

Jan. 8, 1946.

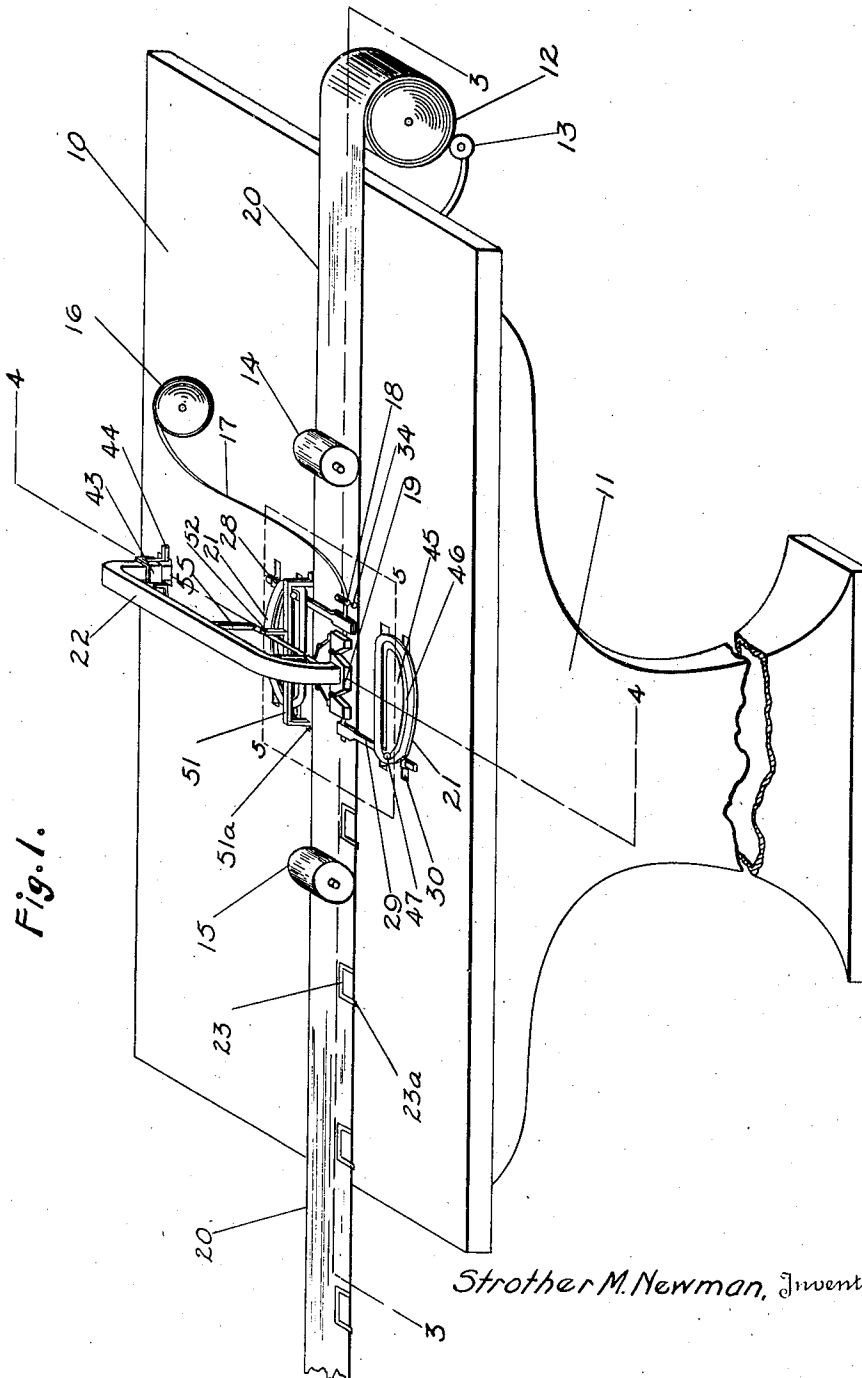
S. M. NEWMAN

2,392,609

TAPE APPLYING MACHINE

Filed Jan. 29, 1942

15 Sheets-Sheet 1



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Chas. E. Egan

Attorney

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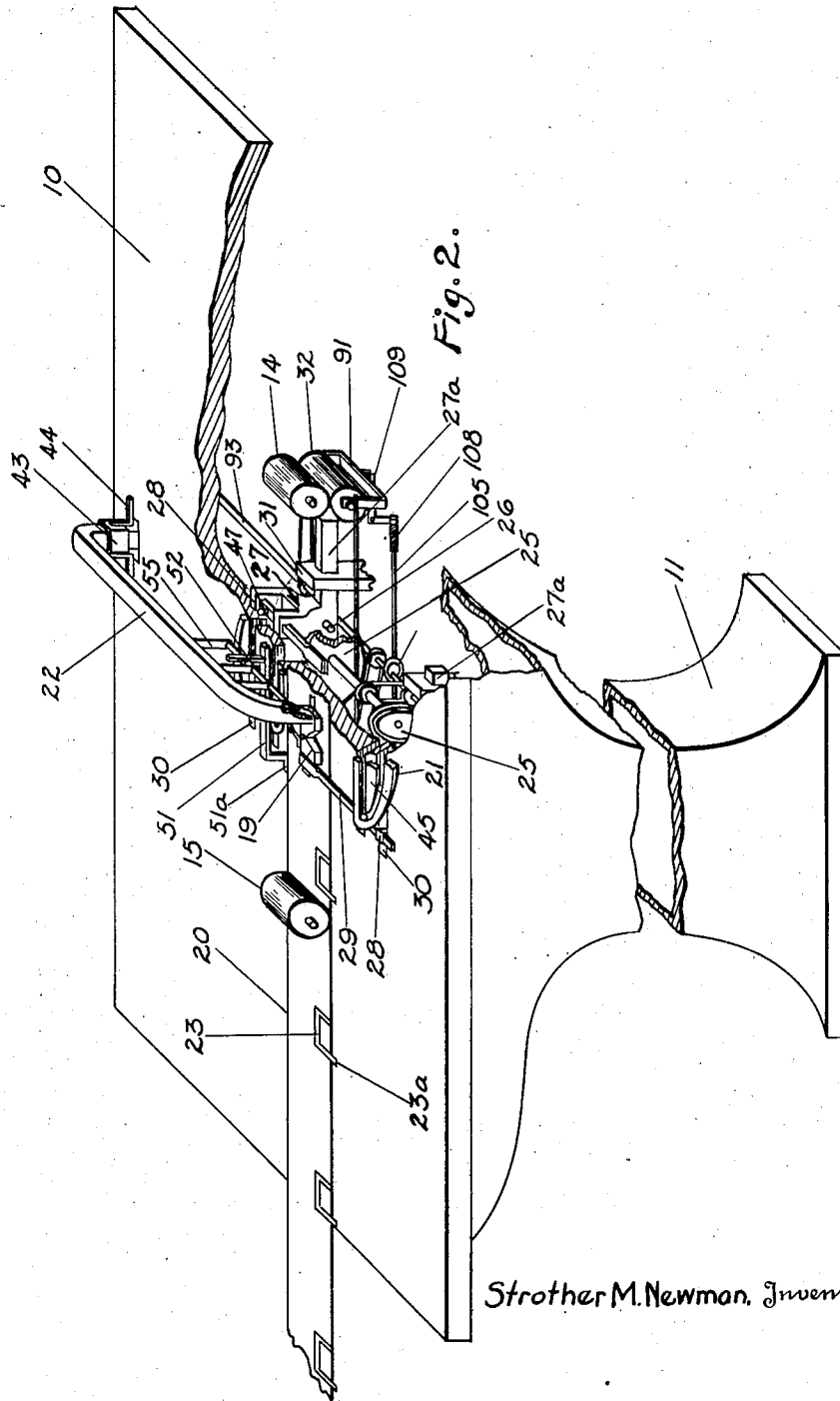
S. M. NEWMAN

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15 Sheets-Sheet 2



Strother M. Newman, Inventor

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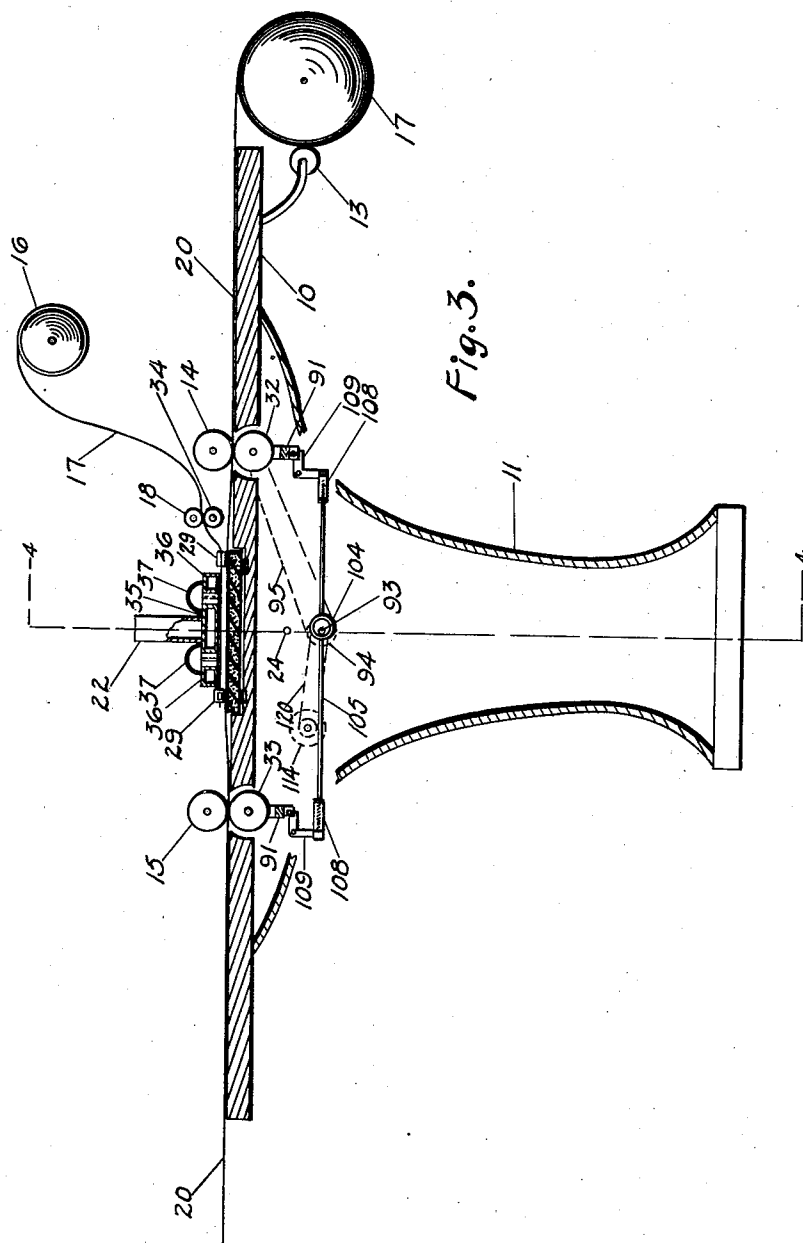
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TAPE APPLYING MACHINE

Filed Jan. 29, 1942

15 Sheets-Sheet 3



Strother M. Newman, Inventor

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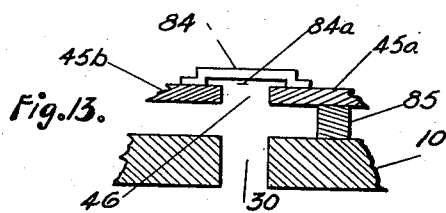
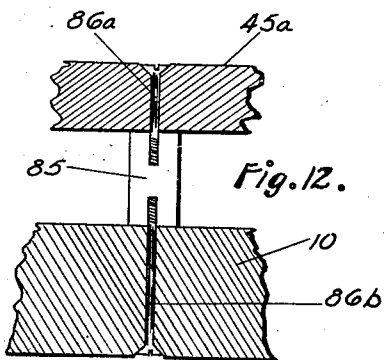
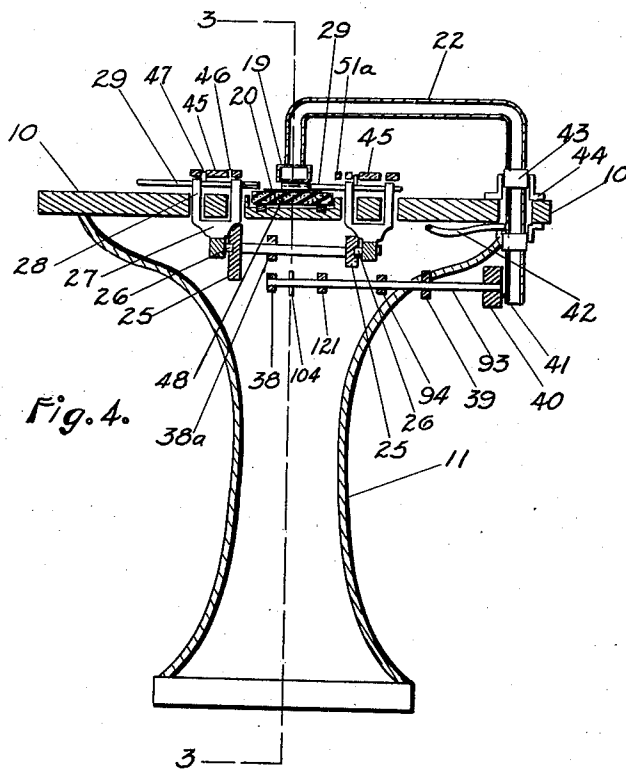
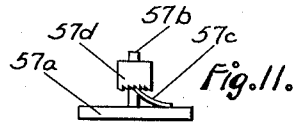
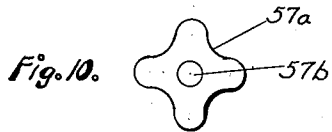
S. M. NEWMAN

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15 Sheets-Sheet 4



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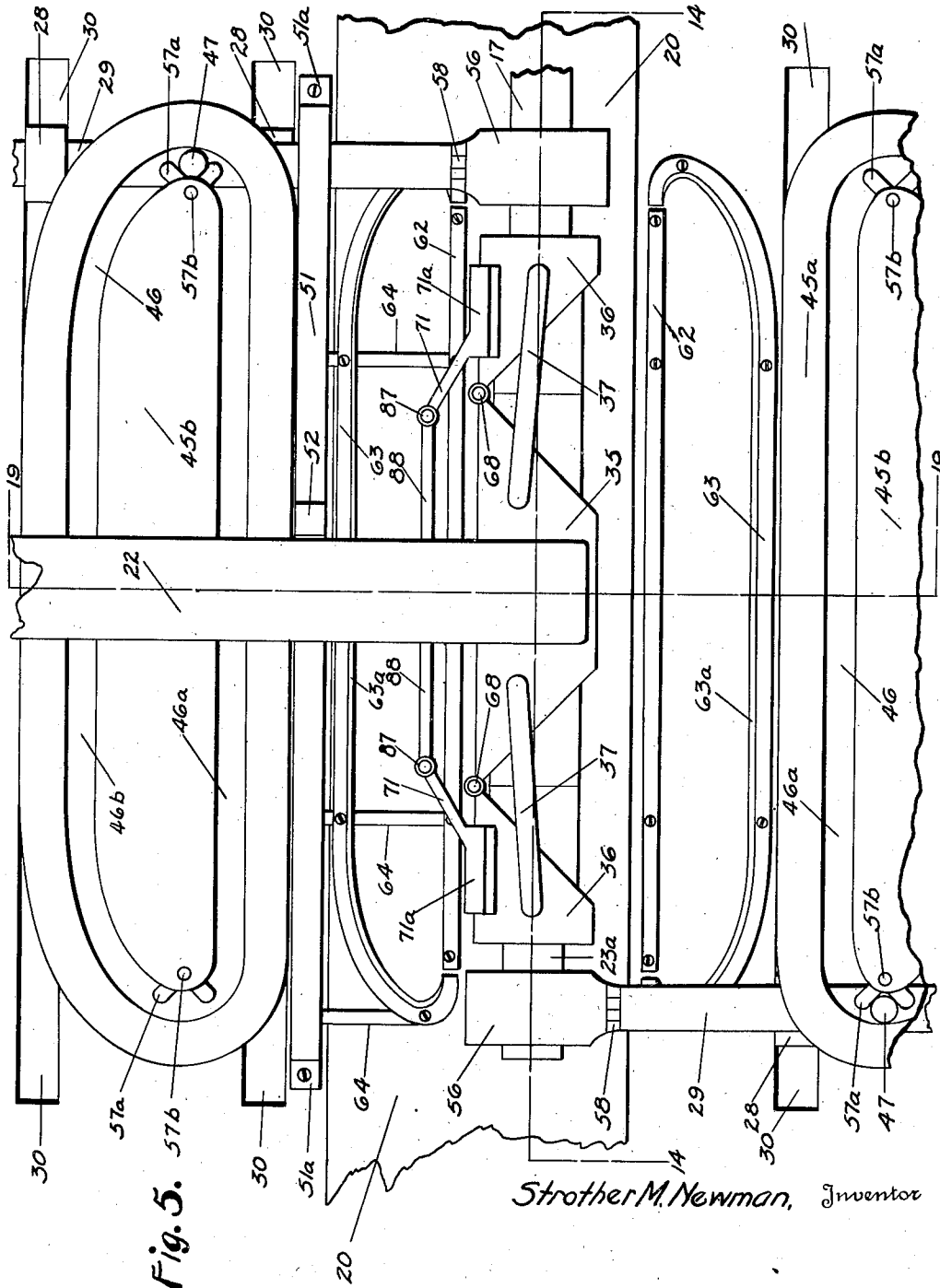
S. M. NEWMAN

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15 Sheets-Sheet 5



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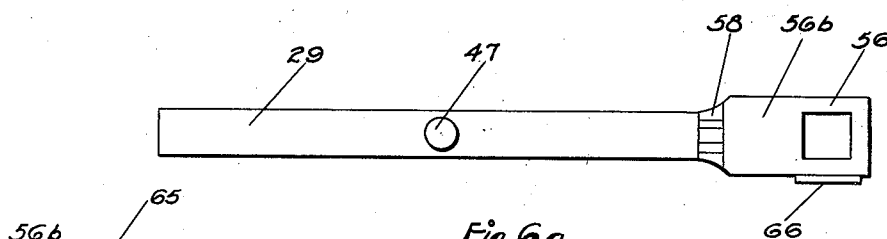


Fig. 6a.

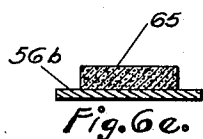


Fig. 6c.

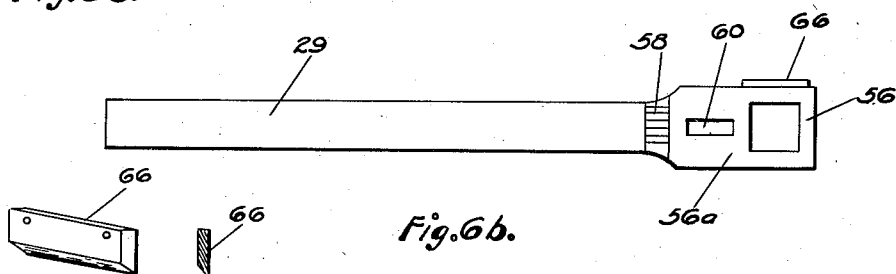


Fig. 6b.

Fig. 6f. Fig. 6g.

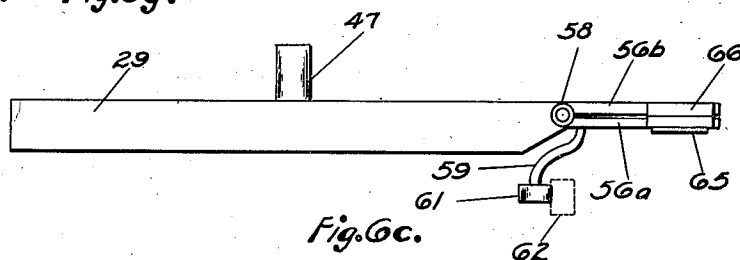


Fig. 6c.

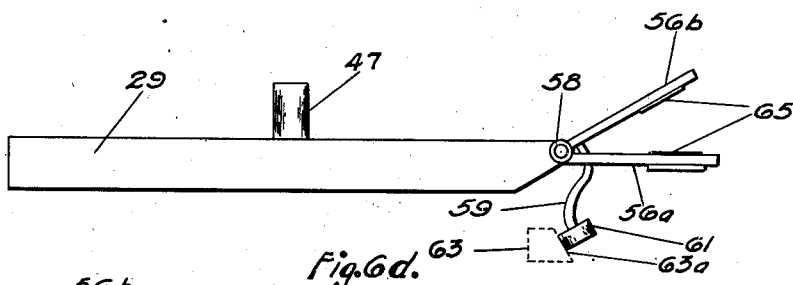


Fig. 6d.

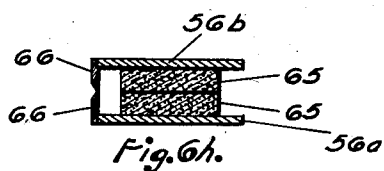


Fig. 6h.

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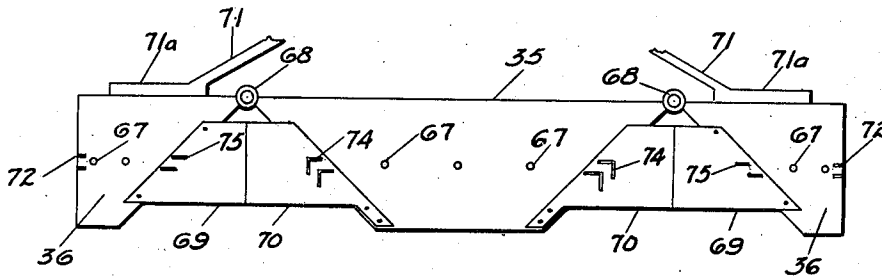


Fig. 7.

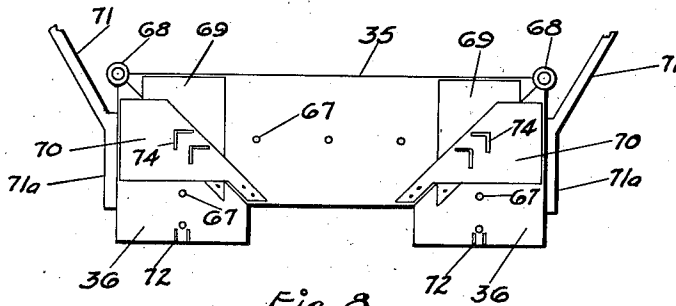


Fig. 8.

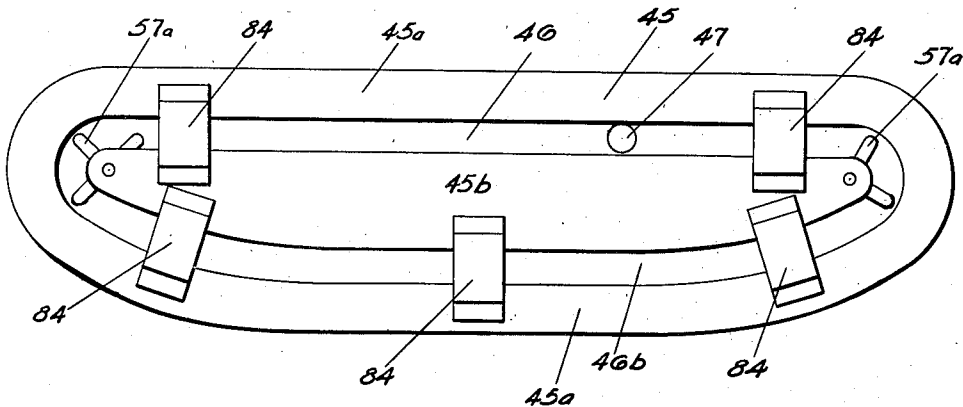


Fig. 9.

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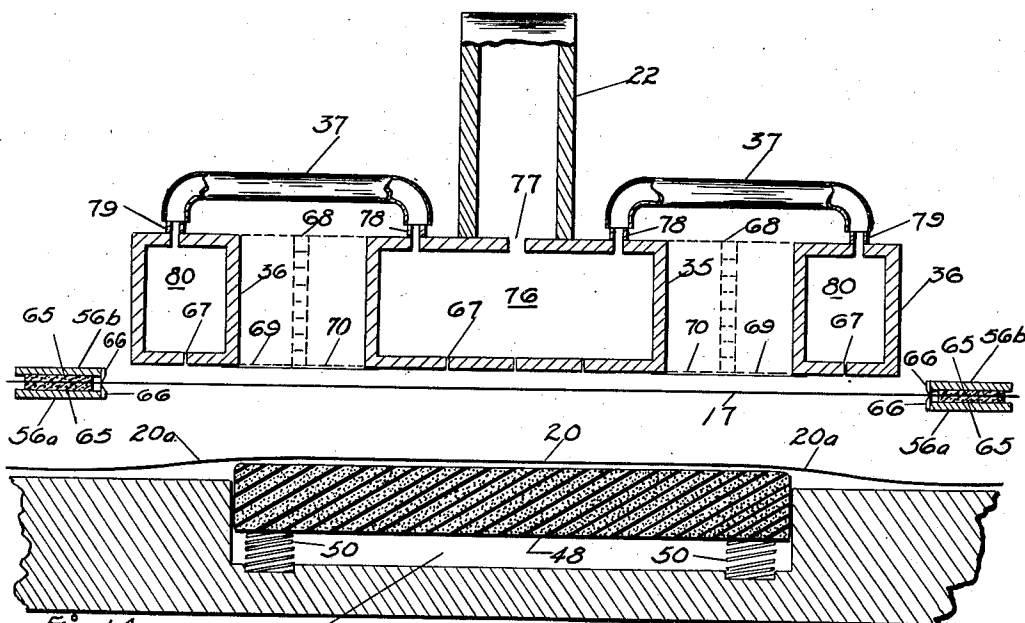
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TAPE APPLYING MACHINE

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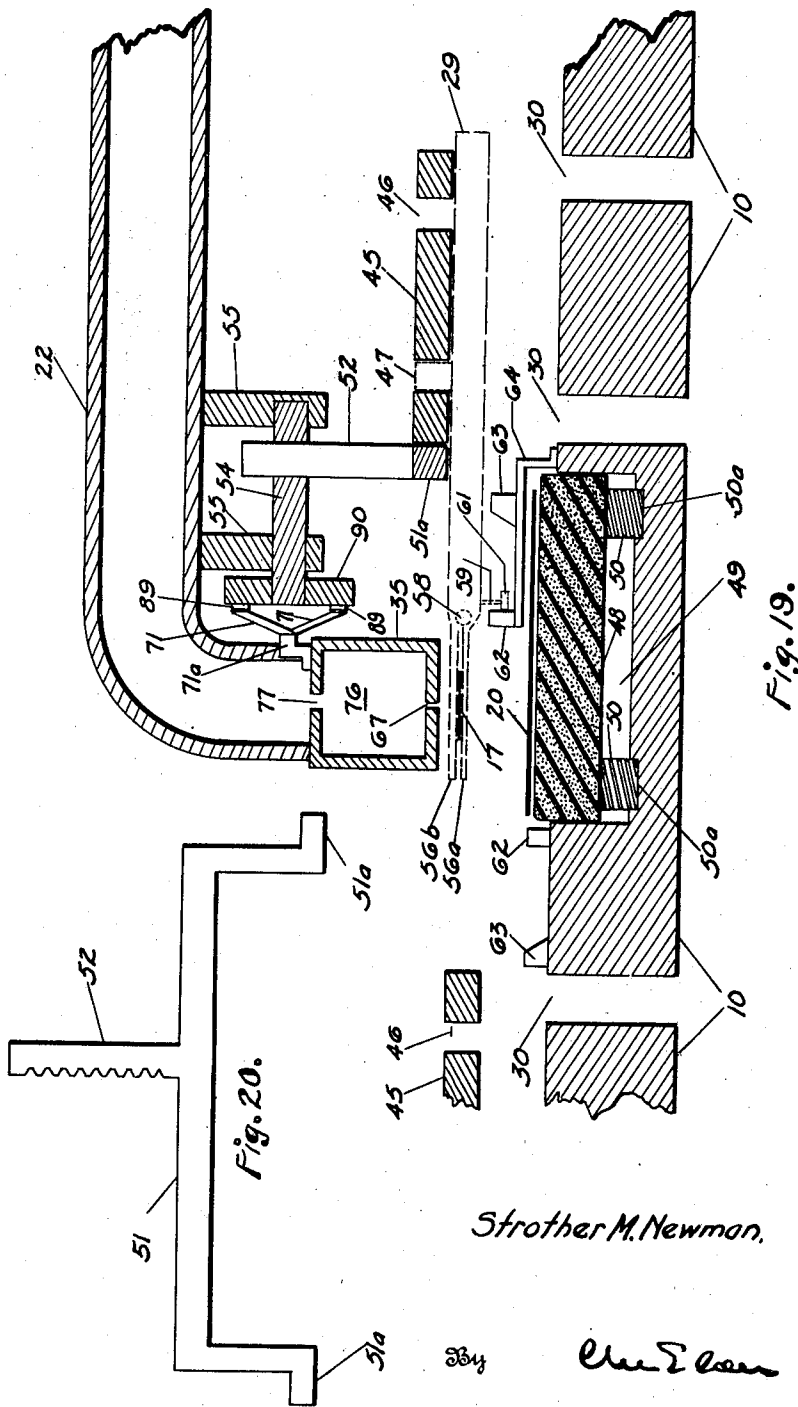


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Fig. 21.

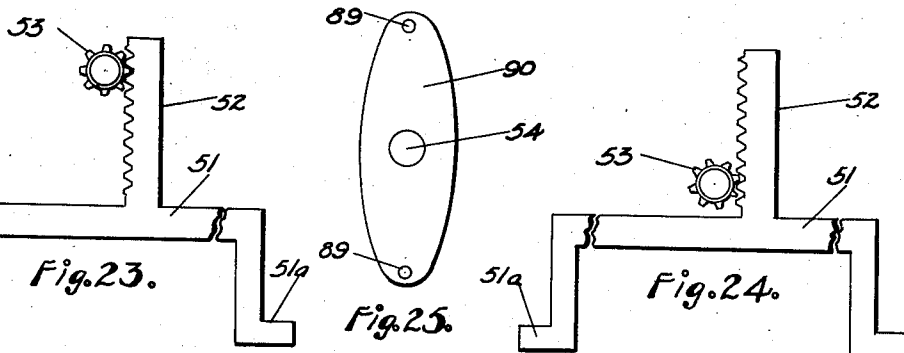
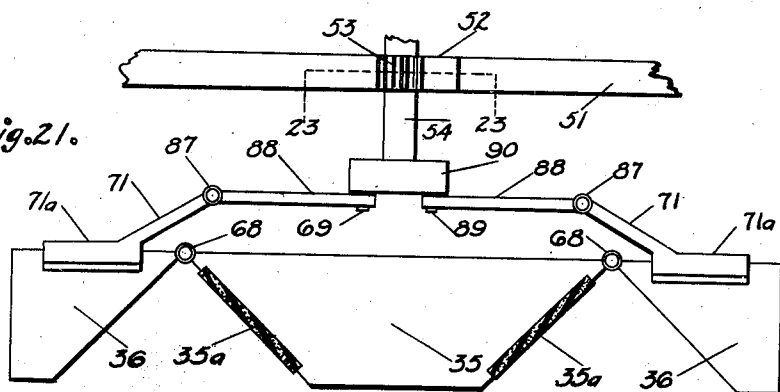
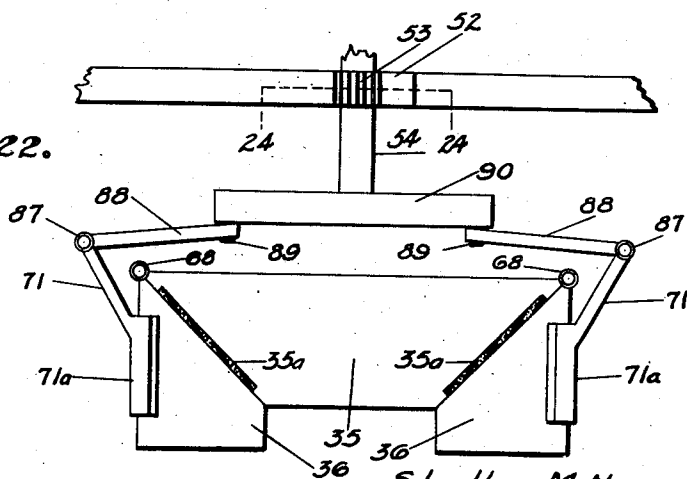


Fig. 22.



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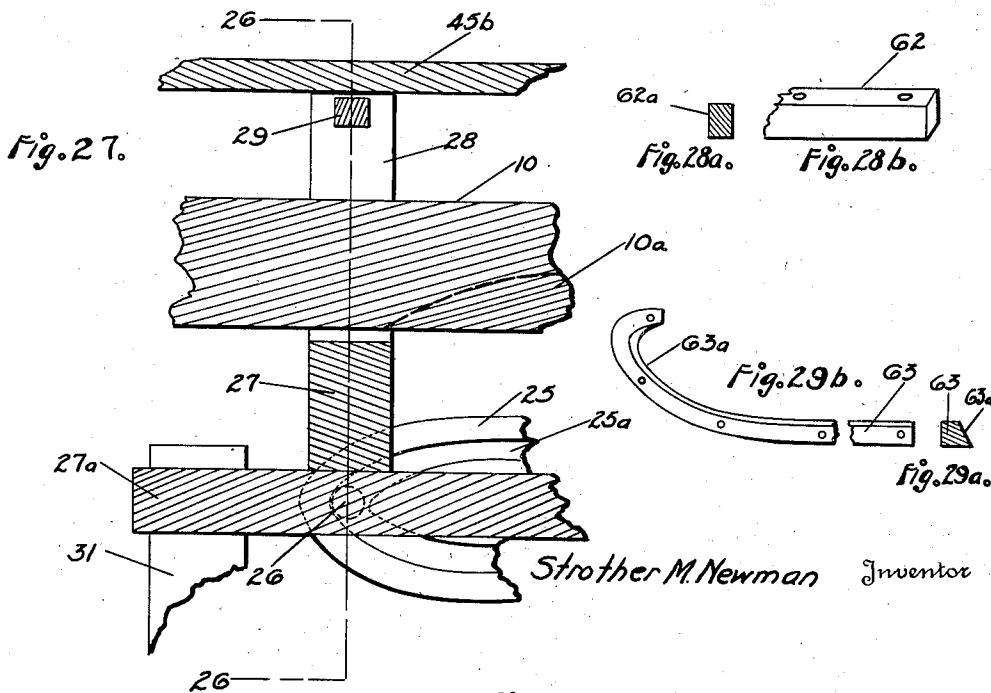
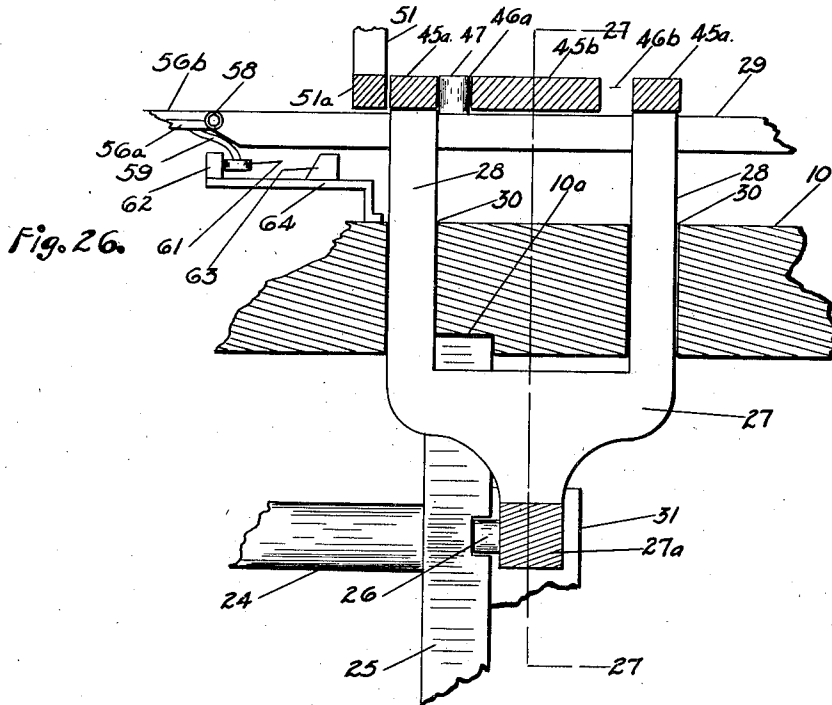
S. M. NEWMAN

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TAPE APPLYING MACHINE

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TAPE APPLYING MACHINE

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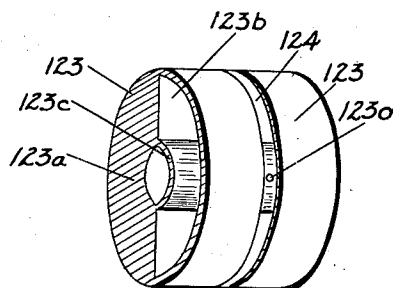
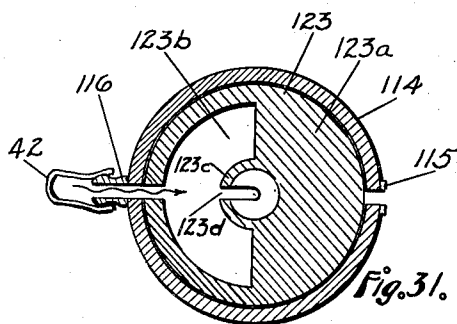
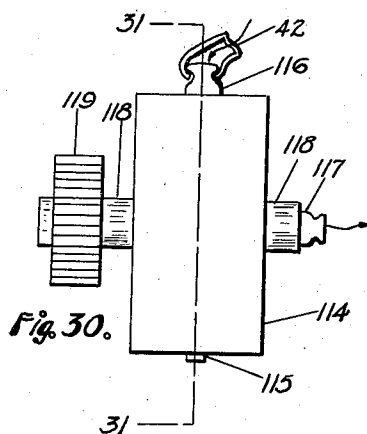
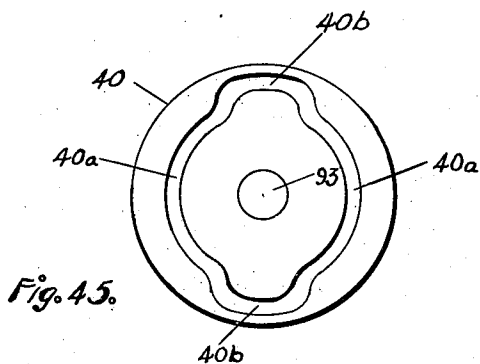


Fig. 32.

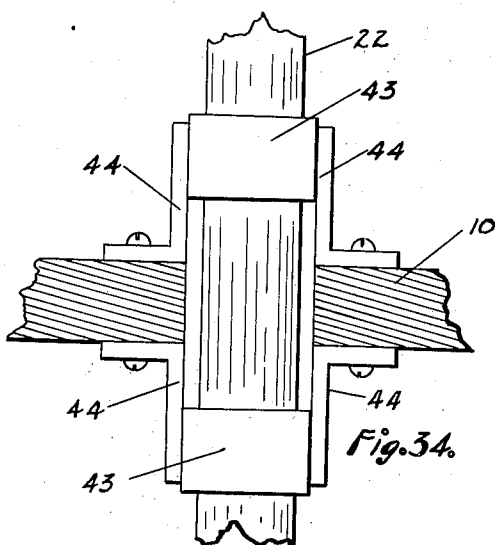


Fig. 34.

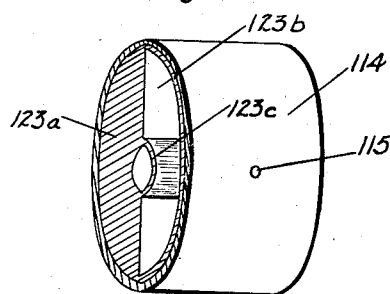


Fig. 33.

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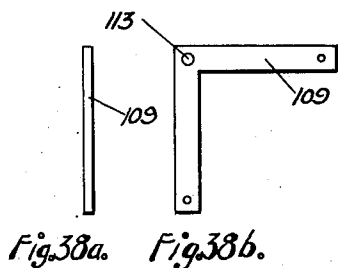
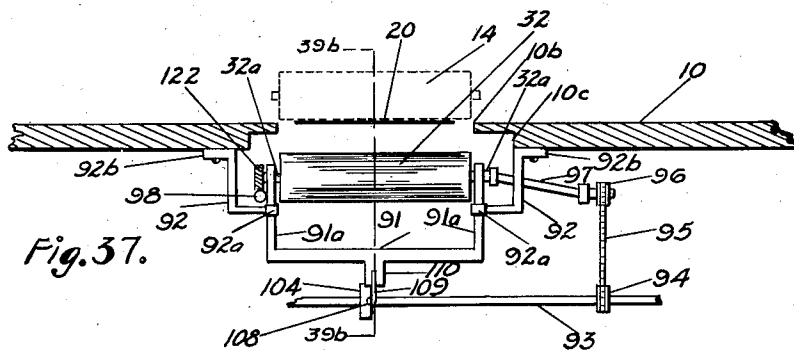
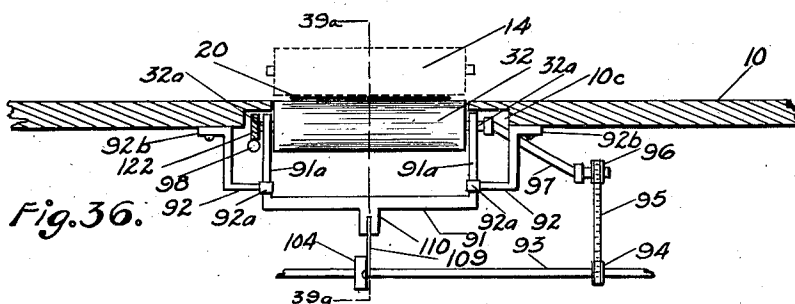
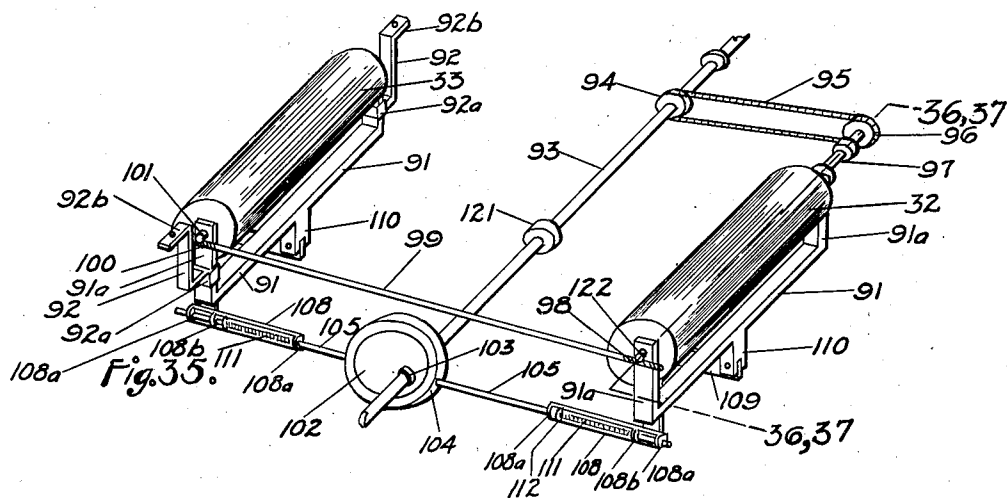
S. M. NEWMAN

2,392,609

TAPE APPLYING MACHINE

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Jan. 8, 1946.

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TAPE APPLYING MACHINE

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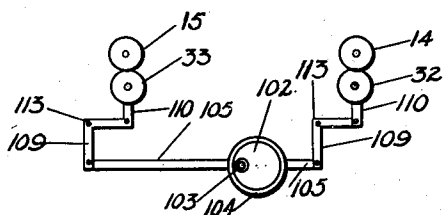


Fig. 39a.

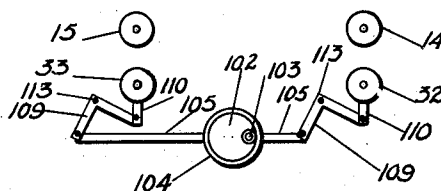


Fig. 39b.

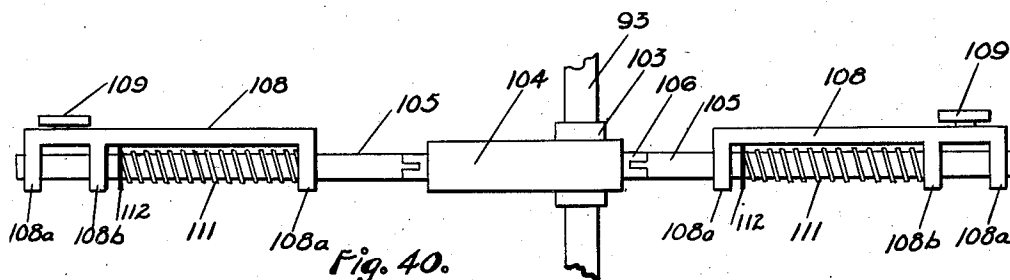


Fig. 40.

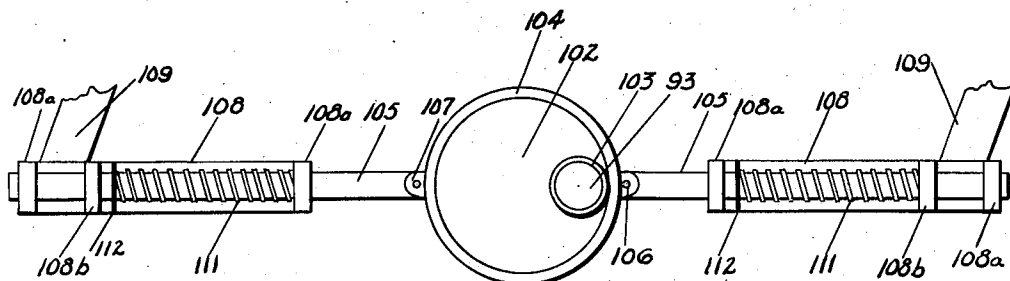


Fig. 41.

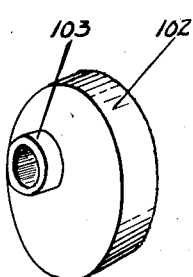


Fig. 42a.

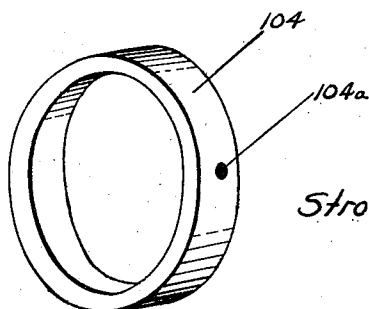


Fig. 42b.

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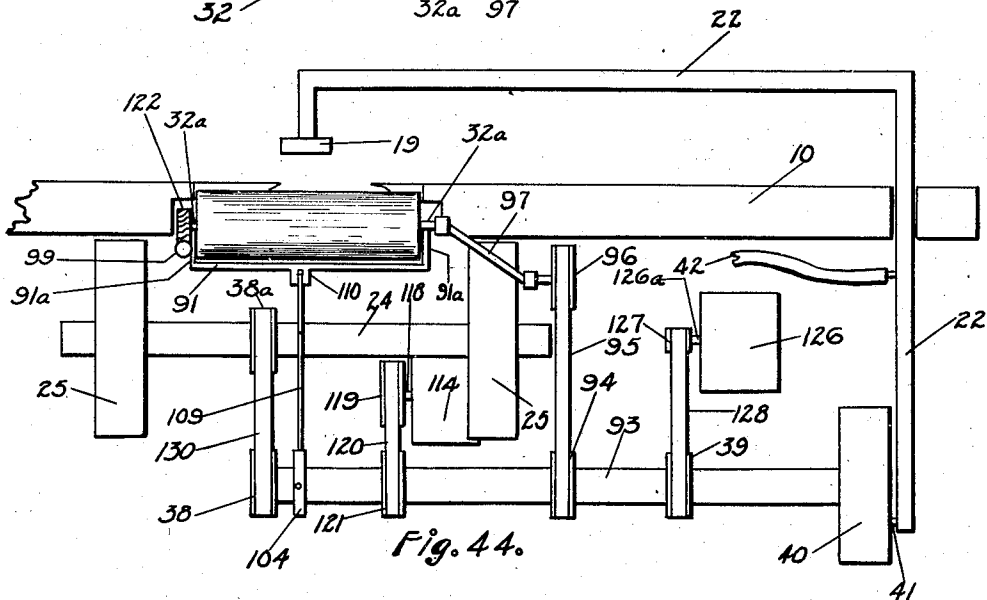
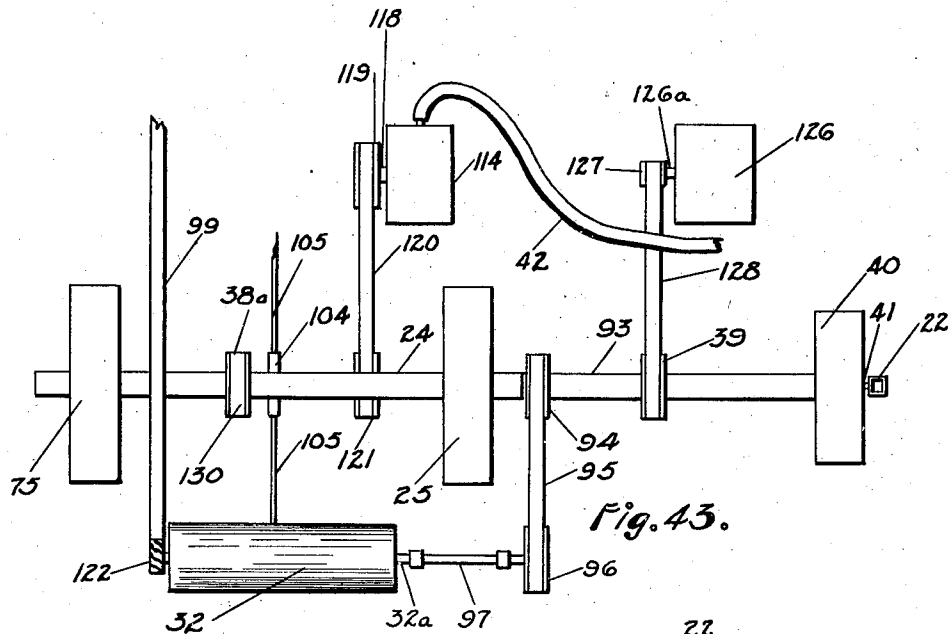
S. M. NEWMAN

2,392,609

TAPE APPLYING MACHINE

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15 Sheets-Sheet 15



Strother M. Newman. Inventor

By *Chas. E. Keen*

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UNITED STATES PATENT OFFICE

2,392,609

TAPE-APPLYING MACHINE

Strother M. Newman, Staunton, Va., assignor of
one-half to John A. Clem, III, Staunton, Va.

Application January 29, 1942, Serial No. 428,696

23 Claims. (Cl. 93—1)

My invention relates to a machine for effectively and in simple manner applying ripping tape to wrapper material for cigarette and other broadly similar packages. This application is companion to my co-pending application for Letters Patent of the United States for Carton wrapper, Serial Number 413,988, filed October 7, 1941.

An object of my invention, therefore, is to produce a sturdy, reliable and compact machine for accurately cutting off, positioning, and positively applying tearing ribbon at predetermined and accurately spaced points along the length of a roll or sheet of wrapper material of Cellophane or broadly similar paper-like composition.

Another object is to produce such a machine which is comparatively simple, is of small compass, occupies a minimum of floor space, and which is characterized by freedom from mechanical difficulties even after extended operation thereof.

Other objects will in part be obvious and in part pointed out hereinafter, in connection with the following description.

Accordingly, my invention consists of the several parts and features of construction, and in the relation of each of the same to one or more of the others, all as described in the following specification, taken in light of the accompanying drawings, wherein is illustrated one embodiment of my invention which I prefer at present.

In the drawings:

Figure 1 illustrates in perspective the machine according to my invention;

Figure 2 is a view similar to Figure 1, in which part of the working table is broken away, to permit illustration of certain of the mechanism disposed under the table; Figures 3 and 4 are longitudinal and transverse sections through the machine, taken respectively on line 3—3 and line 4—4 of Figure 1, certain details of the actuating mechanism for the forming head end sections being omitted for clarity; Figure 5 shows in plan, on enlarged scale, details of the blocked portion 5—5 of Figure 1.

Figure 6a illustrates, in top plan, details of a shuttle as employed in my machine and discloses a recess for the anti-stick gripping pad of Figure 6e; Figure 6b is a bottom plan thereof; Figures 6c and 6d are side views, respectively showing the shuttle head in closed and open position, and the relation of the shuttle to the closure and opening tracks while in those positions; Figure 6e is a sectional view showing a gripping pad of suitable anti-stick material serving as an insert for one or both parts of the shuttle head to prevent the adhesive-coated ripping tape from adhering thereto; Figures 6f and 6g show in perspective and in section respectively, the detailed construction of the knife disclosed in Figures 6a and 6b;

while Figure 6h is a front elevation, on enlarged scale, showing in detail the manner of cooperation of both the knives and adhesive resistant pads on the shuttle head. Figures 7 and 8 are bottom plan views of the vacuum head of the machine, respectively showing the head in its open or unfolded position, and in its closed or folded position;

Figure 9 is a plan view of one of the tracks for guiding the shuttles, and illustrating the details thereof, the location of this track relative to the rest of the machine being best depicted in Figure 1; Figure 10 is a detail of the turnstile head as employed with the track of Figure 9; Figure 11 discloses in elevation the ratchet mechanism of this turnstile; Figure 12 is a sectional detail of the track elevation stud; while Figure 13 shows in elevation the association of this stud with a track bracket.

Figure 14 is a section, on enlarged scale, taken on line 14—14, of Figure 5, and illustrating the vacuum or forming head, the associated forming plate, etc.; Figure 15 is a sectional view through the forming plate of Figure 14 showing the location of the linear scoring knives; Figures 16 discloses in plan the top surface of this forming plate; Figures 17a and 17b are end and elevational views, respectively, of the angled scoring knives; while Figures 18a and 18b are similar views of the linear scoring knives;

Figure 19 is a sectional view taken on line 19—19 of Figure 5, and illustrating certain details of the forming head, the table, and the forming plate construction; Figure 20 shows in elevation the rack bracket of the rack and pinion mechanism of Figures 21 through 24; Figures 21 and 22 are plan views showing the forming head and related parts in open and closed or folded positions, respectively; Figure 23 is a view, corresponding to line 23—23 of Figure 21, showing the relation of the rack and pinion when the forming head is open; Figure 24 is a view, corresponding to line 24—24 of Figure 22, showing the relation of the rack and pinion when the forming head is closed or folded; Figure 25 is a detail of the cam plate which controls the arms moving the end sections of the forming head.

Details of the shuttle actuating mechanism are shown in Figures 26 through 29. Figure 26 is a side elevation, partly in section, taken on line 26—26 of Figure 27, showing details of the shuttle actuating mechanism; Figure 27 is a view, partly in plan and partly in section, corresponding to line 27—27 of Figure 26; Figures 28a and 28b are cross-sectional and perspective views, respectively, of the shuttle-closure track shown in Figures 5 and 26; Figures 29a and 29b are cross-sectional and plan views, respectively, of the shuttle-opening track shown in Figures 5 and 26.

Figures 30 through 33 relate to the vacuum con-

trol means for the forming head. Figure 30 is a plan view of an intermittent vacuum valve according to my invention; Figure 31 is a cross-sectional view taken on line 31—31 of Figure 30; Figure 32 is perspective view of the valve cylinder; Figure 33 is a similar perspective view of the valve barrel, with the valve cylinder therein, the cylinder being positioned so as to open the valve to the atmosphere;

Figure 34 is an elevational view, partly in section, of the means for supporting and guiding the forming head support arm as it passes through the table;

Details of the drive roller feed mechanism for advancing the wrapper stock at predetermined and proper intervals in the operating cycle constitute the subject matter of Figures 35 through 42b. Figure 35 illustrates in perspective the general arrangement of this mechanism, and the association of the parts thereof. Figures 36 and 37 are side elevations of the mechanism of Figure 35 taken on lines 36—36 and 37—37, Figure 35 illustrating the cooperation of the drive roller with the overlying idler roller, and respectively showing the drive roller positioned adjacent to and away from the said idler roller. Figures 38a and 38b disclose in side and front elevation, respectively, the rocker arm which rocks the drive roller of Figure 35. Figures 39a and 39b are schematic disclosures of the manner in which and mechanism by which the feed mechanism eccentric impels the drive roller towards and away from the idler roller, Figure 39a corresponding to line 39a—39a of Figure 36, while Figure 39b corresponds to line 39b—39b of Figure 37. Figure 40 is a plan and Figure 41 an elevation of the cushioned construction of the eccentric arms reciprocated by the eccentric of Figure 35. Figures 42a and 42b are respectively perspective views of the eccentric core and the eccentric shell.

Figure 43 is a schematic plan view of the power shaft and propelling mechanism, taken in the same horizontal plane, while Figure 44 is a schematic elevation corresponding to Figure 43.

Figure 45 is a plan showing the cam track controlling the forming arm.

As conducive to a more ready and comprehensive understanding of my invention, it may be noted that in my said companion application, Serial No. 413,988, I have disclosed a new carton closure wherein ripping tape is provided in such manner that when the latter is employed to rip open the wrapper or jacket, only one small corner of the latter is removed, leaving the greater part of the jacket intact about the carton itself. This constituted a material improvement, functionally, over the closure means theretofore available.

Both with the embodiment according to my co-pending application, however, as well as with the wrappers employing ripping tapes as theretofore known, considerable difficulty was encountered from a practical standpoint in placing the ripping tape on the Cellophane or other wrapper material in rapid and accurate manner. It is necessary, in the highly competitive cigarette, as well as in other package arts, that devices or machines for applying the ripping tape to the wrapper be comparatively inexpensive, simple, accurate, small, long-wearing, and highly efficient. Any machine or device for this purpose involving any appreciable expense in its use is impractical. In one respect or another, machines heretofore available have fallen somewhat short of fulfilling

entirely the needs of the art, so that the workers in packaging fields have been searching industriously for a more complete solution of their problems.

An object of my invention, therefore, is to avoid in large measure the difficulties and disadvantages heretofore confronting the art, and in so doing, to produce a comparatively simple and inexpensive, highly efficient machine for positioning the ripping tape, in desired variety of configuration, at accurately predetermined points along the length of the wrapping material, and to make it fast thereon.

Referring now more particularly to the general representation of my invention as illustrated in Figure 1, a table 10 is supported on a pedestal or other suitable support 11. Carried on either the support or table by any suitable means such as a bracket, not shown, is a roll 12 of wrapper stock, such as Cellophane or similar suitable paper-like wrapper material. Since the motion of the machine is intermittent or step by step, as will be more fully described hereinafter, I find it advisable to brake the roll 12 by any conventional means such as follower 13. This follower is biased against the roll 12 by means such as a weak spring, and serves to prevent over-running or backlash as the roll unwinds. Idler or guide roller 14 cooperates with a corresponding drive roller disposed therebelow, and to be described later herein, as for example, in connection with Figures 35—39b, to feed the wrapper stock in proper manner under the forming head of the machine. A similar guide roller 15 serves together with a take-up roller disposed therebeneath, but not shown in Figure 1, to take up the wrapper stock at the outlet end of the machine, after the ripping tape has been applied thereon, and feed it to the wrapping machine, or to storing means, as the case may be. It is of course evident that the positions of the rollers 14 and 15 may be reversed with respect to their corresponding drive rollers, and the latter disposed uppermost. However, I find it more convenient at this time to employ the arrangement illustrated.

A roll 16 of ripping tape is provided, carried either independently of and above the machine now undergoing description, or carried thereon as by suitable brackets, not shown. The ripping tape 17 is fed from roll 16 under idler roller 18. This roller 18 cooperates with a second idler roller 34 disposed therebeneath. Thence the ripping tape is passed beneath the forming head indicated broadly at 19, is cut off into predetermined lengths, and is positioned properly on, and applied to the wrapper stock 20. If desired, a friction brake similar to brake 13 for roll 12 may be provided for roll 16 to prevent backlash or over-running and consequent slack in the ripping tape.

Shuttle mechanism indicated broadly at 21—21 serves to carry the ripping tape along its path of intermittent travel. The forming arm 22 serves to carry the forming head 19, and is secured thereto in suitable manner, such as by threading, lag bolts, bayonet slots or the like, so that the heads 19 are replaceable as desired.

This ripping tape 17 carries any desired form of adhesive on that side which will be disposed adjacent the wrapper stock. The adhesive may be applied either before roll 16 is wound or it may be applied in any suitable and conventional manner not shown during the passage of the tape 17 from roll 16 to its point of application to the wrapper stock 20.

The description of details of the forming head 19 will be more fully developed in connection with the description of Figures 5, 7, 8, 14 and 19-22 inclusive, while the details of the shuttle mechanism will be similarly treated in connection with Figures 5 and 6a-6h inclusive.

While detailed description of the operation of the mechanism will be reserved until later in this specification, I may say at this point that the wrapper stock 20 is fed by suitable mechanism, later to be described in connection with Figures 35-39b, in step by step fashion underneath the forming head. The pauses or stops between each step of the movement is timed to permit application of sections of ripping tape thereto by the forming head 19. Simultaneously, and by the use of shuttle mechanism 21-21, the ripping tape 17 is likewise fed in step-wise fashion under the forming head, overlying and spaced vertically above the wrapper stock 20 as shown for example in Figure 14.

The shuttles alternate, one returning to begin its operation anew while the other shuttle is simultaneously gripping the ripping tape 17 and pulling unit lengths thereof through the area defined by and underneath the forming head 19. The return shuttle, at the end of its return stroke, grips a fresh length of ripping tape, and in so doing, cuts off the trailing edge of the preceding section, which has been positioned under the forming head.

The forming head 19 is timed in its vertical travel with forming arm 22 so that it performs its downward travel during the time that the wrapper stock and sections of ripping tape are momentarily stopped thereunder. The downward motion of head 19 begins at the end of the intermittent forward motion of stock 20 and tape 17.

At the beginning of this downward motion of forming head 19, vacuum is applied thereto, and continues throughout that downward movement. Accordingly, tape 17 comes under the influence of the vacuum—vacuum ports being provided on the under surface of the forming head as will be described later—as soon as the forming head approaches it. Since the end sections of the forming head are subjected to folding stresses through angles of 90° while the head 19 is being lowered, this head folds the ripping tape in accurately predetermined manner, as for example, the generally U-shaped configuration 23, and then during the later part of its travel positions the folded tape section on the wrapper stock. It is to be noted that the folding operation to which the tape sections are subjected begins at the initiation of the downward travel of the forming head, and is completed when this head reaches the bottom of its travel (see Figures 21 through 25 inclusive). At the conclusion of the rest or stop period the forming head 19 is raised and the forward motion of the wrapper stock and ripping tape is resumed.

General association of the shuttle mechanism

The shuttles 21-21 function in alternation, as already referred to. That one of the two shuttles which is beginning its working stroke, having gripped by its gripping head the ripping tape at the inlet end of the machine, carries it linearly forward under the forming head while the latter is in its raised position, reaching the far end of its travel just as the forming head begins to lower.

In the meantime, the other shuttle, constrained on its return journey to an arcuate path by-

passing the forming head, reaches the end of its return stroke at the same time as the first-mentioned shuttle terminates its forward or moving stroke. The return shuttle grips the ripping tape, and in so doing, severs the tape in the leading edge—that nearest the forming head. This action serves to cut off the unit section 17 of the ripping tape which is then under the forming head. The forming head 19, provided with foldable end sections, picks up by vacuum pull the ripping tape section thus provided, still held at its forward extremity by the working shuttle. Due to the automatic folding of the end sections of this head, the ripping tape section is folded into the U-shape 23. Continued downward movement of the forming head 19 then results in the application of the accurately folded tape section 23 onto the desired spot on the wrapper stock, which at that time is momentarily in its stop or rest position.

General association of drive mechanism

The relation of certain elements of the drive mechanism with the parts just described is perhaps best shown in Figure 2. Discussion of the details of the drive mechanism will be reserved, however, for a later point in this specification.

A driven jack shaft 24 runs crosswise the under side of table 10, and preferably is strapped thereto by suitable support brackets, not shown. Plate cams or eccentrics 25-25 serve, by means of cooperating followers 26, to actuate forked shuttle stem guides 27. Because forming head 19 is required to make two working strokes for each cycle of operations, while the shuttle mechanism each carry out only a single operation during such cycle, I find it necessary to design cam plates 25-25 so that they travel at half the angular speed of forming head drive means, later to be described. Each guide 27 has a U-shaped head having arms 28-28 loosely carrying for reciprocation across the span thereof, the shuttle stem 29. These arms 28-28 protrude upwardly through table 10, through slots 30-30 provided longitudinally of the center thereof. An arm 27a (Figure 2) projects laterally from the head of the guide 27, and passing through eccentric shaft hanger 31, constrains the guide 27, under the energization of its corresponding eccentric 25 transmitted through follower 26, to reciprocation in the same horizontal plane. At the same time as the shuttles are moved longitudinally of the table 10 along slots 30-30, they are rocked in arcuate paths laterally of the table by the shuttle mechanism indicated broadly at 21-21 in Figures 1 and 2.

As becomes more evident upon considering Figure 3, drive roller 32 is placed on the under side of table 10 and cooperates with idler guide roller 14 to drive or feed the wrapper stock 20. Similarly, take-up drive roller 33 is disposed beneath take-up idler roller 15 to serve as positive means for drawing the wrapper stock through the machine. Rollers 32 and 33 make one complete revolution for each operating cycle of the machine. Accordingly, the circumference of these rollers is designed to equal the lengths 20 into which the wrapper stock is to be cut. Finally, a second roller 34 cooperates with idler roller 18 to guide ripping tape 17 on its passage to the forming head 19.

This forming head is illustrated as comprising central vacuum section 35, and flanking vacuum end sections 36-36, the central and end sections

being interconnected by suitable vacuum conduits such as flexible rubber tubing 37—37.

Referring now more particularly to the showing of Figure 4, it will be noted that shaft 24 is provided with a gear or similar device represented schematically at 38a for taking off power from shaft 93. The relation of these parts to each other is best understood from Figures 43 and 44. A power take off means 39 is provided on shaft 93, in the form of a gear, pulley, cone or the like, for taking off power from a suitable source such as shown in Figures 43 and 44. The shaft 93 terminates at one end in a plate cam 40, which by means of a stud or follower 41, fast to arm 22 and which travels in a path in the face of the cam, actuates the forming arm 22. Cam track 40a (Figure 45) on cam plate 40 has diametrically opposed convex bumps 40b therein for ensuring the quick lowering and rising of forming head 19. The general construction of this camming means will be discussed at a later point herein. Forming arm 22, by means of a guide collar 43 held by brackets 44—44 fast on table 10, is thereby restrained to a straight line vertical reciprocation. Reference to Figure 34 will show that I prefer to provide collars 43 and brackets 44—44 on both the top and underside of table 10. A rubber tube 42 or other suitable conduit serves to apply a vacuum to the hollow forming arm 22.

Details of shuttle mechanism

The location of the plate cams 45—45 of the shuttle mechanisms 21—21 raised from the surface of table 10 is evident from Figure 4, thereby allowing room for the shuttle stems 29—29 to clear the forming head 19 on their arcuate return strokes. A cam track 46 is provided in each cam plate 45—45 to guide follower studs 47—47 on the shuttle stems 29—29. Forming plate 48, the details of which are shown in Figures 14, 15 and 19, is resiliently supported in a 49 in table 10 as by springs 50—50, and serves to cooperate with forming head 19 in a manner which will be described with reference to the figures just referred to.

Since the presence of cam follower 47 requires that track 46 extend completely through cam plate 45 in the form of a slot, it is necessary to form this latter of two sections 45a, 45b (Figures 9, 12, and 13), and to support one section from suitable means such as table 10, while the latter in turn directly carries the other section.

As may be seen from Figures 9 and 13, the outer cam plate section 45a carries the inner cam plate section by a series of overlying arched brackets 84 extending about the periphery of the cam track 46. These brackets 84 have arches 84a which provide clearance for the free passage therebeneath of cam follower 47.

Studs 85 (Figures 12 and 13) serve to support cam plate section 45a and space it from table surface 10. Suitable means such as bolts, screws or the like 86a and 86b (Figure 12) serve to secure together sections 45a, studs 85 and table 10. These studs are disposed at such points about the extent of cam plate sections 45a that suitable clearance is provided at all points for shuttle stems 29 in their complete passage under guidance of cam track 46.

A rack bracket 51 (Figures 1 and 2) having feet 51a is rigid on table 10, and through rack bar 52 rotates a pinion 53 meshing therewith and fast on stub shaft 54 carried by brackets 55—55 on forming arm 22. These details are later shown in Figures 19 through 24 and are simply referred

to briefly at this point, to disclose their relation to the rest of the mechanism.

Certain features of the shuttle, as well as some of the constructional details of the forming head, can best be ascertained from Figure 5. The relation of the shuttle plate cams 45 to the forming head 19 is clearly evident therein.

It has been suggested hereinbefore that each shuttle head 56 travels in its working stroke under the forming head 19 while the latter is in its raised position, and that this head lowers when each shuttle reaches the end of its working stroke. Thereafter, at the conclusion of the rest or stop period of the wrapper stock and ripping tape, the shuttle head is withdrawn, in an arcuate path, around the forming head, to its initial or starting position.

The manner in which this is accomplished can readily be grasped upon consideration of Figure 5. It will be seen by reference to the rear plate cam 45 (uppermost in Figure 5) that the cam track 46 consists of a front, straight portion 46a and a rear, curved or arcuate portion 46b. It will be recalled (Figure 2) that the shuttle stems 29 are saddled in jaws 28 of guides 27, which guides, by plate cams 25, are reciprocated the lengths of slots 30. During the right-to-left working stroke of the shuttle head 56 the follower stud 47 on stem 29 follows the linear cam track portion 46a to its end, and it is this action which causes shuttle head 56, gripping tape 17, to carry the same under the forming head, into the zone of operation of the latter.

After the momentary rest position at the end of the working stroke, while the follower 47 is passing turnstile 57 from linear cam portion 46a to arcuate cam portion 46b this follower 47 follows this arcuate left-to-right return cam track portion 46b, around the forming head 19, back to its starting position. At the head or beginning edge of this return track portion 46b, at the left in Figure 5, the slope of the curvature of the track is abrupt, so that the shuttle head 56 is pulled out of the range of the forming head 19 before this shuttle head 56 has moved very far along its return stroke. To ensure that the shuttle clears the forming head properly, it is necessary that the minimum clearance between the working cam track portion 46a and the return portion 46b be at least slightly greater than the width of the forming head sections 35 and 36—36.

Turnstiles 57 provide one-way ratcheting mechanism at the junction of the two cam track portions 46a and 46b. These turnstiles ensure that the followers 47 proceed properly along their paths at the ends of their journey in a given direction, and do not seek to retrace their passage over the paths they have just traversed. These turnstiles are better shown in Figures 9, 10, and 11. In Figure 10 the turnstile head 57a is seen to be of roughly clover-leaf configuration. It is mounted on spindle 57b, and by pawl 57c fast to the under side thereof cooperates with ratchet 57d fitted loosely about spindle 57b and made fast to the underside of cam plate 45. The ratchet and pawl mechanism permits the turnstile to rotate in but one direction, so that once the follower stud 47 passes into the turnstile, it is effectively restrained against reversal of direction. Since the purpose of these turnstiles is, as said, to constrain the shuttles to a single path in their travel guided by the cam plates 45—45, and since these cam plates are provided on opposite sides of the forming head 19, the turnstiles of the two shuttle mechanisms 21—21 are cammed in

opposite directions. The turnstile shown in Figure 11 is ratcheted to adapt it for use with the foremost shuttle mechanism as illustrated in Figure 5.

The shuttles

Each shuttle head, shown more completely in Figures 6a through 6h, comprises a bottom head portion 56a integral with the shuttle stem 29, and a top shuttle head portion 56b hinged to the bottom portion 56a at 58. It is essential that it be the top portion which is swingable because the bottom portion 56a closely overlies the table top 10, and is restrained thereby from swinging movement.

As the shuttle stems 29 sweep forwardly at the right end (Figure 5) of their return strokes, a cooperating follower 59 (Figures 6c, 6d), fast to the under side of top shuttle head portion 56b, and extending through and swingable in slot 60 (Figure 6b) in the bottom shuttle head portion 56a, is brought into contact by means of its anti-friction roller 61 with the vertical edge of forward closure track 62 (Figures 5 and 6c). As shown in Figure 5, these tracks 62 are provided, one for each shuttle mechanism 21, on each side of forming head 19. As disclosed in Figure 5, these tracks are straight throughout their entire extent, and as is shown in Figures 28a and 28b, have abrupt vertical walls 62a. The walls 62a serve as stops up which the rollers 61 cannot climb, so that the action of these walls is to cam shut the top head shuttle portion 56b on the corresponding bottom portion 56a.

Since the shuttle head 56 has reached the end of its return stroke with open jaws in a manner to be discussed hereinafter, and is then thrust forwardly, it encloses the ripping tape 17 in that forward motion, and is then clamped thereon, tightly gripping the same, when the roller 61 contacts wall 62a. I prefer to construct hinge 58 so that there is some slight resistance to opening or closing, whereby the top and bottom portions 56a and 56b of the shuttle head retain the open or closed position imparted thereto momentarily after roller 61 leaves the track actuating it.

Considering now Figures 29a and 29b along with Figure 5, return, opening tracks 63—63 are provided for the shuttles, parallel with, but spaced from, the forward closure tracks 62—62 throughout the greater part of their length by the distances corresponding to the maximum amplitude between portions 46a and 46b of cam track 46. The forward closure tracks 62 are in each instance close to forming head 19, so that each shuttle head 56 underlies this latter during its forward movement. At the leading ends of these return tracks 63, near the outlet end of the machine, these tracks curve sharply forwardly towards but just short of the corresponding forward track 62, as is best shown in Figures 5 and 29b. The curvature of the tracks 63 at these points is quite abrupt. Thus, as has already been pointed out, as the shuttles 21—21 are swung rearwardly by the studs 47 in cam tracks 46, the rollers 61 on followers 59 are brought out of contact with vertical walls 62a of tracks 62, by which top and bottom shuttle head portions 56b and 56a are retained closed, and into contact with sloping wall 63a of track 63 (Figures 5, 6d, 29a and 29b). The roller 61 is thereby carried up upon face 63a, due to the backward movement of the shuttle guided by cam track 46. This action forces follower 59 up through slot 60 (Figures 6b through 6d), and separates portions 56a and

56b. Further backward movement of the shuttle head 56 moves it out of range of the severed portion 17 of ripping tape, whereupon the forming head 19, with its end sections 36 just beginning their folding action, and with vacuum applied, functions to control the subsequent manipulation of this ripping tape.

Brackets 64 (Figures 5 and 19), fast on table 10, serve to carry tracks 62 and 63 of the shuttle mechanism disposed in the rear of the forming head 19. This is because it is necessary to provide clearance under these tracks for the passage of the wrapper stock 20. Since this provision is unnecessary with respect to the tracks for guiding the foremost shuttle mechanism, these tracks are secured directly to table 10 (Figure 19).

In the actual production of my machine, I prefer to form the return portion 46b of cam tracks 46 of substantially the same degree of curvature as the return, opening tracks 63. This construction effectively avoids all tendency of the moving parts to bind, and ensures that the shuttle heads 56 open quickly, and that they are brought quickly out of the path of the forming head 19.

Referring again, rather briefly, to the shuttle construction details of Figures 6a through 6h, it will be recalled that at the beginning of each working or forward stroke of the shuttles, the shuttle heads close on the leading end of a section of ripping tape 17. The tape is gripped by a comparatively broad bearing section of the head 56. It is evident however, that since the ripping tape carries either dry or wet adhesive, this adhesive would soon gum this bearing area and would give rise to faulty operation in releasing the shuttle heads from the tape at the conclusion of the operation of the former, unless the latter is especially designed to be adhesive-resistant. To prevent this undesired action, I provide adhesive-resistant inserts 65, preferably in both top and bottom portions of the shuttle heads. These inserts I form of talc, soapstone, or some other material which displays little tendency to become gummy.

Knives 66 are disposed vertically and in co-operating fashion on the leading edge of both the upper and lower shuttle head portions, and serve, upon closure of the shuttle, to sever the trailing edge of the immediately preceding ripping tape section 17 from the stock 16. The manner in which these knives cooperate and carry out their cutting operation can best be grasped from a consideration of Figure 6h.

Since both shuttles perform their working strokes alternately in the same direction, i. e., from right-to-left in Figure 1, and since they are disposed on opposite sides of forming head 19, they are constructed as opposites of each other. That is, while the knives 66 are placed on the right or leading edge of the rearmost shuttle, these knives are disposed on the left or leading edge of the front shuttle.

Details of under side of forming head

In Figures 7 and 8 certain important details of the under side of the forming head are illustrated. It is these under surfaces which serve to pick up and fold the ripping tape sections 17 into proper U-shape. Each end section 36 is hinged to central vacuum section 35 by hinges 68. Vacuum ports 67 are disposed centrally of the working surfaces of the end and central vacuum sections, and serve to pick up the ripping tape and subject it to the folding and applying motions of the forming head.

The action of the vacuum, as will be explained later in connection with Figures 30 to 33, inclusive, is intermittent. Immediately after vacuum is applied to the ripping tape section, which is just before the leading shuttle releases it, and while the trailing shuttle simultaneously severs the trailing end, the end sections 36 begin to fold about hinges 68, under the impetus of mechanism to be described in connection with Figures 21 through 25.

The ripping tape section, held by the vacuum, and subjected to this folding action, is folded in a double fold, into U-shape configuration. It is apparent that when this action takes place there will be a tendency for the tape section 17 to bend at the fold out of the horizontal and up into the spaces between the central section 35 and end sections 36—36. If this occurred the positioning of the tape section 17 on the wrapper stock would be rendered uncertain. To avoid this difficulty I provide fold protector sections 69 in the form of flat extensions made fast in convenient manner to the under surfaces of end sections 36—36, and extending into the space between the sections of the forming head 19 when the latter is unfolded. Similarly, I provide complementary fold protectors 70—70, of construction broadly like that of protectors 69—69, disposed one on each side of section 35, and made fast to the under surface thereof, near its edges.

These protectors 69—69 and 70—70 cooperate with each other to interpose an effective barrier to the passage of the tape section 17 between the forming head sections during the folding operation. The protectors are preferably formed so that an edge of each protector 69 slightly overlies the corresponding edge of protector 70, so that upon folding or swinging of end sections 36—36 about hinges 68—68 under impetus of arms 71—71 (to be described with reference to Figures 21 and 22) the protectors are collapsed one atop the other, as is evident from Figure 8. At all times the barrier heretofore referred to is effectively interposed to tape sections 17, confining these latter to space between the bottom surface of forming head 19 and the wrapper stock 20.

Linear scoring slots 72 are provided at the outermost edges of the under surface of forming head end sections 36. These slots do not extend through the metal of the end sections, and are somewhat in the nature of grooves. When the end sections 36 are folded into the closed position of Figure 8, then these slots 72 are disposed at the forward end of the forming head, as shown in Figure 8. These slots 72 serve to receive cooperating knife blades, such as are shown in Figures 15 through 18b, to provide weakened scoring lines in the wrapper stock 20 near and on each side of the ripping tape 17. They serve to guide the latter when it is used to start a tear across the wrapper after the latter has been applied to a package or the like.

Similar slots 74—74, angular in nature, are provided in each fold protector 70. These slots serve, as do slots 72, for guiding the knives shown in Figures 15 through 18b so as to provide weakened lines of scoring in the wrapper stock on opposite sides of tape sections 17 adjacent the folds in the latter.

Because fold protectors 69 will, when folded, overlie protector sections 70 in the region of slots 74—74, it is necessary to provide auxiliary slots 75—75 in the protector sections 69—69, which will come into coincidence with one leg of each slot 74 when the forming head is folded.

It is to be noted from Figure 7 that these slots 72, 74, and 75 are all disposed centered on the line of vacuum openings 67, and that the knife slots are disposed in pairs. The slots of each pair accordingly are disposed one on each side of tape section 17. This ensures that the scoring is provided properly on wrapper stock 20. It is a matter of but little experimentation, in the manufacture of the machine, to determine exactly where the folds will occur in the tape sections, and some adjustment of this can be provided, if desired, by slotting the protectors 69 or 70, or both, and bolting them through those adjustment slots to their corresponding forming head sections.

I prefer to provide on central vacuum section 35, throughout the extent of the side surfaces thereof which contact end sections 36—36, suitable buffer pads 35a—35a. These effectively avoid the shock and clash of metal against metal which otherwise would be present, and contribute to long life of the machine.

Details of forming head and forming plate

Certain features of construction of the forming head 19 and cooperating forming plate 49 are best evident from Figures 14 through 18b. Considering Figure 14 for the moment, it will be seen that central vacuum section 35 of the forming head is chambered as at 76, and communicated directly, as by orifice 77, with hollow forming arm 22, thereby permitting communication with the vacuum valve of Figures 30 through 33. Vacuum ports 67, of which there are a goodly number, all of extremely small size, serve to open the vacuum chamber to the tape 17 to be picked up thereby.

Nipples 78—78 at the top of section 35, on opposite sides of forming arm 22, serve to apply the vacuum through tubing 37—37 and nipples 79—79 to chambers 80—80 formed in end sections 36—36. The nipples 79—79 are formed in the upper surfaces of end sections 36—36, in like manner to the nipples 78—78 in central section 35.

As pictured in the front elevation of Figure 14, and as already described to some extent with respect to Figure 4, forming plate 48 is resiliently mounted, preferably at four points of support, by coil springs 50 in recess 49 formed in table 10. It can be seen from Figure 15 that springs 50 normally impel forming plate 48 upwardly so that its upper or working surface is raised slightly from the surrounding surface of table 10. It is this which gives the slight jog 20a in wrapper stock 20 as seen in Figure 14.

I have described with respect to Figures 7 and 8 the linear slots 72 and angular slots 74 provided in the sections of the forming head 19. The knives cooperating with these heads are best illustrated in Figures 17a through 18b. The angular scoring knife 81 comprises a shank or blade portion of angle-iron or other suitable material, preferably with a right-angle bend therein. A cutting edge 81a is provided at the upper or outer end of knife 81, while an outwardly flaring flange 81b functions as a base by which the knife is positioned in recess 49. These knives 81 are provided at roughly the central part of forming plate 48, extending through vertical openings 73 therein as best indicated in Figure 16.

Similarly, linear scoring knives 83 are provided, having end-located cutting edges 83a and support flanges 83b. These knives 83 are provided at the front edge of the forming plate, extending through vertical openings 82 therein, as best indicated in Figure 16.

The function of this forming plate and knife arrangement is, as has been suggested with respect to Figures 7 and 8, to provide scoring lines of weakness in the wrapper stock 20 on opposite sides of the tape sections 17 at the leading edge and at the folds thereof. The linear knives 83 function at the ends of the tape section, while the angular knives provide scoring where the folds of the tape are positioned on the wrapper stock. While it is desirable to use the knives 83 providing scoring about the trailing edge of tape 17 on wrapper stock 20, which knives are indicated at the left in Figures 15 and 16, these last-mentioned knives are not essential and may be omitted if desired. These lines of scoring, as explained in my said co-pending application Ser. No. 413,988, are essential because of the amorphous nature of the Cellophane or similar artificial cellulose material of which I prefer to form my wrapper stock. Such material has no appreciable or well-defined marks of weakness, and is inclined to tear in random directions. Thus, particularly at the start of the tearing, as at tabs 23a of folded tape sections 23 in Figures 1 and 2, and at abrupt changes in direction, as at the folds of sections 23, there is considerable likelihood of the tape starting tears in the Cellophane which will spread in undefined directions from the tape, unless some means are provided to inhibit this tendency. It is to avoid this danger that I provide the scoring lines of weakness on the wrapper stock 20, which exert directional control over the tearing as the tape is ripped from the wrapper stock.

The scoring forming mechanism functions as follows: When the forming head 19 (Figure 14) falls, and the end sections 36—36 begin to retract or fold, it at once contacts the extended tape sections 17. At this point in the cycle of operations, the vacuum control means of Figures 30 through 33 comes into operation and causes vacuum to be applied to head 19, whereby this latter picks up tape 17 and folds it as described in connection with Figures 7 and 8. The folded tape section is then forced down by head 19 on resilient plate 48. Continued downward movement of head 19 forces down plate 48, with the overlying juxtaposed wrapper stock 20 and folded tape section 17, against the resistance of springs 50. The collapse of plate 48 in recess 49 causes knives 81 and 83 to project upwardly through their corresponding openings in plate 48, through the wrapper stock 20, and into the corresponding slots 72, 74 and 75 (Figures 7 and 8), thereby producing the accurately-positioned scoring lines of weakness referred to. Of course as soon as the forming head raises, the plate 48, unloaded, is impelled upwardly by springs 50, so that knives 81 and 83 are again sheathed by this plate 48.

As will be seen from Figure 14, I prefer to house the springs 50 in spring wells 50a in the surface of the recess 49.

Forming head folding mechanism

Having discussed the subject matter of Figure 19 with reference to the relation between the forming head 19 and forming plate 48, it becomes important at this point to consider the mechanism which folds the end sections 36—36 of forming head 19 on the central section 35 thereof, as shown in Figures 20 through 25. Arms 71 (Figure 21) serve through large bearing pads 71a to transmit impelling stresses to the end sections 36. These arms 71 are pivoted at 87 to crank arms 88. These arms 88 are pivotally mounted as by studs 89—89 on the generally elliptically

shaped cam plate 90 of Figures 21, 22 and 25. This cam plate 90 is fast on stub or jack shaft 54, already described. Also described previously are the pinions 53 on this jack shaft and the rack bracket 51, carrying rack 52 with which pinion 53 engages. This bracket 51, as was described, is fast on table top 10 or some other suitable immovable support.

It will be recalled that the forming head 19 is carried in its vertical reciprocation by forming arm 22 (Figure 1). Reference to Figures 19, 21 and 22 shows that the shaft 54 is hung directly from arm 22 so that it rises and falls vertically with head 19. The intermeshing of pinion 53 carried on this shaft with stationary rack 52 (Figures 23 and 24) compels rotation of pinion 53 and shaft 54. Consequent oscillatory rotation is imparted to cam plate 90. Rack 52 is so designed with reference to pinion 53 that its length is sufficient to produce approximately 90° turning of cam plate 90 as the forming head moves from one end of its travel to the other.

To illustrate, in Figure 23, which will be recalled as being a section taken on line 23—23 in Figure 21, the pinion is in its top position with respect to rack 52, corresponding to the elevated position of forming head 19. The elliptical cam plate 90 is at that time disposed with its narrow axis in a horizontal plane; crank arms 88—88 are retracted inwardly; and arms 71—71 pull the end sections 36—36 rearwardly about hinges 68—68, bringing the head 19 into its unfolded or extended position. The timing is such that the vacuum through forming arm 22 is discontinued at this time.

In Figure 24, a view on line 24—24 of Figure 22, the pinion 53 is at the bottom of its travel along the rack 52, and as is evident from Figure 22, the cam plate 90 has been swung at 90° to Figure 21, so that its major axis is in a horizontal plane. The crank arms 88 have been forced outwardly, away from the central axis on which lies the stub shaft 54, so that arms 71, tied to the end sections 36 by the pressure-distributing bearing pads 71a, completely fold these end sections 36 on central section 35.

It is at the beginning of the downward travel of the forming head 19, and consequent folding of the end sections 36 thereof, that the vacuum is applied to this forming head. Immediately the head picks up the ripping tape section 17 and folds it, as the end sections 36—36 are pivoted, into the completely folded tape section 23, thereupon pressing the same against the underlying wrapper stock 20, so as to cause the adhesive on section 23 to adhere to the wrapper stock.

Details of shuttle power means, and operation thereof

Certain details of the shuttle actuating mechanism have already been discussed at an earlier point herein. Discussion will be had at this point of the relation of this actuating mechanism with the other parts of the machine. The previous discussion, it will be recalled, was with reference to Figures 2 and 4. It is evident therefrom that like cam plates 25—25, both fast on stub shaft 24, are disposed thereon 90° out of phase, so that they will drive their respective shuttle mechanisms 21—21 in alternation. The present discussion will be undertaken with reference to Figures 26 and 27, illustrating the rear or topmost shuttle mechanism of Figure 2, which is the right-most mechanism of Figure 4.

Shaft 24, powered off the drive shaft 93 shown in Figures 43 and 44, rotates continuously at constant speed, carrying with it cam plates 25. Studs 26 transmit the impelling motion of cam plate 25 to the shuttle stem guide 27. Stud 26 follows in continuous cam track 25a provided in cam plate 25 (Figure 27). As seen from Figure 26, cam plate 25 is recessed at 10a in table 10 to accommodate it throughout its rotary passage.

Hanger 31 fast to table 10 or pedestal 11, and through which arm 27a of guide 27 snugly fits, constrains the latter to movement in a horizontal plane. This brings about a translation of the rotary motion of the cam plate 25 into horizontal reciprocation of guide 27.

Immediately before the cam plate has reached its position shown in Figure 27, at the end of its travel along its major axis, the timing of the machine is such that the follower 47 on shuttle stem 29 has just begun its working stroke along cam track portion 46a, which as will be recalled, is straight, and extends directly to the rear of the plane of the paper in Figure 26. This means that the shuttle head 56 is positioned directly under forming head 19, and that follower 59 has been brought into contact, by its roller 61, with closure track 62. The bottom and top shuttle head portions 56a and 56b accordingly have just closed on a predetermined length of ripping tape 17, and in so closing, have severed, by knives 66—66 shown in Figures 6a through 6h, the trailing end of the immediately preceding section of tape 17.

The section of tape thus severed, and which has just been positioned by the other shuttle, not shown in Figure 26, under forming head 19, is now subjected to the folding, positioning and applying operation of the latter, all of which is completed before the shuttle in question is carried by guide 27 to the left in Figure 2, and to the rear of the plane of the paper in Figure 26.

As the forming head 19 begins to lift, cam plate 25 begins to impel the shuttle stem 29 along path 46a. When this shuttle reaches the opposite end of its travel, the arcuate cam track portion 46b, lying rearwardly of straight cam track portion 46a, withdraws the shuttle quickly backwardly a distance sufficient for shuttle head 56 to clear and pass around forming head 19. At the beginning of this withdrawal the follower 59 and roller 61 are brought out of contact with track 62 and into contact with opening track 63, in a manner already discussed in connection with Figures 5 and 28a through 29b, whereupon the bottom and top shuttle head portions open, releasing the ripping tape section 17 which is now positioned under the lowering forming head, and are retained open throughout the entire return journey of the shuttle. Just at the start of the return journey of the opened shuttle, the forming head 19 begins to lower and carry out its function on the section 17 of tape positioned therebeneath. As the head 19 then lifts, the stud 47 then continues in its travel about the rearward, arcuate cam track portion 46b, while the frontmost shuttle executes its working stroke. It becomes evident from the foregoing that each complete revolution of cam plate 25 brings about a complete cycle of operation of shuttle stem 29.

Vacuum valve details

Vacuum is supplied intermittently through hose 42 (Figures 43 and 44) to forming head forming arm 22 through the vacuum valve shown in Figures 30 through 33. This valve, positioned between any suitable and conventional vacuum

pump (not shown) and the forming arm 22, comprises an outer shell-like barrel 114 provided at one side with air vent 115 and at its other side with nipple 116 serving as an outlet to the forming head 19. A second nipple 117 connects the valve to vacuum pump, in a manner to be detailed.

Fast on valve shaft 118 is a pinion 119 (Figures 30, 43 and 44) which through suitable means such as gearing, link belt 120 or the like is driven by means such as a suitable drive pinion 121 fast on drive shaft 93.

Fitting for rotation within and relative to barrel 114 in air tight manner is valve cylinder 123. This cylinder is fast to valve shaft 118 and is rotated thereby at constant speed as determined by the speed of the drive shaft 93. Thus cylinder 123 consists of a solid part 123a of approximately semi-circular cross-section, and a hollow shell part 123b constituting the remainder of the cylinder. A hollow hub 123c is disposed centrally of cylinder 123 disposed in communication with vacuum pump nipple 117 and serving as a conduit and distributor for the vacuum itself.

Cylinder 123 is provided, as shown in Figure 32, with an approximately semi-circular slot 124 disposed about the middle of the cylinder, with its end walls defined by the face of the solid part 123a of the cylinder. In other words, slot 124 is circularly co-extensive with the shell part 123b of the vacuum cylinder. I provide circular port 123d centrally in hub 123c diametrically opposite solid part 123a for opening shell 123b into communication with hub 123c.

As the cylinder 123 is rotated at constant speed by pinion 119, vacuum is supplied thereto constantly from the vacuum pump through shaft 118, arranged hollow for part of its extent, into chambered hub 123c and thence to shell 123b. During one-half of each revolution of cylinder 123 at constant speed within barrel 114, some portion of the slot 124 in shell portion 123b of the former is in contact with nipple 116 extending to rubber tube 42 (Figures 43 and 44) and thence to the forming head 19. Vacuum is applied from the hub 123c through port 123d to chambered shell 123b and thence through slot 124 to nipple 116. At the same time the wall of solid portion 123a of cylinder 123 moves snugly past air vent 115 in barrel 114, and seals the valve against the atmosphere. It is during this time, during the application of the vacuum, that the forming head is lowering. At this time the semi-circular slot 124 begins to come opposite air vent 115 in barrel 114, so that air pressure is introduced into forming head 19 and atmospheric conditions are almost instantaneously established therein, while the wall of solid part 123a of cylinder 123 effectively blocks the application of vacuum from shell portion 123b to forming head nipple 116. In this manner vacuum is discontinued to forming head 19 until a similar point is reached in the next working cycle. The vacuum pump, not shown, must necessarily have such capacity that the influx of air from vent 115 will not disturb appreciably the vacuum head thereof.

Details of drive mechanism for wrapper stock feed roller mechanism

In Figures 35 through 37 I disclose details of a preferred mechanism for actuating the drive roller 32 and take up roller 33 of Figure 3. In Figure 35 both drive and take up rollers 32 and 33 are rotatably journaled in bracket 91 having forked arms 91a—91a. Paired angle brackets 92

depend from the under side of table 10, being bolted or otherwise secured thereto as by flanges 92b. These brackets 92 terminate at their free ends in channelled heads 92a—92a, in the form of eyes, in which arms 91a of brackets 91 fit snugly, and are guided for vertical reciprocation.

Table 10 is slotted at 10b—10b to receive rollers 32 and 33 when the latter are in their raised position and are recessed at 10c in their under surface to provide clearance for arms 91a and allied mechanism.

It will be recalled that the forward motion of wrapper stock 20 is intermittent or step by step. It is necessary that no forward impetus be imparted to the wrapper stock during the rest positions of the latter, so that there will be no "over-running" of the latter. The mechanism illustrated in Figures 35 through 37 is designed to impart driving impetus to the wrapper stock only at the predetermined drive intervals. To this end the drive roller 32 and take-up roller 33 are rotated continuously, and are intermittently rocked back and forth, towards and out of operative contact with their respective idler rollers 14 and 15. It is only when the cooperating pairs of rollers are in contact that forward drive of the wrapper stock 20 takes place.

Accordingly, a pulley 94 or other suitable power take-off means, fast on drive shaft 93 in Figures 35, 36, 37, 43 and 44, drives through belt or the like 95 the pulleys 96, fast on universal shaft 97. Shaft 97 is keyed or otherwise secured to one of the spindles 32a of the roller 32. Right-hand bracket 92 Figure 36 is slotted to permit passage therethrough of the shaft 97.

Since drive shaft 93 rotates at constant speed, the roller 32 is likewise driven at constant speed. This same constant drive speed is imparted by roller 32 to take-up roller 33. The mechanism for accomplishing this comprises a worm gear 122 on spindle 32a of roller 32, meshing with worm 98 on worm shaft 99. This worm shaft is carried in convenient manner as by brackets, not shown, on the under side of table 10 or on pedestal 11. At the remote end of worm shaft 99 a second worm 100 meshes with worm gear 101, fast on the spindle of take-up roller 33. Through this mechanism the take-up roller 33 is rotated in the same direction and at the same constant speed of roller 32, and since the diameters of the two rollers are the same, they have the same peripheral speeds, and thereby impart the same impelling force to wrapper stock 20. The use of worm and worm gear eliminates practically all back-lash in the gearing.

The mechanism for rocking the rollers 32 and 33 comprises an eccentric core 102 fast by hub 103 on shaft 93 and rotatable therewith. Eccentric collar 104 encircles core 102. This is all illustrated in greater detail in Figures 42a and 42b. In collar 104 opening 104a may be provided as in Figure 42b, for the reception of plungers 105 on diametrically opposite sides of the collar 104. Alternatively, these plungers 105 may be splined to the collar 104, as at 106 as in Figure 40, or pinned thereto as at 107 in Figure 41. Firm but flexible contact between drive roller 32 and idler 14 is ensured by a modified dash-pot mechanism comprising stirrup-like plunger housings 108 (Figures 35, 40 and 41). As best seen from Figures 40 and 41, but also evident from Figure 35, each housing 108 is in the form of a U-shaped bracket, with end arms or studs 108a and intermediate stud 108b, each provided with an eye which encircles the corresponding plunger

105. Thus these housings 108 are slidable along their corresponding plunger. Rocker arms 109 are pivoted to the sides of the housings 108 away from plungers 105, and are pivotally connected at their other ends in slotted studs 110 depending centrally from brackets 91.

Coil springs 111 are provided one around each plunger 105. These springs are disposed between intermediate studs 108b and a stop 112 on plunger 105 such as a pin or the like extending through the plunger. These stops are positioned between that stud 108a which is adjacent eccentric collar 104 and intermediate stud 108b. As shown in Figure 40, when the collar 104 moves plungers 105 to the right, this latter first compresses somewhat spring 111, which thereafter transmits the impelling force to rocker arm 109. More precisely, after this spring take-up, the housing 108 then moves under impelling action of plunger 105, rocking rocker arm 109 in the manner shown in Figure 39b. These rocker arms 109 are pinned at their elbows 113 to the frame of the machine, and rock thereabout to move the rollers 32 and 33 towards and away from their corresponding idler rollers 14 and 15, as already described.

In the instance undergoing description, with the collar 104 in the position of Figures 40 and 41, the housing 108 rocks rocker arms 109 so as to retract take-up roller 33 out of contact with idler roller 15. Simultaneously the right-hand housing 108 is functioning so as to cause drive roller 32 to be retracted from idler roller 14. This action discontinues the forward drive of the wrapper stock 20 (Figure 36). The timing of the mechanism is such that the rollers 32 and 33 are withdrawn and the wrapper stock stopped at the time that the forming head 19 (Figure 1) begins to lower. Immobilization is maintained until the forming head completes its sequence of operation and begins to rise. All this, of course, is a matter of but a moment.

In Figure 39a the eccentric 102 has been swung to the right about hub 103, carrying with it eccentric collar 104. The plungers 105 then are positioned so that through arms 109 they force the rollers 32 and 33 up against their respective overlying idler rollers 14 and 15. This is the drive position of the mechanism. If there is any tendency of the wrapper stock 20 to creep as its forward movement is arrested on the forming plate, this can be effectively counteracted by the use of any suitable and conventional form of brake acting on the wrapper stock when the drive roller 32 comes out of contact with the under surface of said stock.

The drive means

The driving means are shown in Figures 43 and 44. Any suitable power source, preferably an electrical motor (or power take-off direct from a packaging machine) is indicated at 126 in those two figures. Motor shaft 126a is coupled by suitable means, conventionally represented by pulley 127, belt 128 and pulley 39, to drive shaft 93. Pulley 39 is made fast to this last-mentioned shaft.

This shaft 93 is journaled in hangers (not shown) suspended from a suitable one of table 10 and pedestal 11, which together comprise a frame. As is evident from Figure 44, the shaft 93 underlies jack shaft 24, which is powered thereof by conventional means such as pulley 38 fast on shaft 93, pulley 38a fast on shaft 24, and belt 130 running over said pulleys. Through

pulley 94, belt 95 and pulley 96, drive shaft 93 powers rollers 32 and 33; through pulley 121, belt 120 and pulley 119 it powers the vacuum valve indicated at 114. Eccentric 40 controlling the reciprocation of forming arm 22 is fast on shaft 93. Similarly, eccentric collar 104 for lifting roller 32 is powered off this shaft. Driven shaft 24 serves to drive shuttle plate cams 25, 25.

Operation

By now the reader doubtless has a thorough grasp of the operation of the machine. A brief summary, however, may be in order. Assume that the particular shuttle guide 27 shown in Figures 2 and 4 is at the right end of its travel as shown in Figure 2. The corresponding shuttle stem 29 is at the extreme right of its travel in Figure 5. The other shuttle stem 29 at this time is at the extreme left end of its travel, as is evident from Figure 5. This we will assume to be the start of a given cycle of operations. At this time the cam plates 25 (Figure 2) controlling the rearmost shuttle stem 29 of that figure, is oriented with its major axis extending horizontally. The left-most shuttle head 56 of Figure 5 has just positioned a section 17 of ripping tape beneath forming head 19, while eccentric core 102 (Figure 39b) on drive shaft 93 has just retracted rollers 32 and 33 from idler rollers 14 and 15, so that a fresh length of wrapper stock is stretched across forming plate 48 (Figure 14) underneath the tape 17 and forming head 19. Valve cylinder 114 (Figures 30 through 33) has been rotated through gears 121, 119 and belt 120 so that slot 124 is just communicating with nipples 116 leading to forming arm (Figure 44).

Pulley 38a is designed with circumference half that of pulley 38, so that cam plates 25 will operate twice as fast as forming head eccentric 40, which at this time is so positioned (Figure 4) that its follower 41, fast on forming arm 22, is at the top of its travel, just ready to begin its downward reciprocation.

The shuttle head which is at the right in Figure 5 has just been moved forwardly on arcuate cam track portion 46b, and has closed on the leading end of a fresh section of ripping tape 17. In so doing, the knives 66-66 (Figure 6h) have clipped the trailing edge of the tape section 17 underlying forming head 19.

Continued rotation of drive shaft 93 (Figure 44) by motor 126 causes the forming head to move downwardly, it coming almost immediately into contact with the underlying section 17 of ripping tape, and pulling it by vacuum to the under surface of the central section 35 and end sections 36-36 thereof (Figures 7 and 8). At this time movement of pinion 53 fast on stub shaft 54 (Figures 21 through 25) causes folding of end sections 36-36 on central section 35 of forming head 19, into the position shown in Figure 22. Fold protectors 69-69, 70-70 on sections 35, 36-36 constrain the folds formed in the ripping tape 17 to the confined space under the forming head 19, so that these folds are accurately formed at the two described points along the length of tape section 17. During continued rotation of eccentric 40 (Figure 44) the head 19 lowers, and forces the U-shaped section 23 of tape on wrapper stock 20 (Figure 14) down against forming plate 48, seating it against pressure of springs 50 into recess 49. Scoring knives 81 and 83 then protrude through forming plate 48 (Figure 15) and produce scoring lines of weakness in wrapper stock 20 as tape section 23 is being adhered thereto. All this

is but a matter of a few moments, whereupon forming head 19 begins to left again. Cam track 40 (Figure 45) will be seen to have a quick down and up jog thereon at diametrically opposed points therein.

Just as the forming head begins to rise, the cylinder 123 (Figures 30 through 33) is rotated in its barrel 114 so that slot 124 begins to register with air vent 115 in the barrel. Atmospheric conditions at once establish in the forming head 19, so that the latter exercises no effect, while rising, on the tape section 23.

As head 19 rises, pinion 53 (Figures 21 through 25) meshes upwardly along rack 52, causing end sections 36-36 of head 19 to unfold, away from and in line with central section 35, into position for a new operation.

While the head 19 is quickly lowering and rising, the continued rotation of plate cams 25-25 (Figures 4 and 44) causes the shuttle stems 29-29 to circle around the junctions of the ends of the sections 46a and 46b of the cam tracks 46 in Figure 5. The right-most shuttle 56 moves into and is ready to move along front straight portion 46a, while the left-most shuttle is ready to sweep backwardly, out of the path of forming head 19.

As the shuttle moves forwardly, towards the beginning of the working zone under the forming head, the opened shuttle head sections 56a, 56b encompass and close upon the leading end of a new section 17 of ripping tape, at the same time severing the trailing edge of the preceding section. The closed shuttle head then moves along a path having little component of travel longitudinally of forming head 19 until the latter has lowered and risen, whereupon the shuttle head proceeds to repeat its cycle as just described.

It is apparent that the forming head 19 and auxiliary mechanism can be made in various sizes, and constructed so as to be readily interchangeable on forming arm 22, so as to adapt the machine for various, generally similar tape-applying problems. Similarly, rollers 32 and 33 may be interchangeable and provided in a variety of diameters to adapt the machine for various lengths of wrapper stock.

It is possible to rearrange the machine, without material modification, to work from left-to-right, rather than right-to-left, as shown.

Conclusion

By now it doubtless has become apparent that my new machine permits ready folding and application of sections of ripping tape at predetermined points along the length of wrapper stock. The length of the ripping tape sections is accurately determined and the folds in the tape sections are always properly located, and the required extended tab portion 23a (Figure 2) is always provided, of just the required length. The machine is extremely small and compact, and therefore requires a minimum of floor space. The parts are small and light, and are therefore easily powered and are subject to but little wear, this conducing to a long life. The machine is reliable, and being simple, maintenance and repair costs are low, as is its first cost. Its high speed ensures low production costs so that it can economically be employed for many purposes for which the cost of broadly similar apparatus has heretofore been prohibitive.

It is apparent that once the broad features of my invention have been disclosed, many modifications and adaptations will occur to those skilled

in the art, all falling within the compass of my invention. Accordingly, I intend that this invention be limited only by the scope of the appended claims.

I claim:

1. A machine for applying ripping tape to wrapper stock, comprising a table, means for passing wrapper stock thereover in step by step manner, means for positioning ripping tape in spaced relation over said wrapper stock on said table and for cutting off the positioned unit section of said tape, a sectionalized vacuum forming head over said tape means for drawing a vacuum on said head to enable the latter to pick up and hold said section of tape, and mechanisms for actuating the sections of said head while vacuum is applied, to cause it to fold said tape into approximately U-shape, and applying it in accurately predetermined position along the length of the wrapper stock.

2. A machine for applying ripping tape to wrapper stock, comprising a table, means for passing wrapper stock thereover in step by step manner, means for positioning ripping tape in spaced relation over said wrapper stock on said table and for cutting off the positioned unit section of said tape, a sectionalized, vacuum forming head over said tape means for drawing a vacuum on said head to enable the latter to pick up and hold said section of tape, and mechanisms for actuating the sections of said head while vacuum is applied, to cause it to fold said tape into approximately U-shape, and applying it in accurately predetermined position along the length of the wrapper stock, and scoring knives positioned so that as the vacuum forming head moves towards the table, they project into the wrapper stock and produce scoring lines of weakness therein closely adjacent the ripping tape applied thereon, at points where directional impulses are to be imparted to the ripping tape.

3. A machine for applying ripping tape to wrapper stock, comprising a table, means for passing wrapper stock thereover in step by step manner, means for positioning ripping tape in spaced relation over said wrapper stock on said table and for cutting off the positioned unit section of said tape, a vacuum forming head reciprocable perpendicularly to said table, over said tape means for drawing a vacuum on said head to enable the latter to pick up and hold said section of tape, and mechanisms for actuating the sections of said head while vacuum is applied, to cause it to fold said tape into approximately U-shape, and applying it at an accurately predetermined position along the length of the wrapper stock, a resiliently-mounted plate in the table beneath the forming head, and underlying the wrapper stock and ripping tape, and forced downwardly by the forming head as the latter approaches the table, and scoring knives mounted on said table and extending through slots in the forming plate, and exposed when the latter is forced down by the forming plate, to cut and produce scoring lines of weakness in the wrapper stock closely adjacent the ripping tape applied thereon, at points where directional impulses are to be imparted to the ripping tape.

4. Ripping tape applying machine for wrapper stock, comprising a frame, a table constituting part of said frame, means for passing wrapper stock intermittently across said table top, means having alternate working and rest periods for intermittently positioning ripping tape over said wrapper stock and for cutting off unit lengths

thereof, a multisection forming head for picking up by vacuum the unit section of ripping tape, means for folding the sections of the forming head on each other while the vacuum is drawn to fold the ripping tape section into U-shape, and means for moving the forming head to apply the folded tape accurately on said wrapper stock, the rest period of the cycle of operation of said ripping tape positioning means enduring while the forming head moves towards and from said table, and during such rest period having no effect on the ripping tape.

5. Ripping tape applying machine for wrapper stock, comprising a frame, a table constituting part of said frame, means for passing wrapper stock intermittently across said table top, means having alternate working and rest periods for intermittently positioning ripping tape over said wrapper stock and for cutting off unit lengths thereof, a multisection forming head for picking up by vacuum the unit section of ripping tape, means forming part of and operable as an incident to the lowering of the forming head for folding the sections of the latter on each other while the vacuum is drawn, to fold the ripping tape section into U-shape, and means for moving the forming head to apply the folded tape accurately on said wrapper stock, the rest period of the cycle of operations of said ripping tape positioning means enduring while the forming head moves towards and from said table, and during such rest period having no effect on the ripping tape.

6. Ripping tape applying machine for wrapper stock, comprising a frame, a table forming part of said frame, means for passing wrapper stock intermittently across the top of said table, means having alternate working and rest periods for intermittently positioning ripping tape over said wrapper stock and for cutting off unit lengths thereof, a multi-section forming head reciprocable perpendicularly to said table, for picking up by vacuum the unit section of ripping tape, means for folding the sections of the forming head on each other while the vacuum is drawn to fold the vacuum-held ripping tape into U-shape, and means for moving the forming head to apply the folded tape accurately on said wrapper stock, the rest period of the cycle of operations of said ripping tape positioning means enduring while the forming head moves towards and from the table, and during such rest period having no effect on the ripping tape, and means for supplying vacuum to the forming head only while the latter is moving towards the table.

7. A machine for applying ripping tape to paper-like package wrapper stock, comprising a table, means for intermittently feeding wrapper stock over said table, a sectionalized forming head, means for reciprocating said forming head perpendicularly to said table, means for drawing a vacuum through said forming head, means operable as an incident to perpendicular movement of said forming head for positioning the forming head sections over a section of ripping tape to enable the latter to be picked up by vacuum, for folding the sections of the said forming head, together with the ripping tape, into substantially U-shape, continued perpendicular movement of the forming head bringing the latter in position to apply the tape on the wrapper stock, the said perpendicular-motion-imparting-means moving the forming head towards and away from its working position, a pair of shuttles, means for moving said shuttles, means for guiding said shut-

ties in their paths of operation, means for actuating said shuttles during their movement whereby they alternately pick up a free end of ripping stock from a supply thereof and move it under the raised forming head and over the wrapper stock, means for thereupon causing the operable shuttle to release the tape to be folded by the forming head, the other shuttle being simultaneously returned by the shuttle-moving means through its guided path around the forming head and seizing a new length of ripping tape, and means for simultaneously actuating said last-mentioned shuttle to sever the trailing end of the preceding section of tape.

8. As part of a machine for applying ripping tape to wrapper stock, and having a table and an overlying forming head for folding ripping tape and applying it to the wrapper stock, matched shuttle mechanisms, operable in alternation, disposed one on each side of said forming head, over said table, and each mechanism including a shuttle, means for guiding each shuttle alternately forwardly and linearly, lengthwise under said forming head, and backwardly in a sweeping path around the latter, means for causing each shuttle during its forward movement to pull a section of ripping tape along with it, simultaneously acting means for causing the other shuttle, at the end of its rearward travel, to grip the forward end of a new section of tape and to cut off the trailing end of the preceding section, and means for driving the shuttles in their alternating action.

9. A ripping tape positioning mechanism forming part of a ripping tape applying machine having a table and employing a forming head for folding and applying the ripping tape to paper-like package wrapper stock, comprising a pair of shuttle mechanisms, each shuttle mechanism comprising a plate cam having a cam track therein comprising a linear portion adjacent the forming head, a shuttle for each mechanism, guided by a follower in the corresponding cam track, means for driving said shuttles in alternation, gripping means on said shuttles, and means for actuating said gripping means, at predetermined stations in the paths of said shuttles for causing each shuttle alternately to grip the leading end of a section of ripping tape, simultaneously to sever the trailing edge of the preceding tape section, thereafter to carry, during its movement, the gripped section linearly under the forming head, and thereupon to release it, and each said shuttle then being swept in a guided path in its return journey around the forming head, to the point of beginning of its cycle.

10. A shuttle mechanism, forming part of a machine for applying ripping tape to paper-like wrapper stock, comprising a drive means; a cam driven thereby; a shuttle stem guide reciprocated by said cam; a shuttle stem supported by said guide for reciprocation transversely of the direction of movement of said guide; a plate cam having a cam track therein with its major axis extending parallel to the direction of reciprocation of said guide, and having a linear forward portion and an arcuate return portion; a follower on said shuttle stem received in said cam track for reciprocating the latter in said guide in accordance with said cam track; a shuttle head on said shuttle stem, having a top, hinged portion; a linear closure track and a return, opening track curved at its front part disposed along said cam plate; and a follower on said hinged portion of the shuttle head, terminating in a contact means

which cams against said tracks and closes the shuttle head on its forward stroke and opens it on its return stroke.

11. A shuttle mechanism, constituting part of a machine for applying ripping tape to paper-like package wrapping stock, comprising a drive means; a cam driven thereby; a shuttle stem guide reciprocated by said cam; a shuttle stem supported by said guide for reciprocation transversely of the direction of movement of said guide; a plate cam having a cam track therein with its major axis extending parallel to the direction of reciprocation of said guide, and having a linear forward portion and an arcuate return portion; ratcheted turnstiles in said cam track at the junctions of said forward and return portions; a follower on said shuttle stem received in said cam track for moving the latter in said guide in accordance with said cam track, said turnstiles constraining the follower to motion in but a single direction along said cam track; a shuttle head on said shuttle stem, having a top hinged portion; a linear closure track and a return, opening track curved at its front part disposed along said cam plate; and a follower on said hinged portion of the shuttle head, terminating in a contact means which cams against said tracks and closes the shuttle head on its forward stroke and opens it on its return stroke.

12. A shuttle mechanism, constituting part of a machine for applying ripping tape to paper-like package wrapping stock, which machine includes a table, comprising a drive means; a cam driven thereby; a shuttle stem guide reciprocable by said cam; a shuttle stem supported by said guide for reciprocation transversely of the direction of movement of said guide; a plate cam having a cam track therein with its major axis extending parallel to the direction of reciprocation of said guide, and having a linear forward portion and an arcuate return portion, said cam plate consisting of an outer and inner section with the cam track intervening; studs supporting and spacing the outer section from said table; arched brackets carrying the inner section from said outer section; a follower on said shuttle stem received in said cam track for moving the latter in said guide in accordance with said cam track, the shuttle stem passing between said table and said cam plate; a shuttle head on said stem having a top, hinged portion; a linear closure track and a return opening track curved at its front part disposed along said cam plate; and a follower on said hinged portion of the shuttle head, terminating in a contact means which cams against said tracks and closes the shuttle head on its forward stroke and opens it on its return stroke.

13. As part of a ripping tape applying machine, a ripping tape gripping shuttle, comprising an elongated stem, a shuttle head at one end of said stem, means for imparting bodily motion to said shuttle, comprising a cam follower fast to and protruding from said stem intermediate its length and physically and functionally separate from said shuttle head, said shuttle head comprising a prolongation of said stem and a section cooperating with, hinged to, and swingable relative to said prolongation, said prolongation and said swingable section having cooperating flat bearing surfaces for gripping therebetween a section of ripping tape.

14. As part of a ripping tape applying machine, a ripping tape gripping shuttle, comprising an elongated stem, a shuttle head at one end of said stem, said shuttle head comprising upper and

lower sections hinged together and one of which is fast to said stem, having cooperating flat bearing surfaces for gripping therebetween a section of ripping tape, and cooperating and facing knives disposed one on each section of said shuttle head, at that side thereof which, during the operation of the shuttle, leads during the forward stroke thereof.

15. As part of a ripping tape applying machine, a ripping tape gripping shuttle, comprising an elongated stem, a shuttle head at one end of said stem, comprising an upper section hinged to said stem, and a lower, longitudinally slotted section, forming a prolongation of said stem, and a follower depending from the under surface of said upper section and extending through the slot in said lower section, and terminating in an anti-friction roller, the sections of the shuttle head having cooperating flat bearing surfaces for gripping therebetween a section of ripping tape.

16. As part of a machine for applying ripping tape to paper-like wrapper stock, a shuttle, having a head consisting of an upper hinged section, and a lower section, a plate cam having a cam track comprising a linear forward portion and an arcuate return portion, a follower on said shuttle engaging said cam track, a pair of tracks parallel through the greater part of their extent and extending parallel with said linear forward portion of the cam track, one said track having vertical walls and the other track having a sloping wall and being curved at its leading end towards the other track, and a follower on the upper shuttle section, extending through a slot in the lower section, and a roller at the free end of said follower, bearing against the vertical-walled track during the forward movement of the shuttle, so that the shuttle sections are retained closed, and bearing against the sloping-walled track on the return movement of the shuttle, thereby maintaining the shuttle sections open.

17. As part of a machine for applying ripping tape to wrapper stock and including a table, a vacuum forming head, comprising a central vacuum section and end vacuum sections hinged thereto, and foldable thereon into substantially U-shape, flexible vacuum conduits interconnecting said sections, said sections having a plurality of small vacuum ports on the under faces thereof, adjacent the table surface, a support arm reciprocable perpendicularly to the table and on which the forming head is fast, and means operable as an incident to reciprocation of the forming head and support arm to close and open the end sections relative to said central section.

18. As part of a ripping tape applying machine having a frame, a forming head construction, movable relative to said frame, comprising a central vacuum section, and vacuum sections hinged to fold onto said central section, a rack fast on said frame, a stub shaft movable with said forming head and having a pinion meshing with said rack, a cam plate rocked by said shaft, and linkage interconnecting said cam plate and said end sections, to fold and unfold the end sections as the forming plate moves towards and away from said frame.

19. A forming head for use in a ripping tape applying machine having a frame, and movable relative thereto, comprising central and end vacuum sections hinged together and foldable into U-shape, and having a plurality of small vacuum ports on the undersurface thereof, adjacent the

frame, and flat, contacting and overlapping fold protectors extending laterally towards each other from adjacent edges of the under surfaces of said sections, collapsing upon each other when the end sections are folded, and interposing at all times an effective barrier to the passage of ripping tape up between the sections of the forming head.

20. A forming head for use in a ripping tape applying machine having a frame, and movable relative thereto, comprising central and end vacuum sections hinged together and foldable into U-shape, and having a plurality of small vacuum ports on the undersurface thereof, adjacent the frame, and flat, contacting and overlapping fold protectors extending laterally towards each other from adjacent edges of the under surfaces of said sections, collapsing upon each other when the end sections are folded, and interposing at all times an effective barrier to the passage of ripping tape up between the sections of the forming head, a plurality of pairs of slots being provided at the outer peripheries of the undersides of the end sections, and in the fold protectors, for receiving scoring knives passing upwardly through underlying wrapper stock and into said slots.

21. As a part of a machine for applying ripping tape to wrapper stock and including a table, a vacuum forming head comprising a centrally disposed main vacuum chamber, auxiliary and smaller vacuum end sections hinged thereto, each said section having a plurality of small vacuum ports on the under surface thereof adjacent the table surface, means for swinging said end sections relative to said central section, a reciprocable support arm on which the forming head is fast, cam means operable as an incident to reciprocation of said support arm for swinging said end sections, and guide means on the table for guiding the support arm in reciprocation perpendicularly to the surface of the table.

22. As part of a machine for applying ripping tape to wrapper stock, a forming table construction comprising a solid, plate-like table having a large area, a shallow recess in the working surface thereof, a one-piece, generally rectangular forming plate having small thickness compared to its surface area resiliently and collapsibly disposed in said recess, and coiled springs seated in wells in the said recess at the corners of the forming plate, and normally urging the forming plate in such manner that its upper surface extends slightly beyond the outer confines of the table.

23. As part of a machine for applying ripping tape to wrapper stock, a forming table construction comprising a solid, plate-like table having a large area, a shallow recess in the working surface thereof, a one-piece, generally rectangular forming plate having small thickness compared to its surface area resiliently and collapsibly disposed in said recess, and coiled springs seated in wells in the said recess at the corners of the forming plate, normally urging the forming plate in such manner that its upper surface extends slightly beyond the outer confines of the table, said forming plate having slots extending there-through, and scoring knives mounted on and in said recess and extending into said slots and normally lying beneath the surface of said forming plate and projecting beyond the upper surface of said forming plate only when the latter is collapsed.

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