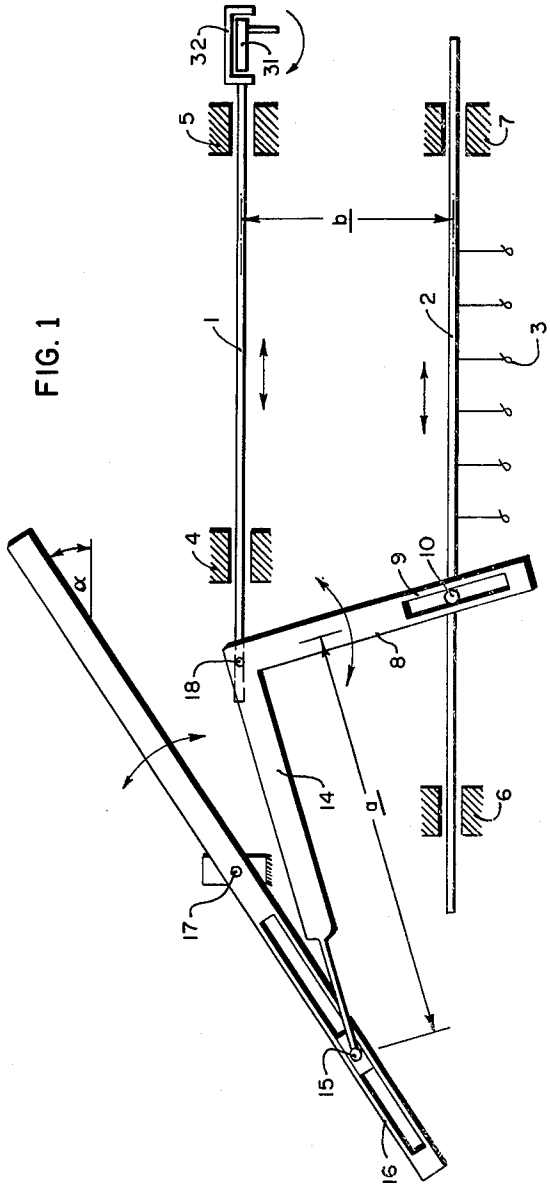
Sept. 7, 1965 J. VAN SILFHOUT 3,204,885

TRAVERSE MECHANISM

Filed Jan. 10, 1964 4 Sheets-Sheet 1

FIG. 1



PRIOR ART

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TRAVERSE MECHANISM

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FIG. 2

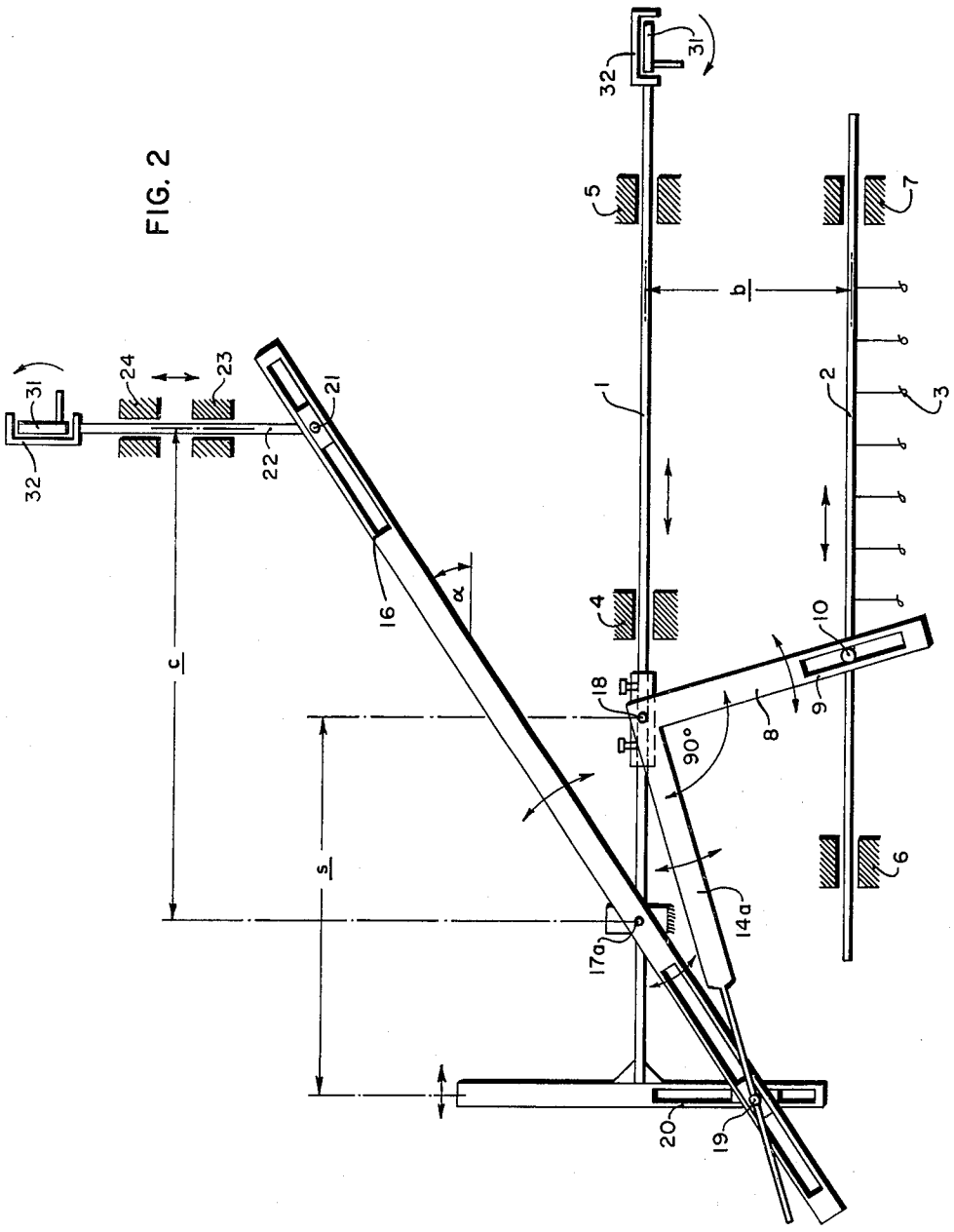

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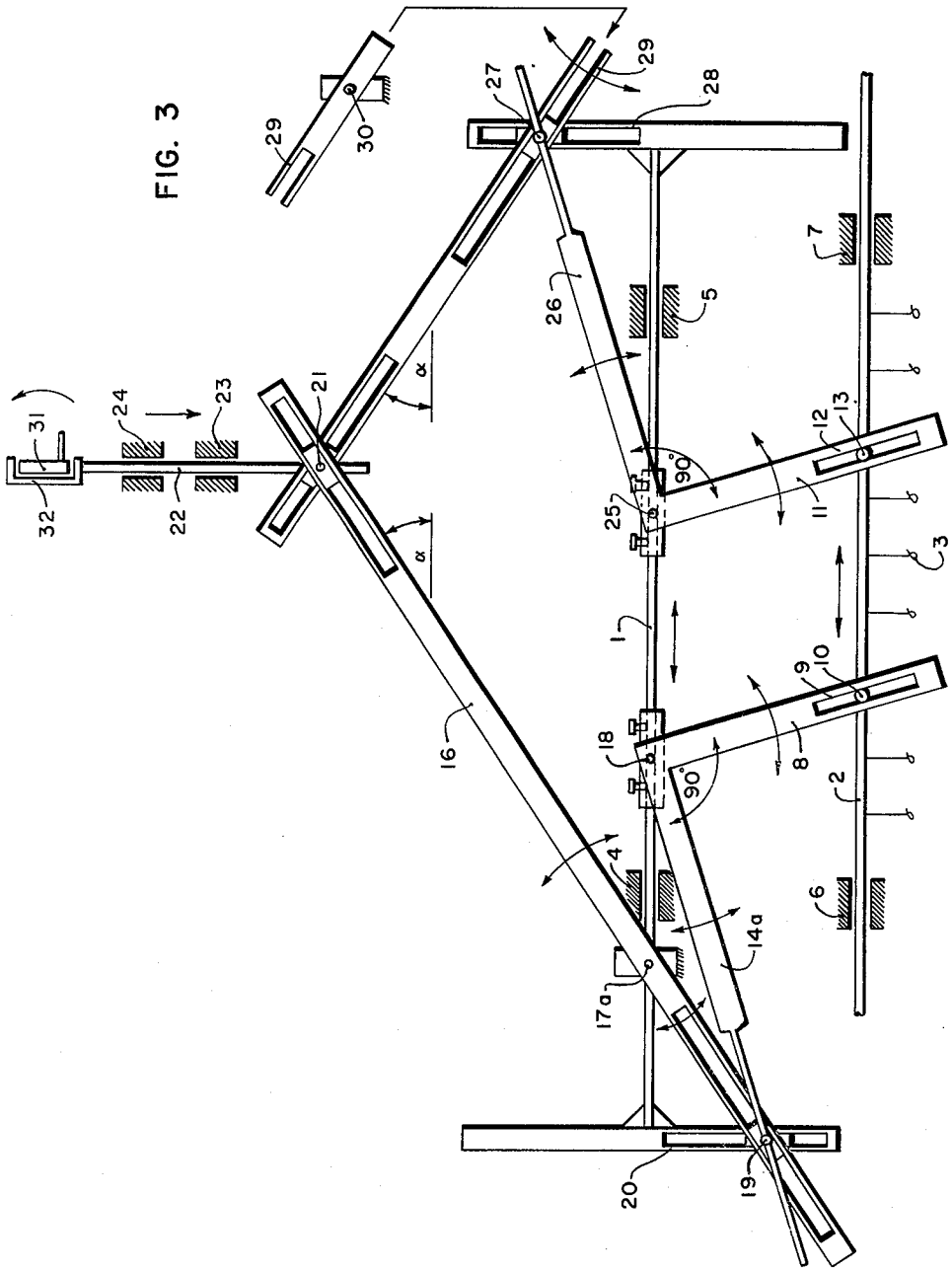
FIG. 3



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TRAVERSE MECHANISM

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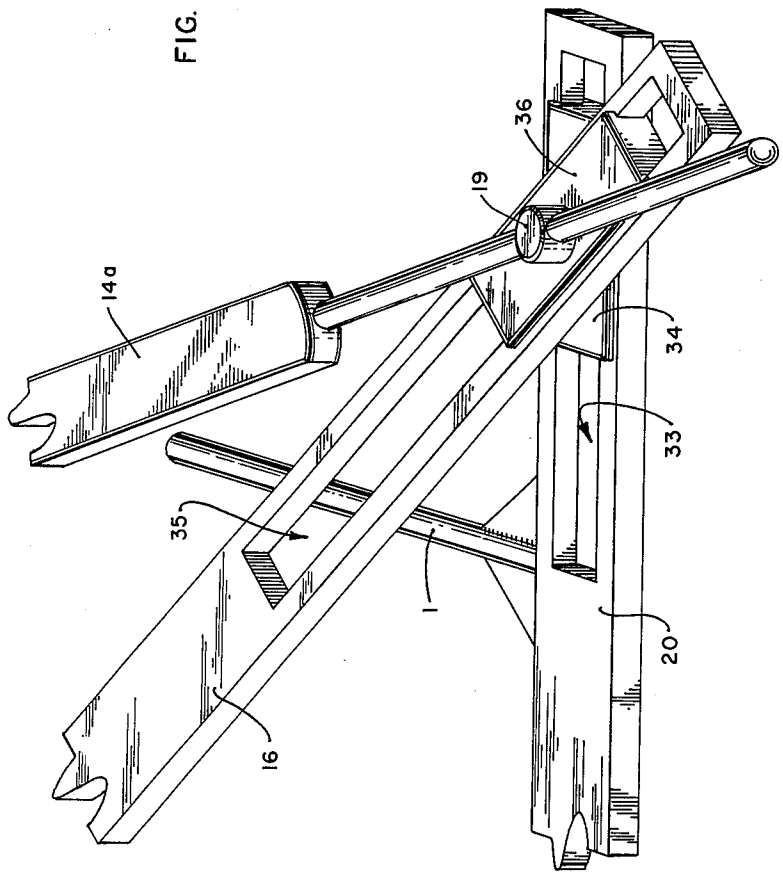
FIG. 4



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TRAVERSE MECHANISM

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8 Claims. (Cl. 242—43)

This invention relates generally to the building of packages from textile yarns and threads and more particularly to a traverse mechanism having an adjustable stroke which may be changed during operation of textile winding machinery, and is a continuation-in-part of application Serial No. 197,640, filed May 25, 1962, now abandoned.

This particular invention is adaptable for use on textile winding devices utilizing a drive bar reciprocated by cam or other means, a driven thread guide supporting bar mounted for sliding movement parallel to that of the drive bar and means such as a coupling rod interconnecting the drive and driven bars so that the latter will receive movement in proportion to that of the former.

In the operation of known apparatus of this type, a control arm is fixed to and extends normally from the coupling rod for cooperation with an oscillatable guide channel. This guide channel may be angularly adjusted or oscillated during operation about a fixed pivot point in order to vary movement of the driven bar relative to a given reciprocating motion imparted to the drive bar.

It has been found, however, that only when the guide channel extends parallel to bar movement does reciprocation of the driven bar uniformily follow movement of the drive bar. On the contrary, when the guide channel extends at an angle relative to bar reciprocation as is the usual arrangement, uniform movement of the drive bar along a longitudinal axis imparts non-uniform movement to the driven bar due to a secondary movement imparted to the coupling rod by the guide channel. Non-linear movement in the driven bar due to reciprocation of the drive bar increases in proportion to the angular disposition of the guide channel relative to the axis of bar movement.

If the guide channel is adjusted to a position paralleling bar reciprocation, movement of the driven bar will be identical to, rather than proportionate with, movement of the drive bar. In most instances of textile package building, it is desirable that the driven bar movement be proportionate to drive bar movement at every point of adjustment on the guide channel. The known traverse mechanism is not readily susceptible to the modification necessary for overcoming this disadvantage.

One of the objects of this invention is to provide a traverse mechanism not having the disadvantages enumerated above.

Another object of the present invention is to provide a traverse mechanism which will afford proportionate and adjustable movement of thread guides relative to a given reciprocating movement throughout all phases of adjustment.

Still another object of this invention is to provide a stroke adjustment for a traverse mechanism which provides throughout all ranges of adjustment a uniformly proportionate movement between two relatively reciprocable elements.

These objects may be accomplished in accordance with this invention by mounting the fulcrum point of a known oscillatable guide channel in alignment with a reciprocated drive bar and by adding an additional guide channel fixed relative to the drive bar but slidably coupled to

the original guide channel and to the control arm of a coupling rod attaching the drive bar to a thread guide supporting driven bar. Additional advantages may be obtained by utilizing two oscillatable guide channels angularly adjusted from the same source and by fixing a laterally reciprocable guide channel to each end of the drive bar.

Other objects and advantages will become apparent upon study of the following detailed disclosure taken in conjunction with the accompanying drawings, wherein

FIGURE 1 is a plan view, in schematic form, of a known two-bar traversing mechanism included herein only for the purpose of pinpointing differences of construction;

FIGURE 2, also a plan view in schematic form, illustrates the modifications necessary for converting a conventional two-bar traverse mechanism for operation as herein described;

FIGURE 3, also a plan view in schematic form, is a more refined embodiment utilizing dual guide channels throughout, but retaining a single adjustment point; and

FIGURE 4 is an isometric view illustrating in detail the sliding connection affording relative movement among the reciprocating drive bar, the oscillating guide channel and the oscillating control arm.

With attention now directed to the drawings, wherein like reference numerals are used througout to represent corresponding parts, operation of the known traversing system illustrated in FIGURE 1 will be reviewed. Drive bar **1** is reciprocated longitudinally through fixed bearings **4** and **5** and by any suitable means such as cams, eccentrics, or other linkages indicated generally by cam **31** and cam follower **32**. The cam of course may be rotated by any suitable means connected to the unidentified cam shaft. Driven bar **2**, which supports one or more thread guides **3**, is reciprocated through bearings **6** and **7** by a coupling rod **8** pivotally attached through pin **18** to the drive bar **1**. The lowermost end of coupling rod **8** terminates in a fork **9** which slidably engages a pin **10** fixed to driven rod **2**. A control arm **14** is fixed to and extends normally from coupling rod **8** as shown. This control arm terminates in a cam follower or pin **15** which slidably engages within guide channel **16**. The guide channel may be oscillated about fixed fulcrum **17** for adjustment purposes or continuously during operation of the traverse mechanism for varying relative movement imparted to driven bar **2** from drive bar **1**.

It will be seen from FIGURE 1 that any movement imparted to drive bar **1** will also be transferred to coupling rod **8** and control arm **14** by virtue of the fixed pivot **18**. Should guide channel **16** be adjusted to a position extending parallel with drive bar **1**, i.e., with angle $\alpha=0$, then any movement transmitted to drive bar **1** by the cam means **31**, **32** will be identically transferred to driven bar **2**. Adjustment of guide channel **16** at an angle relative to the axis of drive bar **1**, however, will change this direct drive relationship since pin **15** on control arm **14** will travel along a hypotenuse rather than the base of an imaginary triangle. The stroke and speed of driven bar **2** therefore may be adjusted relative to that of drive bar **1** by shifting the guide channel to vary angle α. The extent of stroke change will also depend upon the ratio between the lengths a and b, indicating respectively the fixed length of control arm **14** and the distance between bars **1** and **2**.

During operation of the device shown in FIGURE 1, a textile package having conical end surfaces may be constructed by continuously oscillating the guide channel **16** toward and away from a position parallel to drive bar **1**. Unfortunately, however, when the guide channel **16** is inclined, as indicated earlier, movement of the

driven bar **2** does not follow movement of the drive bar **1** linearly, but instead has been found to result in a non-uniform reciprocation magnified by the extent of guide channel inclination. Consequently, ridges are formed on the surface of the yarn package during package building and hard spots are produced in the yarn body.

The foregoing disadvantage is obviated completely if, according to this invention, a linear motion-producing additional or laterally reciprocable guide channel is fixed normal to the end of the drive bar and if the otherwise fixed pivot point of the oscillatable guide channel is transferred onto the drive bar for movement therewith. Further, the fixed pivot formerly provided on the control arm **14** should be replaced with a sliding coupling block so that the length of the control arm may vary during operation. With this arrangement, it has been found that non-uniformity in movement of the driven bar is eliminated despite the angular relationship between the oscillatable guide and the drive bar axis. Accordingly, smooth and homogeneous packages may be obtained while using a variable traverse stroke.

With attention now directed to FIGURE 2, it will be seen that drive bar **1** and driven bar **2** are supported in the same conventional manner as that described hereinabove. Drive bar **1** has been extended to pass alongside and in alignment with the pivot pin **17***a* for guide channel **16**. Although this pivot pin is shown as being fixed, the same may be adjustably mounted relative to guide channel **16**, if desired, by any suitable slot and wing nut connection. The fixed pivot pin **15** formerly supported on the end of control arm **14** has been replaced by a 3-way coupling block **19**, to be presently described. An additional or laterally reciprocable guide channel **20** is fixed to and extends normal from the end of the drive bar **1**.

With attention directed to FIGURE 4, it will be seen that coupling block **19** permits relative sliding movement among the oscillatable guide channel **16**, the laterally reciprocable guide channel **20** which is fixed to drive bar **1**, and the oscillatable control arm **14** which is pivotally supported by the said drive bar **1**. In order to accomplish this relative movement, the coupling block **19** consists of a slide **34** which engages and may be moved within slot **33** of fixed guide channel **20**, and a slide **36** which engages and may be moved within slot **35** of the oscillatable guide channel **16**. The coupling block is also apertured to permit sliding movement of the reduced extension of control arm **14***a* relative thereto. Oscillation of control arm **14***a* of course also produces an equal angular movement in coupling rod **8** which is fixed thereon. The pivot pin **18** which supports coupling rod **8** and the control arm **14***a* integral therewith are fixed, during operation, to drive bar **1** a given distance *s* (see FIGURE 2) from the guide channel **20** but may be adjusted when desired by the wing nut means shown. Oscillation may be imparted to guide channel **16** through a push rod **22** which is slidably reciprocated within bearings **23**, **24** by any suitable means, such as the cam **31** and cam follower **32**. Push rod **22** is slidably pinned at **21** to the guide channel **16** a distance *c* from fulcrum **17***a*.

Movement imparted to drive bar **1** will be transmitted to driven bar **2** through coupling rod **8** and control arm **14***a*. Movement of control arm **14***a*, however, now will be affected not only by the angular relationship between oscillatable guide channel **16** and drive bar **1**, but also by the length thereof which may be altered during operation by the vertical guide channel **20** and coupling block **19**. If the drive bar **1** is reciprocated at a velocity V1, then the driven bar **2** will follow at a proportional velocity V2, in accordance with an established relationship:

$$V2=V1\left(1-\frac{b}{s}\right)(\text{tangent }\alpha)$$

The stroke length of the traversing movements made by bars **1** and **2**, which may be identified L1 and L2, respectively, corresponds to the relationship established above in connection with velocities.

As indicated earlier, oscillatory movement may be imparted to guide channel **16** by push rod **22** and the cam means **31**, **32**. If the push rod **22** is reciprocated at a velocity V3, then the following relationship exists for shortening or lengthening the traverse stroke L2 of drive bar **2**:

$$\frac{dL2}{dt}=-L1\left(\frac{(b)}{(s)(c)}\right)(V3)$$

In other words, the stroke displacement of drive bar **2** at a given distance (*d*L2) relative to a given time (*dt*) is equal to (but in the opposite direction of) the stroke displacement (L1) of drive bar **1** multiplied by the velocity (V3) of push rod **22** and the distance (*b*) between bars **1** and **2**, divided by the product of the two fulcrum distances (*s*) (*c*). Accordingly, lengthening or shortening of the stroke imparted to driven bar **2** is also proportionate to the movement of push rod **22**. The adjustment of an arbitrary traversing movement with stroke shortening imparted to this driven bar is considerably simplified since movement of the bar **2** is proportionate to reciprocation of drive bar **1** and any change in stroke length of bar **2** is proportionate to movement of the push rod **22**. Adjustable mounting of pivot pin **18** with regard to drive bar **1** permits utilization of a predetermined traverse stroke with both stroke shortening or lengthening in combination with various traverse displacements.

For reasons to appear hereinbelow, preference is given to a construction utilizing an additional or third guide channel also oscillatable about a fixed pivot for adjusting the angular relationship between first oscillatable guide channel **16** and drive bar **1**. This construction permits a final increase or decrease in stroke length which is proportionate to longitudinal movement of the push rod adjusting the first oscillatable guide channel. With the traverse mechanism thus obtained, a wide variety of package forms may be constructed, each shape depending upon the position of the oscillatable guide channel or the pivots relative to the traverse stroke.

In one end position of the parallel bars **1** and **2**, the transfer of force between the coupling block **19**, on the one hand, and the oscillatable guide channel **16**, traveling guide channel **20** and control arm **14***a*, on the other hand, is less favorable than in the opposite end position of the drive bar. In order to prevent this unfavorable condition, wherein poor reversal occurs, it is preferred that a double set of coupling rods, control arms, and guide channels be provided and that the mechanism be constructed so that both coupling rods will be pivotally connected to the same reciprocating bar and the control arms be attached to the coupling rods in opposite directions. The oscillatable guide channels will make supplementary angles with the parallel bars, and the fulcrum for the two oscillatable channels will coincide with a line drawn through the connecting rod pivots. With this arrangement, the push rod **22** may be positioned for adjusting both oscillatable guide channels an equal extent.

It is noted that at least some conventional traverse mechanisms have stroke adjustments in which either the traversing movements or the change in stroke length is proportional to the longitudinal reciprocation which causes these two movements. Insofar as known, however, a simple construction such as proposed herein for permitting change in stroke length simultaneously with traversing movement while retaining proportionality to the longitudinal reciprocation causing these movements has never before been suggested.

With attention now directed to FIGURE 3, it will be seen that an additional coupling rod **11**, pivotally sup-

ported from drive bar **1** at pivot pin **25**, has been provided. This rod also terminates in a fork, as at **12**, which cooperates with pivot pin **13** fixed on driven bar **2**. Oscillation of coupling rod **11** about pivot pin **25** is produced by control arm **26** fixed to and extending normally from the coupling rod in a direction opposite of the extension of control arm **14***a*. Pivot pin **25** is adjustably mounted to drive bar **1** by wing nuts in a manner similar to that of pivot pin **18**.

An additional vertically extending guide channel **28** is fixed to reciprocating drive bar **1** and extends normal thereto as shown. Another oscillatable guide channel **29** is provided for assisting in the movement of control arm **26**. This guide channel is pivotally supported about a fixed fulcrum **30**, in alignment with drive bar **1** and slidably engages the pivot pin **21** connected to push rod **22**. An additional coupling block **27**, similar to the block **19**, slidably connects vertical guide channel **28**, control arm **26**, and the oscillatable guide channel **29**. To permit operation of this embodiment, the distance between fixed pivot pins **17***a* and **30**, in the extreme leftmost position of drive bar **1**, has been chosen to equal the distance between vertical guide channels **20**, **28**. Coupling rods **8** and **11** may be so positioned as to oscillate about the same pivot pin, in which case the control arms **14***a* and **26** would extend along the same line rather than along parallel lines as shown. This construction permits movement of coupling blocks **19** and **27** relative to the three elements associated with each without binding and without accumulation of slack at reversal points.

The relative movement between elements described hereinabove may be accomplished with a variety of modifications and embodiments. It will be obvious that the channels may be replaced by rods having sleeves slidable thereon or by slotted plates of many constructions. It is only necessary that the relative movement between the vertical guide channels, the oscillatable guide channels, and the control arms be controlled as with the coupling blocks shown. Moreover, gradual adjustment of the oscillatable guides may be accomplished by many other means rather than the cam illustrated. For example crank means or rack and pinion arrangements may be attached to or used in lieu of the push rod **22**.

It will be apparent, additionally, that as many thread guides **3** as desired or as would be feasible may be attached to the driven bar **2**, or they could be attached directly to the coupling rods. Furthermore, the traverse movement or package building motion described herein is not necessarily limited to flat package take-ups, but obviously may be adapted to the vertically reciprocable ring rails of draw-twisting machinery. Likewise, if found to be desirable or expedient, the bar **2** could be directly driven by cams or other means and the bar **1** could support thread guides for utilization of the described movement.

To illustrate the many possibilities of package building which may be produced, it is noted that drive bar **1** is so arranged that in the extreme righthand portion thereof the channel **28** coincides with fixed fulcrum **30**. Regardless of the angle between these channels and the drive bar **1**, therefore, the driven bar **2** consequently will always assume the same righthand position. Accordingly, thread guide **3** will produce a package having one flat end surface and another conical end dependent upon pivot locations, angular relationship between guide channels and drive bars, and speed at which the push rod is reciprocated. The present invention is considered to be sufficiently versatile to enable production of any desired package shape utilizing at least one flat end. It will be evident that the flat end may be eliminated, if necessary, by imparting a non-uniform stroke to the drive bar **1**.

Inasmuch as other modifications will become apparent to those skilled in this art, it is intended that this invention be limited only to the extent set forth in the following claims.

What is claimed is:

1. A traversing mechanism for producing textile yarn packages comprising a drive bar, means for reciprocating said drive bar longitudinally through a predetermined stroke, a driven bar slidably mounted in spaced relationship to said drive bar and extending parallel thereto, at least one thread guide supported by said driven bar for movement therewith, a coupling rod pivotally supported by said drive bar and slidably engaging said driven bar, a control arm rigidly secured to said coupling rod and extending normal thereto, an oscillatable guide channel pivotally supported on a pivot having a longitudinal axis normal to and intersecting the longitudinal axis of said drive bar, means for adjusting the angular relationship between said oscillatable guide channed and said drive bar, an additional guide channel secured to one end of said drive bar and having an axis extending normal thereto, and means slidably coupling said oscillatable guide channel, said additional guide channel and said control arm.

2. A traversing mechanism as set forth in claim **1** and further comprising means for adjustably supporting the fulcrum of said coupling rod relative to said drive bar.

3. A traversing mechanism for producing a textile package builder motion comprising a drive bar, means for reciprocating said drive bar, a guide channel fixed to said drive bar for movement therewith, an oscillatable guide channel pivotally supported on a pivot having a longitudinal axis normal to and intersecting the longitudinal axis of said drive bar, the axes of said channels intersecting, a control arm pivotally supported by said drive bar, said control arm extending over the intersecting point of said guide channels, means connecting said guide channels and said control arm for relative movement at said intersecting point, and means connected to said control arm for guiding thread during a textile package building operation.

4. A variable stroke traversing mechanism comprising a drive bar, means for reciprocating said drive bar, a guide channel fixed to each end of said dirve bar and extending normal to the longitudinal axis thereof, at least one pair of control arms pivotally supported to said drive bar, said control arms extending over and intersecting respective ones of said fixed guide channels, a pair of oscillatable guide channels intersecting at one end of each oscillatable guide channel, the opposite ends of said oscillatable guide channels overlying the respective intersection points of said fixed guide channels and said control arms, each oscillatable guide channel being pivotally supported on a fixed fulcrum having a longitudinal axis normal to and intersecting the longitudinal axis of said drive bar, means slidably connecting respective fixed guide channels, oscillatable guide channels and control arms at points of intersection, means pivotally connecting said oscillatable guide channels at the intersecting ends thereof, and means connected to said control arms for converting motion of said drive bar, guide channels and control arms into a textile package traverse stroke.

5. A variable stroke traversing mechanism as set forth in claim **4** and further comprising means for simultaneously varying the angular relationship between both oscillatable guides and said drive bar.

6. A variable stroke traversing mechanism as set forth in claim **5** and further comprising means for adjusting the fulcra of said control arms relative to said drive bar.

7. A variable stroke traversing mechanism as set forth in claim **4** wherein said last named means comprises a driven bar slidably supported in spaced but parallel relationship to said drive bar, and a coupling rod rigidly secured to each of said control arms at one end and slidably connected to said driven bar at the other end.

8. A traversing mechanism comprising a drive bar slidably supported for longitudinal reciprocating motion, means for reciprocating said drive bar, a guide channel fixedly mounted on said drive bar for movement therewith, an oscillatable guide channel pivotally mounted on a pivot having a longitudinal axis normal to and intersecting the

longitudinal axis of said drive bar and cooperating with said fixed guide channel; a driven bar slidably mounted in spaced relationship with said drive bar, at least one thread guide fixedly mounted on said driven bar, coupling means pivotally supported by said drive bar and slidably engaging said driven bar, control means rigidly secured to said coupling means, and means slidably coupling said oscillatable guide channel, said fixed guide channel, and said control means.

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