United States Patent

Lyon

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[45] **May 30, 1972**

[54] BANDING MEANS

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[73] Assignee: **Halm Instrument Co., Inc.**, Glen Head, N.Y.

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[52] **U.S. Cl.** ..... **100/27**, 53/198 R, 100/33 PB

[51] **Int. Cl.** **B65b 13/12**

[58] **Field of Search** ..... 53/198; 100/27, 28, 33 PB

[56] **References Cited**

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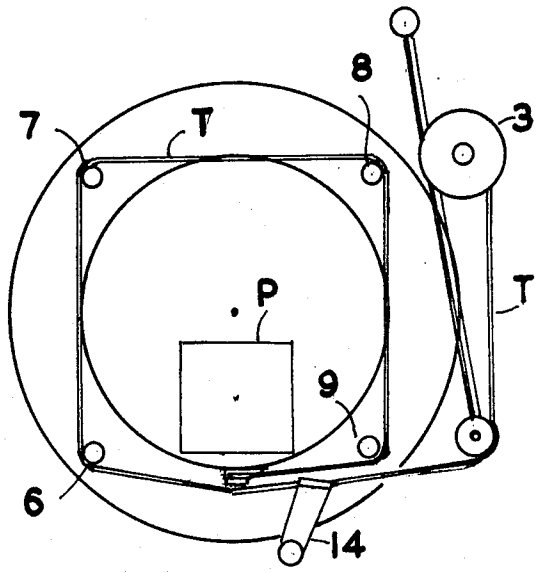
Primary Examiner—Theron E. Condon
Assistant Examiner—Neil Abrams
Attorney—James P. Malone

[57] **ABSTRACT**

A banding machine having an encircling means mounting four retractable fingers. The encircling means encircles a banding station which is adapted to receive a package. A clamp on said ring grips the end of the banding tape and the fingers form the tape around the banding station with no strain on the tape caused by snubbing action around the article. The fingers are then retracted and the slack in the tape is taken up and the tape is snugly wrapped around the package and sealed.

The normal timing cycle is cut in half in production runs since a package may be inserted while the tape is being fed around the fingers.

4 Claims, 12 Drawing Figures



Patented May 30, 1972 3,665,845

4 Sheets-Sheet 1

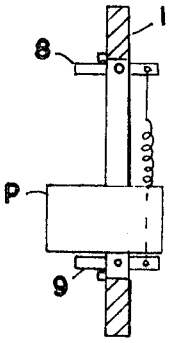


FIG 1B

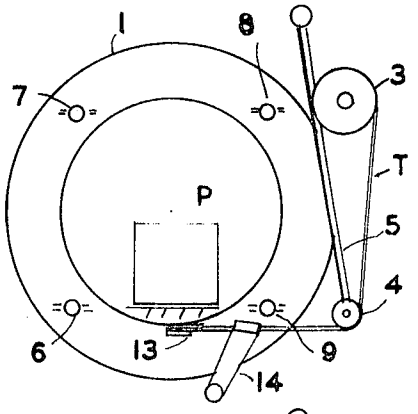


FIG 1A

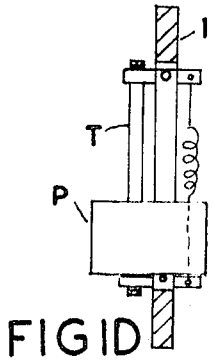


FIG 1D

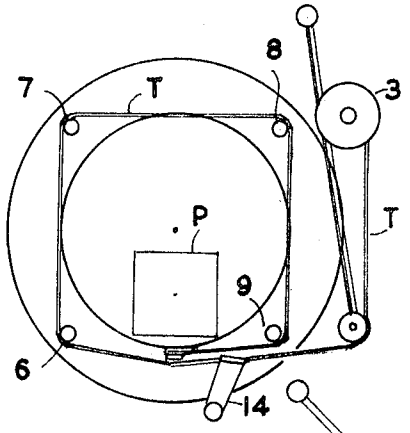


FIG 1C

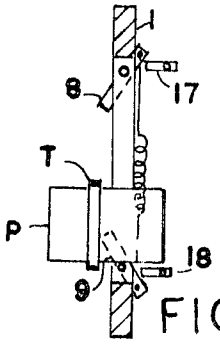


FIG 1F

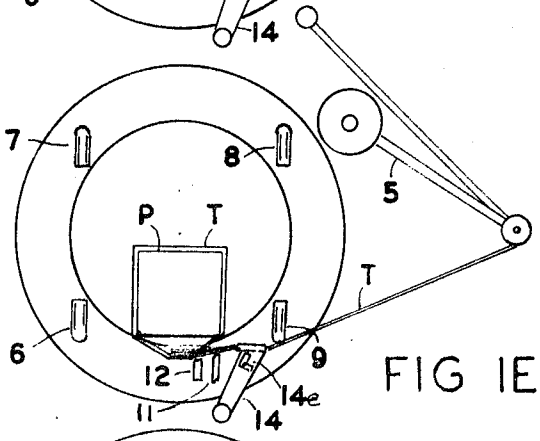


FIG 1E

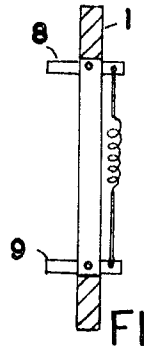


FIG 1H

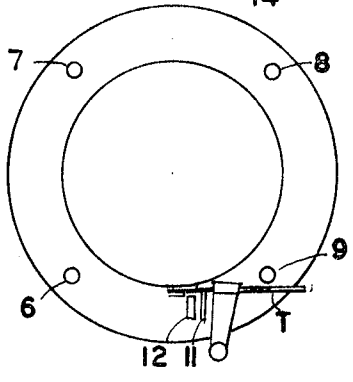


FIG 1G

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FIG 2

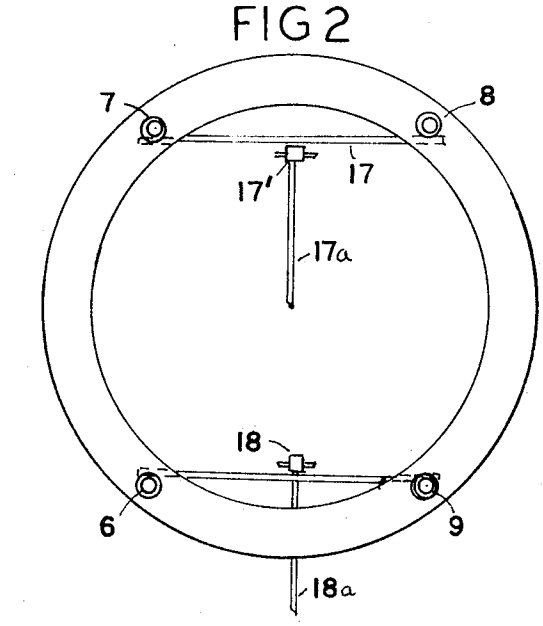


FIG 2A

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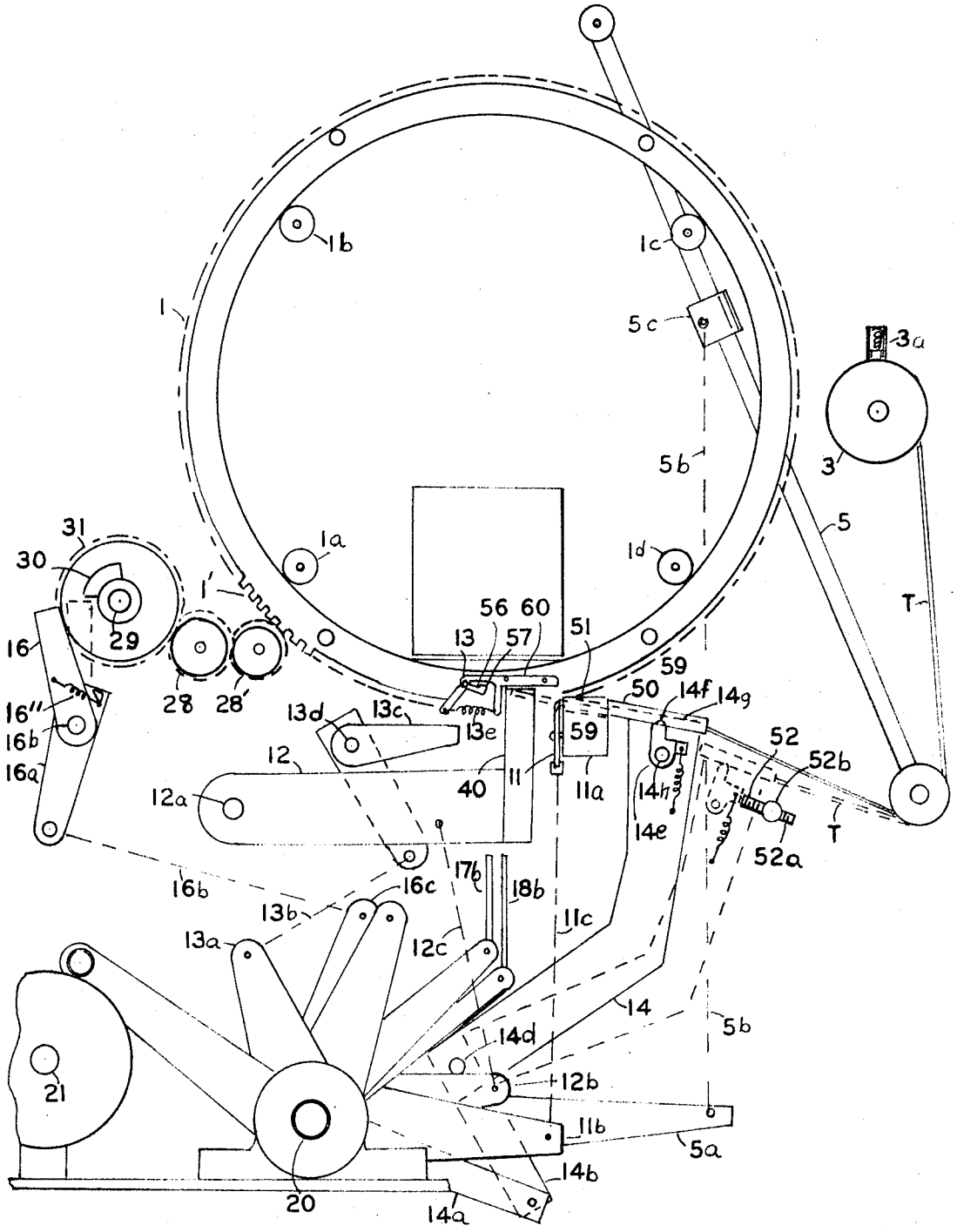


FIG 3

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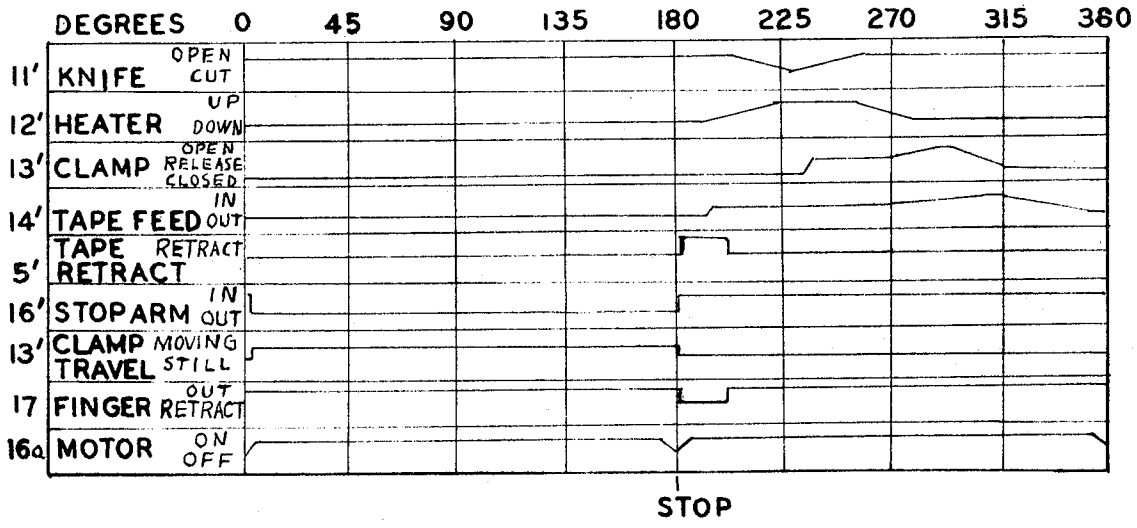


FIG 4

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BANDING MEANS

This invention relates to banding means, and more particularly, to means for wrapping and sealing a tape around a package.

The invention particularly relates to means for feeding a band around an article at the same time the article is being inserted in the banding station.

In conventional banding machines, the article or package is first inserted in the banding station and then the machine is energized to draw the band around the article or package.

In the present invention, the band is formed by four retractable fingers which are mounted on a rotary ring which encircles the banding station so that the band may be wrapped around the fingers while the package is being inserted. There is no snubbing action as the tape is fed. Since there is no strain on the tape, it may be fed faster without danger of snapping. As soon as the band is completely wrapped around, the fingers are retracted and the slack is taken up and the band snugly wrapped around the package, regardless of the size of the package, and the tape is then sealed.

Since a package may be inserted while the tape is being fed, the normal timing cycle is cut to approximately one half during production runs.

Accordingly, a principal object of the invention is to provide new and improved banding means.

Another object of the invention is to provide new and improved high speed banding means.

Another object of the invention is to provide new and improved high speed banding means for packages of variable sizes.

Another object of the invention is to provide new and improved high speed banding machines having four retractable fingers mounted on an encircling means which rotates around the package so that the tape is drawn around with no snubbing strain when the fingers are retracted and the slack taken up, the band is wrapped around the package.

Another object of the invention is to provide new and improved banding means wherein the package may be inserted while the tape is being fed around the banding station so that the normal time cycle is cut substantially in half.

Another object of the invention is to provide a new and improved banding machine of the type feeding a band around at least one article in a banding station, means adapted to encircle said banding station, a plurality of fingers movably mounted on said encircling means, said fingers being spaced so that a band formed by said fingers will encircle said article, means to feed said band so that said fingers form said band around said station, means to retract said fingers after said band is formed completely around and over said fingers and encircles said banding station, and means to pull said band snugly around said article in said banding station, whereby an article may be inserted into said banding station at the same time said band is being formed around said fingers.

These and other objects of the invention will be apparent from the following specification and drawings, of which:

FIGS. 1A–1H are diagrams illustrating the operation.

FIG. 2 is a front view of the ring and finger mechanisms.

FIG. 2A is a developed side view of an embodiment of the invention.

FIG. 3 is a front view of FIG. 2A.

FIG. 4 is a timing diagram showing the developed cam shapes.

Referring to the drawings, FIGS. 1A–1G illustrate the method of operation. FIG. 1A represents the starting position. The package P is placed on a fixed locating platform and extends through the ring 1 which is rotatably mounted. A tape clamp 13 is mounted on the ring 1 and the tape T is fed from the reel 3 around the guide roller 4, which is mounted on a long pivotally mounted arm 5. Four retractable fingers 6, 7, 8, 9 are mounted on the ring 1. The fingers are mounted so that as the ring rotates around the package, the tape is formed around the fingers. The fingers are rotatably mounted so that they can be retracted out of the tape path so that the tape can be tightened up around the package.

FIG. 1C shows the operation after the ring has rotated one turn. The tape T is wrapped around the fingers 6, 7, 8, 9.

FIG. 1E shows the next step with the fingers retracted and the arm 5 swung to the right to take up the slack in the tape T to cause the tape to be snugly wrapped around the package P.

Referring to FIG. 1E, the tape is sealed around the package by a heater 12. The free end of the tape is then gripped by the pawl 14*e* on the feeder arm 14 and the tape is severed by the knife 11.

Thereafter, FIG. 1G, the feeder arm feeds the free end of the tape T into the clamp 13 which returns the apparatus to the starting position of FIG. 1A.

Since a package may be inserted during the operation of wrapping the tape with the fingers, the average forming cycle is reduced by approximately one half. In other words, it is not necessary to insert the package before starting the cycle, so that the forming of the tape around the fingers, which is a substantial part of the cycle, and the inserting of the package may be done at the same time.

FIGS. 2 and 2A show front and side views of the mechanism for operating the fingers. The fingers 6, 7, 8, 9 are pivotally mounted on the ring 1 and are normally held in extended position against stops 8', 9', etc. by means of springs 15, one on each side. The upper pair of fingers are connected by a bar 17 and the lower pair of fingers by a bar 18. The fingers are adapted to be rotated to retracted position by means of the linkage comprising pivotally mounted members 17', 18' which are positioned to contact the bars 17 and 18 to rotate the fingers. On the other ends of the members 17' and 18' are connected linkage members 17*a*, 18*a* which are adapted to move vertically. The lower end of linkage members 17*a* and 18*a* are pivotally connected to crank arms 17*b* and 18*b*. The other ends of the crank arms 17*b* and 18*b* mount cam followers 17*c* and 18*c* which ride on cams 17*d*, 18*d* mounted on cam shaft 21, so that all the fingers are retracted simultaneously.

Referring also to FIG. 3, the tape T is wrapped around the box or package P by means of the traveling clamp 13 which is mounted on a ring 1 which is rotatably mounted on the frame. The ring 1 is driven by shaft 26, slip clutch 47, shaft 29, and gear train 29' 28, 28' which meshes with external gear 1' on ring 1. Camshaft 21 and ring 1 have a 2:1 ratio as the ring is rotated during only the first half of the camshaft 21 rotation. Ring 1 rotates on rollers 1*a*, 1*b*, 1*c*, 1*d*. Shaft 26 is motor driven by motor 43. A positioning stop 30 for the clamp drive is mounted on the disc 31 which is fixedly connected to the shaft 29. The stop 30 is adapted to be released by the stop arm 16 operated by cam 16' and is held open by cam 16' for one ring cycle. Arm 16 is spring connected to arm 16*a* by spring 16''. Arm 16*a* is cam operated by means of the linkage comprising pivotally mounted arm 16*a* journalled to the table, connecting link 16*b* and rocker arm 16*c* which is mounted on the rocker arm shaft 20 and the other end of which rides on the cam 16' mounted on the common camshaft.

The stop 30 is set to stop the clamp 13 in a position underneath the package P where it will receive the end of the tape from the tape feeder arm 14. The tape T is fed from the reel 3 around the roller 4 on arm 5 and thence to the tape feeding arm 14.

The heater and knife mechanisms and means for feeding the tape end to the clamp, and the clamp itself, may be as shown in U.S. Pat. No. 2,971,307. Cam shaft 21 is driven from shaft 26 by gear 21' and idler gear 21''.

The arm 14 is adapted to be actuated by the cam 14' by means of the linkage comprising rocker arm 14*a* which rides on the cam 14', connecting member 14*b* which is pivotally mounted on rod 14*d* and fixedly connected at its other end to the arm 14. The rod 14*d* is journalled to the frame.

The cam operated heating iron 40 is mounted to heat seal the plastic tape after it has been wrapped around the package or box P. The heating iron 40 is mounted on an arm 12 which is pivotally mounted to the main frame at the point 12*a*. It is connected to be actuated by the cam 12' by means of the linkage comprising the rocker arm 12*b* and a connecting link 12*c*

which is pivotally connected at its ends to the rocker arm **12***b* and the arm **12**. The heater **40** element may be the cartridge type of the kind employed in soldering irons. The 150 watt size has been found satisfactory.

A knife is connected to sever the tape T after the heat sealing. It comprises a rotatable knife blade **11** which is pivotally mounted on the block **11***a* on the frame and which is connected to be actuated by the cam **11'** by means of the linkage comprising the rocker arm **11***b* which rides on the cam and which is connected to the blade **11** by means of the connecting rod **11***c*.

The clamp **13** is normally spring closed by a spring **13***e*, but is adapted to be opened by means of the arm **13***c* moving arm **70** connected to clamp jaw **57**. Arm **13***c* is operated by the cam **13'** and connecting linkage comprising a rocker arm **13***a* and connecting member **13***b* connecting the rocker arm to the frame mounted shaft **13***d* and which is fixedly connected at its other end to the arm **13***c*.

Power to ring **1** is provided by motor **43** via shaft **26** and slip clutch **47**, the output of which is connected to shaft **29**. When the stop **30** is engaged by arm **16**, the clutch **47** slips. Shaft **29** is geared to ring **1** by gears **29' 28'**, **28**. The clamp **13** is fixed to the ring **1** and is shown in FIG. **3** in position to receive the end of the tape from the tape feeder **14** which is pivotally mounted on shaft **14***d* journalled to the frame.

The tape feeder **14** has a long extension **50** at right angles to the top of the arm in which the tape is held by a spring. The extension **50** fits through a slot **51** in the block **11***a* attached to the frame and to which the knife **11** is pivotally mounted. The tape feeder arm **14** is retracted to the position shown by the dotted lines when the knife **11** is operated. The arm **14** motion is at least the distance from knife **11** to clamp **13** in loading position.

The tape T is clamped in the arm **14** by means of the wedging action of the pawl **14***e* which is pivotally mounted on the arm. The upper end **14***f* of the pawl squeezes the tape against the surface **14***g*. The pivot point **14***h* is displaced from the contact point so that when the arm **14** is moved up, the pawl **14***e* grips the tape with a wedging action. However, when the arm **14** is rotated down, the pawl **14***e* does not grip the tape so that the tape can slip. The adjustable stop **52** opens the pawl **14***e* in a positive manner when the arm **14** is in the position shown in the dotted lines. The stop **52** comprises a screw **52***a* in a threaded stud **52***b* mounted on the frame. This permits the tape to ride freely during the travel time of the clamp. Also, since the ring travel is greater than the length of tape required to band the box, some tape must be retracted each cycle. This is done by the arm **5** pulling the tape back through the opened pawl **14***e*.

The arm **5** (FIG. **3**) is pivotally mounted and is operated by cam **5'** and linkage comprising rocker arm **5***a*, which is pivotally connected to one end of elongated member **5***b*, the other end of which is slidably connected to arm **5** by slide **5***c*. The reel **3** has a brake **3***a* set so it is not moved by movement of arm **5**. The arm **5** travel is sufficient to take up all slack for the smallest package P desired to be wrapped. Alternatively, the arm **5** could be spring loaded to the right in FIG. **3**, and the cam **5'** linkage omitted.

The ring **1** is driven in predetermined synchronism with the camshaft **21**. It is started by cam **16'** releasing arm **16** and it is stopped by cam **16'** which is connected to operate stop **30**. Ring **1** is driven from shaft **29** by gears **27**, **28**, **28'** which meshes with gear **1'** on ring **1**. The ring rotates twice as fast as the camshaft and only rotates from 0°–180° of the camshaft.

All cams are mounted on the common camshaft **21** which is mounted in the bearing blocks **21***a* and **21***b* connected to the frame. All the associated rocker arms are mounted on the common rocker arm shaft **20** which is mounted in the bearing blocks **21***a* and **21***b*, connected to the frame.

The knife **11** is pivotally mounted on the block **11***a* connected to the frame which has a slot **51** therein through which the tape feeder extension member **50** is inserted to feed the end of the tape to the clamp **13**. The knife **11** is pivotally connected to the connecting rod **11***c* which is pivotally connected at its other end to the rocker arm **11***b* mounted on the shaft **20**. The other end of the rocker arm **11***b* has a cam follower spring loaded against the cam **11'**. The blade **11** shears the tape with a scissor action against a stationary cutting edge **59**, FIG. **3**.

The heater iron **40** is mounted on the arm **12** which is pivotally mounted on the shaft **12***a* journalled to the frame. The arm **12** is operably connected to the connecting rod **12***c* which is connected at its other end to the rocker arm **12***b* mounted on the rocker arm shaft **20**. The other end of the rocker arm **12***b* has a cam follower which is spring loaded against the cam **12'**.

Clamp **13** comprises a plate member **60** having a recess **56** for receiving the end of the tape. The tape is then clamped in the recess by the arm **57** which is pivotally mounted on the plate **60**. An angled extension **70** of the arm **57** is spring loaded in closed position by the spring **13***e*. The clamp is adapted to be opened by means of the arm **13***c* and is connected at its other end by means of the connecting rod **13***b* to the rocker arm **13***a* mounted on the rocker arm shaft **20**. The other end of the rocker arm **13***a* has a cam follower which is spring loaded against the cam **13'**.

The tape feeder arm **14** is pivotally mounted on the shaft **14***d* journalled to the frame. Extension arm **14***b* is fixedly connected to the arm **14** and pivotally connected at its other end to the rocker arm **14***a* mounted on the rocker arm shaft **20**. The other end of the rocker arm **13***a* has a cam follower which is spring loaded against the cam **14'**.

The stop arm **16** initiates the ring cycle by cam release of stop **30** on the disc **31** mounted on the power shaft **29**. The stop control arm **16** is pivotally mounted on the shaft **16***d* which is journalled to the frame. The arm **16** is spring connected to arm **16***a* which is connected by means of connecting rod **16***b* to the rocker arm **16***c* mounted on the rocker arm shaft **20**. The other end of the rocker arm **16***c* has a cam follower which is spring loaded against the cam **16'**. The ring cycle is stopped by action of cam **16'** moving arm **16** to stop position.

The plate **60** preferably contains a rubber insert, for instance, of soft, heat resistant rubber, against which the heater iron seals the tape together. The use of the rubber insert prevents loss of heat since it is an insulator and also due to the fact that it is elastic so that maximum contact is obtained between the heater iron and the tape.

All of the mechanisms above described are synchronized and controlled in a predetermined sequence by means of the cams mounted on the motor driven camshaft. The sequence of operation is plotted by the cam development diagrams of FIG. **5**. Each diagram is the developed periphery of the respective cam.

Referring to FIG. **4**, to start the cycle, momentary pushbutton switch **60** starts motor **43** which rotates cam **60***a* off the indent and engages bypass switch **60'** which holds the motor **43** on from 0°–180° and then stops it. The tape is formed around the fingers during 0°–180°. At 180° a package is inserted and switch **60** pushed again for the wrapping operation. More specifically, the stop **30** is released by the cam **16'** and the tape is pulled by the fingers of the ring **1**. After one ring revolution the ring is stopped (180°) by stop **30** hitting arm **16**, the stop arm having been moved into position by cam **16'**.

The fingers are then released by cams **17***d*, **18***d* and associated linkage (180°) and the long tape feed arm **5** is retracted by cam **5'** and its linkage (180°) to take up the slack and wrap the tape snugly around the package. The slight slack caused by the clamp is taken up by the elasticity of the tape after the package and wrapped tape are slid off the clamp and ejected.

The heating iron **40** is then actuated by the cam **13'** to heat seal the tape loop (220°–250°) and the knife **11** is actuated by the cam **11'** to cut the tape (230°). The clamp **13** is then released by the cam **13'** and connected linkage. The package is now ready to be ejected. The tape feed cam **14'** has moved

arm **14** (190°) so that the tape is gripped by pawl **14***e* before the tape end is severed. The tape feeder arm is then rotated by the cam **14'** and associated linkage to place the end of the tape into the clamp **13**. The clamp grips the tape (320°) as the clamp arm **13***c* is released. The tape feeder arm **14** is retracted out of the way of the knife during the cutting. The apparatus is now ready for a new cycle.

The encircling means is shown as a ring, but may be a chain on a track or other equivalent means.

I claim:

1. In a banding machine of the type feeding a band around at least one article in a banding station,

means adapted to encircle said banding station,,

a plurality of fingers movably mounted on said encircling means, said fingers being spaced so that a band formed by said fingers will encircle said article,

means to feed said band so that said fingers form said band around said station,

means to retract said fingers after said band is formed completely around and over said fingers and encircles said banding station,,

and means to pull said band snugly around said article in said banding station,

whereby an article may be inserted into said banding station at the same time said band is being formed around said fingers,

said encircling means being a member rotatably mounted so as to encircle said banding station.

2. Apparatus as in claim **1** wherein said means to take up said band comprises a long arm having sufficient travel to take up all slack in said tape when said tape is released by retracting said fingers.

3. Apparatus as in claim **2** wherein said finger retracting means comprises a plurality of members pivotally mounted on the frame of said machine.

4. Apparatus as in claim **3** having means to seal said tape around said article, and means connected to sever said tape from the feed roll of said tape.

* * * * *