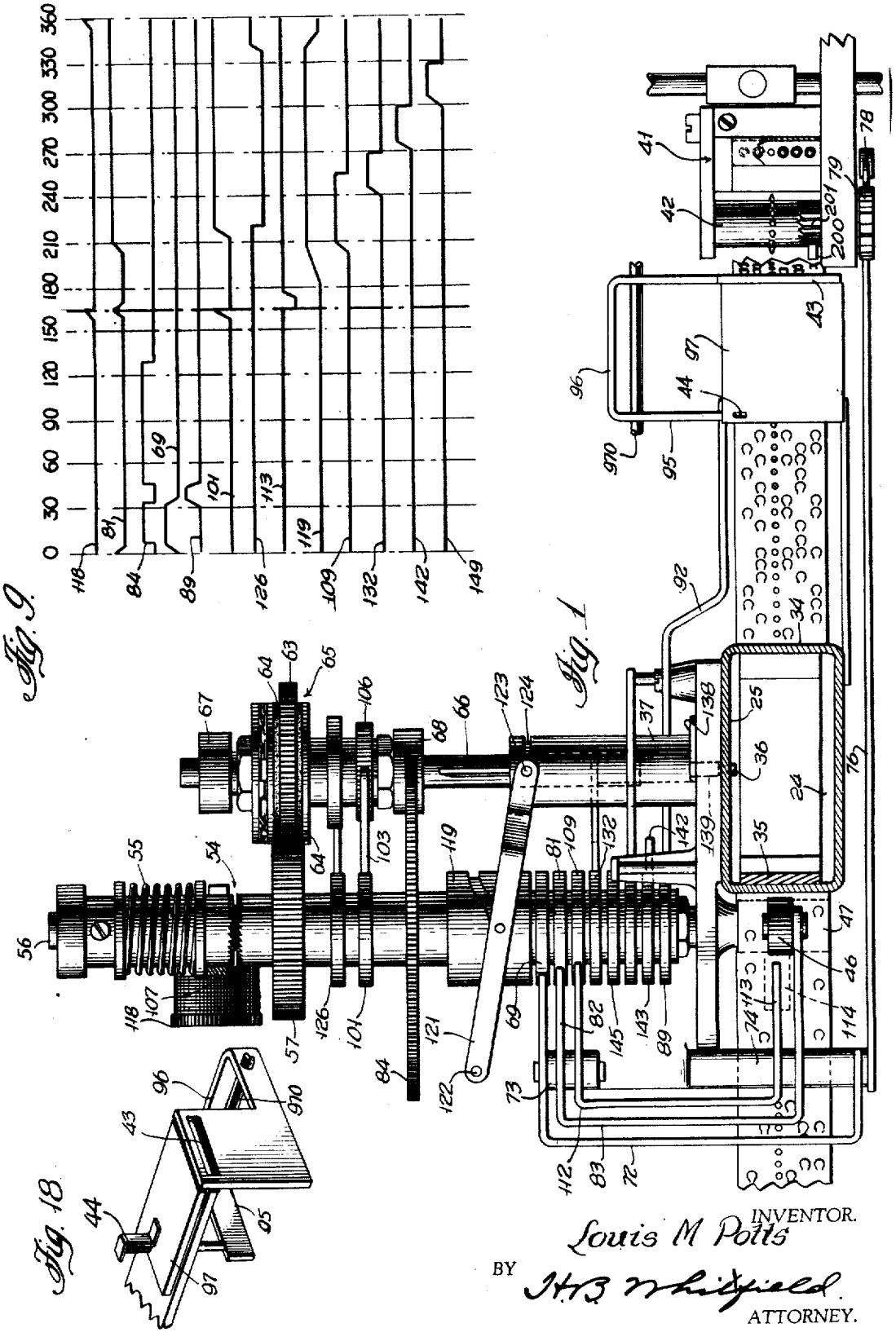
Sept. 4, 1945. L. M. POTTS 2,384,194

TAPE DISTRIBUTION SYSTEM

Filed July 20, 1942 4 Sheets-Sheet 1



Sept. 4, 1945. L. M. POTTS 2,384,194

TAPE DISTRIBUTION SYSTEM

Filed July 20, 1942 4 Sheets-Sheet 2

Fig. 2.

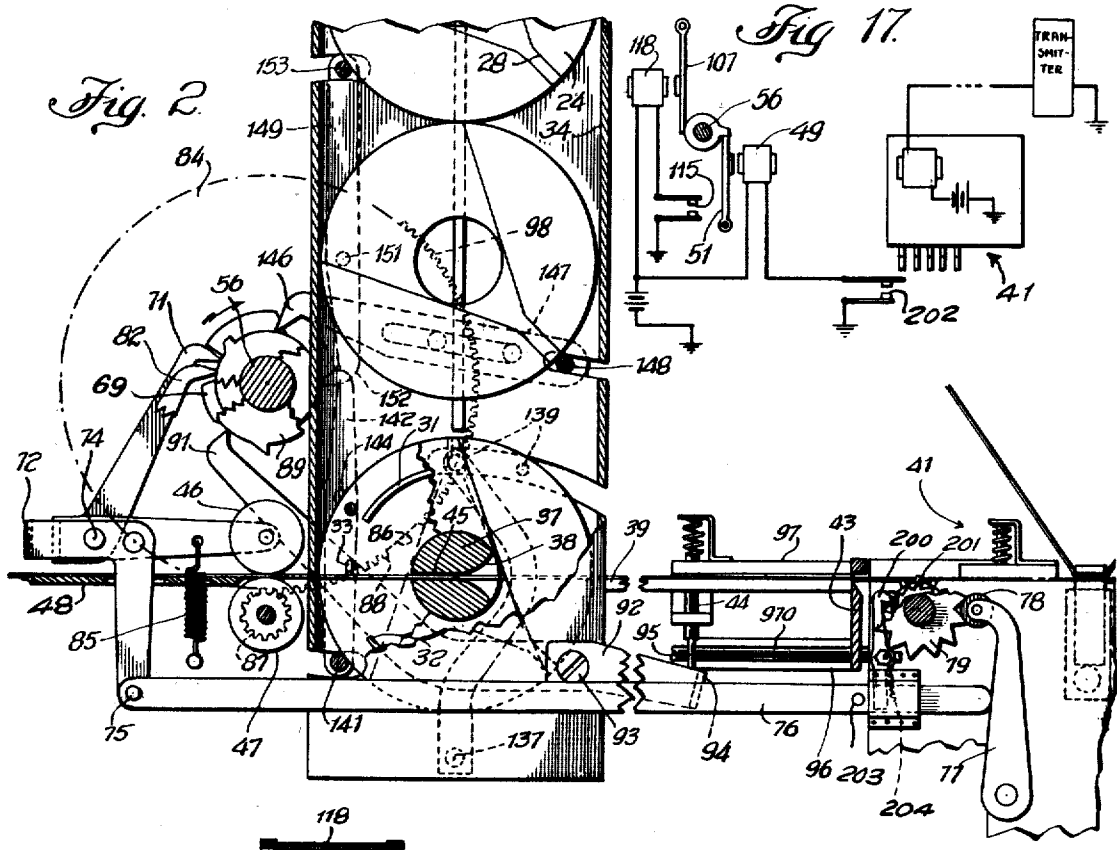


Fig. 17.

Fig. 3.

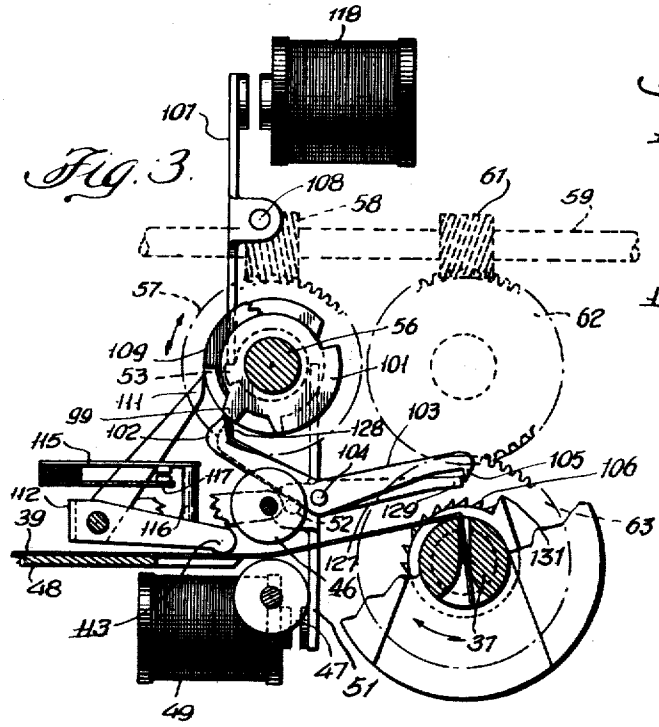
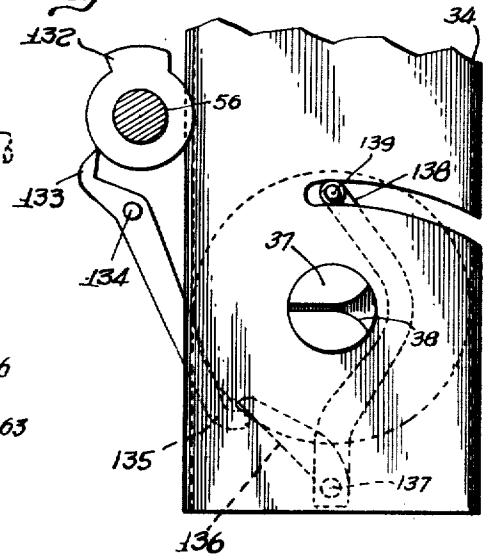


Fig. 10.



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Sept. 4, 1945. L. M. POTTS 2,384,194

TAPE DISTRIBUTION SYSTEM

Filed July 20, 1942 4 Sheets-Sheet 3

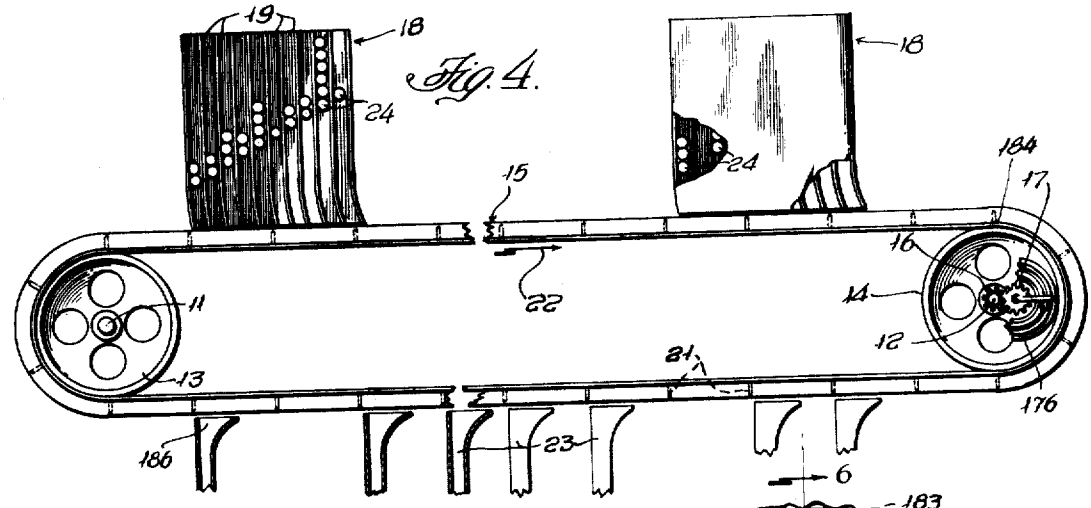


Fig. 4.

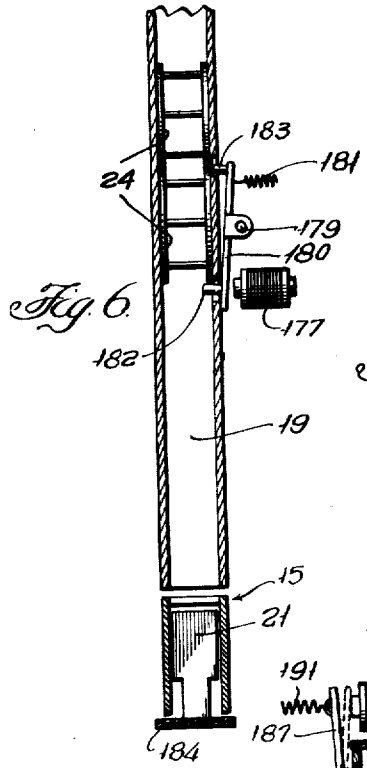


Fig. 6.

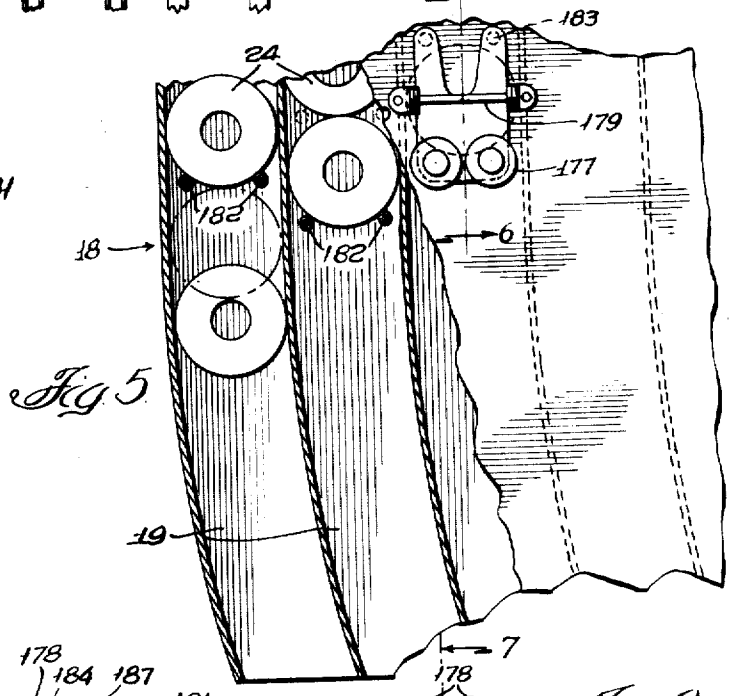


Fig. 5

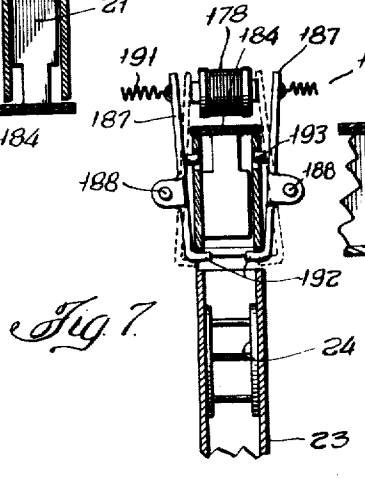


Fig. 7.

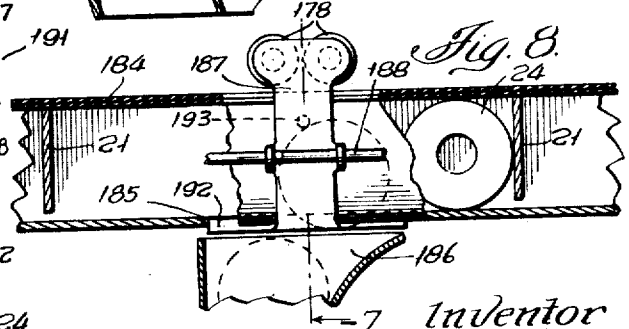


Fig. 8.

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Sept. 4, 1945. L. M. POTTS 2,384,194

TAPE DISTRIBUTION SYSTEM

Filed July 20, 1942 4 Sheets-Sheet 4

Fig. 11

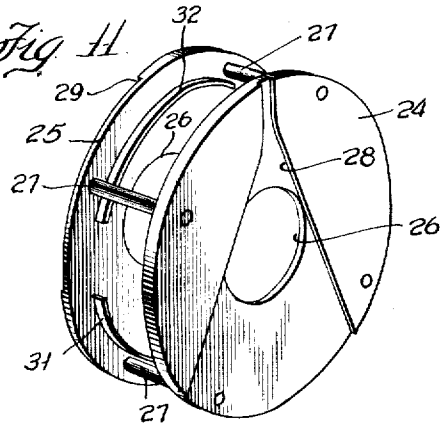


Fig. 12.

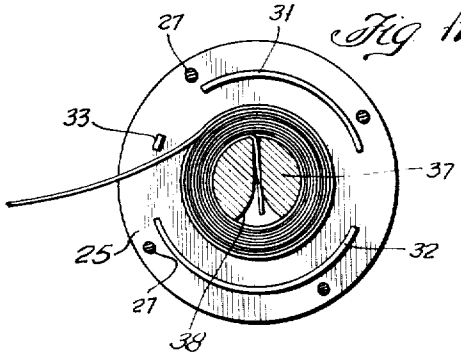


Fig. 13

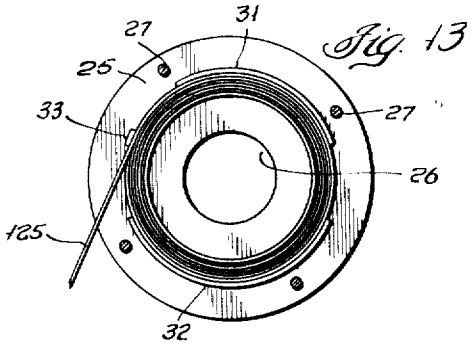


Fig. 16.

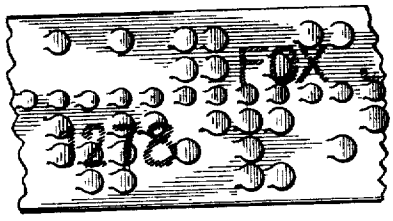


Fig. 14

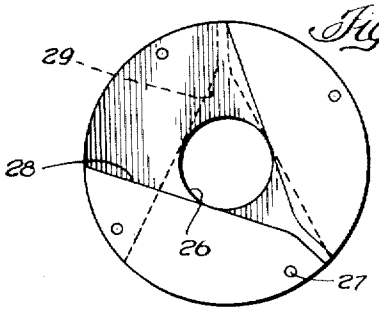
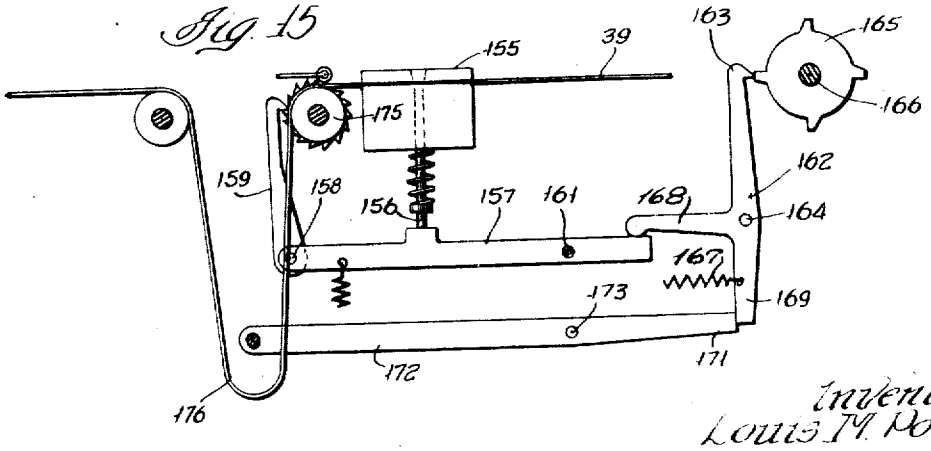


Fig. 15



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UNITED STATES PATENT OFFICE

2,384,194

TAPE DISTRIBUTION SYSTEM

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Application July 20, 1942, Serial No. 451,576

20 Claims. (Cl. 178—17)

The present invention relates to message handling apparatus and more particularly to a system of devices for packaging and distributing perforated or otherwise prepared control forms.

In its fundamental conception, the present invention contemplates apparatus at a central office exchange comprising a plurality of control form preparing machines each responsive to incoming line signals for preparing on storage forms messages usually of predetermined maximum lengths. Included thereon in addition to the message matter may be such other and collateral information as the address of a destination station, the address of the transmitting station, the time of day when the message was received, etc. The messages after being printed and/or perforated upon lengths of tape, are wound into coils within cylindrical containers and in a reverse order to that in which the message was received so that the start of the message is left outermost of the container. Following this, pluralities of said containers, each having a charge consisting of a message from a predetermined one of said plurality of perforating machines, are placed into a selective hopper device, transferred to predetermined compartments in a conveyor belt depending upon the station of destination, and thereafter discharged from the conveyor belt into a routing hopper from which the containers are directed to individual transmitting apparatus whence the messages are retransmitted to their ultimate destination station.

Accordingly, a principal object of the present invention is the provision of automatic tape or control form coiling and routing apparatus for distributing message bearing forms from any one of a plurality of various receiving and tape preparing stations to any one of a plurality of various tape transmitting stations where the stored messages are retransmitted over a line to a destination receiving apparatus.

Among the various features of the mechanisms embodying the present invention, there is provided with each one of a plurality of tape perforating machines a device which contains a supply of empty spools and directs them individually into position to receive a tape as said tape emerges from the preparing machine. The prepared tape or control form is first permitted to accumulate outside the winding machine until there is attained the end of a message, whereupon by special supervisory signal the winding apparatus is initiated into operation and seizing the tail end of the control form first, it proceeds to wind the message within an awaiting container.

When the message bearing tape is fully coiled and positioned within the container, the mechanism acts further to retract the leading end of the form and to dispose it in position so as to display for ready observation the collateral information contained on the message; viz., the address, time, etc. Following this, the winding arbor is withdrawn, the charged spool or container is released from the coiling machine and deposited into a proper division of a distribution apparatus, and a succeeding empty container is advanced into position in the coiling machine to receive the next message.

In the supervision of the routing and distributing apparatus, a controlled circuit has been provided in which a bank of control switches is associated with each tape preparing station and similarly a bank of control relays provided at each discharge hopper. The supervisory control circuit is timed to complete its control supervision for each particular conveyor belt compartment in timed relation with the progress of said particular compartment, so that when the conveyor belt is brought into position opposite the discharge hopper associated with the destination transmitter to which its message happens to be routed, there will be effected a discharge of its contents into the right channel for achieving the ultimate object of retransmitting the message to its addressee.

Collateral features of the present invention, for example, such as pertain to the container devices, include the provision of certain ward or barrier markings and keying indicia to prevent the improper insertion or positioning of the spool into the hoppers associated with winding machines or those associated with the transmitters. The spools or containers are directed automatically during distribution until they reach their ultimate goal; namely, the signal retransmission apparatus.

For a more comprehensive understanding of the present invention, reference may be had to the accompanying drawings and to the following detailed specification wherein like reference characters designate corresponding parts throughout and wherein,

Fig. 1 is a plan view of a control form winding and loading apparatus associated with a tape perforating machine which is shown in fragmentary detail;

Fig. 2 is a side view partially in section of the apparatus featured in Fig. 1;

Fig. 3 is a sectional detail view from the same viewpoint as Fig. 2 but featuring the power distributing and control mechanism of the apparatus shown in Fig. 1;

Fig. 4 is a diagrammatic side elevational view of the conveyor belt apparatus including exemplary loading and discharge station apparatus;

Fig. 5 is an enlarged detail view of a message container magazine;

Fig. 6 is a sectional view taken approximately on line 6—6 of Fig. 5;

Fig. 7 is an enlarged sectional view taken approximately on line 7—7 of Fig. 8;

Fig. 8 is a fragmentary side elevation with parts broken away featuring the mechanism illustrated in Fig. 7;

Fig. 9 is a timing diagram illustrating the relative effective periods of operation of various parts of the control form coiling and container loading machine;

Fig. 10 is a detailed illustration of a portion of the apparatus obscured by the foreground portions of Fig. 2;

Fig. 11 is a detailed perspective view of one of the message containers or spools without its charge of control form;

Fig. 12 is a transverse sectional view through one of the tape coil containers such as that featured in Fig. 11 including the winding arbor applied thereinto as during the process of form winding;

Fig. 13 is a sectional view similar to Fig. 12 featuring the position of the coiled form within the spool after the winding shaft has been withdrawn;

Fig. 14 is a side elevation of a spool or container such as that featured in Fig. 11 illustrating the relative positions of the aligning grooves which are located on the outer surfaces of the spool discs;

Fig. 15 is a diagrammatic detail illustration of a modified tape preperforating mechanism such as may be employed in conjunction with the present invention for the purpose of rapidly perforating feed holes during tape feed-out control;

Fig. 16 is a detail view of a portion of a control form perforated in accordance with the practice taught in U. S. Patent No. 2,255,794, granted Sept. 16, 1941;

Fig. 17 is a simplified circuit diagram of the principal electrical elements illustrated in connection with the foregoing preferred embodiment, and

Fig. 18 is a perspective view of the cutoff and punch unit.

Referring more particularly now to the drawings, attention is directed to the reference characters 11 and 12, Fig. 4, which denote the pivotal axes of a pair of conveyor supporting wheels 13 and 14 over and around which there travels an endless conveyor belt generally indicated 15. Effectively, conveyor roller 13 may be an idler upon shaft 11 but conveyor roller 14 is preferably power driven on or by shaft 12 which carries a driving gear 16 for imparting rotation to a distributor brush arm 17 in timed relation to the progress made by the conveyor belt 15. A definite relationship is maintained between distributor brush 17 and the conveyor belt 15 in any suitable manner as by providing engagement notch and lug attributes between the belt and the roller 14 which in turn is geared to the shaft 12. These attributes will, of necessity, fit one into the other and thereby exclude the possibility of slippage.

The reference character 18 denotes one of a plurality of spool carrying magazines and comprises a definite number of composite chutes 19 each one of which is adapted to receive spools destined for a predetermined transmitting station as will later be explained.

In accordance with a simplified practice of the present invention the spools may be placed into the chute 19 manually by distribution clerks who, by reading the destination address on the outer ends of the messages as they are exposed in accordance with the construction of the spools, will determine into which one of the chutes 19 of any particular magazine 18 the spools are to be placed. The release of the spools from their respective chutes 19 is controlled by an automatic supervisory circuit which forms the subject matter of another application. As each spool is discharged into a particular conveyor belt chamber, which includes the space between two consecutive partitioning walls 21, Fig. 8, it may be carried in the direction of the conveyor belt as indicated by the arrow 22, until the particular chamber becomes aligned with one of the discharge hoppers 23 which, as a destination, is particularly related to one of the chutes 19.

Referring now to Figs. 11 to 14, particular attention will be given to the details of construction of the message containing spools. Each spool is composed of two circular discs indicated 24 and 25, the former of which is preferably somewhat thicker than the latter although otherwise of the same configuration and both provided with a concentric opening 26. At four equally spaced points near the periphery of the side walls 24 and 25 the two discs are joined together by transverse studs 27 which may be suitably anchored into the sides as by riveting.

Of the two discs which comprise each spool, the thicker one 24, foremost in Fig. 11, is provided on its outermost surface with a comparatively shallow groove 28, flared and widened at one end but comparatively narrow at the other end as may be easily observed from this illustration. The opposite side wall 25 is also provided on its outermost surface with a shallow groove 29 which groove is generally similar in shape and proportion to the groove 28 of disc 24, but differs therefrom in one respect; namely, that it is angularly displaced therefrom as may be best seen from the side elevational view, Fig. 14.

The variation in thickness between the sides 24 and 25 and the provision of the shallow grooves 28 and 29 are means for assuring that the spools are inserted properly into the message coiling and loading as well as the transmitting machines, as will be more fully described later.

Integrally associated with each disc 24 and 25 are two longer arcuate ribs 31 and 32 and one short rib 33. These elements project but a small distance above the inner surfaces of the discs and are for confining the roll of tape in the manner shown in Fig. 13 after it has been released from the winding spindle or mandrel shown in Fig. 12. Thus, while the expanded coil of Fig. 13, where the winding mandrel or arbor is shown withdrawn, is almost completely embraced by the symmetrical and opposite shallow rib elements 31, 32, and 33, the surface of the outermost convolution of the tape coil is almost entirely visible to an observer who is handling the container. The containers, Fig. 11, assume a stationary condition in the winding machine, Fig. 1, during the process when a mes-

sage tape is inserted and coiled. They function to shelter and confine the messages during transit from the perforator apparatus to the transmitter.

Observing now Figs. 1, 2, and 3, it will be noted that each tape coiling unit comprises an upright magazine tube 34 shaped of rectangular cross-section to closely define the outline of each spool, as may be seen in Fig. 1. In order to pass the spool in a certain relative position, this magazine 34 is provided with a ward or barrier block 35 of such width and so disposed with respect to the magazine tube 34 as to assure that the thicker disc 24 will invariably be inserted lowermost, as viewed in Fig. 1, and the thinner 25 correspondingly uppermost therein. In addition to these, there is also provided a projecting rib 36 which, when inserted anywhere within the flare of shallow groove 29, will direct said disc 25 by camming the latter rotationally in one direction or the other when said projection 36 engages the side edges of said groove 29 until the position shown in Fig. 14 is attained.

Near the lowermost extremity of magazine tube 34 there is intermittently presentable the winding mandrel or arbor 37 which consists essentially of a split shaft whose transverse slot is flared as at 38 so as to give ready admittance to the end of the perforated tape 39 as it emerges from the printing and/or perforating unit 41.

The perforating unit 41 shown in Figs. 1 and 2 may be a device such as that disclosed in U. S. Patent No. 2,255,794, granted September 16, 1941, or Bulletin No. 165, issued in March, 1941, by the Teletype Corporation, Chicago, Illinois, and copyrighted May 3, 1941. In this type of apparatus wherein the message is cut into the tape as shown in Fig. 16, and in addition is printed on the surface of the tape, a feed sprocket 42 which is rotated counterclockwise in a step-by-step manner, Fig. 2, by means of a pawl 200 engaging a ratchet 201 and operating in a manner well known in the art, causes said tape 39 to be fed leftwardly traversing first the location of a tape severing blade 43, then an end-of-message perforating punch 44, the longitudinal slot 45 of winding arbor 37, and finally the pair of feed rollers 46 and 47 continuing over the discharge platform 48.

As the tape emerges from the form preparing unit 41, its course is uninterrupted through the several above-described elements and as it overruns the extremity of supporting table 48, it is permitted to accumulate in any suitable manner until the end of the message is attained. During all of this time, the coiling mechanism has no function to perform and is disposed in the position illustrated in Fig. 2 so as to permit the tape 39 to continue along its course uninterruptedly. When a message is completely perforated by the unit 41, there is prepared an energizing circuit for releasing for operation the tape coil winding apparatus. This is obtained when a start impulse is communicated to the winding of magnet 49, Fig. 3, the energizing circuit of which is in Fig. 17 and which may be completed upon the closure of a contact pair 202 under the control of one of the perforator pull bars specially assigned to the function of an end-of-message designating signal. Whether this signal be an independent lower-case control signal or whether it be a special signal requiring an upper-case shift as a prerequisite, the supervision may be obtained by a contact mechanism such as that disclosed in Fig. 8 of U. S. Patent No. 2,018,368 issued October 22, 1935.

As a result of the energization of magnet 49, its armature 51 is attracted rotating clockwise about its pivot 52 and withdrawing its stop end from blocking engagement with clutch shoulder 53, Fig. 1, permitting the driven portion of clutch assembly 54 to come into engagement with the driving member thereof under impetus of clutch spring 55. As a result, clockwise (Figs. 2 and 3) rotation is imparted to cam shaft 56 on account of driven gear 57 which is constantly rotated in this direction by the driving worm wheel 58 of a power distributing shaft 59 which, in turn, is rotated by a suitable source of power (not shown). Another driving worm 61, also carried upon power shaft 59 and meshing with a driven worm wheel 62 will be noted, on account of the angle of its driving teeth, to be able to impart faster rotation to its driven wheel 62 than the speed at which driving worm 58 drives its wheel 57.

Driven wheel 62 is itself a means for communicating rotation to the shaft 66 which carries the winding mandrel 37 as may be noted in Fig. 3, so that the rotation of the latter member is counterclockwise as viewed in this illustration in contradistinction from the direction of rotation of shaft 56. Wheel 62 meshes with and accordingly imparts rotation to a driven wheel 63, see also Fig. 1, which is supported between a pair of friction discs 64 forming part of a slip clutch assembly generally indicated 65. The shaft which drives mandrel 37 has been indicated 66 and its journals 67 and 68.

As a consequence of the release of shaft 56 to rotation, one of its cams 69 which forms a part of an assembly of cams noticeable in the foreground in Fig. 1, presents its brief apex portion to the follower projection 71, Fig. 2, of a bell crank lever 72 pivoted with two other bell crank levers upon the supporting journal projections generally indicated 73 and 74. The opposite arm of bell crank 72 is pivoted at 75 to a push bar 76 which moves rightwardly inparting corresponding similar motion to dislodge a detent arm 77 whose roller 78 normally serves to center a star wheel 79 between teeth and through it to position the tape feed sprocket 42 accurately during its step-by-step progress. The push bar 76 has a pin 203 integral therewith which engages the lower end of the pawl 200 upon any rightward movement of the lever, resulting in the pawl 200 being moved in a counterclockwise direction against the tension of its biasing spring 204 thereby releasing the pawl from engagement with the ratchet 201.

This operation relieves the sprocket shaft 42 from any restraint by the detent lever 77 and the pawl 200 so that thereafter when the tape 39 is pulled leftwardly, as viewed in Fig. 2, no substantial resistance will be encountered. The effective period of cam 69 during a complete cycle of operation is indicated by the brief rise of curve 69, as illustrated in Fig. 9. At about the same time that cam 69 becomes effective, its adjacent cam 81 whose curve in Fig. 9 is also indicated 81, withdraws its comparatively long apex from beneath the follower projection 82 of a bell crank 83 permitting pressure roller 46 which is pivotally supported upon the other arm of said bell crank 83 to respond to the urge of its tensioning spring 85 and move toward the driving roller 47 binding between them the tape 39 which, during the operation of the perforator unit 41 and thereafter until the sending of the end-of-message

signal, had been moving leftwardly beyond the table 48 and gathering in a suitable receptacle as stated above.

Secured to shaft 56 is a large driving gear 84 whose periphery on both sides of an intermediate mutilated section indicated 86 is studded with quantities of teeth to be engaged separately by the driven gear 87 integral with the driving roller 47. As one of the groups of driving teeth 88 of gear wheel 84 engages the driven pinion 87, it rotates feed roll 47 which is now in engagement with the pressure roller 46, advancing the tape 39 leftwardly a distance corresponding to or slightly greater than that between the perforating punches of the telegraph perforator 41 and the cutoff knife 43. This, it will be understood, leaves a certain amount of blank tape following the perforated area at the end of the message just as has been done at the beginning.

When the afore-described brief feeding of the tape 39 has been completed, another one of the cams designated 89, Figs. 1 and 2, on the cam shaft 56 encounters with its short apex a follower projection 91 of lever 92 causing it to be rocked counterclockwise about its pivot 93 whereupon its extremity 94 engages one arm 95 of a punch and cutoff knife operating bail 96. The latter member is pivotally supported on shaft 970 and in thus moving it brings the uppermost edge of shearing blade 43 into engagement with a cooperating edge of a plate 97 at the same time that its arm 95 engages the lowermost extremity of punch 44 forcing the latter member through a die opening in plate 97 and accordingly making a special index perforation in the tape to denote the end of a message.

As with the case of the first-described cams, Fig. 9 shows the periodicity and duration curves 84 and 89 denoting the effective periods of gear wheel 84 and that of the cutoff knife operating cam 89 indicated by identical reference characters. Cutoff blade 43 may be shaped as an end plate with the cutoff edge constituting one of the edges of an internal slot in the blade or plate so that following each cutoff operation, the portion of tape 39 extending from the perforator unit 41 will be guided into the slot by reason of the apertured cutoff blade design. Shortly following their operation, knife 43 and punch pin 44 are returned to the normal position, whereupon the group of teeth 98 of mutilated gear wheel 84 come into engagement with those of driven pinion 87 causing the driving roller 47 to resume its counterclockwise rotation and feeding the tape 39 again in the forward direction until the cutoff end of the tape stops substantially within the slot 45 of winding arbor 37.

This condition obtains shortly after the 120° position of curve 84, Fig. 9. After the lapse of a brief interval, the apex 99 of a cam 101 encounters the projection 102 of a clutch stop lever 103 pivoted at 104, rocking the latter member in a counterclockwise direction about its pivot so as to withdraw its holding tooth 105 from engagement with the periphery of a serrated disc 106 which is integrally associated with the driven portion of friction clutch 65.

Since tooth 105 is the sole element for holding driven member of clutch 65 from rotating under the impetus of its driving gear 63, the effect of cam 101 will accordingly, be to release shaft 66 for rotation. The direction of rotation as has been said is clockwise, Fig. 3, causing the winding of the tape as indicated in this illustration beginning with the end-of-message end of the tape innermost. About the same time that the mandrel or arbor 37 through its integral association with shaft 66 enters upon clockwise rotation, the tensioning roller 46 is again retracted from engagement with pulling roller 47 when a brief apex of cam 81 reengages the follower extremity 82 of bail 83. As this occurs, the projection 53 of driven portion of clutch 54, encounters the extremity of an armature 107 pivoted at 108. This brings shaft 56 to rest as the winding arbor 37 continues rotating in a clockwise direction and winding the cutoff portion of the tape 39 about itself after the manner illustrated in Fig. 12.

Shortly before the cam shaft 56 is brought to rest by reason of the engagement of driven portion of clutch 54 with the armature 107, another one of its cams 109 which is shaped with a continuous apex and but a brief depression in its periphery, assumes a position whereat it presents said depression to the extremity of a follower arm 111 which forms part of a bell crank 112 also pivoted upon the supporting journals 73 and 74. As a result, bell crank 112 is permitted to rotate clockwise under the influence of a mild tension spring (not shown) so that its other arm 113 will bear upon the upper surface of tape 39 in search of the foremost end of the tape when it arrives as the mandrel completes the winding of the entire length of tape about itself.

As best seen in Fig. 1 the extremity 113 of the bell crank 112 overlies a notched portion 114 in the supporting table 48 of such width as not to yield to the tension of said arm 113 unless the intermediately traveling tape 39 becomes exhausted as when it is fully wound about the mandrel 37.

Under the circumstance of tape winding completion, when arm 113 drops into the slot 114 and bell crank 112 is permitted to rock clockwise about its pivot 74, tension is relieved from the contact spring 115 whereat insulator 116 rests upon arm 113. As a result said contactor comes into engagement with contact point 117 and a local circuit is completed for energizing magnet 118. This attracts armature 107 withdrawing its blocking extremity from the lug 53 of separable clutch 54 and shaft 56 is thereby permitted to resume rotation. The action of the sensing finger 113 is represented by its similarly indicated curve 113 in Fig. 9 at which time the clutch throwout 118 also becomes effective, and as may be observed from curve 81 the brief apex 99 of cam 101 passes beyond the sensing projection 102 and the friction clutch stop lever 103 immediately arrests shaft 66 against further rotation.

After a brief interval, sensing arm 113, which is under the joint control of the tape 39 as well as of the supervisory cam 109 on shaft 56, is restored to its original position as indicated in Fig. 3 by reason of the depression in cam 109 passing beyond the extremity of its feeler projection 111. When this occurs, the contactor 115—117 is again opened and the energizing circuit for magnet 118 broken.

On shaft 56 is carried a cam 119 within whose peripheral cam groove there resides a follower roller carried intermediate the mandrel retraction lever 121, the latter element being pivotally anchored at 122 and having a pin at its remote end 123 which is confined in an annular groove 124 of the winding mandrel 37. Cam 119 whose function is, accordingly, the retraction of winding mandrel 37 occupies an effective cycle of operation as indicated by its curve 119 in Fig. 9. Dur-

ing the elevated portion of this curve, mandrel 37 is retracted and does not extend into the spool then in form receiving position, and by reason of its being suitably splined on shaft 66, mandrel 37 is capable of free longitudinal movement thereon without radial displacement of said shaft.

It is to be understood that as the winding mandrel 37 is extracted from the container, it is also withdrawn from engagement with the innermost end of the tape coil 39 and that when this occurs the winding tension is relieved from the coil of tape which thereupon seeks to assume a maximum diameter condition such as illustrated in Fig. 13. Also, it is to be noted that since the control of winding is through the end of tape sensing arm 113 which is disposed in a definite relationship with respect to the spool or container, the amount of tape extending outside of the confines established by the arcuate guards 31, 32, and 33 such as represented in Fig. 13 by the reference numeral 125, will, in all cases, be the same or nearly the same amount. Thus is had a manner of assuring that the address or any other information contained upon the foremost end 125 of the tape will be exposed to easy observation and will assume a definite relationship with respect to the fixed characteristics of the spool, namely, the groove 28, so that for purposes of reinsertion into a transmitting machine, as will be disclosed in a copending application, the position established by reason of the shape of the spool will, at the same time, assure a definite relationship between the extending end 125 of the tape and the retransmission apparatus.

As a result of the further rotation of cam shaft 56, a secondary and longer apex of cam 101 carried on said shaft engages follower projection 102 for the second time, rocking lever 103 counterclockwise and withdrawing stop tooth 105 from engagement with the teeth of serrated disc 106. While this is going on, another cam 126 whose continuous apex had been supporting lever 127 in a counterclockwise position by engaging its follower projection 128, now achieves a condition whereat its apex overruns the point of engagement with follower projection 128, leaving lever 127 without support and permitting a spring (not shown) of the latter member to rotate it clockwise about pivot 104 until its extremity 129 is brought into the path of stop tooth 131, whereupon shaft 66 is again brought to rest but this time at a definite angular position determined by said engagement between extremity 129 and stop tooth 131. The effective instants of cam 126 are indicated on curve chart, Fig. 9, by the variations of curve 126. As a result of this stopping of shaft 66 in the manner just described, the slot 45 in its associated winding arbor 37 is positioned horizontally as indicated in Fig. 2, and the apparatus is again in condition to receive a leading end of the perforated tape 39 as it emerges from the printing and/or perforating machine 41.

Meanwhile shaft 56 continues to rotate until its cam 101 again withdraws its apex from the follower 102 permitting said follower lever 103 to resume its position as explained above with stop hook 105 engaging one of the teeth in the disc 106. Shortly following this occurrence, cam 126 again presents its apex to the follower 128 withdrawing the extremity 129 from blocking the stop shoulder 131; however, shaft 66 does not move because it is held arrested by the stop tooth 105 of lever 103.

With the apparatus arrested in this condition, the control remains under shaft 56 and the apparatus is in readiness for a succeeding message coiling and spool loading operation. As shaft 56 proceeds during its final portion of rotation in completing a cycle, another one of its cams indicated 132 encounters with its comparatively brief apex the follower projection 133 of a first class lever pivoted at 134. Its opposite extremity 135, engages one arm 136 of a bell crank assembly pivoted on a shaft 137. In consequence, the assembly is rotated clockwise about its pivot 137 carrying its major arm 138 rightward and as a result moving a pin 139 integral with the extremity of said arm 138 rightwardly within an arcuate cutaway portion of the magazine housing 34, Fig. 2. Pin 139 is in direct alignment with the spool centering web 36, Fig. 1, and accordingly, it assumes a position within the narrow neck of the alignment guiding groove 29 of each spool. When the spool is disposed in the position indicated in Fig. 2, its principal support is afforded by a stop pin 141 carried in the lowermost extremity of a trip lever 142; however, pin 139 assists in maintaining the proper vertical alignment of each spool or container in position for loading during the normal condition of bell crank assembly 136—138.

When this assembly is rocked clockwise by cam 132 as afore-described, however, pin 139 causes the particular spool to be rotated clockwise as viewed in this illustration and since, due to the withdrawal of the winding arbor 37, the tape contained within the spool has been permitted to expand to the position shown in Fig. 13 and thus bind against the confinement segments 31, 32, and 33, the afore-described clockwise rotation of the spool pulls the trailing end 125 from between the pressure rollers 46 and 47 which were previously drawn apart by the action of cam 81, permitting said end 125 to trail loosely beyond the short supporting lug 33 after the manner shown in Fig. 13.

At about the time that projection 139 is assuming a position such as that indicated in dotted outline in Fig. 2 and before it has become disassociated from the surface groove of the spool, a cam 143, Fig. 1, engages the follower extremity of lever 142 rocking the latter member about its pivot 144 in a clockwise direction and withdrawing the stop pin 141 from support of the nethermost spool. This spool is now free to fall from the magazine 34 as an apex of cam 145, Fig. 1, engages the tip 146 of a slidable member 147, shifting the latter rightwardly as viewed in Fig. 2, and dislodging a stop pin 148 integrally associated therewith from the path of a next succeeding spool which thereupon drops into the position occupied by the recently expelled winding spool, the apex of cam 145 passing on beyond the projection 146 and permitting the slide bar 147 in response to a spring (not shown) to resume its normal position which is that illustrated in Fig. 2.

Thereafter, cam 145 encounters with its apex another lever indicated 149 which is pivoted at 151 and as in the case of lever 142 has a follower projection 152, and at its remote end a blocking pin 153. The shifting of pin 153 leftwardly, as viewed in Fig. 2, causes a next succeeding winding spool thereat held by reason of said pin 153, to be dropped to a position such as that illustrated in dotted outline which had previously been occupied by the spool recently advanced to the winding position. A final prep-

aration is made after which the apparatus is in readiness to receive the succeeding message for coiling and loading. This preparation consists in the performance by cam 119 acting upon mandrel retraction lever 121 in the reverse manner to that described above. Accordingly, mandrel 37 is restored to its position whereat it extends within the newly positioned spool after the manner indicated by its curve 119, Fig. 9.

Timing shaft 56 is again brought to rest when the projection 53 of its clutch 54 comes into engagement with the blocking end of armature 51. Thereupon, the mechanism is in readiness to receive a new start (end-of-message) signal from the tape preparing unit 41. It will be recalled that after a message has been perforated and a message end signal transmitted to the magnet 49 as afore-described, that the tape feeding sprocket 42 of the unit 41 is relieved by the withdrawal of its detent arm 77 and pawl 100 and that thereafter, the tape 39 is fed rapidly in a leftward direction before being arrested within cutting range of the mandrel 37. In order to make this manner of operation practical, it is necessary either to have the tape perforated, that is, provided with the central row of feed holes, see Fig. 16, before entering the code preparing machine 41, or to provide an auxiliary device for rapidly making said feed holes in the proximity of said unit 41.

The apparatus now to be described is an auxiliary mechanism especially adapted to provide perforated tape, such as that shown in Fig. 16, with its central row of feed perforations under conditions which will permit of the rapid feeding of the tape in response to an end of message signal. This apparatus is illustrated detailedly in Fig. 15 where the reference character 155 denotes a punch block unit wherein the punch element 156 is graphically portrayed and is operated by a striking lever 157 which serves also through its articulation at 158 as an actuator for feed pawl 159. Motion is imparted to the striking lever 157 which is pivoted at 161 by means of three-armed lever 162. A follower projection 163 which terminates one arm of lever 162 and spring urged in a clockwise direction about the pivot 164 rides the periphery of a continuously rotating cam 165.

The shaft 166 which carries the multiple lobed cam 165 may be a tributary of the principal driving train described above or it may be an independent source of rotary power driven preferably some phase relationship with the coil winding shaft 66 but desirably somewhat faster. When one of the lobes of cam 165 encounters the follower projection 163, it rocks the three-armed lever 162 in a counterclockwise direction against the influence of its restoration spring 167, causing one of the arms 168 to strike against lever 157 rotating the latter member in a clockwise direction about its pivot 161 and pushing pawl 159 forward at the same time that punch 156 is operated. Another arm 169 of said lever 162 describes an arc which may be blocked against return by the end 171 of a tape slack feeler lever 172 pivoted at 173.

When enough of the tape 39 has gathered in the loop 176 to permit the loop sensing arm 172 assume a position, as indicated in Fig. 15, that an extreme counterclockwise position about its pivot 173, it will then interpose its blocking end in the path of arm 169 of lever 162 and prevent said lever from responding to the urge of return spring 167. On the other hand, when the amount of tape in said loop 176 becomes diminished, then the roller at the end of arm 172 will be engaged by said tape, the lever 172 rotating clockwise about its pivot 173, and the blocking projection 171 will be withdrawn from the extremity of lever arm 169, permitting lever 162 the full freedom of its movement in a clockwise direction about its pivot 164. In accordance with the particular contemplation of structure, as illustrated in Fig. 15, tape 39 is advanced leftwardly to conform with the showing of apparatus in Figs. 1, 2, and 3. The perforations for feeding the tape when thus installed by a punch block 155 may conform with the feed hole apertures as illustrated in Fig. 16, where the partially severed tabs remain attached to the body of the tape or they may, in accordance with a well-known practice, be completely severed.

The complete apparatus lends itself to the preparation of messages and the coiling of the tape containing messages within containers, as indicated in the foregoing description. After the coiling and packaging of the message bearing strips of tape or control form has been completed, the address or destination is determined and the containers placed in the proper chute at one of the stations 18, Fig. 4. The apparatus illustrated in Figs. 4 to 8 functions to automatically sort and route each container or spool to a transmitter apparatus represented by one of the several discharge chutes 23.

The operation of the message packaging spool will now be detailedly described. The distribution system illustrated in the drawings contemplates specifically ten destination or transmitting stations each having a chute 23 into which spool containers are discharged to the transmitting mechanism. Accordingly, each one of the receiving stations 18 is provided with ten receptacle chutes 19, one corresponding to each of the destination or discharge chutes 23. While the chutes 19 are designated in a certain order, this need not correspond to the order in which the chutes 23 are arranged as will now be explained.

Firstly, it will be recalled that a distribution apparatus comprising a brush carrier 17 and a segmented distributor 176 are provided which rotate in synchronism with the travel of the distribution belt 15. Moreover, since there are contemplated ten destination stations represented by the chutes 23 there are also provided a number of compartments in the belt 15 which is a multiple of ten in order that the sequence of compartments may have a correspondence to that of the chutes 19. Also, the segmented ring of distributor 176 is divided into ten live or conducting segments in similar correspondence to the ten destinations of distribution.

The lower ends of the several chutes 19 are curbed as best indicated in Figs. 4 and 5, in the direction in which the tape or belt 15 travels for the purpose of imparting to the spools or containers a motion in the direction of the belt 15. Let it be assumed that when the belt 15 is in the position indicated distributor brush 17 is wiping over the live contact segment corresponding to destination No. 1. An impulse for releasing any first spool or container from chute 19 corresponding to destination 1 will then be had, causing the spool to be precipitated to arrive on a horizontal level with the belt at the same time that compartment No. 1 of said belt arrives, in its horizontal travel, beneath the particular chute 19. The discharge hoppers 23 will, in all probability, have a different arrangement from the sequence in

which the chutes 19 are arranged in each one of the stations 18. Accordingly, as each conveyor compartment passes over its particular discharge chute 23, mechanism is provided for opening certain release devices for permitting the contained cargo which may include one or more of these spools or containers to empty into the proper one of the discharge chutes 23.

The apparatus for releasing the containers into the compartments from their respective chutes 19 and that for releasing the containers from the compartments into the discharge chute 23 is under the supervision of release magnets 177 and 178. Of these, the magnets 177 each are associated with an individual armature 180 pivoted at 179, and urged by a spring 181 in a clockwise direction so as to cause to be projected the lowermost pair of stop pins 182 into the channel of the particular chute 19 and thereby to arrest the descent of the lowermost one of a series of spools. Upon the energization of any one of the magnets 177, the position of its associated armature 180 is reversed, namely, with the lowermost projecting pins 182 retracted and with a similar pair of projections located at the upper extremity of the armature and designated 183, momentarily introduced into the path of a second oncoming spool to halt the descent of succeeding spools as the bottom one is released for discharge into one of the compartments of the conveyor belt 15.

The period of energization of magnet 177 is but momentary and following this armature 180 is released to resume its normal position as indicated in Fig. 6. Each chute 19 is provided with one such arrangement including a magnet 177 and an armature 180 and on account of the progressively advanced positions of the successive chutes 19, as indicated in Figs. 4 and 5, the location of said release mechanism 177 and 180 is correspondingly higher as the chutes succeed each other rightwardly.

The conveyor belt 15 consists of an endless flat section designated 184 having secured thereto a plurality of perpendicular partitioning elements 21. At various points around the periphery of the conveyor, openings are provided in a channel having a U-shaped cross section which completely surrounds the path of the belt forming a complementary enclosure in cooperation with the belt 184. These openings are located, for example, in association with the container deposit stations 18 as well as in the proximity of each one of the discharge hoppers 23. In Fig. 8, one such opening is designated 185 and directly beneath is the flared intake section 186 of a hopper 23 whose opposite end discharges onto the proximity of a distributor apparatus.

On each side of the protective enclosure of the belt 184 is mounted an armature 187 pivoted at 188. The pivot shaft 188 is suitably supported by means of ears (not shown) integrally formed with the protective enclosure 189 and the armatures 187 are located opposite the opening 185 so that when magnet 178 is energized as indicated in dotted outline, Fig. 7, the armatures will be attracted at their upper ends against the influence of springs 191 and will withdraw the overhanging lips 192 which ordinarily coincide with the peripheral wall of enclosure housing 189. When the support of the overhanging lips 192 is withdrawn from beneath a particular one or ones of the containers, then in passing over the opening 185 such containers are permitted to fall into the flared section 186 of the corresponding hopper 23 following which they are delivered to the destination transmitting apparatus.

It is to be noted that each one of the armatures 187 has integrally formed therewith a camming pin 193 which is withdrawn from the compartment chamber during the de-energized condition of its respective armature but which upon the energization of its armature is moved inwardly so as to engage the side discs of the spools or containers positively and cam them downwardly through the opening 185 and into the throat 186 below.

In the foregoing description there has been explained and described a tape coiling and message storing apparatus for cooperating with a plurality of tape perforating machines which may be associated with a central office distribution system. This mechanism places each message originating from a particular one of a plurality of receiving tape perforator machines into an individual container. Following this, the containers are deposited in appropriate chutes of a distribution device located predeterminedly with respect to a routing and distribution belt or conveyor from which they may be automatically released to destination chutes.

While the present invention has been explained and described with reference to a particular embodiment, it is to be understood, nevertheless, that numerous changes and modifications may be incorporated without departing from the spirit or scope thereof. Accordingly, it is not intended to be restricted in any manner by the specific language in the foregoing description nor by the details in the accompanying drawings except as indicated in the hereunto annexed claims.

What is claimed is:

1. In a tape preparing and coiling apparatus, means for advancing a tape during preparation, means including a tape puller for advancing said tape during an intermediate operation, and a rotary arbor for coiling said tape including an intercontrol apparatus for suspending the effectiveness of said tape feed means and said tape puller means during the effective period of said arbor.

2. In combination with a tape coiling and packaging machine, an apparatus for preparing a tape with control indicia, feeding means for advancing said tape as each indicia signal is made, means for advancing said tape during a continuous interval in response to an end of message signal in said preparing apparatus, a winding arbor, and means for shifting said winding arbor into position to engage an end of said tape comprising means effective following the response of said continuous tape advancing means for winding said tape into an involute coil within said packaging machine.

3. In combination, a tape preparing and coiling apparatus, a mechanism responsive to permutation code telegraph signals for making corresponding code perforations in a tape, a tape feed device for advancing a tape after each code perforation operation of said mechanism, a mechanism for advancing said tape in a continuous movement independently of said perforating mechanism, and means responsive to an end-of-message signal telegraphically received by said tape preparing apparatus for disengaging from operation said first named feed device and for initiating into operation said continuous motion feed mechanism.

4. In a telegraphically controlled apparatus, means for making character registrations in re-

sponse to permutation code signals upon a surface of a continuous web, and means responsive to a special signal denoting the end of a message for continuously feeding out an invariable length of tape, making a special end-of-signal index on said tape, and for cutting off said tape from its supply stock.

5. In a telegraphically controlled apparatus, means for making code signal character indications on a control form, means for advancing said form coincident with each character marking made thereon, and apparatus responsive to a special supervisory signal for feeding out by continuous motion a predetermined length of blank form, making a special index designation on said form indicative of the end of a message, and for cutting off said form from its supply stock.

6. In a tape preparing machine, the combination of mechanism responsive to telegraph signals for making corresponding permutation code markings in a tape, means responsive to an end-of-message signal telegraphically received by said mechanism for continuously feeding out an invariable predetermined length of tape following the end of a message, and apparatus also initiated by said end-of-message signal for cutting off said tape from its supply stock.

7. In a telegraphically controlled apparatus, mechanism for preparing and handling a control form, including means for making supervisory indicia upon a strip of material in response to telegraph signals, means for advancing said form along a horizontal support as each signal is made, a winding mandrel disposed in the path of said form having a longitudinal slot and flared ingress associated with said slot for receiving and directing through said slot said form during its feeding from said preparing machine, apparatus for pulling said form in a continuous movement in response to a special signal, and means for rotating said mandrel to wind said form with its end-of-message terminal innermost into a convolute coil comprising a rotary power mechanism initiated in response to said end-of-message signal.

8. In a strip winding machine, a winding arbor having centermost thereof a transverse orifice bifurcating said arbor to pass material therethrough, means responsive to a code signal for initiating the rotation of said arbor, an end of tape arm means responsive to the operation of said end of tape arm for arresting the rotation of said arbor after material has been wound, and automatically supervised mechanism for withdrawing said arbor and for thereafter repositioning said arbor to align said orifice with a subsequent material.

9. In a machine for winding strips of material carrying message matter, a strip material preparing apparatus including a feed mechanism for advancing said material horizontally in the order of the appearance of said message matter, a winding mandrel having a central orifice traversed by said material, and means responsive to an end-of-message indicating signal under the control of said strip material preparing apparatus for initiating the winding of said mandrel beginning with the portion of said strip material bearing the end of a message innermost and with the strip material bearing the beginning of a message outermost in a winding convolution.

10. A machine for winding material carrying message matter into involute coils comprising apparatus for making control indicia on said material including a mechanism for advancing said material horizontally as each index is made thereon by said apparatus, a winding mandrel for coiling said material, and means responsive to a signal under the control of said strip material preparing apparatus indicating an end of message for initiating the winding of said mandrel beginning with the message concluding end of said strip material and ending with the message beginning end of said strip material.

11. In a strip winding machine, a bifurcated winding arbor with longitudinal slot to admit the passage of a control strip therethrough, means responsive to a code signal for initiating the rotation of said arbor, means responsive to completion of winding for arresting the rotation of said arbor, and automatically supervised mechanism for withdrawing said arbor and for thereafter repositioning said arbor to align said opening with a subsequently advanced strip.

12. An automatic coil winding mechanism comprising in combination, a rotatable shaft having a bifurcated end, means for feeding a tape transversely of said shaft, means for initiating rotation of said shaft when said tape has been fed to a position whereat its concluding end is within the bifurcated end of said shaft, means for arresting said shaft instantly that a tape coiling operation has been completed, and means for thereafter restarting and again arresting said shaft automatically so as to present its bifurcated end in a predetermined angular position.

13. In combination with a tape coiling and packaging machine, an apparatus for marking a tape, feeding means for advancing said tape as each marking is applied, feeding means for advancing said tape during a continuous interval in response to an end-of-message signal received in said marking apparatus, a winding arbor, means for shifting said winding arbor into position to engage an end of said tape effective following the response of said continuous tape advancing means for winding said tape into an involute coil within said packaging device.

14. In combination, a mechanism responsive to permutation code telegraph signals for making corresponding code perforations in a tape, a feed device for advancing said tape after each code perforation is made, a mechanism for pulling said tape in a continuous movement, and means responsive to a special telegraphically received signal for suspending from operation said feed device and for initiating into operation said mechanism.

15. In a tape preparing machine, the combination of mechanism responsive to telegraph signals for making corresponding permutation code markings in a tape, means responsive to an end-of-message signal telegraphically received by said mechanism for continuously feeding out an invariable predetermined length of blank tape, and means also responsive to said end-of-message signal for making a special perforation in said tape.

16. In a telegraphically controlled apparatus, means for making character control marks in accordance with permutation code signals upon a continuous web, and means responsive to a special signal for continuously feeding out an invariable length of tape and for cutting off said tape from its supply stock.

17. In a telegraphically controlled apparatus, in combination, means for making supervisory indicia upon a form in response to telegraph signals, means for advancing said form as each supervisory indicia is made, a mandrel positioned in

the path of the form having a slot therein so disposed in the unoperative condition of said mandrel that the form may pass therethrough during preparation, a second form advancing means under the control of the form preparing apparatus for continuously feeding the form to a predetermined position with respect to said mandrel, and means for rotating said mandrel to wind the form message end innermost into a convolute coil.

18. In combination, a form preparing apparatus, a form packaging mechanism, a plurality of containers into which message bearing forms are to be coiled by said mechanism, and means under signal control of said apparatus for initiating into operation said mechanism after said form is prepared.

19. In an apparatus for winding strips of material carrying message matter, a strip material preparing apparatus including a step-by-step feed mechanism for advancing said material horizontally in the order of appearance of said message matter, means to inparting a continuous feed to said strip, a winding mandrel having a central orifice traversed by said material, said step-by-step feed mechanism and continuous feeding means causing said strip to overrun and accumulate beyond said mandrel, and means responsive to an end-of-message indicating signal under the control of said strip material preparing apparatus for initiating the winding of said mandrel beginning with the portion of said strip material bearing the end of the message innermost and with the strip material bearing the beginning of a message outermost in a winding convolution.

20. In an apparatus for winding strips of material carrying message matter, a strip material preparing apparatus including a step-by-step feed mechanism for advancing said material horizontally in the order of appearance of said message matter, means to impart a continuous feed to said strip, a winding mandrel having a central orifice traversed by said material, said step-by-step feed mechanism and continuous feeding means causing said strip to overrun and accumulate beyond said mandrel, means including said continuous feed means to cause said strip to be arrested with its terminating end aligned with one side of said mandrel, said strip extending through said orifice and past the opposite side of said mandrel, and means responsive to an end of message indicating signal under the control of said strip material preparing apparatus for initiating the winding of said mandrel beginning with the portion of said strip material bearing the end of the message innermost and with the strip material bearing the beginning of a message outermost in a winding convolution.

LOUIS M. POTTS.

CERTIFICATE OF CORRECTION.

Patent No. 2,384,194. September 4, 1945.

LOUIS M. POTTS.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 3, second column, line 44, for "inparting" read --imparting--; page 8, first column, lines 50 and 51, claim 8, for "an end of tape arm" read --an arm responsive to passage of the end of the strip,--; line 52, strike out "end of tape"; and second column, line 13, claim 11, before "code" insert --permutation--; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 29th day of January, A. D. 1946.

Leslie Frazer

(Seal) First Assistant Commissioner of Patents.

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18. In combination, a form preparing apparatus, a form packaging mechanism, a plurality of containers into which message bearing forms are to be coiled by said mechanism, and means under signal control of said apparatus for initiating into operation said mechanism after said form is prepared.

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