Jan. 9, 1945. J. J. CHEESMAN 2,367,168

PACKAGE BINDING

Filed Sept. 1, 1942 3 Sheets-Sheet 1

FIG. 1.

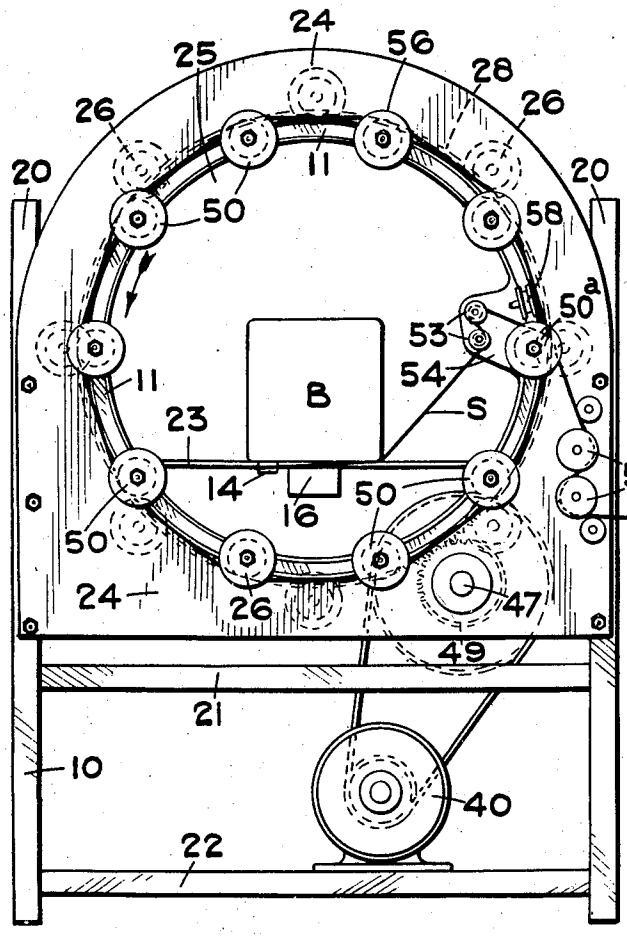
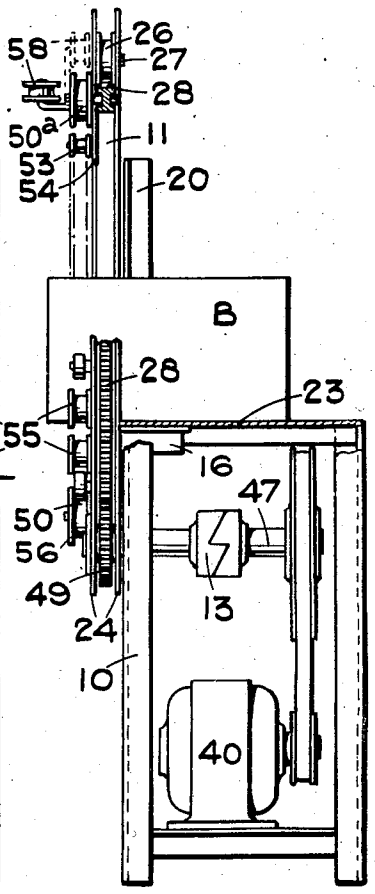


FIG. 2.



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Filed Sept. 1, 1942 3 Sheets-Sheet 2

FIG. 3.

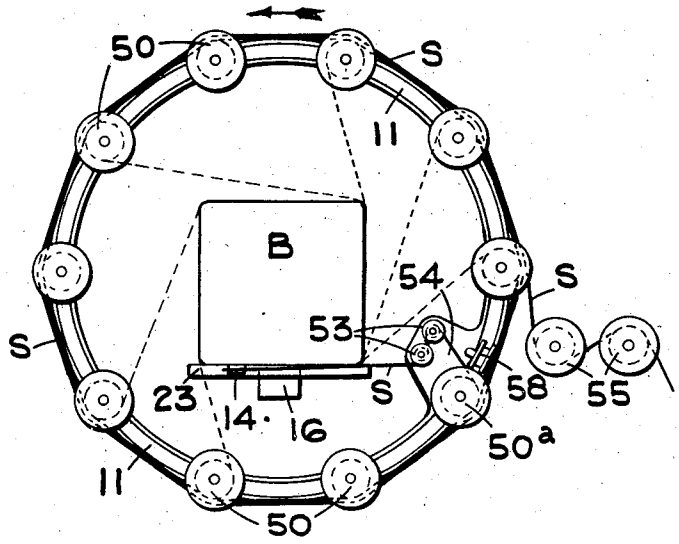
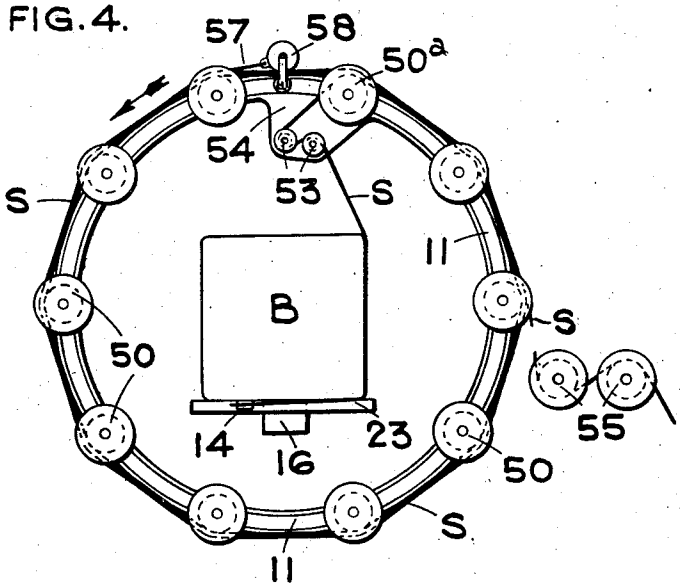


FIG. 4.



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PACKAGE BINDING

Filed Sept. 1, 1942 3 Sheets-Sheet 3

FIG. 5.

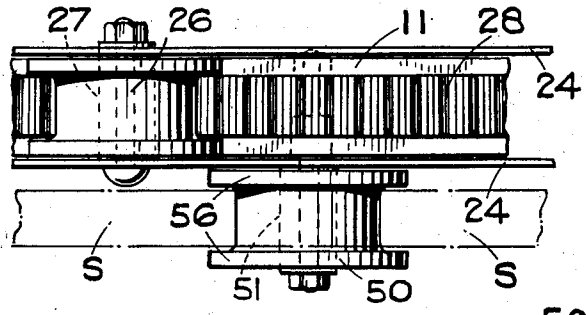


FIG. 7.

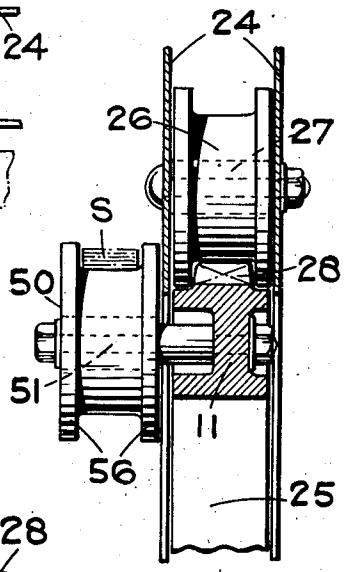


FIG. 6.

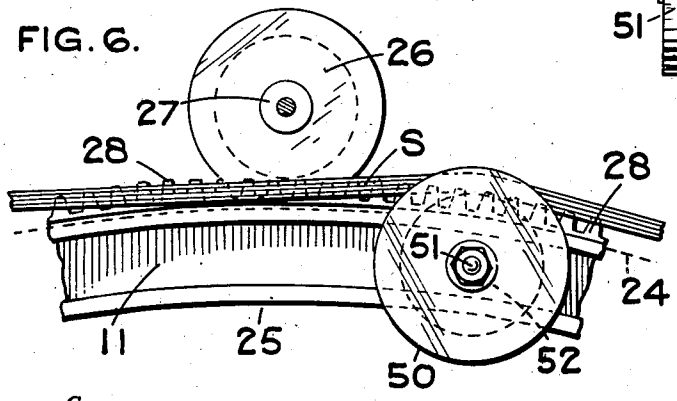
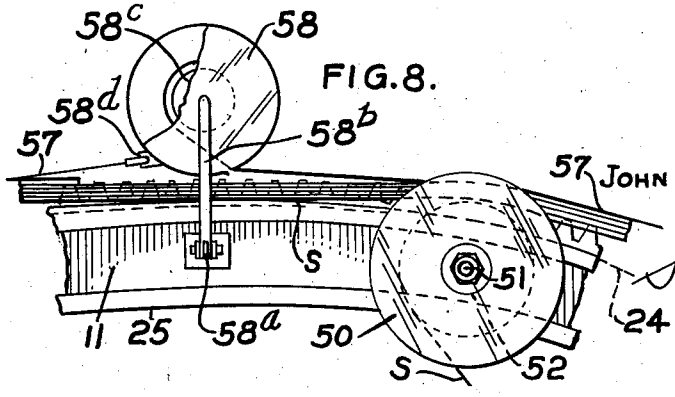


FIG. 8.



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UNITED STATES PATENT OFFICE

2,367,168

PACKAGE BINDING

John James Cheesman, Gerrards Cross, England

Application September 1, 1942, Serial No. 456,944
In Great Britain September 2, 1941

17 Claims. (Cl. 100—31)

This invention relates to mechanism for binding packages or like articles with flexible material and its principal object is to provide new or improved unidirectional means for training metal strip or band in such binding operations.

The terms "unidirectional" and "unidirectionally" are used herein to denote passage or rotation of a ring or equivalent training device or of a coil of strip or band around the article always in the same direction in successive binding operations, without intermediate reverse rotation between the operations. Again, the term "article" includes different parts of a single article or a number of articles to be bound in successive operations, where the context so requires.

Consider a freely rotating roller on a ring which is unidirectionally rotated intermittently, one revolution at a time during each of which revolutions the strip is laid once around the article. At the start, the strip passes over the roller from the supply to a gripper adjacent the article to be bound, the roller lying adjacent the strip which is accordingly undeflected thereby and passes directly from the supply to the gripper. Now the ring is rotated through one revolution bringing the roller back to its starting position. During this revolution the strip will have been caught up and laid around the article and the supply portion thereof will be left overlying the free gripped end for connection thereto. It will be appreciated that the length of strip which is drawn from the supply during this single revolution, assuming it to be fed through tension rollers immediately adjacent the outer circumference of the ring, will be sufficient to lap the ring once together with what is needed to bind the article. At the commencement of the next operation therefore, the ring will start off with a complete lap of strip around it and a further complete lap will be added at each succeeding revolution of the ring in addition to what is required for the binding of the article during that revolution. The result is that a stock of strip will be built up around the ring at the rate of one complete lap each revolution. After the first one or two revolutions the effect of this is that sufficient strip to bind the article is withdrawn from the interior of this coil at each revolution while simultaneously the same length together with a complete lap of the coil is laid around the outside of the latter. It is clear that this process cannot be allowed to continue indefinitely, so accommodation must be provided on the ring for the stock which is built up in the manner indicated, and in order that the device may be commercially practical, arrangements must also be made for consuming this accumulated stock at intervals.

According to the invention, I bind articles with strip or band which is supplied substantially in the plane of binding by deflecting strip which extends between the supply and the article to be bound, by means of a member passing unidirectionally around the article which member trains the strip about the latter and I also support around but out of contact with the article, the aditional strip which is simultaneously drawn from the supply during a number of successive passages of the said member around the article. The mechanism I use preferably comprises a training device which carries in the said plane a seating permitting mobility of the strip on the said training device about the article, a drive for the said device whereby the seating is rotated unidirectionally around the article, means permitting passage of the strip through the seating to the article and means providing accommodation for the stock of strip which is simultaneously accumulated during a number of successive rotations of the seating around the article.

Also according to the invention I bind articles with strip taken off the coil of strip such as is accumulated in the manner just mentioned, by rotating the coil unidirectionally around the article and controlling the coil so that the strip is kept sufficiently tightly wound during such rotation of the coil, the strip passing from the interior of the coil to the article for instance over the aforementioned deflecting member or through the said seating which also moves around the article when the coil is rotated.

The invention may be put into practice by providing a training device in the form of a ring carrying a series of coplanar freely rotatable flanged rollers mounted around it to constitute the mobile seating for the strip which is fed in from a convenient fixed point outside the ring and in the same plane with the rollers while the end of the strip passes over one of the rollers which functions as a deflecting member, to the article being bound within the ring. The strip may be accumulated to the depth of the flanges, which serve as lateral containing means for the strip which is accumulated during binding and may be drawn off the ring with comparatively little friction. The strip will be accommodated lap upon lap between the roller flanges and since the latter are of course free to rotate with the actual roller surface on which the lowermost lap of strip rests, frictional effects on the edges of

the strip are also largely avoided. The construction may however be such that frictional effects on the edge of the strip are not eliminated as for instance when the ring is built up of two coaxial annular plates spaced apart a little more than the width of the strip which is accommodated on plain cylindrical rollers between the annular plates.

In order to secure the necessary mobility the laps of strip should lie about the ring in a form which does not depart too much from the circular so as to avoid such bends as would be caused by accommodating it on an insufficient number of rollers. The rollers should therefore be at reasonably close spacing around the ring whereby more than a slight change of direction of the strip from one to the next is avoided.

It should be understood that as with all training devices of the rigid ring type there may be a minimum-circumference article which can be successfully bound by means of a ring of any particular size. Accordingly the references in this specification to sufficient tension being maintained on the strip are subject to this known relation, operations in which the article by reason of its small size and/or position in relation to the ring, result in loose excess strip remaining between the ring and the article at the conclusion of a rotation of the ring around the article being excluded from the definitions of the invention which are herein contained.

The invention will now be described with reference to the accompanying drawings in which a constructional embodiment is illustrated by way of example.

Fig. 1 of these drawings shows in front elevation a machine fitted with a ring for binding metal strip or band about the article;

Fig. 2 is a side elevation of the machine shown in Fig. 1, but broken away in part and omitting details which would interfere unnecessarily with the clarity of the illustration, and for the same reason showing the take-off roller in a position at the top of the ring instead of in that shown in Fig. 1.

Fig. 3 is a diagrammatic front elevation showing how the strip is laid about an article during a revolution of the ring;

Fig. 4 is a similar diagrammatic view to Fig. 3, showing an article being bound with strip accumulated on the ring, the supply to which is cut off;

Fig. 5 is a detail fragment of the ring and fittings thereof drawn to a much larger scale in plan;

Fig. 6 is a similar view in front elevation;

Fig. 7 is a similar view in section, and

Fig. 8 is a view similar to Fig. 6 showing means whereby the accumulated strip may be kept coiled after severance of the supply.

The construction, mounting and driving of the ring in the illustrated machine follows known practice for wire binding machines wherein the bight of wire is fed in from the front at right angles to a shuttle mounted on the ring, which thus acts purely as a suitable support for carrying this shuttle round the article. The shuttle is omitted in the present machine being replaced by other suitable means which constitutes the special feature of the invention.

Describing firstly those parts of the present machine which follow known practice in the machine just referred to, we have a supporting frame **10**, a ring **11** rotatably mounted thereon and means for operating and controlling the ring.

The frame **10** is provided to carry the various parts of the machine and may be formed and proportioned to act as a table for supporting the articles or boxes B to be bound and may include legs or uprights **20** and upper and lower horizontal members **21** and **22** extending between and connecting the uprights. The uprights **20** and the horizontal members **21** and **22** may be formed of angle iron. A plate or top **23** is provided on the upper side of the supporting frame **10**. The upper side of the top **23** is preferably flat and horizontal to form a table or support for the object or box B being bound. It is to be understood that the supporting frame **10** may be of any other suitable construction and design.

The ring **11** is a rigid continuous member and in the construction illustrated is rotatable about a fixed horizontal axis. Suitable supporting and bearing means are provided on the frame **10** to carry the ring **11**. Two uprights **20** of the frame **10** may be extended to project upwardly beyond the top **23** and vertical plates **24** are secured to the outer sides of the extended portions of the uprights **20**. The plates **24** are shaped to define or have a horizontal opening **25** whose diameter is somewhat larger than the internal diameter of the ring **11**. The ring **11** is arranged between the spaced plates **24** in concentric relation to the opening **25**. An annular series of spaced rollers **26** carries the ring **11** for rotation. The rollers **26** are rotatably supported between the plates **24** on ball or roller bearing hubs **27**. The ring **11** has an external or peripheral flange **28** and the rims of the bearing rollers **26** are grooved to receive the flange **28**. The ring **11** supported as just described has its major portion projecting above and a smaller part extending below the top **23** adjacent the near edge of the latter.

A suitable means for rotating the ring **11** in one direction only is driven from a motor **40** to turn the ring **11** through one revolution in each binding cycle of the machine and may be started by a manual operation and stopped on completion of the revolution of the ring by the action of a control part thereon. This means, including a clutch **13**, is not shown in detail in the drawings, being well known in the art. The shaft **47** transmits the drive to the ring through a pinion **49** which is mounted on this shaft between the plates **24** and meshes with gear teeth cut in the aforementioned peripheral flange **28** of the ring.

Turning now to the consideration of those features whereby the illustrated machine is differentiated from the known shuttle type, we have in place of the shuttle a set of rollers **50** spaced around the ring **11** and mounted on pins **51** projecting laterally therefrom and constituting the essential novel feature. These rollers must be sufficiently spaced from the ring to clear the near side plate **24**. They may be very similar to the bearing rollers **26** and similarly provided with ball or roller bearing hubs **52**. The distance between their flanges **56** must of course determine the possible width of strip which can be used. One of these rollers, **50a**, acts as the take-off roller and may have associated with it a set of adjustable rollers **53** to act as a tension feeding device for the strip S passing to the article B which rollers are mounted on a plate **54** supported by the ring. Tension rollers **55** for supplying strip to the rollers **50** are mounted on the near side plate **24** so that they lie in the plane of rollers **50**. Rollers **55** should be adjustable in known manner for the purpose of controlling the tension of the

strip which is drawn onto rollers **50** by and during revolution of the ring **11**.

The operation of the device will be clear from a consideration of the various figures. In the first place it should be mentioned that **14** is a gripper located on the near edge of top **23** in the same plane as rollers **55**, **50** and **53**. It may be of any suitable form to take in tension an end of strip which is inserted preferably laterally as this will be from the front of the machine. At the commencement of a binding cycle the strip S passes direct from the supply rollers **55** to the gripper **14**, the take-off roller **50***a* then occupying its rest position just beneath the strip which position is shown in Fig. 3, though this figure actually shows the state of the strip on completion of two binding revolutions of the ring. If the take-off tension rollers **53** are used, the end of the strip will have to be threaded between these before passing to the gripper. Figure 1 shows the position of the strip shortly after commencing the first revolution of the ring. Various subsequent positions are indicated in Fig. 3 in which the variation in the length of the strip passing between roller **50***a* and the article during the revolution of the ring is clearly brought out.

When the take-off roller **50***a* has regained its original position the strip will have passed around the article and will overlie the gripper (which should accordingly be as shallow as possible) and the original end part of the strip. A suitable sealing mechanism of any known kind is indicated at **16** for the purpose of interconnecting the two lengths of strip which lie one beneath the other. The front edge of top **23** may be suitably gapped to permit this sealing device to operate. This is common practice in strip sealing machines of the kind as is also the association with such machines of strip tensioning means and cutters. In fact **16** may be a standard hand operated sealing machine inverted beneath the top **23**. However as it is necessary to leave the plane of binding entirely clear during the revolution of the ring the sealing device **16** must be mounted in such a way that it can be withdrawn from this plane as for instance making it capable of swinging or sliding back therefrom beneath the top **23** during the binding. It is to be understood that the means for tensioning, sealing or otherwise connecting and severing the ends of the strip following binding form no part of the present invention which is solely concerned with the binding operation and the means for effecting it.

At the conclusion of the first revolution of the ring it will be appreciated that the latter will now have nearly a complete lap of strip about it on the rollers **50**. The reason why the lap is not quite complete will be apparent from Fig. 3 which shows how the spacing of rollers **55** away from the ring brings this about. As already remarked, Fig. 3 actually shows the condition at the end of the second revolution when there is a complete lap together with an outer nearly complete one. This process of binding articles whilst simultaneously building up a stock of strip on rollers **50** is only limited by the depth of the flanges **56** on these rollers in relation to the thickness of the strip used. When the rollers are full as shown in Fig. 4 (in Figs. 6 and 7 they are shown only partly full) the supply strip from rollers **55** is cut (naturally whilst ring **11** is stationary) and in order to maintain the coiling of the strip on rollers **50** a device **57** is brought into operation. This is to secure the coil to prevent the severed end from swinging out but in such a way as not to bind or seize up the coil by preventing the free end from sliding over the lap of strip beneath it. The device **57** as shown is in the nature of a resilient clamping band about the coil which should preferably be attached at one end to the ring **11** near the point where the supply strip is severed so that it can be applied round the coil in the direction of the strip coiling, i. e., oppositely to the direction of rotation of the ring, and secured at its other end to the same point of the ring. In this way the clamping band can very nearly fully encircle the coil at the time the strip is cut so that the latter has no chance to uncoil. The clamping band which may be of canvas, metal or other suitable material is most conveniently mounted in a spring coil container **58** which can be swung into and out of operative position. In Figs. 1 and 3 this container is shown swung out of the binding plane, so as not to interfere with the supply of strip to the ring from rollers **55**, whilst in Fig. 2 the same inoperative position is shown in full whilst the operative position is shown dotted.

The mounting of container **58** on the ring is shown in detail in Fig. 8, wherein **58***a* is a hinge mounted on the side of the ring and at a sufficient distance laterally thereof to ensure that the arm **58***b* which carries the container on its cranked extremity, stands clear of the strip to the side thereof, when the container is in its operative position. The container is shown partly broken in Fig. 8 so that the manner in which the clamping band is accommodated around the central spring drum **58***c* can be seen, it being understood that the container is shown almost empty of band because of the latter being drawn out around the coil of strip S on the ring with its end secured to the hook **58***d* on the container.

If a spring tensioned clamping band is not employed then the material of the band must itself be elastic. The condition of the fully loaded ring with the clamping band in position is shown in Fig. 4, in which an article is partly bound. The free end of band **57** having been drawn round the coil of strip to a position close behind the place where the supply strip has been cut (i. e., most of the way round it), is then coupled up with the container **58** as by hooking it thereto, immediately severing has taken place. The tensioning of band **57** may be made adjustable by setting the spring in drum **58***c* and should be such that the pressure on the coil of strip resisting settling of the laps with consequent sliding thereof one over another as strip is taken off from the underside over roller **50***a* during continued binding operations, corresponds in effect with the pull of the strip from rollers **55** during the time that strip is being fed therefrom to the ring. The correct adjustment of rollers **55** and then of clamping band **57** may well render the use of the take-off tensioning rollers **53** unnecessary. Accordingly in Fig. 8 these rollers are omitted, it being understood that even if provided they need not be used since the strip can be passed directly to the article from any one of the rollers **50**, providing that the ring is geared to the drive so that the selected roller stops at each revolution in the right position in relation to gripper **14**. When the stock of accumulated strip is sufficiently exhausted the clamping band **57** may be removed and the free end of strip connected to the supply from rollers **55** as by welding.

Having now particularly described and ascer-

tained the nature of my said invention, and in what manner the same is to be performed, I declare that what I claim is:

1. Mechanism for binding articles with band or strip material which is supplied substantially in the plane of binding from a main source of supply comprising a training device, seating means in said plane mounted on said training device and adapted to carry the material about the article to be bound, means for rotating said training device unidirectionally about the article, whereby the material is caused to pass from the main source of supply to the seating means and thence to and around the article, said seating means being adapted to accommodate material which is accumulated during binding.

2. Mechanism according to claim 1 together with tensioning means for the band or strip material between the main source of supply and the seating means.

3. Mechanism according to claim 1 together with tensioning means for the band or strip material between the seating means and the article to be bound.

4. Mechanism according to claim 1 together with means whereby upon discontinuance of the supply of band or strip material from the main source of supply and after a stock of material has been accumulated on the seating means, the said stock can be controlled to permit continued withdrawal therefrom of material for binding articles.

5. Mechanism according to claim 1 together with means whereby upon severance of the band or strip material from the main source of supply and after a stock of material has been accumulated on the seating means, the said stock is kept coiled about the seating means so as to permit continued withdrawal therefrom of material for binding articles.

6. Mechanism according to claim 1 together with means whereby upon severance of the band or strip material from the main source of supply and after a stock of material has been accumulated on the seating means the said stock is contained about the seating means with like mobility thereon as before severance of the material so as to permit continued withdrawal of the latter from the seating means for binding articles.

7. Mechanism according to claim 1 together with tensioning means for the band or strip material between the seating means and the article to be bound and means whereby upon discontinuance of the supply of material from the main source of supply and after a stock of material has been accumulated on the seating means, the said stock can be controlled to permit continued withdrawal therefrom of material for binding articles, said stock controlling means comprising the said tensioning means in conjunction with means whereby the stock is kept coiled about the seating means.

8. Mechanism for binding articles with band or strip material which is supplied substantially in the plane of binding from a main source of supply comprising a training device, a series of freely rotatable rollers mounted on said training device and arranged in the plane of binding and around the article to be bound, means for rotating the said training device unidirectionally about the article whereby the material is caused to pass from the main source of supply to the rollers and thence to and around the article, the rollers being provided with lateral containing means to permit of accommodation thereon of material which is accumulated during binding.

9. Mechanism according to claim 8 wherein the rollers are provided with flanges constituting the lateral containing means for the accumulated band or strip material.

10. Mechanism according to claim 8 together with a band whereby upon severance of the band or strip material from the main source of supply and after a stock of material has been accumulated on the rollers the said stock is kept coiled about the latter by means of the band passed peripherally around it so as to permit of continual withdrawal of material from the rollers for binding articles.

11. Mechanism and means for binding articles with band or strip material comprising a training device, seating means mounted on said training device substantially in the plane of binding, means for rotating said training device unidirectionally about the article to be bound, a coil of band or strip material carried on said seating means and about the article and means for controlling the said coil to permit withdrawal of the band or strip material for binding articles, from the seating means and from inside the coil.

12. Mechanism and means according to claim 11 wherein the coil of band or strip material is controlled by means for keeping it coiled about the seating means.

13. Mechanism and means according to claim 11 wherein the coil of band or strip material is controlled by means for keeping it coiled about the seating means in conjunction with means for tensioning the material passing to the article from the said seating means.

14. Mechanism and means according to claim 11 wherein the means for controlling the coil of band or strip material comprises a band passed peripherally about it whereby it is kept coiled about the seating means.

15. Method of binding articles comprising supporting an article within a coil of band or strip material, fixing one end of the coil adjacent the article and rotating the coil around the article while controlling the coil to permit withdrawal of material from the interior thereof onto and about the article.

16. Method of binding articles comprising supporting an article within a coil of band or strip material, fixing one end of the coil adjacent the article and rotating the coil around the article while keeping the material coiled to provide tension therein for binding as material is withdrawn from the interior of the coil onto and about the article.

17. Method of binding articles comprising supporting an article within a coil of band or strip material, fixing one end of the coil adjacent the article and rotating the coil around the article while maintaining tension in the material between the coil and the article as material is withdrawn from the interior of the coil onto and about the article for binding.

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