Jan. 10, 1956 J. J. CHEESMAN 2,730,036

PACKAGE AND LIKE BINDING MECHANISM

Filed May 29, 1951 11 Sheets-Sheet 1

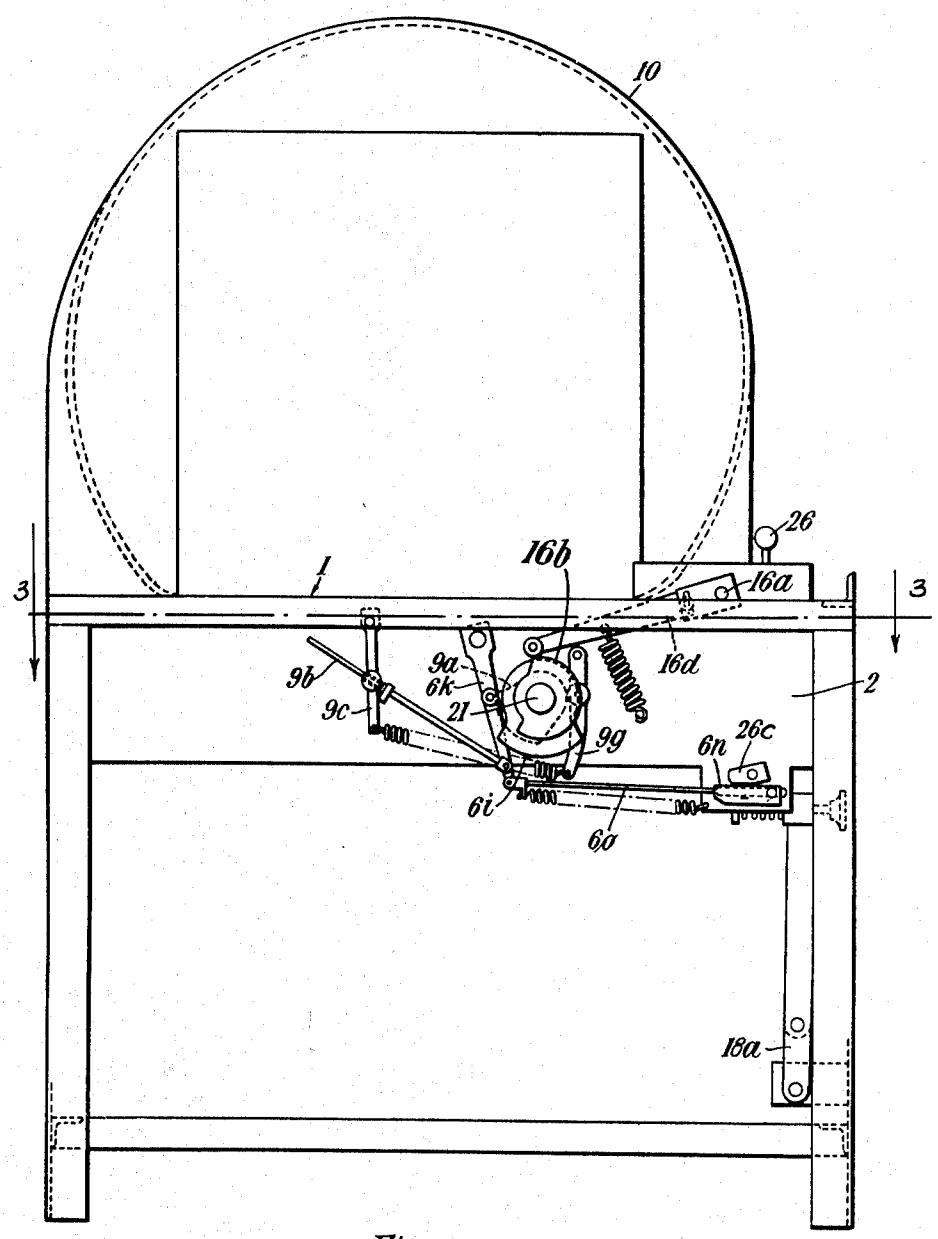


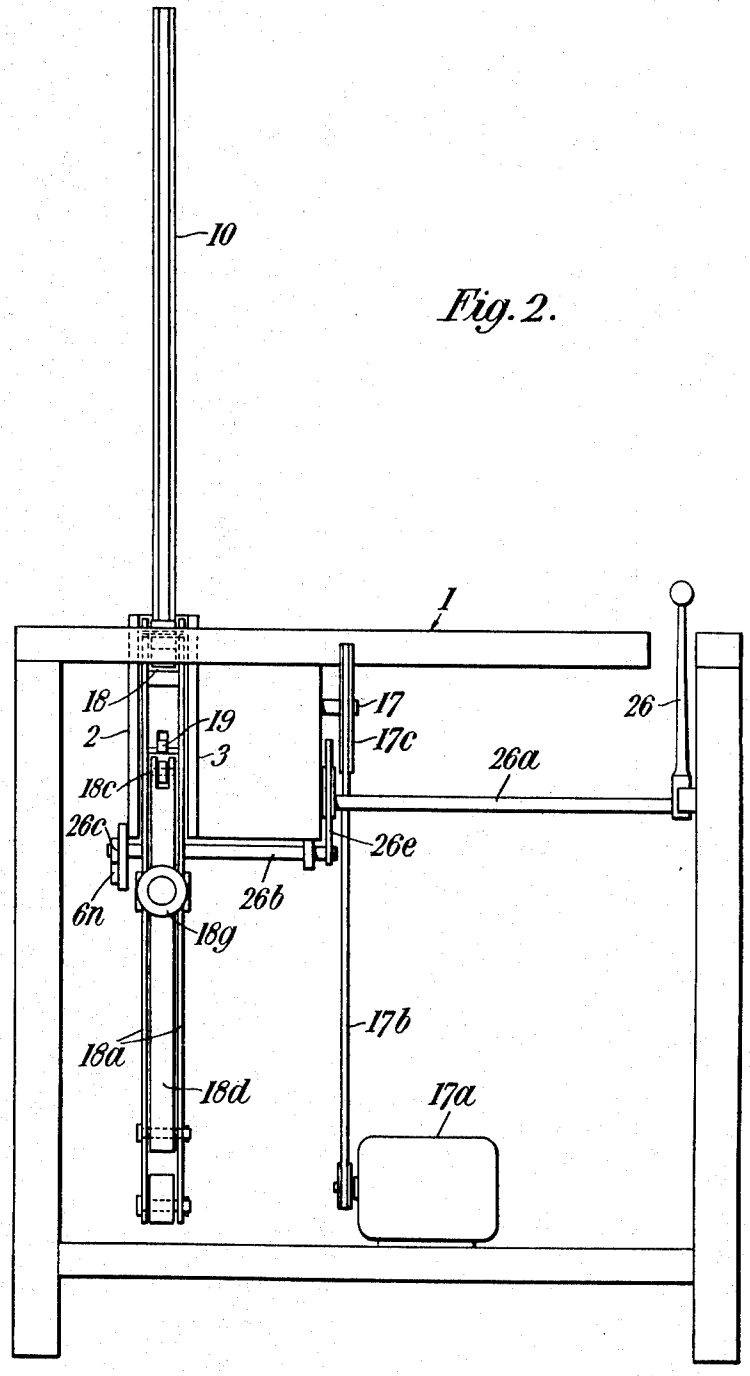
Fig. 1.

INVENTOR
John J. Cheesman
by Seidemer & Parker

PACKAGE AND LIKE BINDING MECHANISM

Filed May 29, 1951 11 Sheets-Sheet 2

Fig. 2.



INVENTOR
John J. Cheesman
by Serrimeau & Parker

Jan. 10, 1956 J. J. CHEESMAN 2,730,036

PACKAGE AND LIKE BINDING MECHANISM

Filed May 29, 1951 11 Sheets-Sheet 3

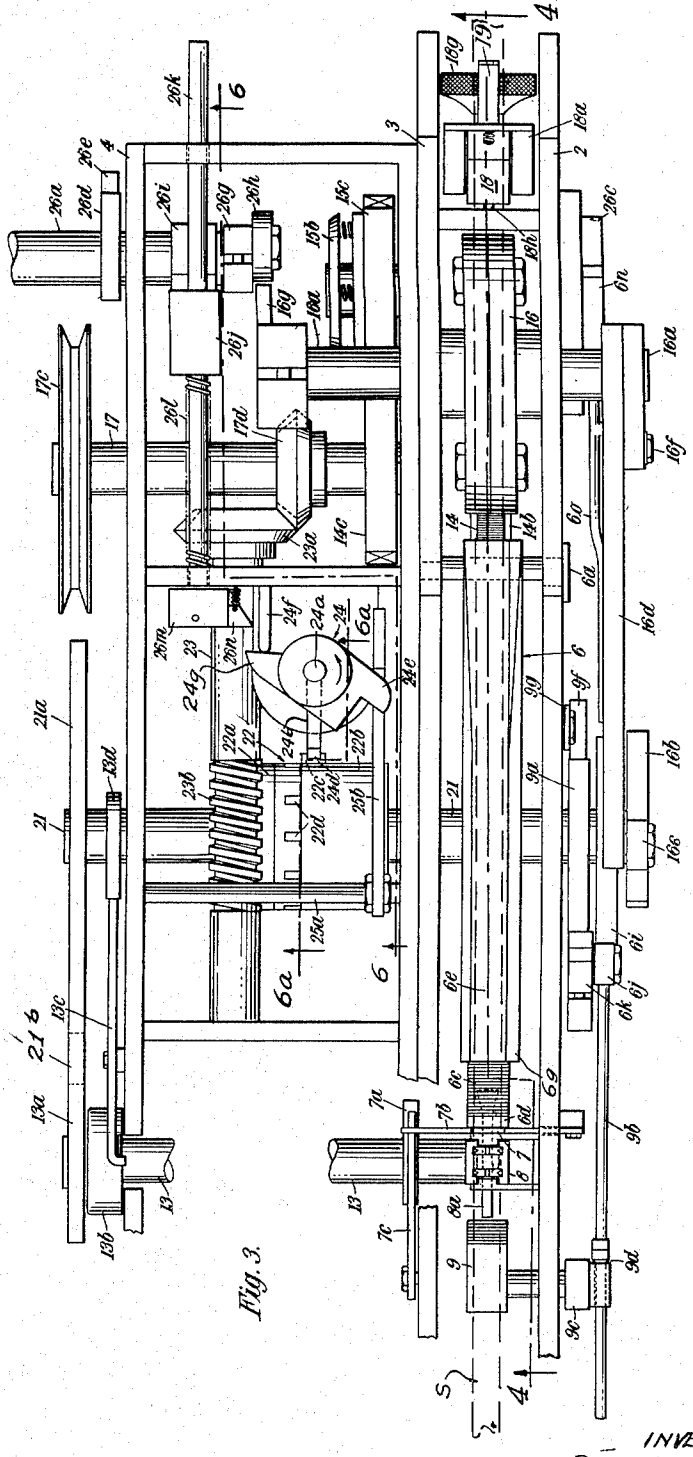


Fig. 3.

INVENTOR
John J. Cheesman
by Seinauer & Parker

Jan. 10, 1956 J. J. CHEESMAN 2,730,036

PACKAGE AND LIKE BINDING MECHANISM

Filed May 29, 1951 11 Sheets-Sheet 4

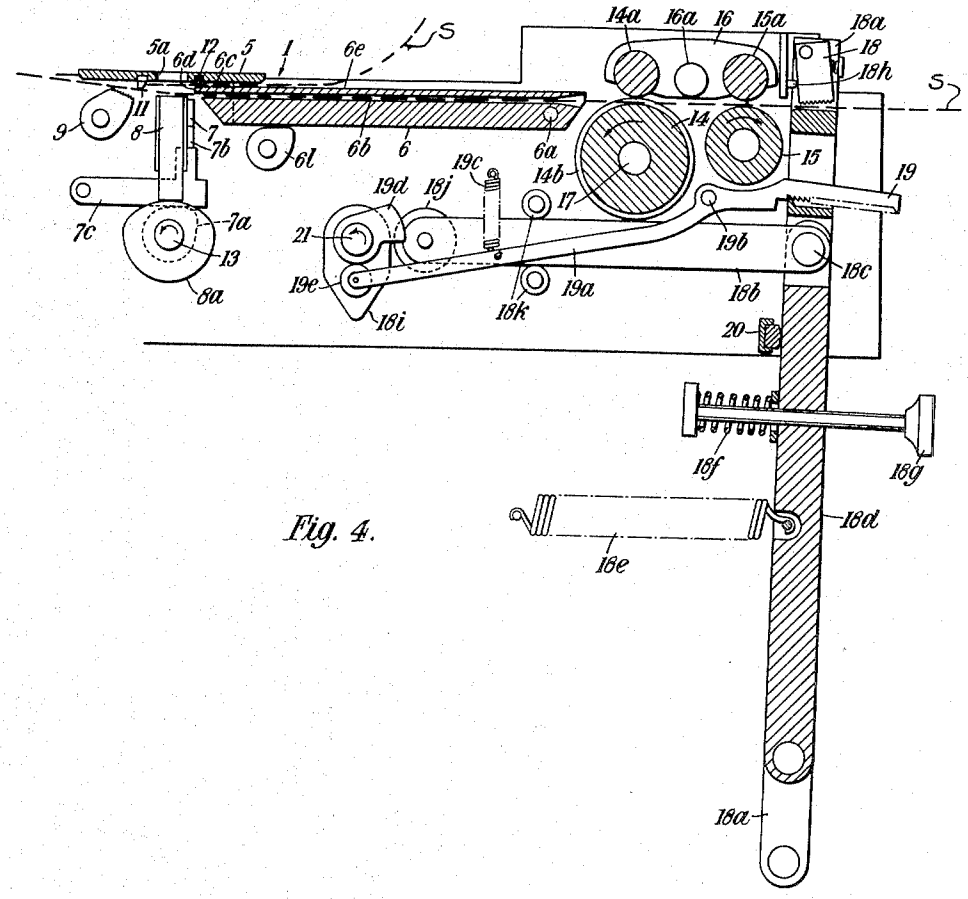


Fig. 4.

INVENTOR
John J. Cheesman
by Scrivener & Parker

Jan. 10, 1956 J. J. CHEESMAN 2,730,036

PACKAGE AND LIKE BINDING MECHANISM

Filed May 29, 1951 11 Sheets-Sheet 5

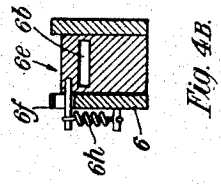


Fig. 4B.

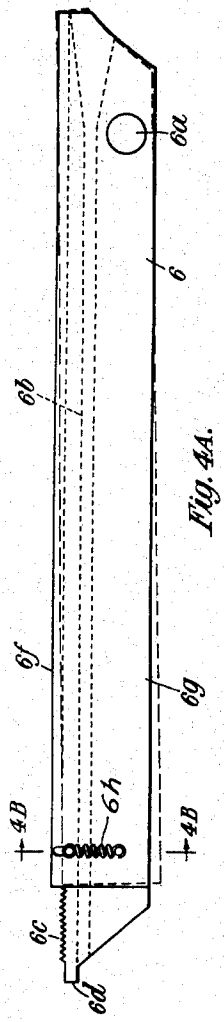


Fig. 4A.

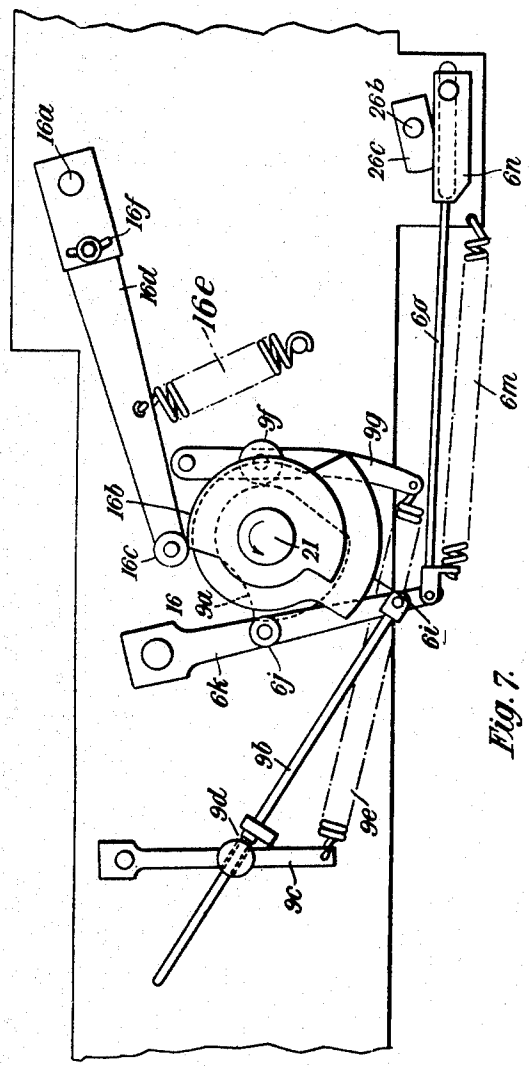


Fig. 7.

INVENTOR
John J. Cheesman
by Scrivener & Parker

Jan. 10, 1956 J. J. CHEESMAN 2,730,036

PACKAGE AND LIKE BINDING MECHANISM

Filed May 29, 1951 11 Sheets-Sheet 6

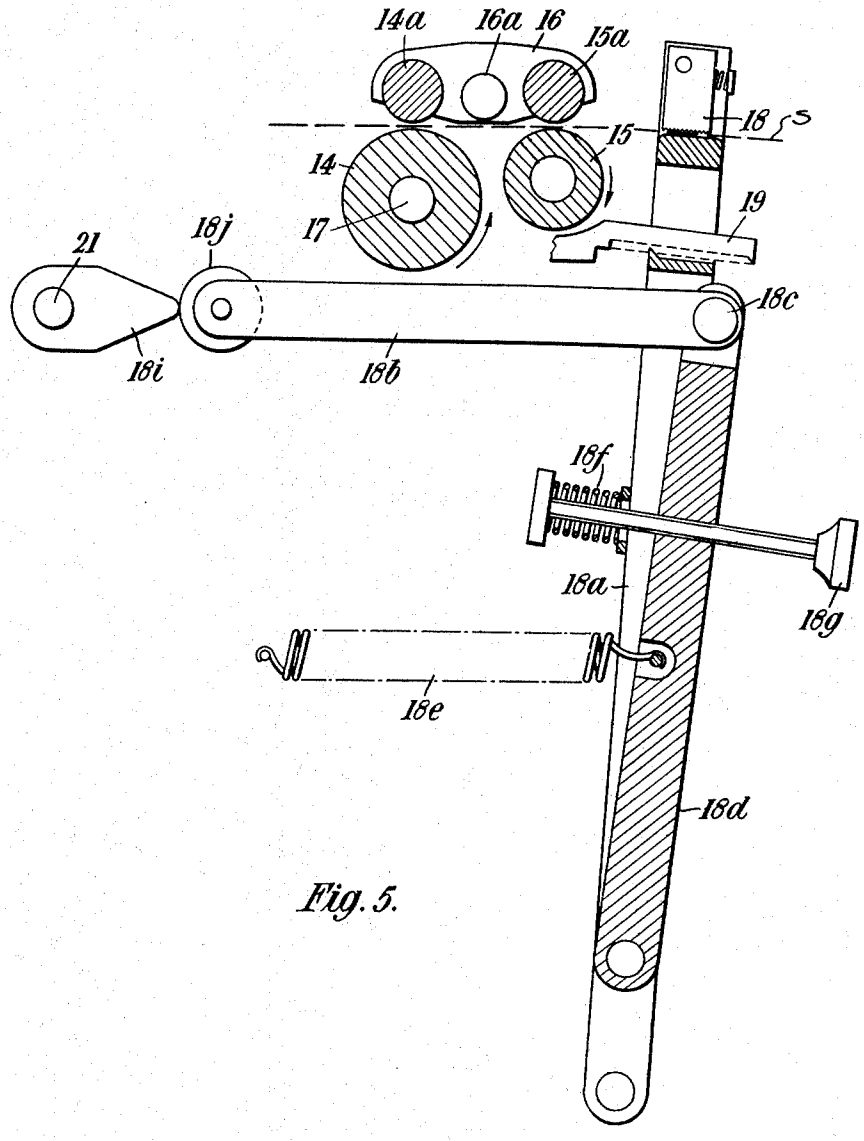


Fig. 5.

INVENTOR
John J. Cheesman
by Seidenberg & Parker

Jan. 10, 1956 J. J. CHEESMAN 2,730,036

PACKAGE AND LIKE BINDING MECHANISM

Filed May 29, 1951 11 Sheets-Sheet 7

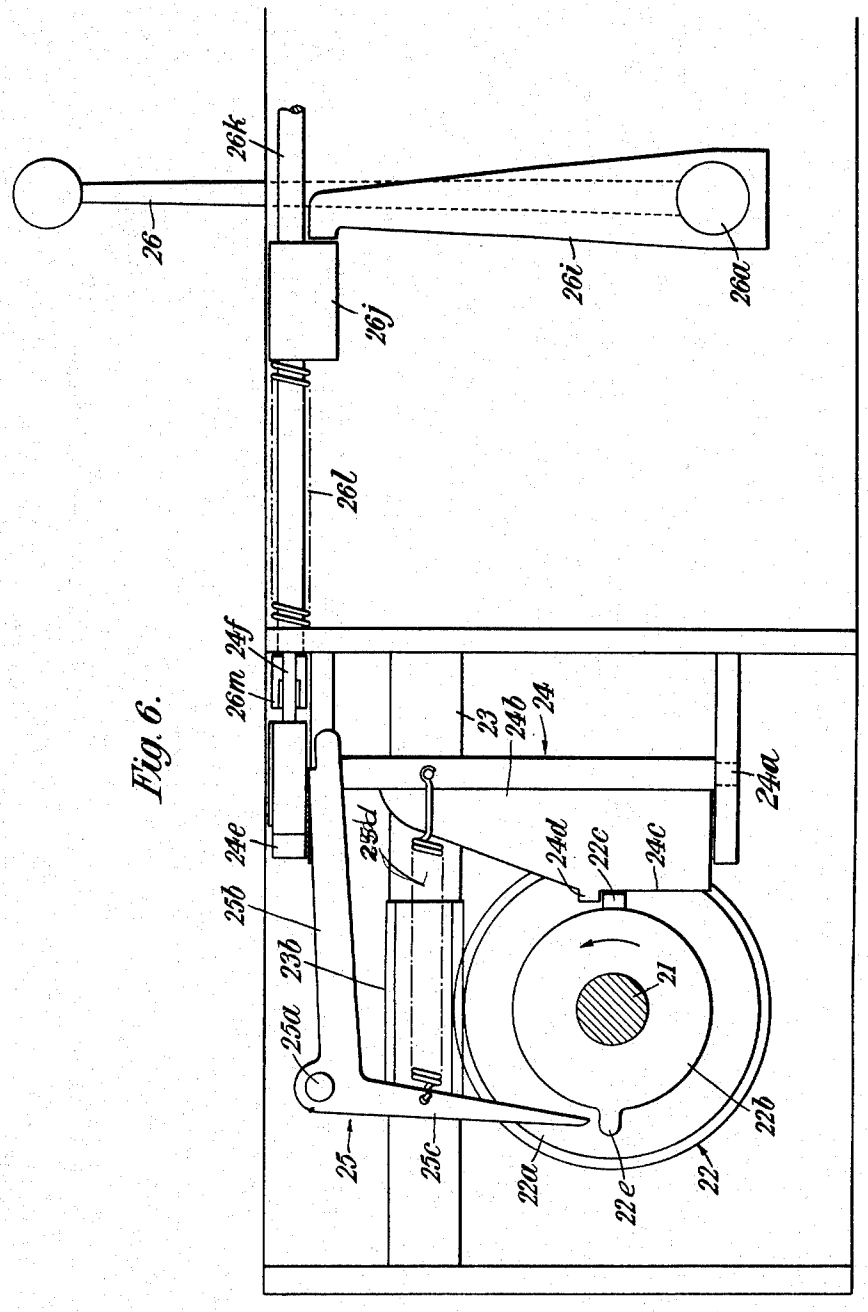


Fig. 6.

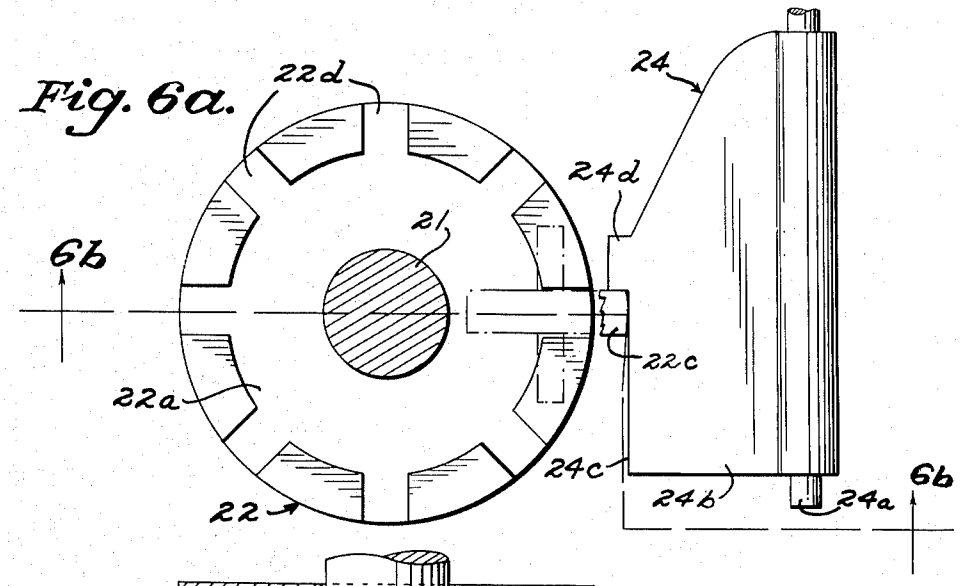
INVENTOR
John J. Cheesman
by Seinsener & Parker

Jan. 10, 1956 J. J. CHEESMAN 2,730,036

PACKAGE AND LIKE BINDING MECHANISM

Filed May 29, 1951 11 Sheets-Sheet 8

Fig. 6a.



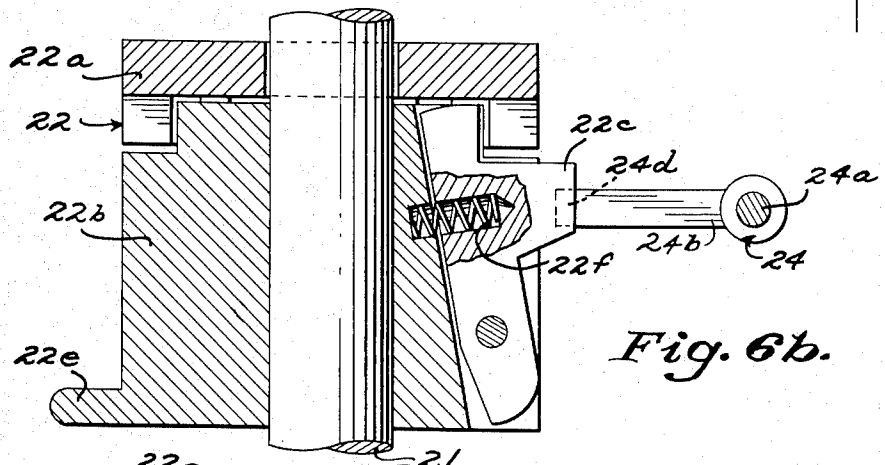


Fig. 6b.

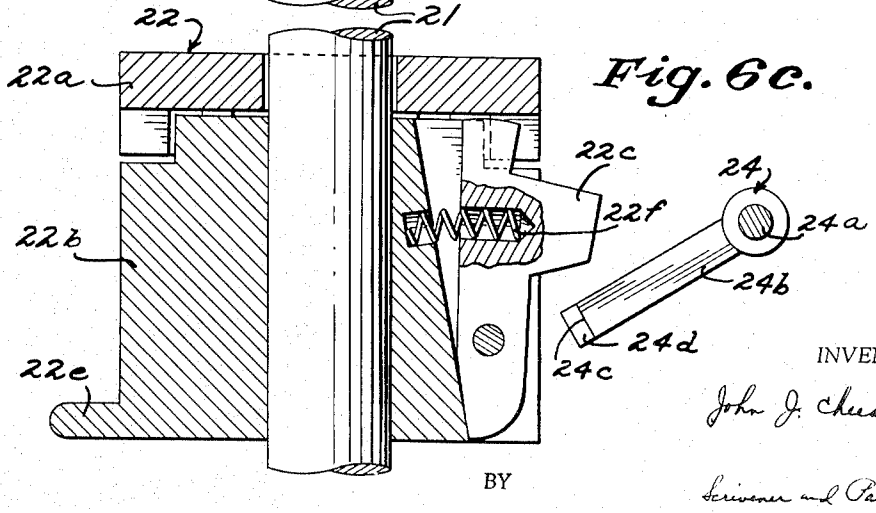


Fig. 6c.

INVENTOR
John J. Cheesman

BY
Scrivener and Parker
ATTORNEYS

Jan. 10, 1956 J. J. CHEESMAN 2,730,036

PACKAGE AND LIKE BINDING MECHANISM

Filed May 29, 1951 11 Sheets-Sheet 9

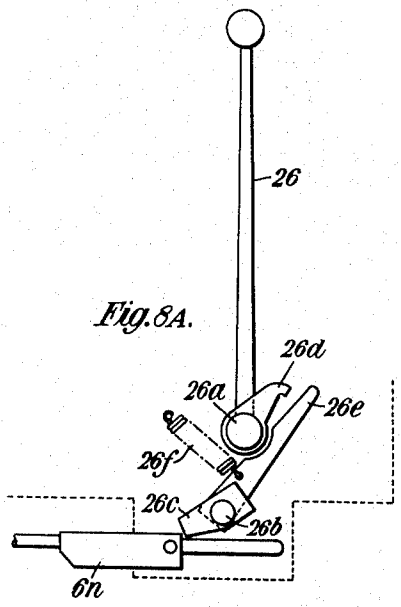


Fig. 8A.

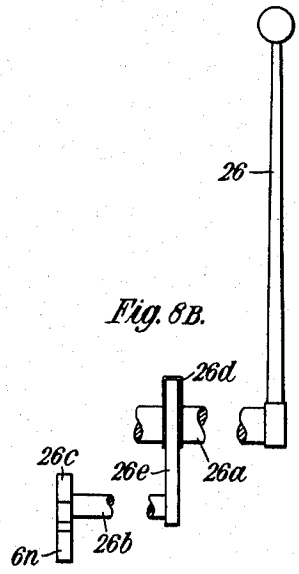


Fig. 8B.

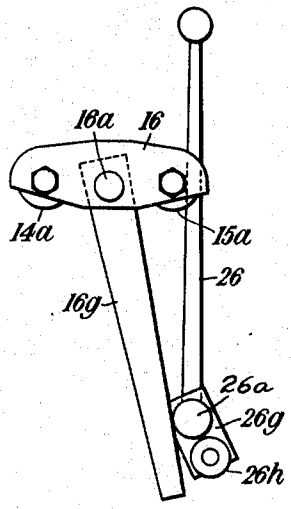


Fig. 9A

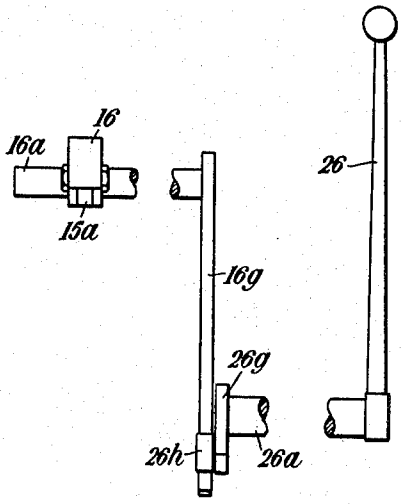


Fig. 9B.

INVENTOR
John J. Cheesman
by Serrurier & Parker

Jan. 10, 1956 J. J. CHEESMAN 2,730,036

PACKAGE AND LIKE BINDING MECHANISM

Filed May 29, 1951 11 Sheets-Sheet 10

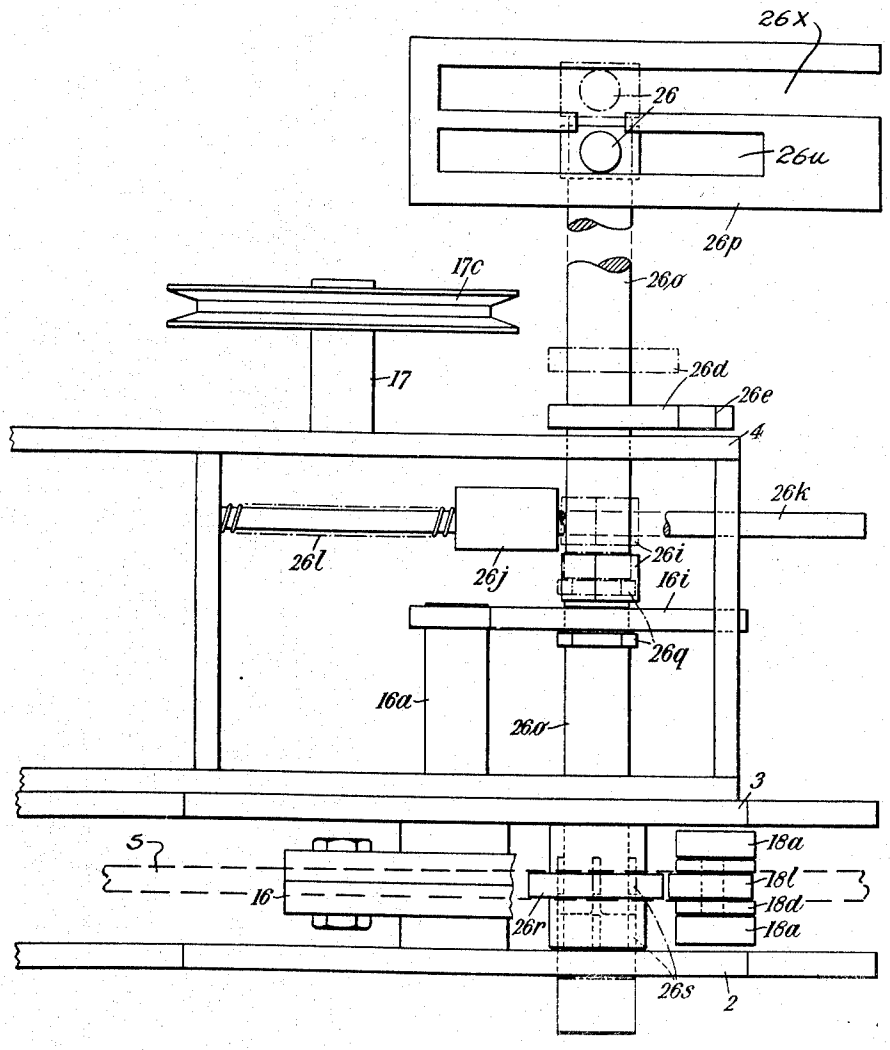


Fig. 10.

INVENTOR
John J. Cheesman
by Scrivener & Parker

Jan. 10, 1956 J. J. CHEESMAN 2,730,036

PACKAGE AND LIKE BINDING MECHANISM

Filed May 29, 1951 11 Sheets-Sheet 11

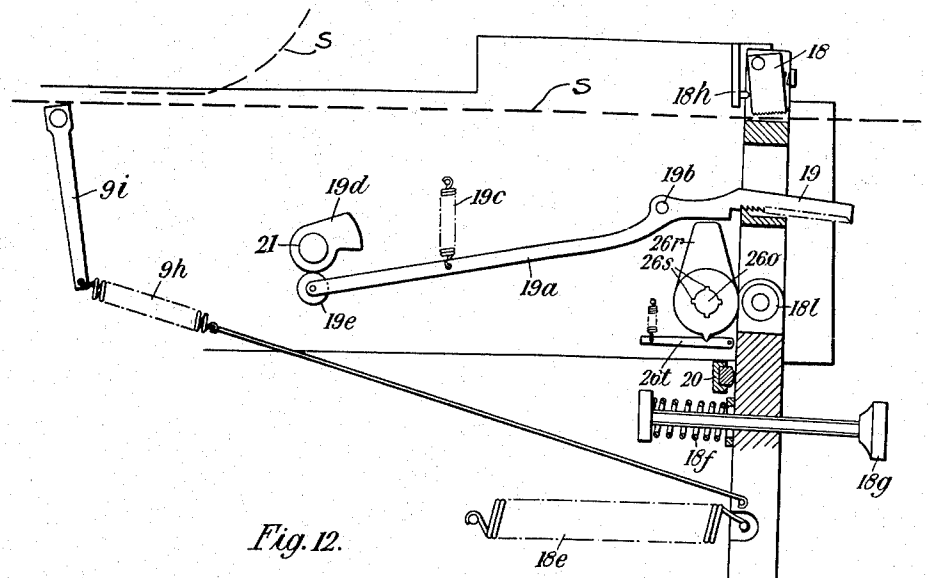


Fig. 12.

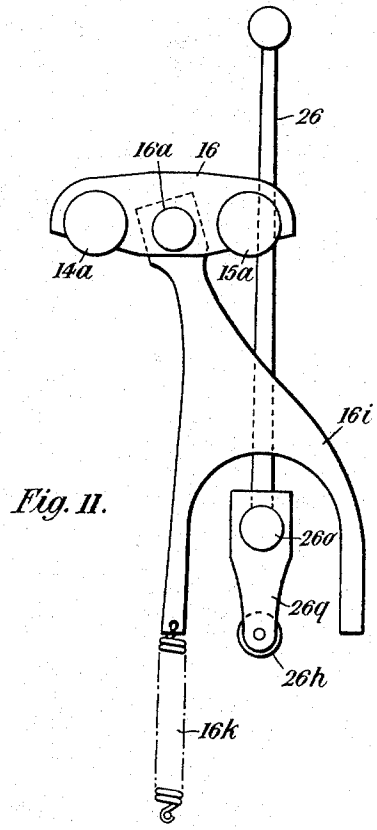


Fig. 11.

INVENTOR
John J. Cheesman
by Scrivener & Parker

United States Patent Office 2,730,036 Patented Jan. 10, 1956

2,730,036

PACKAGE AND LIKE BINDING MECHANISM

John James Cheesman, Gerrards Cross, England, assignor, by mesne assignments, to General Strapping Corporation, New York, N. Y., a corporation of New York

Application May 29, 1951, Serial No. 228,830

Claims priority, application Great Britain July 5, 1950

25 Claims. (Cl. 100—27)

This invention is concerned with mechanism for tying packages or the like with flexible binding material, of the type essentially comprising a connecting device and on the near side thereof a reversible feed, a holding gripper and severing means, operable on the flexible material in the binding plane so that the material, having been fed out from a supply through the connecting device for insertion, after training to form a loop around the package or the like, into the gripper with the free end of the material projecting into the connecting device, is held by closing the gripper, the material being next drawn in and the loop closed onto the package or the like by reversing the feed, following which the parts of the material within the connecting device are joined together by actuating the latter with separation of the looped part of the material from the supply by actuating the severing means and the tied package or the like is released by reopening the gripper.

For the purpose of improving and simplifying the manual control of a mechanism of this type the invention has for its main object the provision of a manually operable device such as a handle, pedal, or other like controller whereby at least one step of the operational cycle of the mechanism is brought under direct control of the operator, which manually operable device (herein referred to generally as a "handle") is utilized for directly controlling in particular the step of feed reversal to close the loop of strip, wire, or other like flexible binding material (herein referred to generally as "strip of flexible material") onto the package, the same handle according to one aspect of the invention being used besides for initiating the operation of means for automatically effecting a sequence of other steps.

According to the invention from a further aspect thereof, at least the steps of closing the holding gripper as well as of reversely actuating the feed are effected under direct control of the same handle.

If desired the same handle may be used for controlling the whole operational cycle, including any automatic sequence which may be comprised therein.

Where the handle is used for initiating the operation of means for automatically effecting a sequence of steps, these preferably include at least the operation of the connecting device and of the severing means. Thus the handle may be movable from neutral in one direction for direct control (for example to effect first the said closing of the holding gripper and then, by further movement, the said reverse actuation of the feed), and in the other direction at least to initiate the said automatic operation.

An operational step is thus under the direct control of the handle when it is effected individually, whether or not assisted by power. The reverse actuation of the feed is preferably thus directly controlled in order to reduce to a minimum slipping of the frictional engagement with the flexible material and consequent wear, since if this operation were automatic and necessarily of sufficient duration therefore to suit the smallest package to be tied, more or less prolonged slip would be inevitable with all larger

packages. Direct control in this instance also results in corresponding saving of time. The closing of the holding gripper also requires to be thus directly controlled where it starts the operational cycle and is separated by directly controlled reverse actuation of the feed from the remainder of the cycle (which may be operated automatically).

Automatic operation involves a sequence of operational steps completed by power without interference once the sequence has been initiated or tripped. Subject to the necessary provision for direct control, the extent of automatic operation is a matter of choice.

The handle is preferably arranged on the near side of the connecting device for movement in or parallel to the binding plane and so that by its outward movement with respect to the said device, i. e. away therefrom, it effects at least the reverse actuation of the feed under direct control and by its inward movement, i. e. towards the said device, effects at least the forward actuation of the feed, these being the movements of the handle in the said plane which are natural to the operations in question, i. e. outwardly for reverse feeding in and inwardly for feeding out the flexible material.

The mechanism may include a shaft under the control of the handle to be thereby shifted longitudinally into alternative operating positions and rocked from neutral in each such position, thus extending the possible direct control by the same handle. Although no gate is necessary for guiding the manipulation of the handle when this simply requires to be moved in opposite directions from neutral, such a gate, e. g. of H-form, is preferably provided where the said manipulation is more complicated, as when the handle is used to control such a shaft.

The mechanism may include a guide around the package or the like for the flexible material which is payed out by the forward actuation of the feed and a stop in the said guide on the far side of the connecting device adapted to permit the free end of the material to pass before training, but engaging with the material to prevent the said end from passing after training. The feed may comprise two constantly and oppositely rotating rollers and a roller frame for frictionally engaging the flexible material alternatively therewith, the movement of the frame required for at least the reverse actuation of the feed being under direct control.

Whether the forward actuation of the feed is operated automatically or under direct control, capacity to slip is not a matter of importance, since in the first case the uniform length of material fed out can be determined to within fine limits and in the second case is determined directly by the operator. The reverse actuation of the feed on the other hand should desirably include means such as a slipping clutch adapted to yield preferentially to slip in the engagement with the flexible material, if undue tensioning of the latter is attempted by injudicious handling of the direct control of the said reverse actuation; so that an upper limit is thereby imposed, without any such slip, on the tension which can thus be applied.

The forward actuation of the feed may conclude the automatic operation, especially when using a guide which requires a uniform length of flexible material to be fed out at each operation subject to possible adjustment to suit different sizes of guides which can be alternatively fitted. However, especially where it is desired to be able to vary the length of material fed out roughly according to the size of an individual package (as for instance when hand training without a guide), the forward actuation also of the feed is preferably under direct control and effected by movement of the handle in the aforementioned opposite direction from neutral.

The holding gripper may comprise a movable jaw in the form of a nozzle through which the flexible material

is fed and the cutter may be adapted to co-operate with this movable jaw in severing the material from the supply.

Preferably the reopening of the holding gripper is included in the automatic operation and to this end the mechanism may include latching means adapted to be released by direct control for closing the said gripper and to become reset when the latter is opened.

Since reverse actuation of a feed operating on the flexible material by frictional engagement is not adapted to apply sufficient tension thereon and indeed is preferably prevented from doing so by the limiting means already referred to, the mechanism may include additional means for gripping the flexible material from the supply and drawing it in to tension the looped part onto the package or the like, the actuation of which tensioning means may either be included in the automatic operation or under direct control. In the latter case it is preferably effected by movement of the handle in the first aforementioned direction from neutral. This tensioning means may be actuated at constant throw and may include a ratchet device for maintaining the applied tension whilst permitting immediate withdrawal of the actuating member, which ratchet device is automatically released after severing of the flexible material to permit return of the tensioning means.

If as preferred, especially when the flexible material is tensioned, it is severed before being connected, a second holding gripper on the far side of the connecting device is required for maintaining any applied tension pending the formation of the connection. This second gripper, whereby the severed free end of the material is left held also projecting into the connecting device for joining to the first free end, may be operable mainly together with the first such gripper.

However, full closing of such second gripper must of course be delayed until completion of the drawing in of the material consequent on the reverse actuation of the feed and on the tensioning, if any. Accordingly, the gripper is, to start with, only partly closed to a position in which it permits passage of the material during such reverse actuation and may during the tensioning be subjected to graduated closing into full engagement.

The invention will now be further described with reference to the accompanying drawings, showing firstly one form of machine in accordance therewith for operating with strip metal or band as the flexible material and in which the extent of automaticity is relatively high and secondly the modifications required in this machine in order to bring it under fuller direct control.

The relatively fully automatic form of the machine appears in Figs. 1 to 9 of these drawings whereof:

Figure 1 is a general front elevation of the machine with the grippers closed;

Figure 2 is a general side elevation showing the gripper control latch but omitting the other parts before the front plate of the machine;

Figure 3 is a plan view, taken substantially on the line **3—3** of Figure 1, of the mechanism beneath the level of the supporting table or platform with the parts in neutral position;

Figure 4 is a vertical section in the binding plane, taken substantially on the line **4—4** of Figure 3 also with the parts in neutral;

Figure 4A is a side elevation and Figure 4B a section along the line *4b—4b* of Figure 4A of the right hand gripper;

Figure 5 is a similar section to Figure 4 to show the tensioning arm fully out, but omitting parts which are not of interest in connection with this action;

Figure 6 is a vertical section taken substantially on the line **6—6** of Figure 3 and shows the control for the single operation clutch;

Figure 6A is an enlarged view of the clutch taken substantially along the line *6a—6a* of Figure 3;

Figure 6B is a view taken substantially along the line *6b—6b* of Figure 6A showing the clutch in disengaged position;

Figure 6C is a change position view similar to Figure 6B but showing the clutch in engaged position;

Figure 7 shows the parts before the front plate of the machine to a larger scale than in Figure 1 but in the same positions;

Figures 8A and 8B are respectively front and side detail views to show the manual release of the gripper control latch; and

Figures 9A and 9B are respectively front and side detail views of a similar kind to show the manual reverse control of the strip feed.

In Figures 10 to 12, showing the modifications required for fuller direct control:

Figure 10 is a plan view corresponding to that of Figure 3, of just the modified parts of the mechanism, showing the control shaft in its two alternative longitudinal operative positions.

Figure 11 is a detail view corresponding to that of Figure 9A to show the manual control of the strip feed, both forwardly and reverse; and

Figure 12 is a section corresponding to that of Figure 4, to show manual tensioning and omitting other parts in this plane.

As shown in Figures 1 to 9 the machine comprises the usual supporting table and platform **1** near the front edge of which extends, in the binding plane, a guide way for the strip of flexible binding material. Beneath this table three main vertical plates **2**, **3**, and **4** for supporting the mechanism are arranged in planes parallel with the binding plane, the front plate **2** just forwardly and the middle plate **3** just rearwardly thereof.

In a central section of this guide way beneath a reaction plate **5** at table level (see Figures 3 and 4) are disposed the first or near side holding gripper **6**, the cutter **7**, the connecting device tool **8** in register with hole *5a* of plate **5** and the second or far side holding gripper **9**, the strip being adapted to emerge from the guide way beyond the grippers to pass around the package. A continuation of this guide way to encircle the package thereby may be provided in the form of an arcuate channel section guide **10** along which the band is pushed in training it around the package.

The strip S is adapted to be fed out longitudinally from the near side of the machine under the first gripper **6**, across the connecting device **7** and through the second gripper **9**, then around guide **10** back through the first gripper and again across the connecting device up to a stop **11** a little short of the second gripper, as shown in dotted lines in Fig. 4. Both grippers are held open during this feeding operation, the stop in question consisting of a pivoted cross member adapted to permit the end of the strip to pass on the first occasion but to block it on the second occasion when this cross member rests on the first portion of the strip.

A feature of the first gripper **6** (see Figures 4A and 4B) is the conformation of its lower jaw which is adapted to rotate clockwise about its pivot *6a* upwardly against plate **5** so as to close the gap therebetween and also to serve as a nozzle for the strip from the feed through its longitudinal passage *6b*, thus enabling the lower first portion and upper second portion of the strip to be brought very close together at this point and the spacing, longitudinally of the run of the strip between the serrated gripping face *6c* of jaw **6** and the connecting device **8**, to be correspondingly reduced. The small deflector **12** beneath plate **5** is designed to prevent the end of the strip at its second pass from curling up into the opening *5a*. The top of jaw **6** is channelled at *6a* as part of the aforementioned guide way for the strip and in order to prevent it from fouling the withdrawal of the bound package from the machine, the frontwall *6f* of this channel is made resiliently depressible at its forward end by pivot-

ing the plate 6*g* about pin 6*a* under control of spring 6*h*. The position of plate 6*g* when thus depressed is indicated by dotted lines in Figure 4A.

The cutter blade 7 is adapted to shear the lower portion of the strip where it emerges from passage 6*b*, being adapted to coact for this purpose with the end 6*d* of the jaw. As appears in Figure 3, the pivot 6*a* is eccentrically mounted to permit adjustment of jaw 6 with respect to blade 7.

The second gripper 9 is of a one-way eccentric type also adapted to rotate upwardly against plate 5.

The cutter blade 7 and connecting device 8 shown in Figure 4 are both operated automatically by cams on the power control shaft 13, arranged transversely of the binding plane, first the lifting of the blade on lever 7*b* by cam 7*a* through the intermediary of cross lever 7*c* and then the upward movement of the connecting device tool 8 directly from cam 8*a*, the actuation, i. e. raising and lowering, of both being completed during one revolution of shaft 13. The connecting device may be of any type suitable for joining overlapped portions of strip, as by cutting or deforming them, with or without a surrounding sleeve, in the former case with provision, if desired, for automatically feeding in and severing a continuous strip for making such a sleeve. Thus a feed roller for this purpose may be driven from shaft 13 to feed such sleeve strip transversely of the overlapped parts, the severing of this sleeve strip being effected by tool 8 as it rises. The cutter blade 7 may, if desired, be caused to dwell with the severed end of the binding strip raised whilst the sleeve strip is fed in under it.

The means for feeding the strip out and for drawing in the slack to close the loop, consists of a roller assembly in the binding plane through which the strip passes from the supply to the nozzle passage 6*b*, as best seen in Figure 4. The lower face of the strip S is adapted to be brought into frictional contact with one or the other of two intergeared rollers driven so as to be in constant rotation in opposite directions, as indicated by the arrows. The first 14 of these rollers is adapted to feed out and the other 15 to feed in. The required pressure on the upper face of the strip to bring one or the other roller into effective operation is exerted by a pair of idler rollers 14*a*, 15*a* mounted in a frame 16 symmetrically fixed on shaft 16*a* by which it can be rocked from a neutral position in which the strip lies between the pairs of rollers uninfluenced thereby, to grip the strip either between rollers 14 and 14*a*, or alternatively between rollers 15 and 15*a*. Roller 14 is provided with side flanges 14*b* to give it a channelled periphery whereby the strip is centred for delivery into passage 6*b*.

Roller 14 is mounted directly on the main transverse driving shaft 17 of the machine, kept constantly rotating by motor 17*a* (Figure 2) through belt drive 17*b* around pulley 17*c* on the near end of the shaft. Roller 15 is driven from shaft 17 through gearing 14*c*, 15*c* and an adjustable clutch 15*b* to enable the roller to slip when the loop of the strip has been closed on to the package. Similar provision of a slipping clutch may be made in connection with roller 14 if desired.

The tensioning device (Figures 4 and 5) comprises a gripper 18 mounted to the near side of the feed roller assembly on a pair of arms 18*a* adapted to be swung back in the binding plane about bottom pivots, by push rod 18*b* pivoted at 18*c* to the top of the shorter lever 18*b* which is disposed between arms 18*a* and pivoted to them at its lower end, somewhat above their own pivots. The thrust of rod 18*b* is opposed by tension spring 18*e*, its throw being constant to cover the whole required range of possible movement of gripper 18. For the purpose of adjusting the stroke of the gripper (and consequently the applied tension) within this range, a variable compression spring 18*f* (with control knob 18*g*) is provided between lever 18*d* and the arms 18*a*, the thrust being transmitted through this spring to the desired extent for moving the parts from the position shown in Figure 4 to that shown for example in Figure 5. The gripper 18 is normally held open by abutment against stop 18*h*, as shown in Figure 4, and closes automatically as it moves away therefrom.

The tension is maintained by return release ratchet 19 associated with the tensioning means, until at or near the end of the operating cycle, since it is preferable for the strip to be severed whilst under tension. This ratchet is on a lever 19*a* pivoted at 19*b* and urged into engagement with a cross stirrup between arms 18*a* under the influence of spring 19*c*. This arrangement has the advantage that rod 18*b* can be withdrawn immediately by spring 18*e* to relieve any compression on spring 18*f* before the arms 18*a* themselves are released by the ratchet to return under the residual tension of spring 18*e*. A buffer 20 may be provided to cushion yet further the return of the arms thus already softened.

The fully automatic part of the operation of the machine is effected or controlled from the main transverse power control shaft 21 which is driven from shaft 17 through the clutch 22 to rotate once during each operating cycle, see Figs. 3 and 6. The transmission from shaft 17 is by way of worm shaft 23 through bevel gears 17*d* and 23*a*, the worm 23*b* on shaft 23 being in mesh with the rotatable worm wheel clutch member 22*a*. Driving engagement between this member and drum member 22*b* fixed on shaft 21 is through a pivoted dog 22*c* (Figures 6 through 6C) on drum 22*b* and urged outwardly by spring 22*f* so as to be engageable, when released, with any of the slots 22*d* of member 22*a*. The clutch is controlled through the member 24 pivotally mounted about a vertical axis 24*a*. Wing 24*b* of this control member normally acts (as shown in Figures 3 and 6) to hold dog 22*c* disengaged through its camming edge 24*c* above which edge the projection 24*d* serves as a stop to positively prevent rotation of drum 22*b*. By rotating member 24 until head part 24*e* thereof becomes engaged and held by bell-crank 25, dog 22*c* is permitted to engage the clutch. This bell-crank, which is pivoted at 25*a*, comprises an upper limb 25*b* and a tail part 25*c*. Tension spring 25*d* between this tail part and the member 24 serves not only to urge limb 25*b* upwardly into engagement with part 24*e* when turning of member 24 makes this possible, but also urges member 24 itself towards its normal clutch disengaging position against stop 24*f*. Just before the engaged clutch completes its single revolution, projection 22*e* of member 22*b* engages tail 25*c* and thereby releases member 24 into the path of dog 22*c* which is thereby withdrawn gradually as it rides up edge 24*c* and fully just before it reaches projection 24*d*.

Shaft 21 is drivably connected with the subsidiary power control shaft 13 of the connecting and severing mechanism by chain 21*b* around sprocket wheels 21*a*, 13*a* on the respective shafts, through a simple dog clutch 13*b* the engagement and disengagement of which is controlled by lever 13*c* from cam 13*d* on shaft 21 to cause shaft 13 to complete a single rotation during that part only of the rotation of shaft 21 when connecting and severing takes place. Alternatively, the rotation of shaft 13 may be effected directly from the main driving shaft 17, but this would subject clutch 13*b* to continuous operation which the arrangement as shown avoids.

Shaft 21 also carries the following cams (see Figures 4 and 7), the function and operation of which will next be described, viz. holding gripper control cams 6*i* and 9*a* and forward feed control cam 16*b* disposed before the front plate 2, and cams 18*i* and 19*d* for respectively operating the tensioning arms and ratchet tension-maintaining device disposed between plates 2 and 3.

Considering firstly the actuation of the holding grippers (as best shown in Figure 7), the first or near side gripper 6 is actuated from cam 6*i* through roller 6*j* on follower arm 6*k* and cam 6*l* beneath the gripper jaw (see Figure 4 in which the grippers are shown open). The arm is held

against cam 6*i* by tension spring 6*m* acting to close the gripper, i. e. to move the parts into the position shown in Figure 7. The gripper is adapted to be held open against spring 6*m* by the latch 6*n* on rod 6*o* connected to arm 6*k*, which latch is adapted to be engaged automatically by cam 6*i* when it acts to open the gripper. The gripper is thus left open but before the cycle ends the cam becomes positioned to permit it to reclose directly the latch is released. Before the cycle ends the cam becomes positioned to permit reclosing of the grippers directly the latch is released.

The actuation of the second or far side gripper 9 is effected mainly in conjunction with that of gripper 6, by means of the thrust rod 9*b* pivoted to arm 6*k* and acting on the lever arm 9*c* of gripper 9 through the lost-motion connection 9*d*. In contrast to gripper 6 which is either fully on or off, closing of gripper 9 can thus be graduated under the influence of tension spring 9*e* on arm 9*c*, so that at first this spring acts only quite lightly, enabling the strip to be readily drawn back through the gripper 9 during reverse feeding. The influence of spring 9*e* is is however then substantially reinforced to tighten the hold of the gripper during tensioning, by the action of cam 9*a* through roller 9*f* on follower arm 9*g* to which the spring is anchored. The automatic opening and latching of gripper 9 is effected through rod 9*b* along with that of gripper 6. It should be observed that when gripper 9 is lightly closed the lost-motion connection 9*d* is separated sufficiently to permit of the further movement of arm 9*c* involved in the tightening of the gripper. Cam 9*a* removes the additional tension on spring 9*e* a little before the grippers are opened by cam 6*i*.

The feeding out of the strip is controlled from cam 16*b* acting through roller 16*c* on follower arm 16*d* fixed on the front end of the roller frame pivot shaft 16*a* which is urged towards the position of the frame in which rollers 14 and 14*a* are brought into operation by tension spring 16*e* acting on arm 16*d*. The high part of cam 16*b* holds the frame in neutral against the influence of this spring. The length of strip which is fed out whilst the low part of the cam permits the frame to rock to this position, can be adjusted slightly by varying the angular inclination of the arm about shaft 16*a* by the means shown at 16*f*, but any substantial change requires the substitution of another cam.

Cams 18*i* and 19*d* for respectively operating the tensioning arms and ratchet tension-maintaining devices appear in Figure 4 and the former also in Figure 5 at the top of its constant throw. Thrust rod 18*b* is held with the follower roller 18*j* at its end in engagement with cam 18*i* by the pair of guide rollers 18*k*, and the end of ratchet lever 19*a* is provided with roller 19*e* to follow cam 19*d*. For reasons already stated the cams are so formed as to permit return of rod 18*b* before the ratchet is lifted to release the arms.

It now remains to describe the manual control of the machine by means of lever handle 26 on the near side of the machine where it is fixed on the main transverse manual control shaft 26*a*, so that it can be swung in a plane parallel with the binding plane thereby to rock the shaft.

By rocking the shaft outwardly from its neutral position (shown in Figure 8A), tripping of the holding gripper latch 6*n* is first effected by the raising of catch 26*c* at the forward end of subsidiary rock shaft 26*b* (which catch is shown engaged in Figures 8A and 8B, but released in Figure 7), due to the abutment of the arm 26*d* on shaft 26*a* against the arm 26*e* on shaft 26*b*. Tension spring 26*f* acts on arm 26*e* in the opposite rotational sense to arm 26*d* so that when the handle returns to neutral the catch 26*c* is positioned by this spring to reengage latch 6*n* directly the latter is returned by cam 6*i* as part of the automatic sequence already described.

Before that sequence is initiated, however (as explained below), shaft 26*a* is rocked outwardly beyond the angular position in which it releases the latch, thereby merely further raising catch 36*c* idly against the action of spring 26*f* and without additional effect, this outer range of the shaft movement being utilized for the controlled rocking of roller frame 16 to bring rollers 15 and 15*a* into operation (by the means best shown in Figures 9A and 9B) consisting of arm 26*g* engaging through the roller 26*h* thereon with depending arm 16*g* fixed to the rear end of pivot shaft 16*a* of the said frame. The spacing between arms 16*g* and 26*g* must be sufficient to permit the free swinging of arm 16*g* from neutral (into the position shown in Figure 9A) consequent on the automatic rocking of the frame for feeding out, by cam 16*b* acting through arm 16*d* (Figure 7). In the reverse manual rocking of the frame for feeding in, the consequent lost motion up to the neutral position of arm 16*g* is first taken up by arm 26*g* during the aforesaid gripper-closing rocking of shaft 26*a* to trip latch 6*n*, after which the operative engagement of arm 16*g* by arm 26*g* is accompanied by more or less raising of arm 16*d* idly from cam 16*b* against spring 16*e*, besides the idle raising of catch 26*c* already mentioned.

The opposite rocking of shaft 26*a* inwardly from neutral serves solely to initiate the operation of the fully automatic part of the mechanism by tripping of control member 24. This is effected by arm 26*i* fixed on the shaft to engage with block 26*j*, fixed on push rod 26*k*, against the action of spring 26*l* (see Figures 3 and 6). The head 26*m* at the end of rod 26*k* carries a spring latch 26*n* to engage head part 24*g* of the control member and thereby to rotate the member as required to engage clutch 22. Latch 26*n* permits free return of the rod 26*k* and associated parts with shaft 26*a*.

In Figures 10 to 12, the same references are used as far as possible and only modified parts are shown. Generally speaking, the differences are: firstly, the transfer from automatic (by the power control shaft 21) to manual control of the feeding out of the strip, with elimination of cam 16*b* and arm 16*d* shown in Figure 7; secondly, in the substitution of a cam on the manual control shaft in place of cam 18*i* of Figure 5 for thrusting back the tensioning arms (the operation of the return release ratchet 19 remaining automatic); and thirdly, in anchoring the closing spring of gripper 9 to the tensioning arm lever 18*d* to reinforce the holding action of this gripper during tensioning instead of to the follower arm 9*g*, which can thus be eliminated together with cam 9*a*, this alteration being rendered necessary by the fact that tensioning takes place before rotation of shaft 21 commences.

In order to permit of the two additional operations of the manual control shaft 26*o* on which the handle 26 is in this case mounted, the shaft is made longitudinally shiftable from the position in which it is shown, together with its actuating members, in full lines in Figure 10 to that as shown in dotted lines, the resulting more complicated manipulation of the handle being guided by the H-form gate 26*p*.

The manual control of roller frame 16 for feeding strip out as well as in, consists of the fork 16*i* (see Figure 11) in place of arm 16*g* of Figure 9A cooperating with an appropriately modified arm 26*q* (carrying the roller 26*h*) fixed on shaft 26*o*, and with spring 16*k* for holding the frame normally in neutral position.

The manual actuation of the tensioning arms is by means of cam 26*r* directly engaging roller 18*l* (in place of pivot 18*c* of Figures 4 and 5) at the top of lever 18*d*. Driving engagement between this cam and shaft 26*o* is effected through splines 26*s* on the latter, such engagement being effected slidably by the longitudinal shifting of the shaft, the resilient catch 26*t* being provided to hold the cam in proper angular position for such engagement.

The tension spring 9*h* for reinforcing the holding action of gripper 9 is secured between tension arm lever 18*d*

and a supplementary lever arm 9*i* of the gripper in the same, i. e. the binding plane.

When shaft 26*o* is in its full line position (see Figure 10) with handle 26 in the forward limb 26*w* of the gate, it is placed to engage through its arm 26*d* with the holding gripper latch releasing arm 26*e* and through its arm 26*q* with the roller frame fork 16*i*. Outward rocking to the right in Figure 10 therefore effects the same operations as in the first form of the machine i. e., gripper closing and reverse feeding, but straight opposite inward rocking to the left gives controlled feeding out of the strip. Movement of the handle through the gate into limb 26*x* thereof shifts the shaft longitudinally in a rearward direction to engage splines 26*s* with the tensioning cam 26*r* and also to bring arm 26*i* into position to engage with the block 26*j* for tripping the clutch control member 24. Outward rocking to the right in this limb 26*x* of the gate serves therefore to tension the strip, for which purpose this limb is left open in this direction to permit the considerable throw of the handle required, whilst straight forward inward rocking to the left in Fig. 10 initiates the automatic sequence as in the first form of the machine.

I claim:

1. Mechanism for binding packages or the like of the type having means for feeding a strip of flexible material in a binding plane to form a loop around the article to be bound, a holding gripper movable for gripping the strip adjacent the free end thereof, means for reversing the operation of the feeding means to close the loop onto the package and to tension the strip, means for connecting the parts of the strip defining the ends of the loop, and means for severing the looped part of the material from the strip, in combination therewith, single handle means directly controlled by the operator movable to one position for at least moving said gripping means and operating said reversing means and movable to another position for initiating automatic operation of at least the connecting means and the severing means.

2. Mechanism for binding packages or the like of the type having means for feeding a strip of flexible material in a binding plane to form a loop around the article to be bound, a holding gripper movable for gripping the strip adjacent the free end thereof, means for reversing the operation of the feeding means to close the loop onto the package and to tension the strip, means for connecting the parts of the strip defining the ends of the loop, and means for severing the looped part of the material from the strip, in combination therewith a single handle directly controlled by the operator having a neutral position and movable in at least two directions therefrom, gripper moving means actuated by said handle to close said gripper upon movement of said handle in one direction from neutral, means actuated by said handle for operating said reverse feed upon further movement of said handle in the first direction, and tripping means actuated by said handle upon movement in a second direction from neutral for initiating automatic operation of at least the connecting means and the severing means.

3. Mechanism for binding packages or the like of the type having means for feeding a strip of flexible material in a binding plane to form a loop around the article to be bound, a holding gripper movable for gripping the strip adjacent the free end thereof, means for reversing the operation of the feeding means to close the loop onto the package, means for tensioning the strip, means for connecting the parts of the strip defining the ends of the loop, and means for severing the looped part of the material from the strip, in combination therewith a single handle directly controlled by the operator selectively movable from a neutral to any one of a plurality of positions, gripper moving means actuated by said handle to close said gripper upon movement of said handle towards a first position, means actuated by said handle for reversing said feeding means upon movement to said first position, and means actuated by said handle for operating said feeding means upon movement to a second position.

4. Mechanism in accordance with claim 3 having means actuated by said handle for operating said tensioning means upon movement of said handle to yet another position.

5. Mechanism in accordance with claim 3 having tripping means acuated by said handle upon movement to yet another position for initiating automatic operation of at least the connecting means and the severing means.

6. Mechanism according to claim 3 in which the feeding and reversing means comprises a pair of constantly and oppositely rotating rollers and a rockable roller frame for frictionally engaging the flexible material alternatively with said rollers, and means controlled by said handle to rock said frame to feed or to reverse said material in accordance with the positioning of said handle.

7. Mechanism in accordance with claim 2 in which said handle is movable from neutral to any operating position in a plane parallel to the binding plane.

8. Mechanism according to claim 7 in which a gate is provided for guiding said handle in its movement.

9. Mechanism according to claim 7 in which said handle is movable to operating position in directions corresponding to the desired direction of movement of said flexible material.

10. Mechanism in accordance with claim 9 having ratchet means for retaining said tensioning means in material tensioning position, and means for automatically releasing said ratchet after severing of the flexible material.

11. Mechanism according to claim 9 having means actuated by movement of said handle in said second direction for effecting feeding of said flexible material.

12. Mechanism for binding packages or the like of the type having means for sequentially performing a plurality of binding steps including means for feeding a strip of flexible material in a binding plane to form a loop around the article to be bound, means for gripping the strip adjacent the free end thereof, means for tensioning the strip, means for connecting the parts of the strip defining the ends of the loop, and means for severing the looped part of the material from the strip in combination therewith, means for normally urging said gripping means to gripping position, a latch for releasably retaining the gripping means in non-gripping position, a single handle directly controlled by the operator having a neutral position and movable in at least two directions therefrom, latch releasing means controlled by movement of said handle in one direction from neutral to release said gripping means, and tripping means actuated by said handle upon movement thereof from neutral in a second direction for initiating automatic operation of at least the connecting and severing means.

13. Mechanism according to claim 12 having means actuated by movement of said handle in said first direction for reversing the operation of said feeding means.

14. Mechanism according to claim 13 having a one-way gripper for gripping the opposite end of said looped material to permit reverse movement only thereof, and means cooperating with the movement of said first named gripping means to gripping position to move said one-way gripper to gripping position.

15. Mechanism in accordance with claim 13 including timing means for automatically opening said first-named gripping means, means cooperating with said gripping means for moving said one-way gripper to open position, and means for reengaging said latch with said first-named gripping means to retain it and said one-way gripper in open position.

16. Mechanism for binding packages or the like of the type having means for feeding a strip of flexible material in a binding plane to form a loop around the article to be bound, a holding gripper movable for gripping the strip adjacent the free end thereof, means for reversing the operation of the feeding means to close the loop onto the

package, means for connecting the parts of the strip defining the ends of the loop, and means for severing the looped part of the material from the strip, a single handle selectively movable to any one of a plurality of positions, gripper moving means actuated by said handle under the direct control thereof to close said gripper upon movement of said handle to one position, means actuated by said handle under the direct control thereof for reversing said feeding means upon movement of said handle to a second position, and means actuated by said handle for operating said feeding means upon movement of said handle to a third position.

17. Mechanism for binding packages or the like of the type having means for feeding a strip of flexible material in a binding plane to form a loop around the article to be bound, a holding gripper movable for gripping the strip adjacent the free end thereof, means for reversing the operation of the feeding means to close the loop onto the package, means for connecting the parts of the strip defining the ends of the loop, and means for severing the looped part of the material from the strip, a single handle movable to any one of a plurality of positions, gripper moving means actuated by said handle under the direct control thereof to close said gripper upon movement of said handle to one position, means actuated by said handle under the direct control thereof for reversing said feeding means upon movement of said handle to another position, and tripping means actuated by said handle upon movement to yet another position for initiating automatic operation of at least the connecting means and the severing means.

18. Mechanism for binding packages or the like of the type having means for feeding a strip of flexible material in a binding plane to form a loop around the article to be bound, a holding gripper movable for gripping the strip adjacent the free end thereof, means for reversing the operation of the feeding means to close the loop onto the package, means for connecting the parts of the strip defining the ends of the loop and means for severing the looped part of the material from the strip, a single handle selectively movable to any one of a plurality of positions, gripper moving means actuated by said handle upon movement thereof to one position, and means actuated by said handle under the direct control thereof for reversing said feeding means upon movement of said handle to another position.

19. Mechanism for binding packages or the like of the type having means for feeding a strip of flexible material in a binding plane to form a loop around the article to be bound, a holding gripper movable for gripping the strip adjacent the free end thereof, means for reversing the operation of the feeding means to close the loop onto the package, means for connecting the parts of the strip defining the ends of the loop and means for severing the looped part of the material from the strip, a single handle selectively movable to any one of a plurality of positions, means actuated by said handle under direct control thereof for reversing said feeding means upon movement of said handle to one position, and tripping means actuated by said handle upon movement to another position for initiating automatic operation of at least the connecting and severing means.

20. Mechanism for binding packages or the like of the type having means for feeding a strip of flexible material in a binding plane to form a loop around the article to be bound, a holding gripper movable for gripping the strip adjacent the free end thereof, means for reversing the operation of the feeding means to close the loop onto the package, means for connecting the parts of the strip defining the ends of the loop and means for severing the looped part of the material from the strip, a single handle movable to any one of a plurality of positions, means actuated by said handle under the direct control thereof for reversing said feeding means upon movement of said handle to one position, and means actuated by said handle for operating another of said previously named means upon movement of said handle to a second position.

21. Mechanism for binding packages or the like of the type having means for feeding a strip of flexible material in a binding plane to form a loop around the article to be bound, a holding gripper movable for gripping the strip adjacent the free end thereof, means for reversing the operation of the feeding means to close the loop onto the package, means for connecting the parts of the strip defining the ends of the loop and means for severing the looped part of the material from the strip, a single handle movable to any one of a plurality of positions, means actuated by said handle under the direct control thereof for reversing said feeding means upon movement of said handle to one position, and means actuated by said handle for operating said feeding means upon movement of said handle to a second position.

22. Mechanism for binding packages or the like of the type having means for feeding a strip of flexible material in a binding plane to form a loop around the article to be bound, a holding gripper movable for gripping the strip adjacent the free end thereof, means for reversing the operation of the feeding means to close the loop onto the package, means for connecting the parts of the strip defining the ends of the loop and means for severing the looped part of the material from the strip, a single handle movable to any one of a plurality of positions, means actuated by said handle under the direct control thereof for reversing said feeding means upon movement of said handle to one position, and means actuated by said handle for initiating a sequence of automatic operation of at least two other of said previously named means upon movement of said handle to a second position.

23. Mechanism for binding packages or the like of the type having means for feeding a strip of flexible material in a binding plane to form a loop around the article to be bound, a holding gripper movable for gripping the strip adjacent the free end thereof, means for reversing the operation of the feeding means to close the loop onto the package, means for connecting the parts of the strip defining the ends of the loop and means for severing the looped part of the material from the strip, a single handle movable to any one of a plurality of positions, means actuated by said handle under the direct control thereof for reversing said feeding means upon movement of said handle to one position, and means actuated by said handle for initiating a sequence of automatic operation of at least two other of said previously named means, including operation of said feeding means as a final step, upon movement of said handle to a second position.

24. Mechanism for binding packages or the like of the type having means for feeding a strip of flexible material in a binding plane to form a loop around the article to be bound, a holding gripper movable for gripping the strip adjacent the free end thereof, means for reversing the operation of the feeding means to close the loop onto the package, means for connecting the parts of the strip defining the ends of the loop and means for severing the looped part of the material from the strip, a single handle movable to any one of a plurality of positions, means actuated by said handle under the direct control thereof for reversing said feeding means upon movement of said handle to one position, and means actuated by sand handle for operating all the other said previously named means upon movement of said handle to at least two other positions.

25. Mechanism for binding packages or the like of the type having means for feeding a strip of flexible material in a binding plane to form a loop around the article to be bound, a holding gripper movable for gripping the strip adjacent the free end thereof, means for reversing the operation of the feeding means to close the loop onto the package, means for connecting the parts of

the strip defining the ends of the loop and means for severing the looped part of the material from the strip, a single handle movable to any one of a plurality of positions, means actuated by said handle under the direct control thereof for reversing said feeding means upon movement of said handle to one position, and means actuated by said handle for operating all the other said previously named means upon movement of said handle to at least two other positions, including initiation of a sequence of automatic operation of at least two of the said other means upon movement of said handle to one of said other positions.

References Cited in the file of this patent

UNITED STATES PATENTS

1,201,688	Bunn	Oct. 17, 1916
2,134,187	Harvey	Oct. 25, 1938
2,195,043	Wright	Mar. 26, 1940
2,215,121	Harvey et al.	Sept. 17, 1940
2,409,652	Workman	Oct. 22, 1946
2,438,386	Chamberlain	Mar. 23, 1948
2,597,675	Sackett	May 20, 1952