April 12, 1927. 1,624,060

J. NANTERME

MACHINE FOR INSPECTING A PIECE OF TISSUE, MEASURING ITS LENGTH, AND FOLDING IT

Filed Oct. 31, 1925 4 Sheets-Sheet 1

Fig. 1

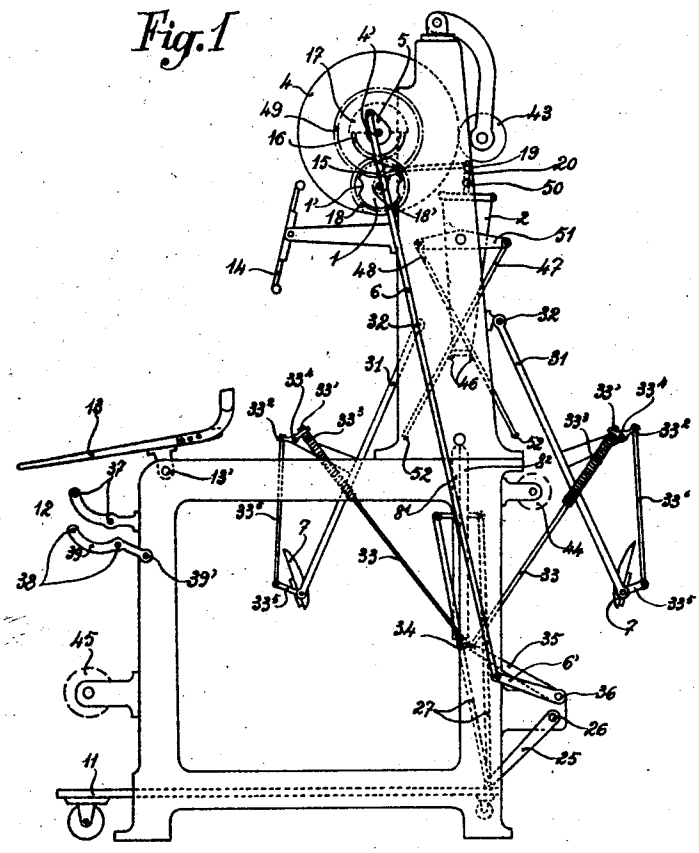
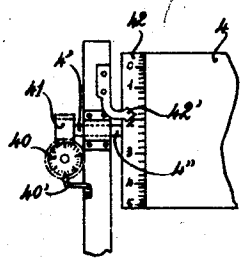


Fig. 9



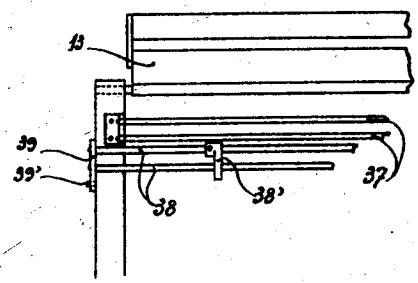


Fig. 8

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Filed Oct. 31, 1925 4 Sheets-Sheet 2

Fig. 2

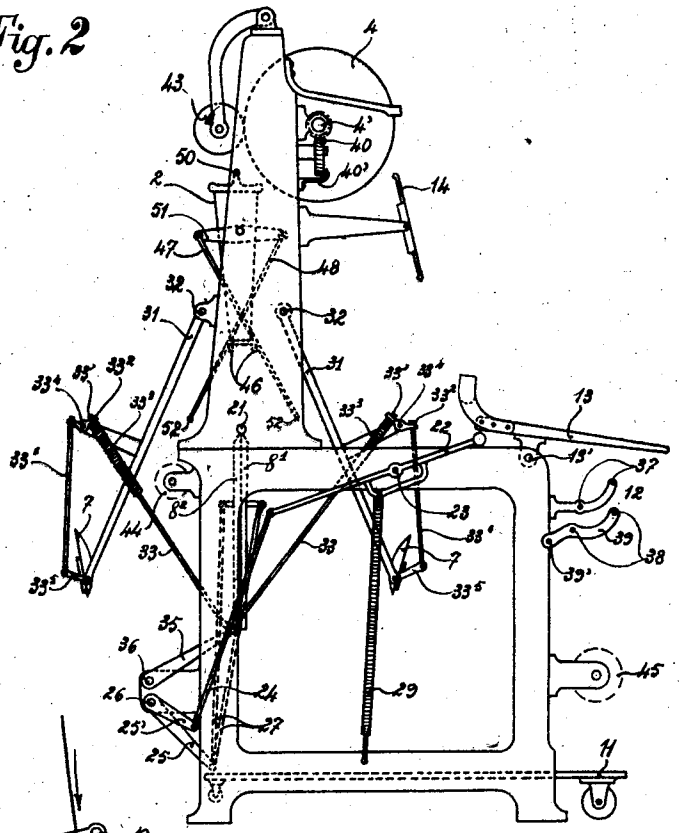

Fig. 5

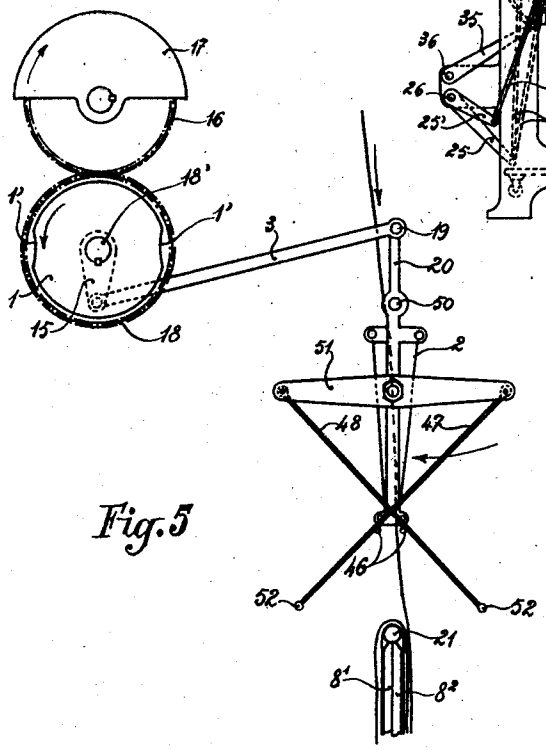

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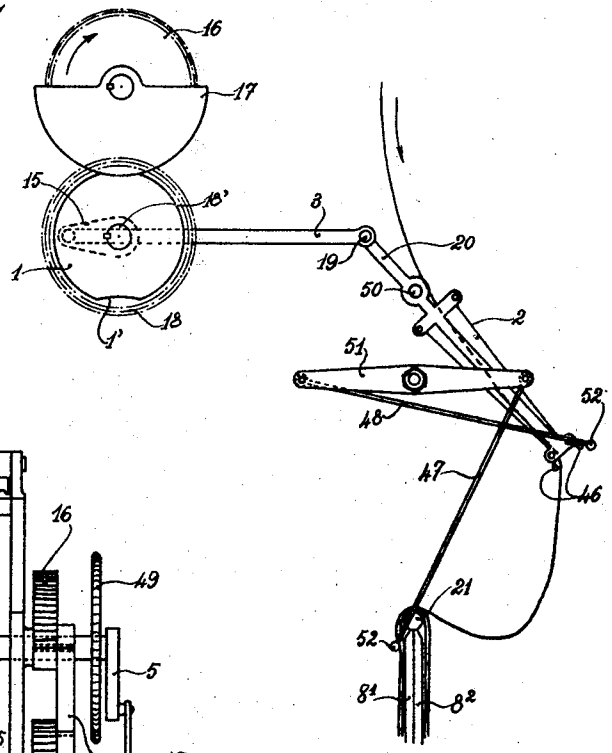
Fig. 7



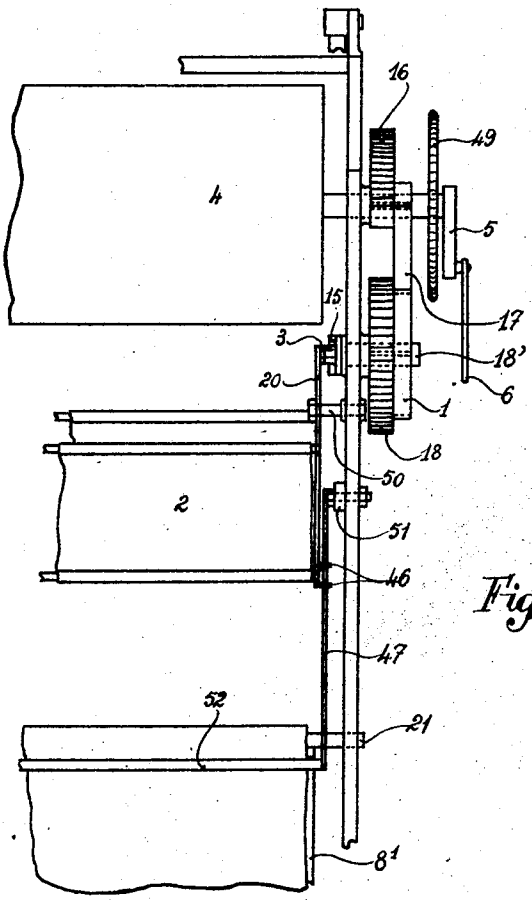


Fig. 3

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MACHINE FOR INSPECTING A PIECE OF TISSUE, MEASURING ITS LENGTH, AND FOLDING IT

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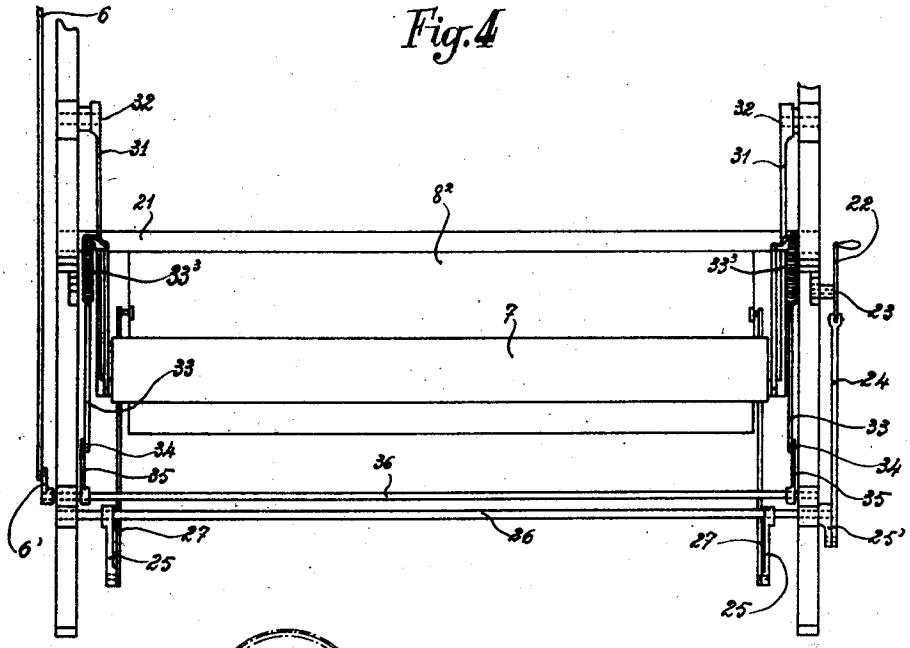
Fig. 4



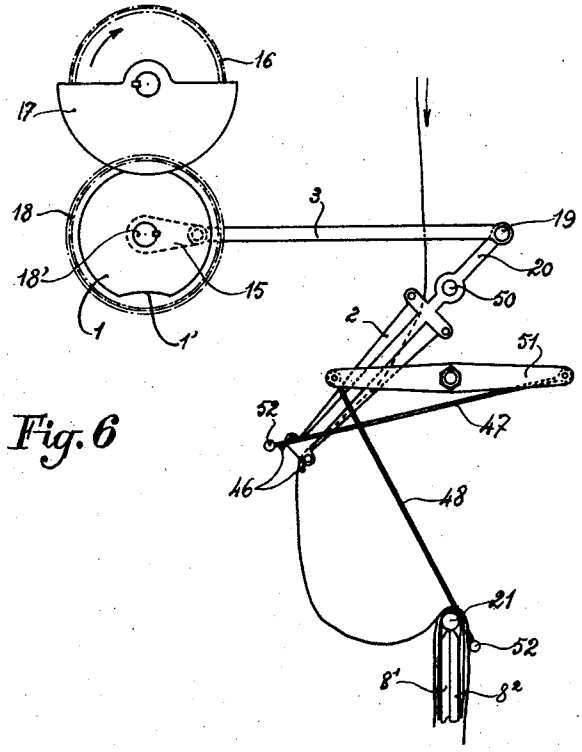


Fig. 6

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1,624,060

UNITED STATES PATENT OFFICE.

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MACHINE FOR INSPECTING A PIECE OF TISSUE, MEASURING ITS LENGTH, AND FOLDING IT.

Application filed October 31, 1925, Serial No. 66,118, and in France February 11, 1925.

The present invention relates to the class of machine which is used for inspecting a continuous strip or piece of fabric of indefinite length. These machines are usually made in several types: one for light and extra-light fabrics, another for fabrics of average weight, and still another for heavy and thick fabrics. This is, of course, a serious drawback, as it necessitates the provision of several cumbersome and costly machines, which are often idle, in order to treat all kinds of fabrics. Furthermore, the measuring and folding devices with which the machines are sometimes equipped have usually been uncertain in their operation.

The improved machine which is the object of this invention is capable of being used equally well with all kinds of fabrics, from the lightest to the heaviest; it is relatively small and not particularly complicated; it can be run silently at high speeds; and the operator has free access to every part of it. Moreover, it will indicate at any moment the exact length of the strip which has been passed through it, and it may be used either to fold or to wind up the fabric as desired.

The machine according to the invention comprises the following main devices or mechanisms:

1. A special gear train which is utilized to impart an oscillating or rocking movement to a folder head, with an interval of rest at the conclusion of each stroke equal to the duration of the stroke itself;

2. A support against which the fabric is folded by the action of the rocking head and associated parts, this support being composed of two members or leaves which are normally disposed face to face in vertical position, but which can be swung upwardly away from each other into horizontal alinement;

3. A pair of clamps which are movable simultaneously into engagement with the opposite sides of the vertical support during the movements of the folder head;

4. A device for stopping the formation of a fold as soon as it has been completed by the action of the folder head, in order to prevent slippage;

5. A device for imposing a constant tension on the fabric.

A machine embodying the above and other improved featuers is illustrated in the accompanying drawings, whereof:

Figs. 1 and 2 are opposite side views of such machine;

Fig. 3 is an enlarged fragmental front view showing the gear train and related parts;

Fig. 4 is a fragmental back view showing the lower parts of the machine;

Figs. 5, 6 and 7 are enlarged detail views in side elevation, showing in different positions, the gear train, the rocking head or folder and the fold-stopping device;

Fig. 8 is a fragmental front view showing the stretching device;

Fig. 9 is a fragmental front view showing the meter.

Referring more particularly to the drawings, 4 indicates the main driving or feeding roller of the machine, the shaft 4′ of which is journalled in the framework and carries at one end a sprocket 49 (Figs. 1, 3 and 8) whereby it is connected with a suitable source of power. The shaft 4′ is utilized to operate a head 2 which is rocked first to one side and then to the other and serves to guide the fabric during its passage through the machine, as subsequently explained.

According to the construction illustrated, there are keyed to the main shaft 4′ (which is constantly rotated) a semi-circular toothed sector 16 (Figs. 3, 5, 6 and 7) and a semi-circular plate 17; the two parts 16 and 17 being located close to each other but in inverted relation. The sector 16 is designed to mesh at regular intervals with a gear 18 keyed to a secondary shaft 18′ which has also keyed to it at the side of said gear a circular plate 1 provided at diametrically-opposite points with a pair of peripheral recesses or notches 1′ wherein the sector plate 17 periodically engages. A crank 15 is also secured to shaft 18′ and is connected to a rod 3 which, in turn, is pivotally connected at 19 with an arm 20 forming an extension of the head 2, the latter being pivoted at 50 to the adjacent frame members.

Due to this arrangement, it will be apparent that starting with the parts in the position shown in Figs. 3 and 7 the gear sector 16 and gear 18 will be out of mesh for the first half-revolution of shaft 4′, during which time the untoothed sector 17 will be engaged in one of the notches 1′ in the plate 1 and will thus lock said plate and, consequently, its shaft 18′ against rotation. During the succeeding half-revolution, the gear sector is brought into mesh with gear 18, while at the same time the locking sector 17 disengages plate 1, whereupon the rotation of shaft 18′ commences (Fig. 5). This rotation is transmitted through crank 15 and rod 3 to the head 2, which is thereby caused to rock about its pivot 50 as an axis; such movement taking place first in one direction and then in the other, with an interval of rest between each stroke of the same duration as the stroke itself.

The main roller 4 is located at the top of the frame and is preferably faced or covered with rubber or the like to prevent slippage of the fabric during the hereinafter-described feed movement; and to hold the fabric against said roller a presser roll 43 may be provided at the rear thereof, the rocker 2 being disposed directly below the bight of the two parts 4 and 43. At the front of the machine, some distance below the roller 4, a pivotally-mounted inspection table 13 is arranged, said table rocking around an axis 13′; and between the table and the said roller 4 is interposed a screen 14 across which the fabric also passes for purposes of inspection on its way from the table to the roller. A carriage 11 (Figs 1 and 2), which initially supports the folded fabric, is movable into and out of position at the bottom of the machine, and the fabric is led therefrom through a tensioning device 12 and thence to and across table 13. The tensioning device comprises two pairs of horizontal rods 37 and 38, around both of which pairs the fabric passes; the rods 37 being fixed to the machine frame, while the rods 38 are carried by levers or arms 39 pivoted at 39′ to the frame, the combined weight of the arms and their associated rods 38 causing the latter to constantly exert a pressure upon the fabric. Guides 38′ (Fig. 8) are provided on rods 38 for insuring a rectilinear travel of the fabric.

As stated above, the fabric, after passing between the feed and presser rolls 4 and 43, is led through the oscillating rocker head 2 which guides it first in one direction and then in the other. It is thereby delivered to a support 8 upon which it is folded with the assistance of a pair of clamps 7 and associated devices. The support 8 consists of a pair of flat leaves or members 8′, 8^2 which are hinged together at 21 along one side edge and which normally occupy a vertical face-to-face position (Figs. 5–7). These members can, however, be swung upwardly away from each other into alining position in a common horizontal plane; such movement being effected by means of a hand lever 22 (Fig. 2) which is fulcrumed at 23 on the machine frame and is connected by a rod 24 with a lever 25′ fixed to one end of a horizontal shaft 26 (Fig. 4). This shaft 26 has two additional cranks or lever arms 25 secured to it, each connected to the lower ends of a pair of diverging rods 27 which, in turn, are attached at their upper ends to the leaves or members 8′, 8^2, so that the operating movement of lever 22 will thus be transmitted through rod 24 and arm 25′ to rock shaft 26, and thence through arms 25 and rods 27 to members 8′, 8^2, which will thereby be spread out or extended into table form. A spring 29 (Fig. 2) is preferably connected to lever 22 to hold the same in a position to maintain the said members folded vertically together.

The clamps 7 previously referred to are in the form of blocks which extend horizontally across the machine at opposite sides of the support 8 when the latter occupies its normal vertical or folded position, so that they can act to press the fabric thereagainst. Their operation is effected automatically at regular intervals, when the machine is running, by the following mechanism: The shaft 4′ of the main roller 4 is provided with a crank 5 (Fig. 1), said crank being connected by a rod 6 to a crank or arm 6′ secured to a horizontal rock shaft 36 journaled in the lower part of the frame. The shaft 36 is likewise provided with an additional pair of arms or cranks 35, (Fig. 4), to each of which are connected at 34 the lower ends of a pair of diverging rods 33; and the upper ends of said rods are jointed at 33′ to the corresponding ends of double levers 33^2, pivoted at 33^4. The other ends of levers 33^4 are connected with the clamps 7 through vertical connecting rods 33^6 and levers 33^5. Clamps 7 are also pivotally connected to the lower ends of pairs of converging suspension levers 31 which are pivotally attached at their upper ends at 32 to the adjacent frame members. Hence, the rotation of crank 5 will be transmitted through rod 6 and crank 6′ to shaft 36, and thence through cranks 35 and rods 33 and 33^6 to the clamps 7 which will thereby be caused to swing inward against the fabric on opposite sides of the support 8; and to compensate for the gradual increase in the thickness of the folds or plies of fabric on the support, the rods 33 are preferably constructed to include spring portions 33^3.

In connection with the rocker or folder head 2, stopping means are provided for insuring regularity in the folds, such means comprising a pair of short projections or

shoulders 46 at each pair of lower corners of the folder head (Figs. 5–7). Each pair of shoulders coacts with a pair of rods 47 and 48 which are pivotally suspended from a cross-piece 51 fixed at its center to the adjacent frame members, the lower ends of corresponding rods being connected by horizontal cross-bars 52. The rods 47 and 48 intersect each other and are adapted to rest on the shoulders 46 of the folder head 2, so that when the latter is rocked to either side from its intermediate or neutral position represented in Fig. 5, one pair of rods and their connecting bar 52 will be lifted and swung upwardly and outwardly away from the support 8, while the other pair will swing downwardly and inwardly by their own weight and will ultimately engage the fabric and hold it against the upper portion of said support so as to prevent slippage. Thus, assuming that the parts are moving from Fig. 5 to Fig. 6 position, and the head or rocker is being turned in a clockwise direction, the two rods 47 and their bar 52 will be lifted upward and to the left by the left-hand shoulders 46, while the two rods 48 will swing downward and to the right and will finally bear against the fabric on the right side of support 8. Fig. 7 shows the rocking head moving in the opposite direction, the rods 48 raised and the rods 47 lowered to engage the fabric on the left side of the support. Hence, the fabric is carried by the rocking head to one side of the support, drops freely down that side, and is then brought back and carried over the top of the support to the other side thereof; the bar 52 which is in action at that time engaging the fabric at the other side of the support so as to prevent slippage during the fold-forming step.

In order to measure the length of the strip of fabric which is fed between the rollers 4 and 43 by the action of the former, the said roller 4 may be provided at the opposite end from the sprocket 49 with a circumferential band 42 (Fig. 9) which is graduated from 0 to 100 to indicate centimeters, the circumference of the roller itself being exactly 1 meter; and a dial wheel 40, graduated in meters, may be driven from the shaft 4′ by means of a worm wheel 41, said dial wheel being turned the extent of one graduation for each complete revolution of roller 4. Suitable pointers 42′ and 40′ are provided for coaction with the graduated band and dial wheel, as will be understood.

The complete operation is substantially as follows: The folded strip of fabric to be inspected, measured and then refolded is placed upon the carriage 11 which is then moved into position at the bottom of the machine; whereupon the free end of the strip is passed through the stretching or tensioning device 12 and led across the table 13 and the front face of the screen 14, and then between the rollers 4 and 43. The machine is then started, and the roller 4 feeds the strip through the folder head 2 which is rocked or oscillated periodically by the intermittently acting gear train. As the support 8 normally occupies its vertical position, the strip will be folded alternately on opposite sides thereof, the clamps 7 pressing the folds against the support and the stop device constituted by the shoulders 46 and rods 47, 48 with their connecting bars 52 preventing irregularities in folding. The operator stands at the front of the machine and watches the strip for any defects therein as it passes over the two inspection members 13 and 14.

When the entire strip has been fed through the machine, the two members $8'$, 8^2 of the support 8 are moved into horizontal position by operating the hand lever 22 as above explained, whereupon the inspection table 13 may be tilted downward toward the support to enable the re-folded strip to be slid across the table and withdrawn at the front of the machine. The measuring device constituted by the parts 42—40 will, of course, give the length of the strip in meters and centimeters.

Instead of being carried into the machine in folded condition the strip may be wound upon a reel, in which event the reel may be mounted in the machine as indicated at 45 in Figs. 1 and 2. Also, if preferred, the strip need not be re-folded after having been inspected and measured, but can be wound upon reel 45, in which event it may be placed upon support 8 (which has previously been extended) if in folded condition, or, if wound upon a reel, the latter may be mounted in the rear part of the machine at 44 (Figs. 1 and 2), the rocking head 2 having first been disconnected in some suitable manner. The machine is then run backwards, the strip being wound up on reel 45 which may be rotated in any desired way; the meter being read inversely in this case.

I claim as my invention:

1. A machine for folding a continuous strip of fabric, comprising a feed roller over which the strip passes; a folding head engaging the strip beyond the roller; a gear train connecting the feed roller and folding head for oscillating the latter; a substantially vertical support on opposite sides of which the strip is folded alternately by said head; and a device for automatically stopping the folding operation at the completion of each fold.

2. A machine for folding a continuous strip of fabric, comprising a feed roller over which the strip passes; a folding head engaging the strip beyond the roller; a gear train connecting the feed roller and folding head for oscillating the latter; a substan-

tially vertical support on opposite sides of which the strip is folded alternately by said head; a pair of clamps movable into engagement with the folds at opposite sides of the support; and a device for automatically stopping the folding operation at the completion of each fold.

3. A machine for folding a continuous strip of fabric, comprising a feed roller over which the strip passes; a folding head engaging the strip beyond the roller; a gear train connecting the feed roller and folding head for oscillating the latter; a substantially vertical support on opposite sides of which the strip is folded alternately by said head; a meter operated by the feed roller for indicating the length of the strip fed thereby; and a device for automatically stopping the folding operation at the completion of each fold.

4. A machine for folding a continuous strip of fabric, comprising a feed roller over which the strip passes; a folding head engaging the strip beyond the roller; a gear train connecting the feed roller and folding head for oscillating the latter; a substantially vertical support on opposite sides of which the strip is folded alternately by said head; a pair of clamps movable into engagement with the folds at opposite sides of the support; a device for automatically stopping the folding operation at the completion of each fold; and a meter for automatically indicating the length of the strip fed by the feed roller.

5. In a machine for folding continuous strips of fabric, the combination, with strip-feeding means, and an oscillating folder head, of a gear train operatively connecting the folder head and feeding means and actuated by the latter; said gear train comprising a locking sector and a gear sector driven in unison, a gear wheel periodically engaged by the gear sector, a disk connected to rotate with the gear wheel and periodically engaged by the locking sector, and a connection between said gear wheel and the folder head.

6. A folding machine, according to claim 5, in which the strip-feeding means embodies a roller and a shaft whereon the roller is mounted; and in which the gear and locking sectors are fixed to said shaft in inverted relation.

7. A folding machine, according to claim 5, in which the disk connected to the gear wheel is provided with a pair of diametrically-opposite notches wherein the locking sector is alternately engaged.

8. A machine for folding continuous strips of fabric, comprising a feed roller, a main shaft whereon the same is mounted, a secondary shaft, a gear sector and a locking sector fixed to the main shaft, a gear wheel and a disk fixed to the secondary shaft for periodic engagement by the gear sector and locking sector, respectively, an oscillating folder head, and a connection between the secondary shaft and the folder head for operating the latter.

9. A folding machine, according to claim 8, in which the gear sector and the locking sector are mounted in inverted relation on the main shaft; and in which the disk on the secondary shaft is provided with a pair of diametrically-opposite notches wherein the locking sector is alternately engaged.

10. In a strip-folding machine, the combination of an oscillating folder head; operating means therefor; a roller over which the strip passes to be fed to the folder head; and a meter for indicating the length of the strip fed by the roller and embodying a graduated band encircling one end of said roller, a dial wheel driven one step by the roller at each complete revolution of the latter and located directly adjacent said band, and pointers for coaction with the band and dial wheel.

11. In a strip-folding machine, the combination of an oscillating folder head; operating means therefor; a roller over which the strip passes to be fed thereby to the folder head; and an inspection screen across which the strip passes on its way to the feed roller, said screen being disposed at the front of the machine in substantially vertical position.

12. In a strip-folding machine, the combination of an oscillating folder head; operating means therefor; a roller over which the strip passes to be fed thereby to the folder head; an inspection screen across which the strip passes on its way to the feed roller, said screen being disposed at the front of the machine in substantially vertical position; and a tiltable inspection table at the front of the machine located below the screen and across which the strip passes on its way to said screen.

13. In a machine for folding continuous strips of fabric, the combination of feeding means; an oscillating folder head; operating means therefor; a normally vertical support on opposite sides of which the strip is deposited alternately in folds by the folder head, said support comprising a pair of mating members hinged along one horizontal edge to enable them to be swung together in vertical face-to-face relation or to be swung away from each other into horizontal alinement; and a tiltable inspection table across which the strip passes on its way to the feeding means, said table being movable toward said support members when the latter occupy their horizontal position, thereby to enable the folded strip to be slid across the inspection table from said members and removed from the machine.

14. A folding machine according to claim

13, in which the inspection table is disposed at the front of the machine to enable the operator to pull the folded strip across the horizontal support members and the table and withdraw it while remaining at the front of the machine.

15. A machine for folding a continuous strip of fabric, comprising an oscillating folder head; a driving roller for feeding the strip thereto; a gear train leading from said roller to the folding head; and a support on opposite sides of which the strip is alternately folded by the movements of said head, said support embodying a pair of mating members hinged along one horizontal edge to enable their normal disposition in vertical face-to-face relation, but adapted to be swung upwardly away from each other into horizontal alinement at the conclusion of the folding operation.

16. A machine for folding a continuous strip of fabric, comprising an oscillating folder head; a driving roller for feeding the strip thereto; a gear train leading from said roller to the folding head; a vertical support on opposite sides of which the strip is alternately folded by the movements of said head; and a pair of clamps movable simultaneously into engagement with the folds on both sides of the support after a fold has been formed and removable from such engagement before the next fold is formed.

17. In a strip-folding machine, the combination of an oscillating folder head; operating means therefor; means for feeding the strip to the folder head; a support whereon the strip is folded by said head; and an inspection element across which the strip passes on its way to the feeding means.

18. In a strip-folding machine, the combination of an oscillating folder head; operating means therefor; means for feeding the strip to the folder head; a support whereon the strip is folded by said head; an inspection element across which the strip passes on its way to the feeding means; and a stretching device for exerting tension on the strip before it reaches the inspection element.

19. A strip machine, according to claim 18; in which the stretching device embodies two coacting sets of horizontal arms around which the strip is passed, one set being movable relatively to the other.

20. In a strip-folding machine, the combination of an oscillating folder head; operating means therefor; a vertical support on opposite sides of which the strip is formed into folds alternately by the movements of said head; and means for automatically stopping the folding operation at the completion of each fold.

21. A strip-folding machine, according to claim 20, in which the stopping means embodies a pair of suspension devices, and means on the folder head for simultaneously bringing one device into engagement with the fold on one side of the support and moving the other device away from the fold on the other side of the support.

22. A strip-folding machine, according to claim 20, in which the stopping means embodies a pair of suspension devices, and shoulders on the folder head for engagement with said devices to simultaneously bring one device into position to bear against the fold on one side of the support and move the other device away from the fold on the other side of the support.

In witness whereof I have signed this specification.

JOSEPH NANTERME.