24, 1965 3 Sheets-Sheet 1

FIG. 1

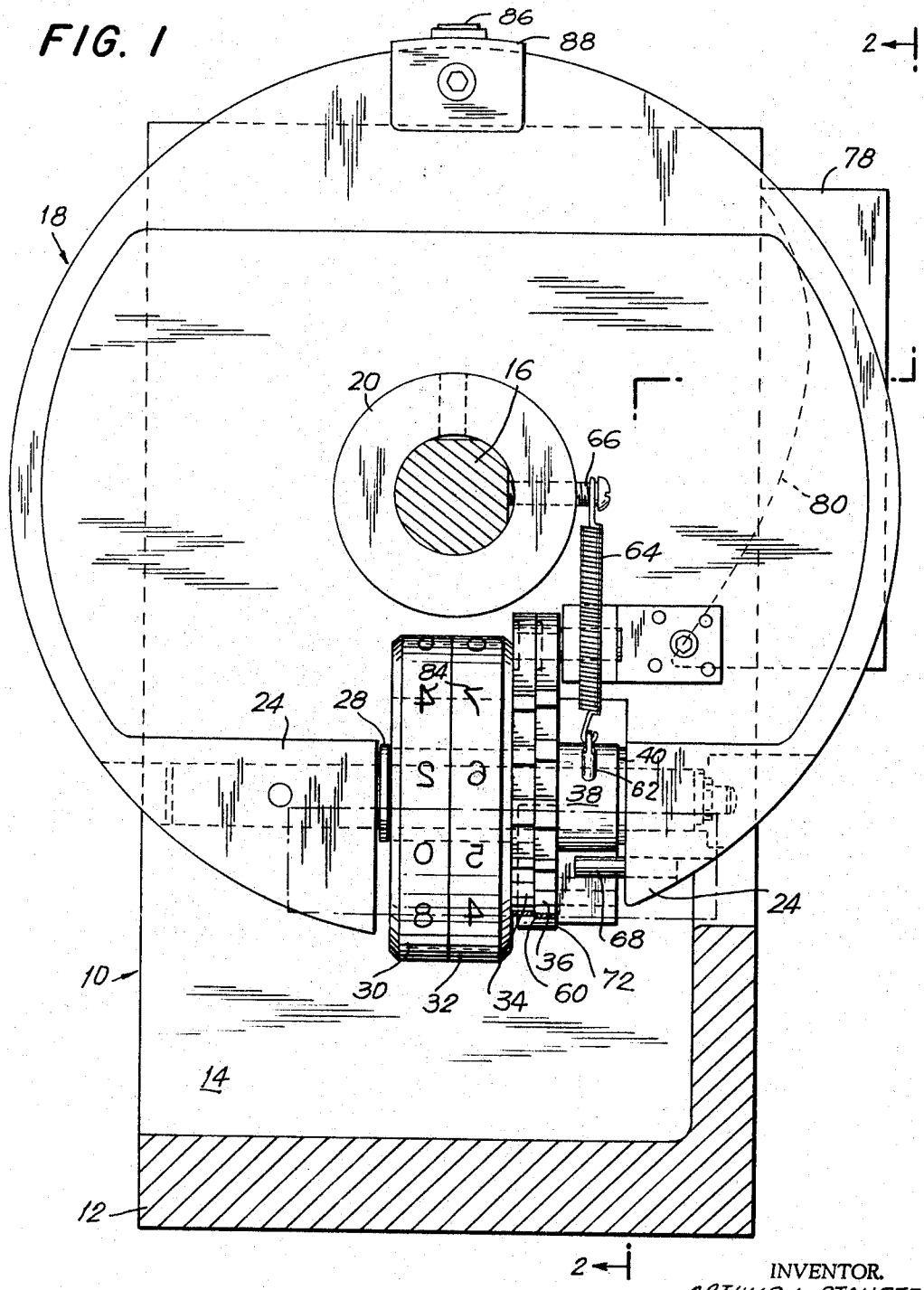

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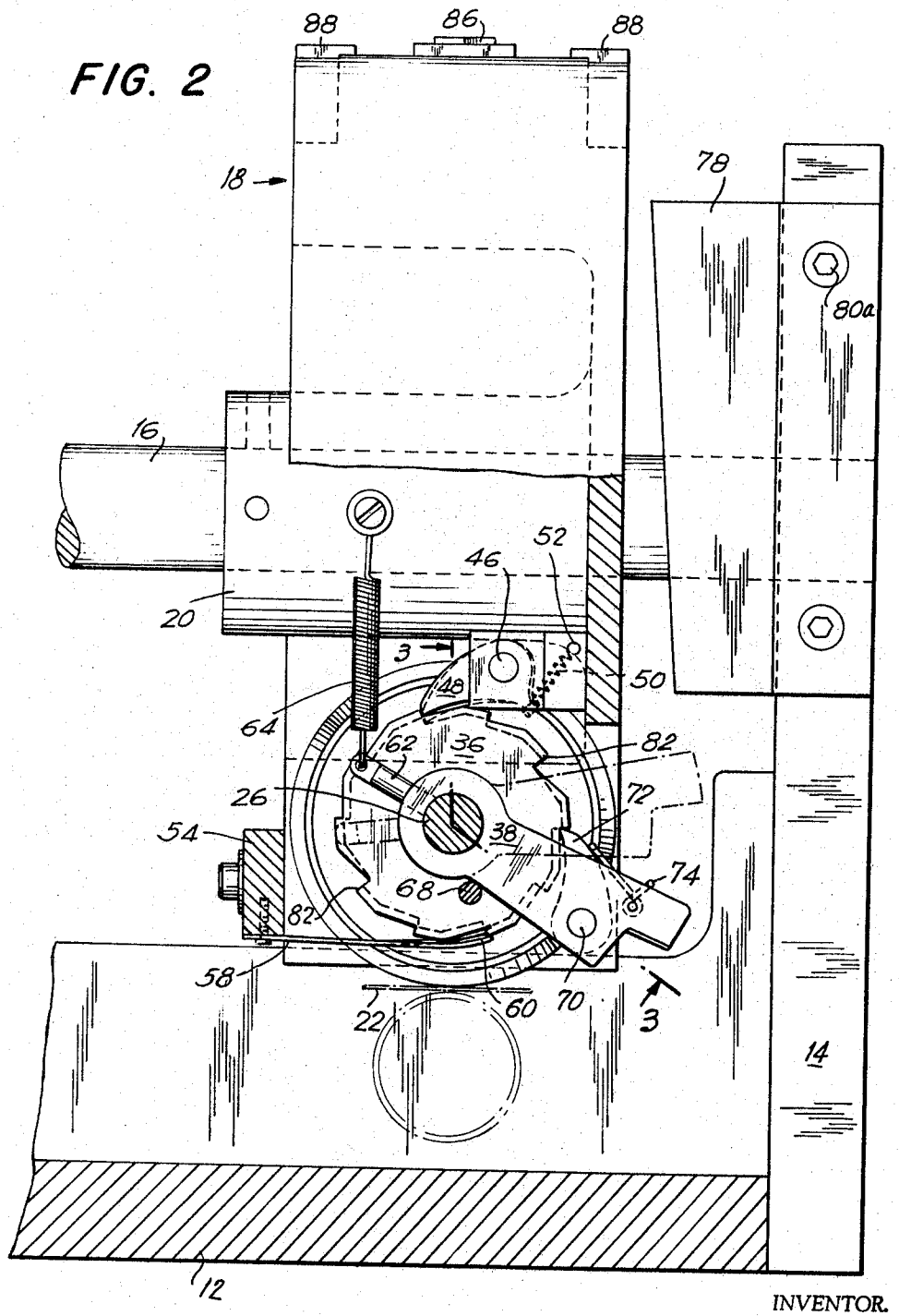
FIG. 2



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APPARATUS FOR PRINTING ON SCREENING

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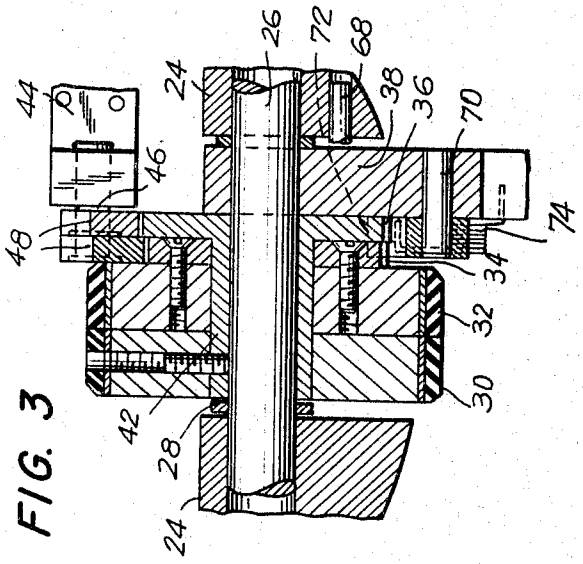

FIG. 3

FIG. 4

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APPARATUS FOR PRINTING ON SCREENING

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4 Claims. (Cl. 235—58)

The present invention relates to apparatus for printing on a moving surface.

Thus, various types of sheet material can conveniently have indicia printed thereon while the sheet material is moving, and of course the distribution of the printed material on the sheet must be carefully correlated with the movement of the moving surface itself.

Various types of sheet material goods are supplied in roll or spool form, so that one can conveniently cut from a roll or other supply source a desired length of the material. For example, sheets of screening, fabric, metal, and other forms of sheet material are generally required to be cut into predetermined lengths, and this latter objective is met at the present time simply by measuring a required length of the sheet and cutting it from the source. However, this conventional, age-old method is cumbersome as well as inaccurate and time consuming.

It is accordingly a primary object of the present invention to enable sheet material of the above general type to be placed in a condition which will render the sheet material far more convenient to cut to a selected length.

In particular, the objects of the invention include the provision of an apparatus which will print directly on a moving surface of the sheet material numerical indicia which will enable an attendant thereafter to cut a desired length of the sheet material from the source thereof.

More particularly, it is an object of the present invention to provide an apparatus which will automatically print on the moving surface of a moving sheet, such as a sheet of screening or the like, numerals which are indicative of the length of the sheet, these numerals automatically being graduated as they are printed on the sheet so as to provide between successive numerals a distance equal to the length of the sheet as indicated by the numerals imprinted thereon. Therefore, it will be possible with such printing directly on the sheet for the attendant to cut the sheet into suitable lengths simply using for measuring purposes the indicia which is printed directly on the sheet with the structure of the present invention.

It is also an object of the present invention to provide a structure, therefore, which will automatically totalize the length of the sheet or the like as it moves past a given point and will automatically print the length of the sheet at various increments thereof in accordance with the movement of the sheet.

The objects of the present invention also include the provision of an exceedingly simple and compact totalizing mechanism which is capable of printing graduations over a range which would normally require with conventional totalizers far more totalizing structure than that required by the present invention.

Furthermore, it is an object of the invention to provide a structure of the above type with a means which will enable the totalizing structure to be efficiently mounted on moving parts in a manner which will automatically actuate the totalizer so as to provide an accurate indication

of the length of the moving surface which moves past a given point.

Primarily with the structure of the invention there is a support means and a rotary housing carried by the support means for rotation about an axis which extends perpendicularly to the direction of movement of the moving surface. The rotary housing carries part of a totalizing means the other part of which is carried by the support means, and this totalizing means responds automatically to the rotation of the rotary housing for totalizing the length of the moving surface which moves past a given point. Printing type is actuated by the totalizing means for printing indicia indicating this length directly on the moving surface simultaneously with the movement thereof.

The invention is illustrated by way of example in the accompanying drawings which form part of the application and in which:

FIG. 1 is a partly sectional front elevation of one possible embodiment of an apparatus according to the present invention;

FIG. 2 is a sectional side view of the structure of FIG. 1 taken along line 2—2 of FIG. 1 in the direction of the arrows;

FIG. 3 is a longitudinal fragmentary section of the totalizing structure, taken along line 3—3 of FIG. 2 in the direction of the arrows; and

FIG. 4 is an exploded perspective illustration of the components of that part of the totalizing means which is carried by a rotary housing of the invention.

Referring now to the drawings, the structure illustrated therein includes a support means **10** in the form of a suitable base member **12** having an upstanding wall **14**, and this structure is stationary and rigid. The upstanding wall **14** has a suitable bearing which supports for rotary movement a shaft **16** which is continuously rotated in a well known manner referred to below. This rotary shaft **16** fixedly carries a rotary housing **18** of the invention. The rotary housing **18** has an axially bored hub **20** through which the shaft **16** extends and to which the shaft is fixed. For example the shaft **16** may have, as shown in FIG. 1, flat surface portions engaged by suitable set screws which extend through threaded bores of the hub **20** for fixing the housing **18** to the shaft **16**. The sheet material, such as screening, for example, is adapted to move from right to left, as viewed in FIG. 1, beneath the rotary housing **18**. Part of this sheet material **22** is indicated in phantom lines in FIG. 2.

The sheet material **22** is continuously advanced in a known way with a conventional structure which does not form part of the invention and is therefore not illustrated. Thus the sheet material can be nipped between rollers which in a well known manner will provide a predetermined rate of movement of the sheet material. The upper surface of the sheet material is supported either on a suitable roller or on a suitable support member along which the sheet material slides so that the upper surface of the sheet material will be situated in a given plane which is the plane of the upper surface of the sheet material **22** as illustrated in FIG. 2.

A totalizing means of the invention is carried in part by the rotary housing **18** for rotation therewith and in part by the support means **10**.

Considering first the part of the totalizing means which is carried by the rotary housing **18**, it will be seen that this housing has a pair of relatively robust portions **24**,

and the housing is formed between the portions **24** with a space which receives various components of the totalizing means. The housing **18** fixedly carries a shaft **26** which extends across the space between the relatively heavy portions **24** of the housing **18**, and this shaft **26**, it will be noted, is perpendicular to the shaft **16** while being fixed to the housing **18** for rotation therewith. Starting from the left in FIG. 1, it will be seen that there is situated in the space between the portions **24** of the housing **18**, on the shaft **26**, a washer **28**, a units wheel **30**, a tens wheel **32**, a tens ratchet **34**, a units ratchet **36**, an actuating lever **38**, and a washer **40** between the lever **38** and the right portion **24** of the housing **18**, as viewed in FIG. 1.

As may be seen particularly from FIG. 4, the tens ratchet **34** is fixed directly to the right face of the tens wheel **32**. The units ratchet **36**, on the other hand, is fixed to one end of a tubular sleeve **42** which extends slidably through the ratchet **34** and the wheel **32** while extending into and being fixed to the units wheel **30**. Therefore, the sleeve **42** is situated between the shaft **26** and the tens wheel **32** and its ratchet **34**, these latter elements being freely turnable on the sleeve **42**.

The face of the rotary housing **18** which is visible in FIG. 1 fixedly carries an L-shaped bracket **44** which serves to carry a pawl pin **46** on which a pair of holding pawls **48** are mounted in respective alignment with the ratchets **34** and **36**. Springs **50** are respectively connected to the holding pawls **48** and a pin **52** is also fixedly carried by the bracket **44**, so that these springs urge the tips of the pawls **48** respectively into engagement with the toothed peripheries of the ratchets **34** and **36**. Thus, while these ratchets can turn in a counterclockwise direction, as viewed in FIG. 2, the holding pawls **48** will prevent them from turning in a clockwise direction, as viewed in FIG. 2.

In addition, the right portion **24** of the housing **18**, as viewed in FIG. 1, fixedly carries a supporting bar **54** (FIG. 2) to the bottom face of which is fixed an elongated leaf spring **58** which has, as shown most clearly in FIG. 4, a pair of free springy tongues **60** respectively in alignment with and pressing frictionally against the ratchets **34** and **36**. Therefore any possible play in the ratchets is eliminated by the friction spring **58** while turning of the ratchets in only one direction is assured by the holding pawls **48**. Because these pawls respectively cooperate with the ratchets independently of each other, it is possible for each ratchet to turn independently of the other.

The lever **38** of the totalizing means fixedly carries at one end a pin **62** connected to one end of a tension spring **64** whose opposite end is fixed to the shank of the set screw **66** which also serves to fix the housing **18** on the shaft **16**, as indicated in FIG. 1, so that the front end of the lever **38** is always urged upwardly by the spring **64**. Situated beneath the actuated lever **38** is a stop pin **68** fixedly carried by the right portion **24** of the housing **18**, and thus the extent to which the lever **38** can be turned by the spring **64** is limited by engagement of the stop pin **68** with the lower surface of the lever **38**.

This lever **38** fixedly carries at its rear, actuating end, a pawl pin **70** which serves to pivotally carry a stepping pawl **72** which is situated directly beside the lever **38** and carried by the latter. The width of the stepping pawl **72** is equal to the total width of both ratchets **34** and **36**, and the stepping pawl **72** extends across both of these ratchets so that the ratchets are actuated in common, in a manner described below, by the one stepping pawl **72** which is pivotally carried by the lever **38**. A spring **74** is coiled on a pin **76** fixedly carried by the lever **38**, and one end of the spring **74** presses against the upper surface of the lever **38**, as indicated in FIG. 2, while the other end of the spring **74** presses against the pawl **72** for urging the latter toward the ratchet. In this way the spring **74** maintains the tip of the pawl **72** constantly in engagement with the ratchets **34** and **36**.

As was indicated above part of the totalizing means is fixedly carried by the support means **10**. This latter part of the totalizing means is in the form of a cam **78** fixed as by the screws **80***a* to the upstanding wall **14** of the support means, and this cam **78** has a curved camming surface **80** the curvature of which is most clearly apparent from FIG. 1. This curved camming surface is situated in the path of movement of the rear actuating end of the lever **38** which turns with the housing **18** in a clockwise direction, as viewed in FIG. 1. It is apparent that during each revolution of the housing **18** the rear end of the lever **38**, which is the right end thereof as viewed in FIG. 2, will necessarily engage and slide along the camming surface **80** of the totalizing means, so that in this way the lever **38** will be turned in opposition to the spring **64** to a position shown in dot-dash lines in FIG. 2 with respect to its stationary position engaging the stop pin **68**, and in this way the stepping pawl **72** is actuated to advance the ratchet teeth through a distance of one tooth with respect to the holding pawls **84**. As a result at each revolution of the housing **18** at least one of the stepping pawls will be advanced by an increment of one tooth with this totalizing means of the invention.

In accordance with a further feature of the invention, the units wheel **30** carries a plurality of series of digits ranging between 0 and 8, so that more than one series from 0 to 8 is distributed along the periphery of units wheel **30**. In the illustrated example there are two series of digits ranging between 0 and 8 and uniformly distributed along the periphery of the units wheel **30**. Furthermore, in accordance with a further feature of the invention, the digits carried by the units wheel do not include all digits in the series. In the example illustrated only even numbers are included, so that in the units place of the totalized values given by the totalizing means of the invention there will always be an even number. The tens wheels on the other hand, carries a single series of digits ranging between 0 and 10 and all of the digits in this series are included at and uniformly distributed along the periphery of the tens wheel **32**. With this arrangement a tens digit carried by the wheel **32** will always be situated beside an even units digit carried by the units wheel **30**.

As is apparent particularly from FIG. 2, the teeth of the units ratchet **36** are shallower than those of the tens ratchet **32**, so that the stepping pawl **72** will for the most part advance only the units ratchet **36**, and thus through the sleeve **42** the units wheel **30** will be advanced through an angular increment, corresponding to the angular distance of one tooth of the ratchet **36** at each revolution of the housing **18**.

However, two of the teeth of the units ratchet **36** are deeper than the others, and these are the pair of diametrically opposed teeth **82** which are respectively aligned with the 0 digits carried by the units wheel **30**. As a result whenever the stepping pawl **72** reaches a tooth **82** it will advance the tens wheel **32** by one increment simultaneously with the units wheel **30**, and in this way at each one half revolution of the units wheel **30** the tens wheel **32** will be turned by one increment. Thus with this exceedingly compact structure requiring no more than is required by conventional units and tens wheels it is possible to greatly reduce the wear of the parts. With the structure of the invention it is only necessary for the units wheel to turn through a half revolution in order to bring about results conventionally requiring a full revolution.

Thus, the extent of rotation of the housing **18** is such that, for example, every five revolutions of the housing corresponds to a length of 10 feet of the sheet material, and the totalizing means will indicate, for example, a

length of 10 feet during five revolutions when the units wheel will have been stepped through five increments while the tens wheel will have been stepped through one increment. The remaining half of the revolution of the units wheel will be completed during the next five revolutions corresponding, for example to the next ten feet. In this way the totalizing means is capable of totalizing from 0 up to 99 feet of sheet material before starting at 0 again. The digits **84** carried by the totalizing wheels **30** and **32** are in the form of printing type made, for example, of rubber and fixedly mounted on steel strips which in turn are fixed to the periphery of the wheels **30** and **32**. This printing type is capable of receiving a coat of ink from a suitable ink supply at each revolution of the housing **18** so that when the totalizing means reaches its lowest position shown in FIG. 1 it is capable of printing a numerical indication on the surface of the moving material **22** while moving at the same speed as the material **22**, and in this way even-numbered graduations will be automatically applied to the moving sheet material indicating from one graduation to the next a distance of two feet, for example.

Additional subject matter may be printed with the structure of the invention. Thus, the housing **18** can carry additional printing type **86** carried by a suitable support which is fastened to the exterior periphery of the housing **18**. In alignment with the additional type **86** are a pair of material-engaging elements **88** fixed to the housing **18** for rotary movement therewith and capable of engaging the sheet material so as to hold the sheet material in a condition rendering it more suitable for receiving an impression from the type **86**.

This type **86** can be relatively localized and can have any desired configuration such as that of a suitable trademark, for example. In addition, however, it will be noted that the type **86** is situated at a part of the housing **18** which is diametrically opposed to the totalizing wheels **30** and **32**. As a result, the mark which is made by the type **86** will be situated on the moving surface midway between the graduations imprinted thereon from the type **84** carried by the wheels **30** and **32**, so that the mark provided by the type **86** can be used to guide the cutting of the sheet material at locations situated midway between a pair of graduations. It will therefore be seen that even though the odd-numbered graduations are lacking from those which are applied to the sheet material, nevertheless the type **86** will make a mark on the sheet material at those locations where the odd-numbered graduations would have applied their mark had they been provided, and thus the even numbered graduations together with the marks made by the type **86** situated midway therebetween enable the same results to be achieved as would have been provided with a complete set of digits at the totalizer. Of course, such a complete set of digits would have required the shaft **16** together with the housing **18** to rotate at twice the speed actually required with the structure of the invention, and in addition the totalizing wheel **30** would have required turning at twice the speed through twice the distance that it turns through with the structure of the invention. Therefore, the combination of the totalizing means together with the mark **86** greatly reduces the wear and tear on the parts, and in addition promotes an operation of the structure which is far quieter than would otherwise be possible.

What is claimed is:

1. In an apparatus adapted to be used with a moving surface, support means, a rotary housing supported by said support means for rotation about an axis extending perpendicularly with respect to the direction of movement of said moving surface, said housing being adapted to rotate at a speed which has a predetermined relationship with respect to the speed of movement of said moving surface, totalizing means carried in part by said rotary housing and in part by said support means and including

a rotary units wheel and a rotary tens wheel situated beside said units wheel, said wheels having a common axis and said totalizing means further including a pair of stepping ratchets situated in side by side relation and operatively connected with said wheels, a stepping pawl common to both of said ratchets and extending over the latter, an actuating lever having a turning axis common with that of said wheels and ratchets and having a free actuating end, said totalizing means including a stationary cam carried by said support means in the path of turning of said free end of said lever to engage said lever and actuate the same at each revolution of said housing, said lever carrying said stepping pawl and said totalizing means including a spring urging said lever to a given rest position and a stop member engaged by said lever to determine said rest position thereof, said cam engaging said end of said lever for displacing the latter away from said stop member in opposition to said spring at each rotation of said rotary housing, and said common axis of said wheels, ratchets, and actuating lever being perpendicular to the axis of rotation of said housing, said wheels respectively carrying numerals in the form of printing type for engaging the moving surface and printing numerical indicia thereon at each revolution of said housing, and wherein said housing carries at a location angularly displaced from said totalizing means, additional printing type for printing additional information, and wherein said units wheel carries only even digits arranged in two series uniformly distributed along the periphery of said units wheel with each series extending from 0 to 8, and said tens wheel having a number of digits equal to those of said units wheel but including all of the digits, said stepping ratchets respectively having teeth corresponding to the digits of said wheels and said units wheel having all of its teeth except two shallower than those of said tens wheel, said two teeth of said units wheel being situated at diametrically opposed parts of said ratchet of said units wheel aligned with the 0 digits thereof and having a depth at least equal to that of said teeth of said tens wheel so that at the end of each series of digits of said units wheel said stepping pawl will advance said tens wheel together with said units wheel.

2. The apparatus of claim **1**, wherein said totalizing means provides through the printing type numerical graduations on the moving surface.

3. The apparatus of claim **1**, wherein said rotary housing carries at a location diametrically opposed to the part of the totalizing means carried by said rotary housing said additional printing type providing an intermediate mark on the moving surface midway between each pair of graduations derived by printing from the type of said totalizing means, so that the intermediate marks together with those derived from the totalizing means provide a complete set of graduations along the moving surface.

4. In an apparatus for printing on a moving surface, support means, a rotary housing supported by said support means for rotation about a given axis extending perpendicularly with respect to the direction of movement of the moving surface at a speed of rotation which has a predetermined relationship to the speed of movement of the moving surface, totalizing means carried in part by said rotary housing and in part by said support means and responding automatically to rotary movement of said housing about said axis for totalizing numerical information having a predetermined relationship to the moving surface, said moving surface moving at least in the region of said rotary housing in a given plane, and numerical printing type carried by said totalizing means and situated at least once during each revolution of said housing at said plane in which said moving surface moves while moving at substantially the same speed as said moving surface in said plane for printing directly on the moving surface the totalized numerical information, and wherein said totalizing means includes a stationary actu-

ating cam carried by said support means and an actuating lever pivotally carried by said housing and having an actuating end in whose path of turning movement said cam is situated so that once during each revolution of said housing said lever is actuated by said cam, said lever actuating other elements of said totalizing means to step the latter through a given increment at each actuation of said lever by said cam, and wherein said lever has on said housing a turning axis which is perpendicular to the axis of rotation of said housing.

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