P. M. DIKS AND M. VAN DEN HEUVEL.

MACHINE FOR AUTOMATICALLY BINDING HEAD ENDS OF STRAW CASES.

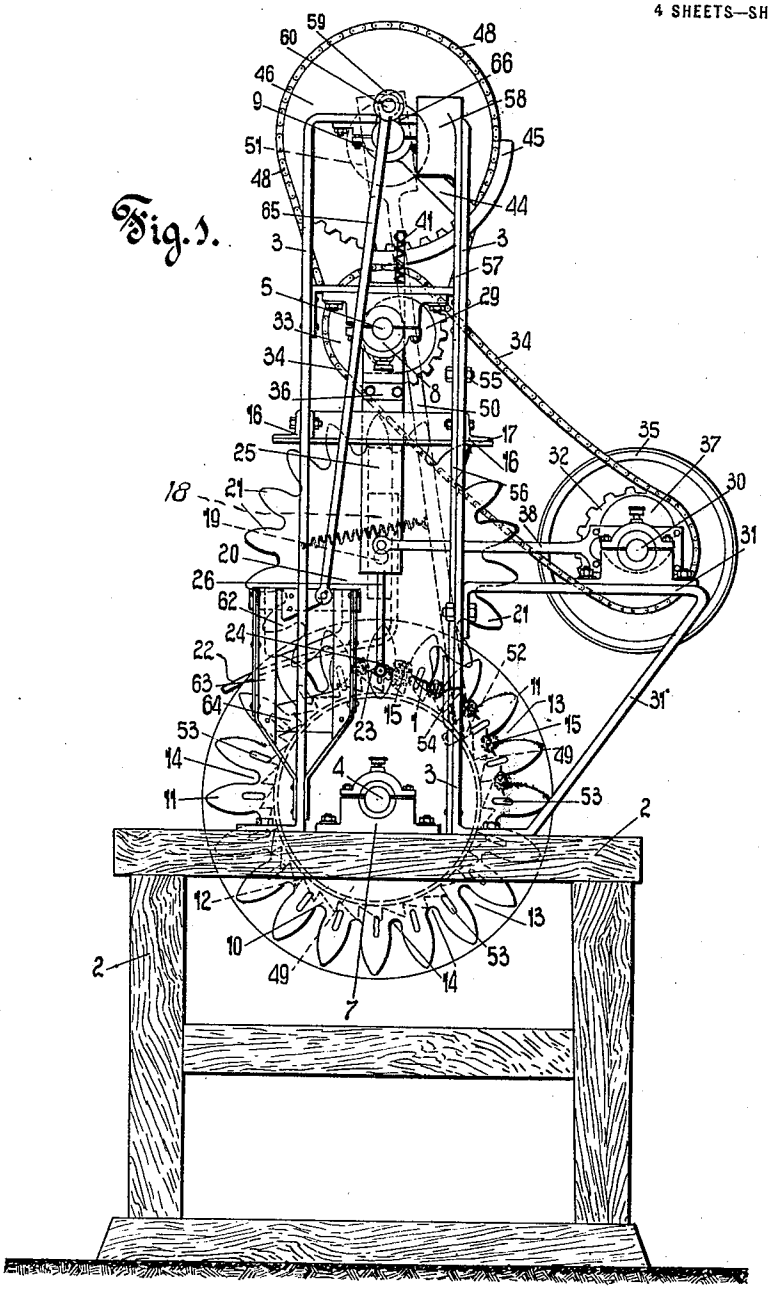
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1,323,169.

Patented Nov. 25, 1919.

4 SHEETS—SHEET 1.

Fig. 1.



Witnesses

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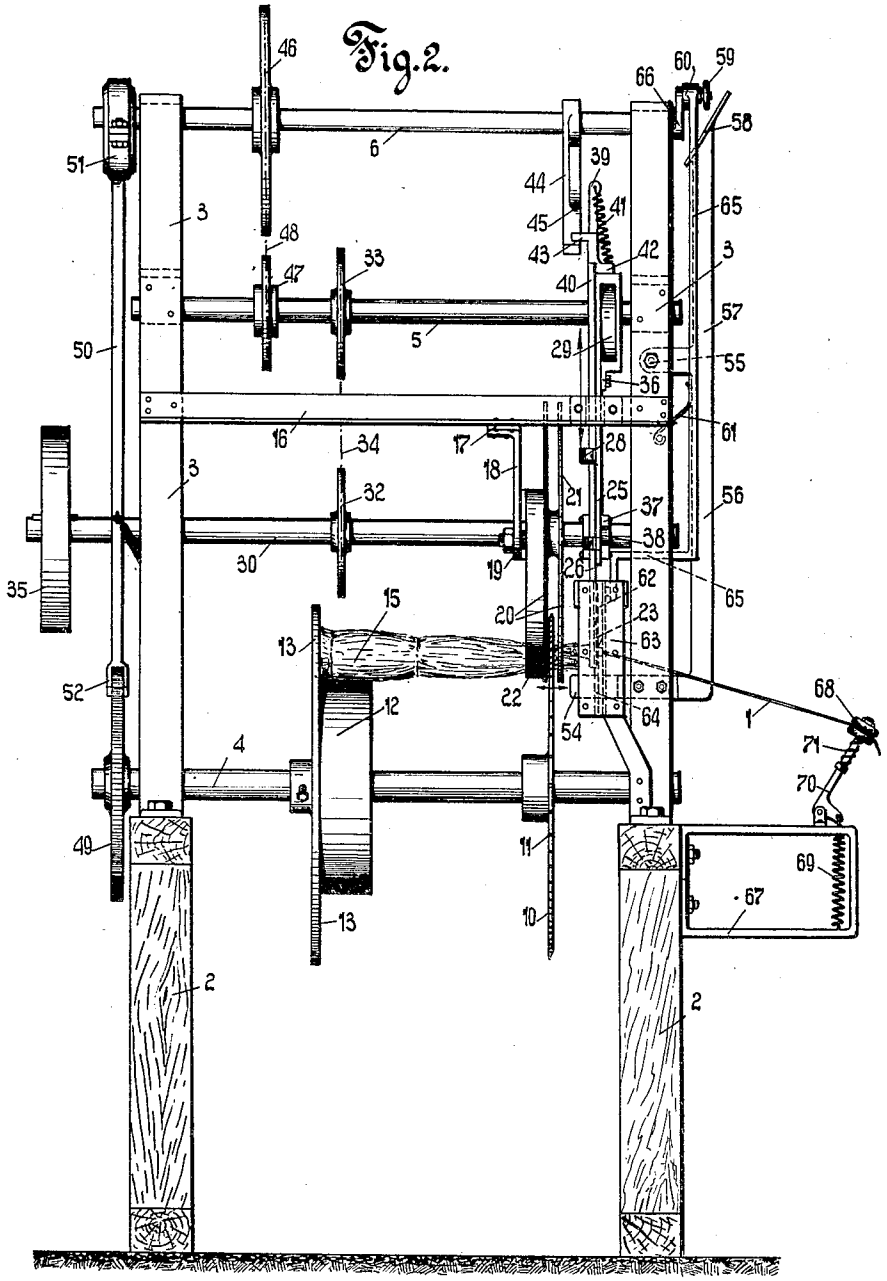
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4 SHEETS—SHEET 2.

Fig. 2.



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4 SHEETS—SHEET 3.

Fig. 5.

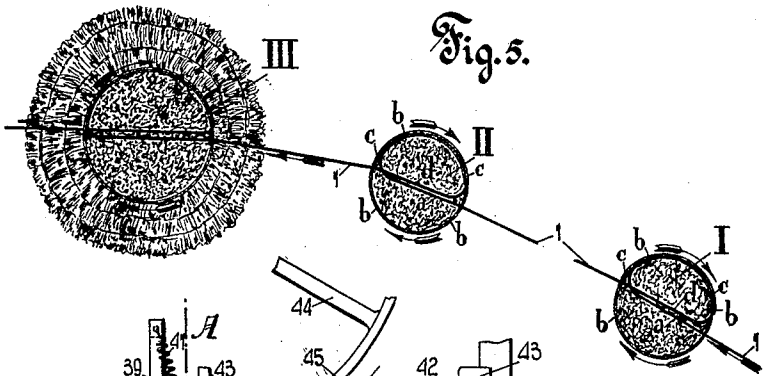


Fig. 3.

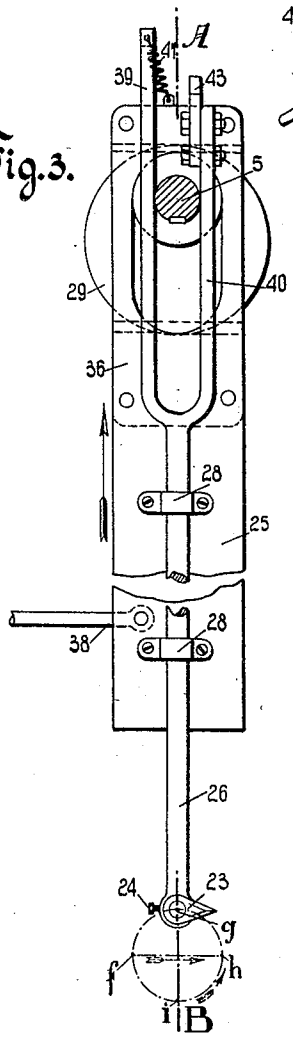
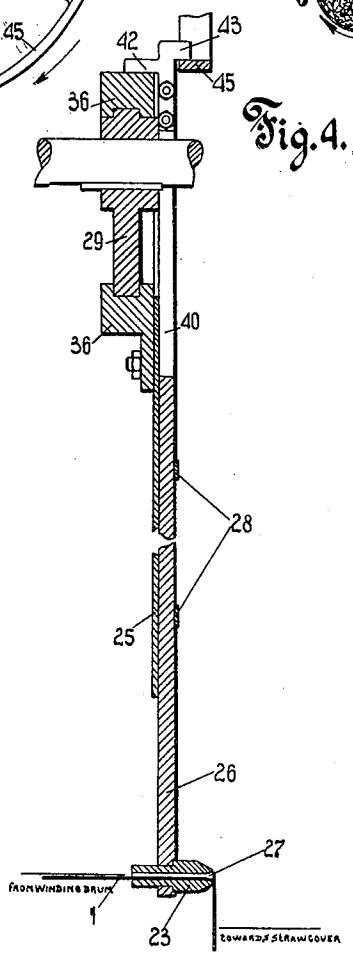


Fig. 4.



Witnesses

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4 SHEETS—SHEET 4.

Fig. 6.

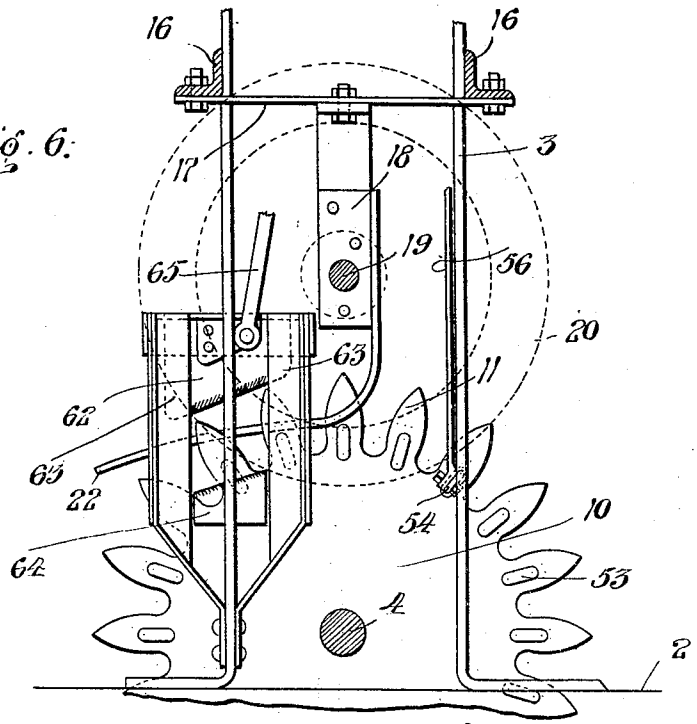
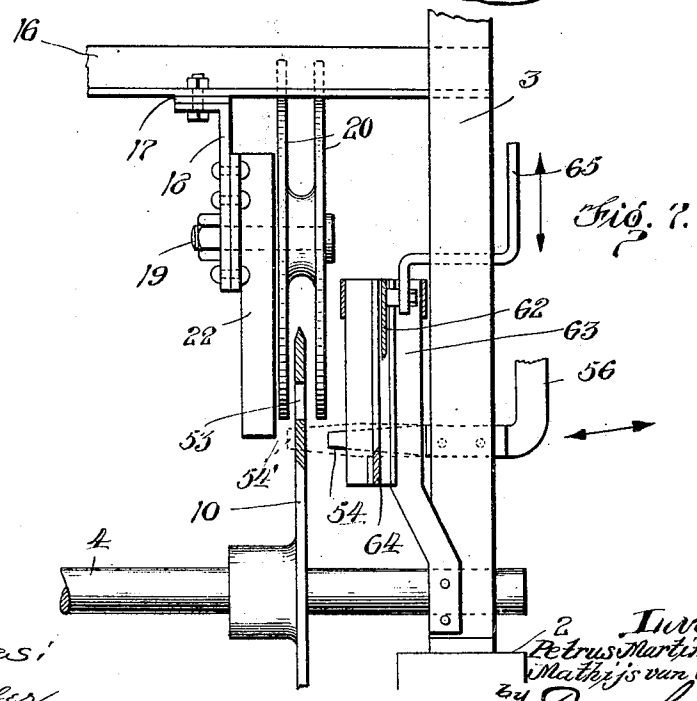


Fig. 7.



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UNITED STATES PATENT OFFICE.

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MACHINE FOR AUTOMATICALLY BINDING HEAD ENDS OF STRAW CASES.

1,323,169. Specification of Letters Patent. Patented Nov. 25, 1919.

Application filed April 26, 1917. Serial No. 164,781.

To all whom it may concern:

Be it known that we, PETRUS MARTINUS DIKS and MATHIJS VAN DEN HEUVEL, subjects of the Queen of the Netherlands, residing at Uden, Province of Noord Brabant, in the Kingdom of the Netherlands, have invented certain new and useful Improvements in Machines for Automatically Binding Head Ends of Straw Cases, of which the following is a specification.

The invention relates to a machine for automatically binding the headends of strawcases, adapted to pack bottles and the like. The invention has for its object to bind these strawcases in quite a novel manner. Binding the cases manually whereby the cases, prior to the binding, are compressed in a clamp, does not enable a high production to be obtained and causes high production costs.

In well-known machines the headends of the cases are closed by forming a stitching at the headends, or by wrapping metal-wire around said ends.

The machine according to the present invention, however, is arranged in such a manner that the binding-thread, approximately in the direction of the diameter of the cross-section of the head of the case, is pulled through the latter, then is wound one and a half times around the head and then again is pulled through the head of the case in the same direction and finally is tensioned and cut off.

This mode of binding is simple, and loosening of the cases bound in this manner is practically impossible. As the time required for machine binding the cases in this manner is very short, the output of the machine according to the invention is higher than hitherto attained.

The invention also relates to mechanism of such organization that the binding-thread is drawn in one single movement successively through two succeeding cases, after which it is wrapped around the second of these two cases and then is pulled through said second case and a third case, and thereafter the operation is repeated in the same manner successively for the following cases to be bound.

In a further construction of the machine according to the invention, a thread-guide, which guides the binding-thread coming from the supply reel, is moved alternatively approximately in a straight line and then in a circle, and during the rectilinear movement the strawcases are moved in the opposite direction over an equal distance.

In order to obtain this result, the thread-guide, according to the invention, is arranged on a slide movable perpendicularly to the longitudinal axis of the threadguide in a guide plate, which derives a reciprocating motion at the same time from two eccentrics, acting at an angle of approximately 90°, the apparatus being constructed in such a manner that, at the conclusion of the performance of six half strokes, the slide fails to participate during two half-strokes in the movement imparted to the guide-plate by one of the eccentrics.

The particular manner in which the machine is constructed and arranged to cut off the binding wire at the proper point and in the right manner will be fully described hereinafter with reference to the accompanying drawings, as well as the particular shape which can be given to the thread guide according to the invention.

In the accompanying drawings:—

Figure 1 is a side elevation of a machine according to the invention.

Fig. 2 is a front elevation of the machine illustrated in Fig. 1.

Fig. 3 is a side elevation on a larger scale, and

Fig. 4 a front elevation of an inferior part of the machine.

Fig. 5 shows diagrammatically the manner in which the headends of strawcases are bound with the machine according to the invention.

Figs. 6 and 7 are respectively a front and side elevation of parts of the mechanism on an enlarged scale.

With reference to Fig. 5, it first will be explained in what manner the heads of the case are bound with the machine according to the invention.

The binding thread 1, coming from the winding drum, is first pulled through the head of the case approximately in the direction of the diameter of the cross-section of the head, and then is wound around the entire circumference of this head (portion *b*), whereafter it is wound half a time around the case (portion *c*), so that the binding thread is again returned to the starting point of the whole operation.

From this point the binding thread is again pulled through the head of the case in the same direction (*d*), and thereafter the operation is repeated for the following case. The tightening and cutting of the thread is effected for each case after one or more cases have been treated in the same way, that is to say, between two consecutive cases, and at the same time the binding thread is tensioned. In the example illustrated in Fig. 5, the cases I, II and III are successively treated. The machine may be constructed in such manner that the binding thread is drawn by a single stroke successively through two succeeding cases. The portion *d* of the thread in the first cases and the portion *a* in the next case are applied in one single motion, and thereafter the thread is wrapped around the last case and is again drawn through the said case and a third case, and so on.

The machine shown by way of example in Figs. 1–4 comprises a frame 3 on a base 2, in which frame three parallel shafts 4, 5 and 6 are supported, respectively one above the other in bearings 7, 7, 8, 8 and 9, 9.

To the shaft 4 is secured a guide wheel 10 with teeth 11, and spaced therefrom at an adjustable distance on the same shaft 4 is a drum 12 provided with a wide flange 13. The cases to be bound are supported with their lower ends against said flange, and the headends of the cases lie in the toothspaces 14 of suitable shape between the teeth 11 of the guidewheel. The axes of the cases are then situated approximately along the generatricies of a cylinder surface, the axis of which coincides with the axis of the shaft 4. The cases 15 are placed between the drum 12 and the guidewheel 10 by hand or by means of a suitable feeding mechanism.

The shaft 4 is driven intermittently, as follows: To angle irons 16 at both sides of the frame, forming a connection of the two halves of the frame, a strip of sheet iron 17 is secured, on which a bearing 18 is bolted for supporting a shaft 19. Rotatable about this shaft are two guide wheels 20, 20, circumferentially provided with teeth 21 reaching to or beyond the foot of the teeth of the guidewheel 10. The spaces between the teeth 21 of the wheels 20, during the rotation of the wheels, remain opposite the spaces 14 of the wheels 10. The guide wheels 20, 20 insure the proper disposition of the case at the moment of binding and sufficiently compress the straw of the caseheads. In order to compensate for difference in thickness of various kinds of cases, the shafts 4 and 19 are relatively adjustable to vary the distance between them by slotting the bearing 18, so that the spaces in the guide wheel 10 for the caseheads can be correspondingly modified. A fixed guidepiece 22, opposite the teeth of the wheel 10, during the rotation, serves for pressing the cases into the spaces 14 between the teeth 11 of the guidewheel 10. At the side of the guidewheel 10 opposite the drum 12 a thread guide 23 is arranged opposite one of the spaces 14, said thread guide by means of a screw 24 (Fig. 3) being adjustably secured to a slide 26 movable on a guide plate 25. This thread guide is preferably arranged perpendicular to the plane of the guide wheel 10 and is provided with a central bore 27, through which passes the binding thread 1. From the ends of the thread guide 23 facing the guide wheel 10, the binding thread is guided to the nearest straw-case, around the head of which it is wrapped, and then from this case to the immediately-preceding case.

The guide plate 25 (Fig. 3) has guide brackets 28 through which the slide 26 is movable, and at its upper end is connected to an eccentric 29 the motion of which is imparted to the said guide plate 25. The eccentric 29 is secured to the shaft 5 (Fig. 1), which is driven by a shaft 30, supported in a bearing 31 parallel to the shafts 4, 5 and 6, through the medium of gear wheels 32, 33 and a chain. The shaft 30 is driven by means of a pulley 35 from the transmission shaft. The guide plate 25 derives a vertical motion from the eccentric, as only the vertical and not the horizontal displacement is imparted to the guide pieces 36; the slide 26 participating in this vertical motion when not held fast.

The guide plate or the slide are, moreover, moved by a second eccentric 37 (Fig. 1) on the shaft 30, synchronously driven with the shaft 5 and at an angle of 90° with the first-mentioned eccentric. The eccentricity of these two eccentrics is aproximately equal. The last-mentioned eccentric reciprocates the guide plate 25 and the slide 26 by means of an eccentric rod 38, connected with the guide plate 25. By means of these two eccentrics the lower end of the slide 26, containing the thread guide 23, is moved approximately in the circumference of a circle. The slide 26, however, periodically fails to participate in the up and down motion of the guide plate under the action of the eccentric 29, each time after the thread guide has described one and a half times the circumference of the circle of its movement.

In the example shown, this is attained as follows: The upper end of the slide 26 is bifurcated and the two legs 39 and 40 of this end at both sides project beyond the shaft 5. The leg 39 at its upper end is connected by means of a helical spring 41 to the guide plate, so that during the downward movement of the guide plate the slide 26 also has a similar movement imparted thereto. The legs 39 and 40 serve at the same time for guiding the slide and the guide plate with

respect to the shaft. The slide is pulled down by the spring 41 and rests with the cam 42 of the leg 40 on the guide plate or the guide piece 36 of the eccentric.

A second stop 43 of the slide 26 serves to prevent a periodical downward motion of this slide. For this purpose a hub with an arm 44 is keyed to the shaft 6, said arm being provided with a curved sector. The arm 44 is of such length that a rotation of the shaft 6 causes the sector 45 to engage with the stop 43 and prevents the slide 26 being lowered. Only the guide plate 25 then follows the movement of the two eccentrics, and the slide does not participate in the movement caused by the eccentric 29, so that the thread guide 23 at the lower end of the slide is no longer moved in the circumference of a circle, but approximately horizontally in a straight line. The shaft 6 is driven by the shaft 5 by means of gear wheels 46 and 47 and a chain 48 at such speed, and the segment 45 is of such diameter, that every time after having circularly revolved one and a half times, that is to say, after the guide plate 25 and the slide 26 have made six half strokes, the thread guide then has reached, (for instance, the point *f* in Fig. 3), the slide 26 is held fast about the middle of the downward stroke by the sector, which at that moment engages the cam 43. The guide plate 25 then moves downwardly against the tension of the spring 41, over the last half stroke, then over a half stroke upwardly, after which the member 36 strikes against the cam 42 and the slide is again carried with the guide plate until after six half strokes (at which moment the guide plate and the slide are again midway their downward movement), the segment 45 again engaging the cam 43 and the slide and held fast during two vertical half strokes of the guide plate. The eccentric 37 on the shaft 30, however, continuously acts on the guide plate and slide. Consequently, the thread guide moves along the dotted path (Fig. 3), as follows:—*h*, *g*, *f*, *i*, *h*, *g*, *f*, *h*—*h*, *g*, *f*, *i*, *h*, *g*, *f*, *h*.

The principle on which the invention is based is not changed at all in the event of the binding thread being wound around the casehead two and a half, instead of being wound one and a half times around the said head. In using very smooth strawcases or smooth binding thread this might be necessary, in order to obtain a very good connection. By suitable choice of the relation of the speed of the shafts 5 and 30 this can be attained without any further change. The binding thread 1 carried through the central opening of the thread guide, therefore, is pulled through each strawcase in the manner indicated in Fig. 5.

As already explained above, the machine shown not only moves the thread guide, but also the cases themselves, and in such a manner that, while the thread guide moves approximately in a straight line over the distance, *f*, *h*, the strawcases are moved in opposite directions, so that, while the thread guide moves from *f* to *h* (Fig. 3) the thread guide successively passes through two strawcases (for instance I and II in Fig. 5), whereby the thread portion *d* is passed through the case I and the thread portion *a* through case II. In the construction shown the shaft 4 with the guide wheel 10 and the drum 12 is driven in such manner while the thread guide moves over the distance *i*, *h* (Fig. 3), that the cases to be bound are moved opposite the thread guide. For this purpose a ratchet-wheel 49 (Fig. 2) is secured to the shaft 4, which ratchet wheel is moved by a rod 50 with pawl-shaped end 52, which engages over the edge of the ratchet wheel. This driving rod is moved up and down by an eccentric 51 on the shaft 6, so that the ratchet wheel at each revolution of the shaft is rotated over the pitch of one tooth.

Stretching and cutting off the binding thread between two bound cases occur as follows:—The guide wheel 10 is provided circumferentially with oblong openings 53. The thread 1 binding the bound cases as shown in Fig. 1 passes beyond the center of these openings. The machine is further provided with an automatically reciprocated tapering knife 54 arranged opposite the guide wheel 10 and passing during its movement through the openings 53, thereby carrying along the binding thread 1 stretched in front of these openings, whereby in the two adjacent cases the binding thread is again pulled, so that the heads of the cases are bound very tightly. As the edge of the knife 54 is not very sharp the thread is cut only after it has been tightened sufficiently. The dimensions of the openings 53 and of the tapering knife 54 can be so determined that after moving the said knife a certain distance to tighten or stretch the binding thread, the latter is clamped between the edges of the openings 53 and the knife, and by further moving the knife the tension of the binding thread is increased to such a degree that the thread is severed by the knife. As the guide wheel is moved in an intermittent manner, the reciprocating knife 54 is pressed successively into succeeding openings 53.

The movement of the knife 54 may be accomplished by different mechanisms. In the example shown (Figs. 1 and 2) the knife is arranged at the lower end of a knife holder 56 pivoted to rotate about a horizontal shaft 55 mounted in the frame 3. The part 57 of the knife holder, extended at the other side of the pivot, is provided at its end with a plate 58 with which, during the rotation of the shaft 6, engages a roller 59,

on the end of a crank pin 60, so that the said knife holder 56 is reciprocated against the action of a spring 61 coöperating therewith and whereby the knife 54 is given the desired stroke.

In order to cut off the case heads at the required length prior to the binding operation to obtain a clean and smooth cut, the machine is also provided with an automatic shearing device or knife 62 arranged at a suitable distance from and parallel to the guide wheel 10, said knife 62 being movable vertically in a fixed guide plate 63 along a second knife 64. The shearing device is so arranged that the case-heads of the cases lying in the guide wheel 10 are cut off uniformly by the said knife 62 before they attain the position opposite the thread guide 23. The up and down motion of the knife 62 is obtained by means of a rod 65, the upper end of which is connected to a crank 66 of the shaft 6.

On a lateral support 67 secured to the base 2 a spring actuated sectional guide roller 68 is mounted and carried by a hinged lever 70, which is kept in the desired position by a spring 69 associated therewith. The two halves of the roller 68 are pressed against each other by a spring 71 engaging the same, so that the binding thread is always maintained sufficiently tight.

What we claim is:—

1. A machine for automatically binding the head ends of straw cases, comprising mechanism for feeding and inserting a binding thread through a case head approximately in the direction of the diameter of said head, and then winding the thread around the head and stretching the same in a transverse direction through the head for similar engagement with another case head if desired, and means for subsequently tensioning and severing the thread.

2. A machine of automatically binding the head ends of straw cases, comprising mechanism for feeding and inserting a binding thread in one single motion transversely and successively through two succeeding cases and wrapping the thread around the second of these two cases and then pulling the thread through the said second case and a third case of a succeeding number of cases, whereby the operation may be repeated for all succeeding pairs of cases.

3. A machine for automatically binding the head ends of straw cases, comprising mechanism for feeding and inserting a binding thread through a case head approximately in the direction of the diameter of said head and including a thread guide which is positioned at the head end of the cases and provided with means for alternately giving the same an approximate rectilinear and an approximate circular motion, and means for moving the straw cases during the rectilinear motion of the thread guide in an opposite direction over an equal distance.

4. A machine for automatically binding the head ends of straw cases, comprising mechanism for feeding and inserting a binding thread through a case head approximately in the direction of the diameter of said head and comprising a thread guide, a slide to which the thread guide is connected, a guide plate for the slide, the slide being movable perpendicularly to the longitudinal axis of the thread guide, eccentrics for operating the guide plate to impart to the latter a vertical reciprocating movement in opposite directions, and means whereby after every six half strokes the slide, during two half strokes, is prevented from participating in the movement which one of the eccentrics imparts to the guide plate.

5. A machine for automatically binding the head ends of straw cases, comprising mechanism for feeding and inserting a binding thread through a case head approximately in the direction of the diameter of said head and comprising a thread guide, a slide to which the thread guide is connected, a guide plate for the slide, the slide being movable perpendicularly to the longitudinal axis of the thread guide, eccentrics for operating the guide plate to impart to the latter a vertical reciprocating movement in opposite directions, and a shaft having a sector rotatably mounted thereon and adapted to engage a portion of the slide at intervals to prevent the slide from participating in the reciprocating movement of the guide plate.

6. A machine for automatically binding the head ends of straw cases, comprising mechanism for feeding and inserting a binding thread through a case head approximately in the direction of the diameter of said head and comprising a thread guide, a slide to which the thread guide is connected, a guide plate for the slide, the slide being movable perpendicularly to the longitudinal axis of the thread guide, eccentrics for operating the guide plate to impart to the latter a vertical reciprocating movement in opposite directions, a guide wheel having teeth with spaces therebetween to receive the head ends of the straw cases and mounted opposite the thread guide, and means for intermittently rotating the guide wheel over the pitch of one tooth thereof and also for preventing the slide from participating at intervals in the reciprocating movement of the guide plate, the guide wheel rotating during the time that the slide does not participate in the movement of the guide plate.

7. A machine for automatically binding the head ends of straw cases, comprising mechanism including a thread guide for

feeding and inserting a binding thread through a case head approximately in the direction of the diameter thereof and then winding the thread around the said head, the thread guide consisting of a cylindrical member bored throughout its entire length and having a conical end, the mechanism being operable to simultaneously similarly apply the binding thread to a number of the head ends of straw cases, and means for tensioning and severing the thread after it is inserted through the said head ends of the straw cases.

8. A machine for automatically binding the head ends of straw cases, comprising mechanism including a thread guide for feeding and inserting a binding thread through a case head approximately in the direction of the diameter of said head and then winding the thread around the said head and stretching the thread in the same direction transversely through the head of the case for similar engagement with another case head, a slide to which the thread guide is connected, a guide plate for the slide, the latter being movable perpendicularly to the longitudinal axis of the thread guide, eccentrics for operating the guide plate, a guide wheel having teeth with spaces therebetween to receive the head ends of straw cases, said guide wheel being provided with means for intermittently rotating the same and also having a series of openings therethrough, and a tapering knife movable through the openings of the guide wheel and having means for moving the same through the openings in the guide wheel opposite thereto during the period of rest of said guide wheel, the tapering knife operating to tension the binding thread prior to cutting the same, and the slide during a stroke thereof at the conclusion of every six half strokes being prevented from participating in the movement of the guide plate.

In testimony whereof we have hereunto set our hands.

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