May 21, 1963 S. FÜRST ETAL 3,090,178

METHOD AND DEVICE FOR STACKING YARN COILS AND COIL CORES

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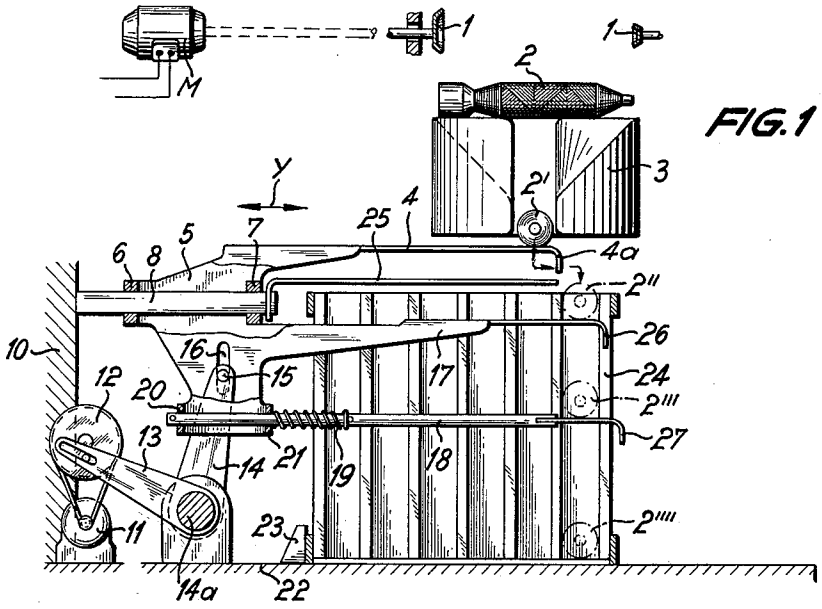


FIG. 1

FIG. 2

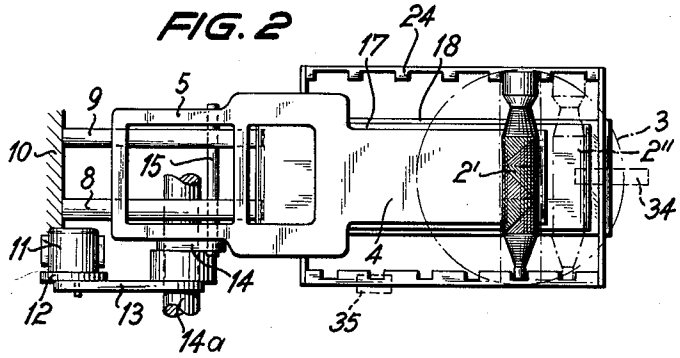
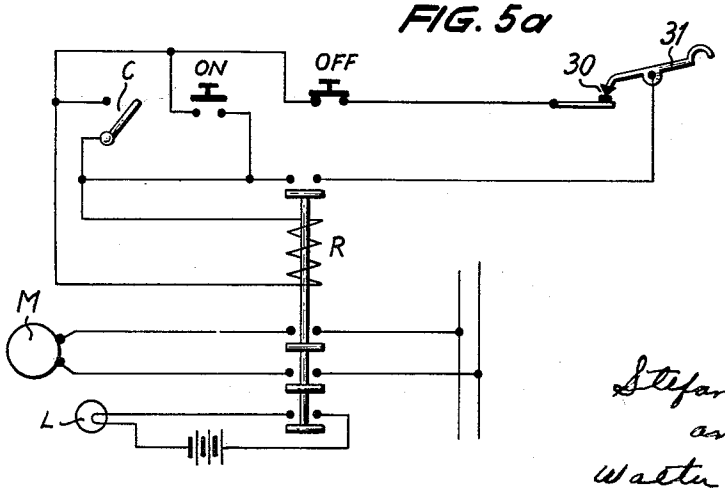


FIG. 5a



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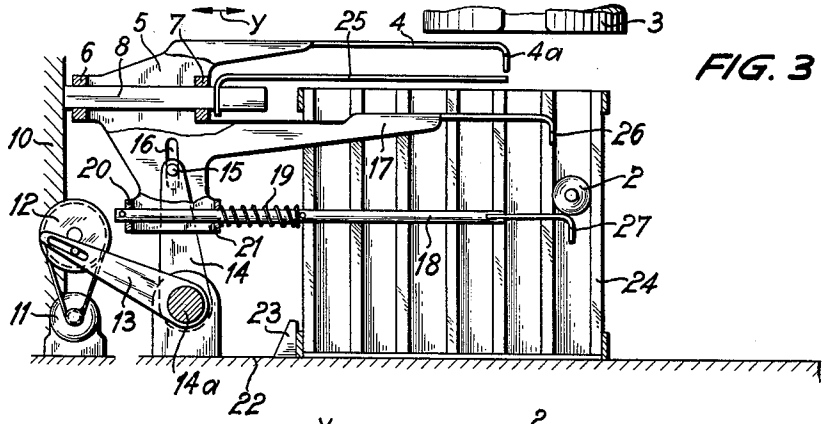


FIG. 3

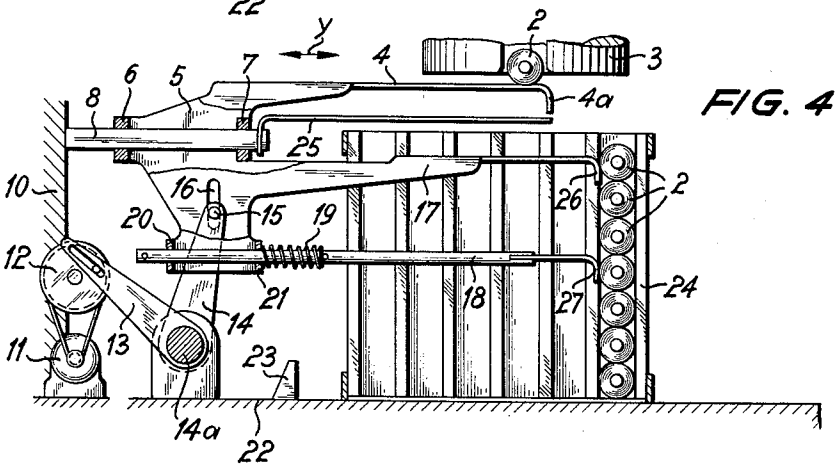


FIG. 4

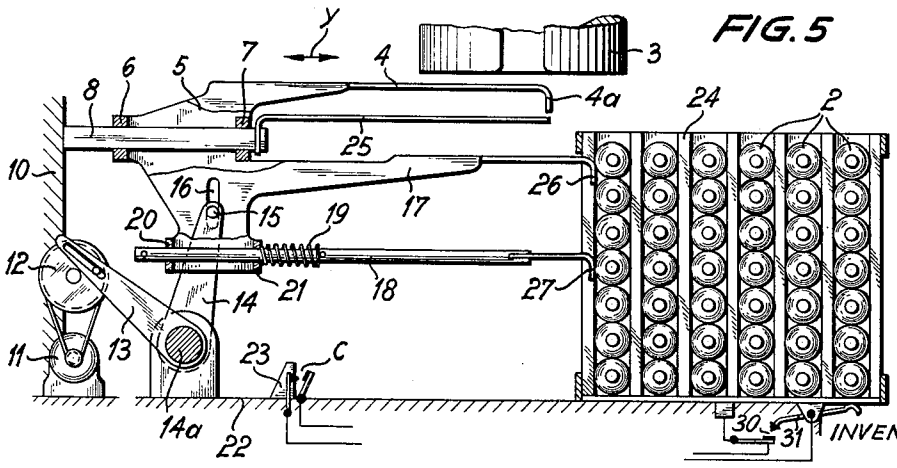


FIG. 5

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FIG. 7

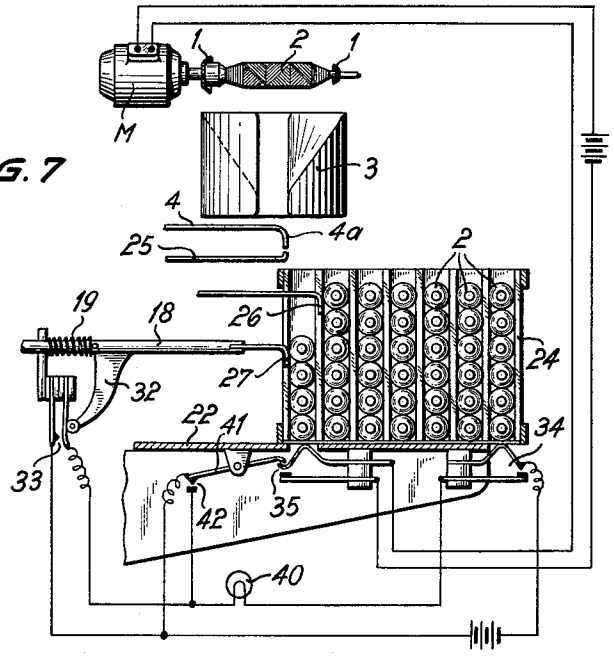
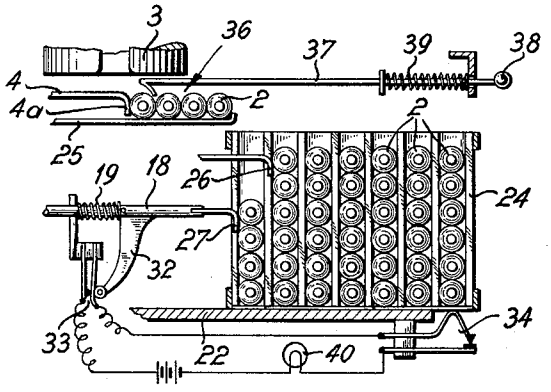


FIG. 6



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METHOD AND DEVICE FOR STACKING YARN COILS AND COIL CORES

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Filed Sept. 9, 1960, Ser. No. 55,042
12 Claims. (Cl. 53—246)

Our invention relates to a method and means for stacking yard coils and coil cores in magazines.

In textile manufacturing operations, the yarn coils wound in winding machines or the quills or other cores used for coil winding, are usually placed into collecting boxes from which they are removed when performing the next following fabricating operation. It is desirable to stack the cores of coils in the magazine so as to maintain a given sequence of coils and to protect the coils or cores from damage or soiling. It has been proposed, for this purpose, to place the cores or coils in multi-chamber magazine boxes so that they lie prone above one another in the sequence in which they were produced. Another way of vertical stacking is to place the coils or cores, not into shaft-like chambers, but to guide them in guiding grooves along the box wall so that only the core tip and the core foot in each stack are in contact with the box walls or with vertical guide rails.

Our invention, in a more particular aspect, relates to the stacking of coils or cores (hereinafter briefly referred to as "coils" although the same applies to the stacking of cores and quills) with the aid of multi-chamber magazine boxes and preferentially to boxes in which the tips and feet of the coil cores are guided in slots or similar guide structures.

It is an object of our invention to devise a stacking apparatus that permits placing the coils into proper stacking position merely under the action of their own gravity. During free fall of the coils there is the danger that the individual coils will not be located horizontally but at a slant so that edging may occur. Such a slanting coil interferes with the proper stacking of the coils in the magazine.

It is therefore a more specific object of our invention to reliably prevent such edging so that a satisfactory stacking without any damage to the coils or interference with the proper operation is secured.

To this end and in accordance with our invention, the coils entering the magazine are caused to drop down in a number of individual stages, each coil being caught and temporary arrested before it can reach the bottom or lower portion of the magazine. As a result, the resulting gravity acceleration of each coil is slight and the possibility of the coil being positioned in the magazine in a slanting position is eliminated. Depending upon the depth of the magazine container to be supplied with coils, it is preferable in some cases to provide for a number of dropping stages. The dropping height of each individual stage is preferably kept smaller than the actual length of the coil body, particularly in cases where it is necessary to stack incompletely wound coils.

According to another feature of our invention, we provide a magazine box suitable for receiving vertical stacks of horizontally located coils, and adapt this magazine box for placement underneath the coil-delivering location, for example the coil outlet of a winding machine. Particularly suitable for this purpose is a magazine box of the above-mentioned type in which the individual coils are each guided at the coil tip and the coil foot. We further provide in the magazine, between the entering place of the coils and the point of their deposition, at least one space-dividing member which limits the free fall of the coil downwardly. This member preferably extends and is displaceable in a horizontal plane and serves to temporarily stop and hold the dropping coil. After the coil has become quiescent, the stop member shifts in order to release the coil so that it can drop into the space underneath.

The above-mentioned space-dividing members, hereinafter called closure members or stop members, are preferably so designed that they possess a front edge which is bent vertically with respect to the horizontal displacing direction. This has the advantage that the displacement of the stop member which from time to time releases a coil to drop into the space underneath, can also be utilized for displacing the magazine box after a stack has been filled. During such operation it is preferable to employ the uppermost coil of a filled stack as a coupling member between the magazine and the displaceable stop member that serves for advancing the magazine. This arrangement has the advantage that the incremental advance of the magazine box is obtained without any need for additional feeding or control devices. For achieving this advantage, the displaceable stop members are preferably so actuated that they move in opposition to the stepwise advancing motion of the magazine box when they release a coil whereas they are moved in the advancing direction of the magazine when they pass into the closing position.

According to a further feature of our invention, only the uppermost stop member is rigidly or substantially constrainedly connected with the reciprocating drive so that this uppermost member can take care of advancing the magazine step by step as described above. The other stop member or members, located beneath the uppermost member, are preferably joined with the reciprocating drive by an elastic connection so that they cannot cause displacement of the magazine box after the portion of a coil stack beneath the latter stop members are filled. That is, when the lower stop member or members are moved in the magazine-advancing direction while a coil is already located in a stack at the height of the stop member, the stop member is merely placed under spring tension against the coil already located in the magazine, but will then yield rather than push the magazine box forward.

The foregoing and more specific objects and features of our invention, said features being set forth with particularity in the claims annexed hereto, will be apparent from, and will be mentioned in, the following description of the embodiments of coil stacking devices according to the invention illustrated by way of example on the accompanying drawings, in which:

FIG. 1 is a front view and FIG. 2 a top view of a magazine with appertaining hopper for use with a coil winding machine of which only the winder spindle is schematically indicated.

FIGS. 3, 4 and 5 show the same stacking device and magazine in three different positions respectively as occurring during the operation of the device.

FIG. 5*a* shows a circuit diagram illustrating how the winding station control center or drive is controlled by closing or opening the contacts of FIG. 5.

FIG. 6 is a part-sectional front view of a modified embodiment, and

FIG. 7 illustrates schematically and partly in section a further modification.

According to FIG. 1, a spindle head 1 is driven by a motor M in a known manner as further illustrated, for example, in U.S. Patent No. 2,657,867 of S. Fürst. A coil, such as a shuttle bobbin 2 after having been completely wound on the winding spindle 1 of the coil winding machine, is released therefrom when the head and tail of the spindle move apart, and drops into a funnel-shaped hopper 3 of known design in which the funnel walls are so shaped as to turn the coil 90° and drop it to the position occupied by the coil denoted by 2'. Mounted beneath the hopper 3 is a horizontally recipro-

cable catcher sheet 4 beneath which a stationary horizontal cover sheet 25 is mounted. The catcher sheet 4 has a pusher or downwardly bent portion 4*a* on one end and is fastened onto an arm 5 which has fixed thereto two glide bearings 6 and 7 horizontally displaceable along a pair of holder rods 8 and 9 (FIGS. 1, 2). The two rods 8 and 9 are firmly secured to the machine frame structure 10. A motor 11 drives a crank mechanism 12, 13 for reciprocating a swing arm 14 on a pivot shaft 14*a*. The arm 14 has a drive pin 15 engaging an elongated slot 16 in arm 5 so that during operation of motor 11 the arm 5 is horizontally reciprocated, as indicated in FIG. 1 by a double-headed arrow *y*. Also attached to the arm 5 is a closure member 17 whose remote end has a downwardly bent portion 26. Another closure member 18, having a downwardly bent marginal portion 27, is elastically connected with arm 5 by means of a spring 19 and can slide horizontally in two bearings 20 and 21. A collecting magazine box 24 is horizontally displaceable on a guideway 22 which has a fixed stop 23 defining a limit position for the magazine box.

When a finished coil 2 is released from the winder spindle 1 and drops into the hopper 3, it is turned to a horizontal position 90° to assume the position 2'. The coil then first drops onto the catcher 4 beneath which a free space is available. The arm 5, driven by the motor 11, then moves toward the left (FIG. 1). The catcher 4 then opens the space available beneath it, and the coil 2' drops onto the cover sheet 25. During the next following motion of arm 5 toward the right, the coil is pushed toward the right by the lug or downwardly bent portion 4*a* of the catcher sheet 4 until the coil reaches the position shown by dot and dash lines at 2'' in FIGS. 1 and 2. In this position, the coil is at first prevented by the closure member 17 from dropping to the bottom of the magazine box. Only after the arm 5 has again moved toward the left can the coil drop from position 2'' onto the second closure member 18 to the position 2'''. However, shortly before the arm 5 reaches its left-hand limit position, the closure member 18, extending farther to the right than the closure member 17, opens the space available beneath it, so that now the coil can drop entirely down to the bottom of the magazine box to the position 2''''.

After a number of coils have thus been released from the winding machine and have been stacked in the first vertical stack chamber of the magazine box, this first chamber will be filled (FIG. 4). When the last coil is placed into this chamber, the frontal lug portion 26 of closure member 17 is placed against the uppermost coil. Since the member 17 is rigid, by pushing against the core 2 it entrains the magazine box 24 toward the right when the arm 5 and the closure member 17 next moves in that direction. In this manner the magazine box is advanced one step equal to the horizontal width of an individual chamber, but this can take place only after a chamber is completely filled, because prior to such condition the lug portion 26 of member 17 pushes into idle space in the chamber. During the advancing step to the right of the magazine box 24 just described, the lug portion 27 of the lower closure or stop member 18 was placed against the coil located at about ½ of the stack height. However, due to the elastic junction of member 18 with the arm 5 through spring 19, it cannot transmit to the coil and the magazine box 24 the force necessary for advancing the magazine box.

After the magazine box 24 is displaced toward the right by the width of a single chamber, the above-described cycle of operation is repeated for each subsequent chamber. Mounted on the frontal edge of the slideway 22 is a pair of electrical contacts 30 (FIGS. 5, 5*a*) actuable by a feeler lever 31. The feeler lever 31 is pivotally displaced as soon as the magazine box has advanced to such an extent that part of its weight rests upon the feeler 31, thus opening contacts 30 to the position illustrated in FIG. 5. The opening of contacts 30 by opening the holding circuit of relay R issues the signal for the termination of the winding operation, this signal being supplied through the relay R either to a control center or directly to the drive M of the particular winding station which supplies the finished coils to the magazine box. This stops the drive M and thus prevents the issuance from winding head 1 (FIG. 1) of further coils which can no longer be accommodated in the filled magazine box 24. Only after the filled magazine box is exchanged for an empty one which is pushed up to the limit stop 23, will the contacts 30 close and thereby cause the drive M for the continuance of the winding operation to be switched on. This switching operation may also be effected manually by on-off push buttons (FIG. 5*a*) when inserting a new magazine box. If desired, however, a second contact C may be mounted as a limit switch C (FIGS. 5, 5*a*) near the stop 23 in order to close the contacts of relay R and thus issue a signal to the control center or the winding-station drive M for initiating a new cycle of coil winding operations. When an empty magazine box 24 is placed into position against stop 23, a signal lamp L indicates when the relay contacts are closed and when motor M is switched.

According to another feature of our invention, illustrated in FIGS. 6 and 7, one of the above-mentioned stop or closure members is simultaneously designed to operate as an indicating device. According to a more specific feature, the stop member 18 which is located beneath the uppermost stop member and which is elastically coupled with the reciprocating drive for the stop members, serves to actuate an electric contact device 33, utilizing the displacement occurring between the drive and the stop member due to the elasticity of the coupling. An electric circuit and contact is then employed for actuating a signal lamp or other signal 40 in order to indicate the fact that the particular stack of the magazine box is partly filled. Due to the continuance of the reciprocating motion of the contact-controlling stop member 18, the signal 40 will then be a blinking signal, which calls attention of the attending personnel to the fact that the stack will soon be filled.

It is preferable, according to another feature of our invention illustrated in FIG. 7, to provide an additional contact device 35 which puts such a signalling operation into action only when the last stack of the magazine is being filled, so that the personnel immediately recognizes that a magazine must soon be exchanged when the signal occurs.

According to experience, however, some amount of time must be available to the personnel for removing a filled magazine box and inserting an empty one. This is because modern highly automized manufacturing plants require an individual person to supervise a relatively large number of winding or other working stations. In order to prevent, however, the too-early removal of magazines that are not yet completely filled, and in accordance with a further improvement feature of our invention, we provide, aside from the magazine box proper, an intermediate magazine which permanently remains at the winding station or filling station and from which, if a few, for example two or three, coils are still needed for completely filling a magazine, this number of additional coils can be taken for example by manual actuation of a handle. This offers the assurance that always completely filled magazines can be taken from the filling station. According to another feature of the invention, we provide means which automatically stop the operation of the winding station when the magazine box is filled, particularly when the magazine is shifted from the filling location to a position in which it can conventiently be removed.

Embodiments incorporating the above-mentioned further features of the invention will be described now with reference to FIGS. 6 and 7.

The modified embodiments illustrated in FIGS. 6 and 7

are to some extent similar to the one described above with respect to FIGS. 5 and 5*a*, as is apparent from the use of the same reference numerals for respectively similar components. However, in the devices of FIGS. 6 and 7 the elastically mounted closure member **18** simultaneously serves as a signal actuating member. An arm **32** attached to the closure member **18** actuates an electric contact pair **33** when a predetermined degree of magazine filling is attained. The contacts **33** close a signalling circuit when the arm **5** next moves toward the right (this arm and other components being omitted from in FIGS. 6 and 7 for simplification, since it may be identical with that illustrated in FIGS. 1 through 5). A lamp **40** connected in the signalling circuit thus becomes lit through the closing of contacts **33** when the arm **5** is moved toward the right and the lug portion **27** of closure member **18** abuts against the half-way filled stack. In order to make certain that this blinking signal **43** is not issued when each of the vertical stack chambers is half-way filled, a second pair of electric contacts **34**, as shown in FIG. 6, connected in the same signalling circuit with signal **40**, is mounted at the forward end of the glideway **22**. As the magazine box moves toward the right, the circuit becomes closed only after the first-filled stack of the magazine box is located on top of the contact **34** and when the last stack is simultaneously located beneath the entering location of the coils. Consequently the device functions such that a signal is issued only when the magazine box **24** is almost completely filled.

The embodiment of FIG. 7 incorporates a further improvement. Another contact pair **35** is provided which, after filling of the last stack and movement of the magazine, opens to issue the signal for stopping the winding station, or directly controls such stoppage through drive motor M. The contact pair **35** is held closed by the side wall of box **24** resting upon the upper member of the pair, and is opened only when the magazine box **24**, after filling the last stack, has been pushed out of the position of FIG. 7 which it previously occupied. The relative positions of contacts **34** and **35** in plan view are indicated in FIG. 2. Connected with the movable contact member of contact pair **35** is a lever **41** (FIG. 7) for closing a switch contact **42** when the contacts **35** are opened. This closing of contacts **42** takes place when the contact pair **35** opens (i.e. when the magazine box **24** has been removed) and serves to close an electric circuit which causes the signal lamp **40** to remain lit continuously. Such continuously lit signal indicates to the personnel that the magazine box is completely filled, whereas during previous signalling by contacts **33** actuated by arm **18**, only a blinking signal was issued.

As further illustrated in FIG. 6 the device may be provided with an intermediate magazine **36** in which a few coils, for example one-half the number of a full stack, are temporarily kept on fixed closure member **25** before being forwarded into the magazine box by pusher **4***a*. An actuator rod **37** with a handle **38** and a return spring **39** permits the operator to manually pull forward a few coils such as still may be required for completely filling the last stack so that these will then drop into the magazine box **24** after the winding operation and the supply of further coils to the hopper **3** has been stopped.

The invention affords fully utilizing the space usually available beneath a coil winding machine, by accommodating a relatively large magazine in that space. Nevertheless the invention provides the assurance that the coils will be automatically transferred into a magazine box best adapted to the requirements of the further fabrication of the coils, and that the coils will be issued and stacked in the magazine box in the accurate sequence of their manufacture and will not be subjected to damage on the way from the winding machine to the magazine.

In lieu of providing a magazine box comprising several vertical stacks or chambers, the magazine **24** may also consist of an assembly composed of individual containers, each of which contains only a single stack. These individual containers may then be joined together by suitable connecting means such as a base plate, frame structure, connecting clamps or the like permanent or releasable connecting means.

It will be obvious to those skilled in the art, upon a study of this disclosure, that this invention permits of various modifications and alterations with respect to the various machine components and method steps disclosed, and hence can be embodied in equipment other than as particularly illustrated and described herein, without departing from the essential features of the invention and within the spirit and scope of the claims annexed hereto.

We claim:

1. In the art of winding, an apparatus for stacking quills in vertical stacks, comprising means for feeding the quills downwardly to a horizontally axial issuing position, a magazine box, means for supporting said box at a defined horizontal limit position of said box beneath said issuing position for receiving said quills, said box having guide means fixed to the side walls thereof and defining vertical chambers for receiving a number of vertical stacks of quills, and horizontally reciprocable stop means located in spaced sequence between said issuing position and the bottom of said magazine box for incrementally limiting the free fall of each quill downwardly, said stop means including a member extending horizontally within said magazine box and adapted to engage a quill in a filled stack for advancing the box horizontally during reciprocation of said member when the last named stack is filled, and drive means linked to said stop means for reciprocating the latter.

2. In the art of winding, an apparatus for stacking quills in vertical stacks, comprising means for feeding the quills downwardly to a horizontally axial issuing position, a magazine box, support means for supporting said box beneath said issuing position for receiving said quills, said box being horizontally slidable on said support means and having guide means fixed to the side walls of said box for receiving a number of vertical stacks of quills, a plurality of stop members located in vertically spaced sequence for vertically subdividing the total height between said issuing position and the bottom of said magazine box into a sequence of spaces for dropping said quills in a sequence of steps, said stop members including a member extending horizontally within said magazine box and adapted to engage a quill in a filled stack for advancing the box horizontally during reciprocation of said member when the last named stack is filled, and drive means operably linked to said stop members for reciprocating the latter.

3. In the art of winding, an apparatus for stacking quills in vertical stacks, comprising means for feeding the quills downwardly to a horizontally axial issuing position, a magazine box, means for supporting said box beneath said issuing position for receiving said quills, said box having guide means fixed to the side walls thereof defining chambers for containing a number of vertical stacks of quills, and horizontally reciprocable stop means located in vertically spaced sequence between said issuing position and the bottom of said magazine box for incrementally limiting the free fall of each quill downwardly, and drive means linked to said stop means for reciprocating the latter, said horizontally reciprocable stop means having a front pusher portion at one end thereof extending vertically with respect to the direction of reciprocation of said stop means, said pusher portion being arranged to engage a quill in a filled stack for advancing the box horizontally due to the horizontal motion of said stop means.

4. In the art of winding, an apparatus for stacking quills in vertical stacks, comprising means for feeding the quills downwardly to a horizontally axial issuing posi-

tion, a magazine box having a plurality of compartment spaces, means for supporting said box beneath said issuing position for receiving said quills, said box having guide means fixed to the side walls thereof for receiving a number of vertical stacks of quills, and horizontally reciprocable stop means having a plurality of members positionable in vertically spaced sequence between said issuing position and the bottom of said magazine box for incrementally limiting the free fall of each quill downwardly, one of said members extending horizontally within said magazine box through at least some of said compartment spaces, and drive means linked to said stop means for axially reciprocating the latter, means guiding said stop means along a horizontal path of displacement, the length of said one member in one position of the latter being sufficient to close off a predetermined compartment space when said one member is displaced in a predetermined direction, said drive means having linkage means for displacing said one member in the opposite direction to uncover said predetermined compartment space and for subsequently moving said one member back in said predetermined direction to engage a quill therein when said compartment space is filled for horizontally stepwise advancing the travel of said magazine box, said stop means when moving in the advancing direction of said magazine box being in position to block the free fall of said quills.

5. In the art of winding, an apparatus for stacking quills in vertical stacks, comprising means for feeding the quills downwardly to a horizontally axial issuing position, a magazine box having a plurality of compartment spaces, means for slidably supporting said box beneath said issuing position for receiving said quills, said box having guide means fixed to the side walls thereof for containing a number of vertical stacks of quills, a plurality of stop members arranged for reciprocation along a horizontal path and positionable in vertically spaced sequence for vertically subdividing the total height between said issuing position and the bottom of said magazine box into a sequence of spaces for dropping said quills in a sequence of steps, and drive means operably linked to at least one of said stop members for reciprocating the latter along said path, the lowermost of said stop members having a vertical portion and means slidably and elastically connecting said lowermost member with said drive means for yieldable horizontal movement within and relative to said box and to other stop members when said vertical portion engages a stacked quill.

6. In the art of winding, an apparatus for stacking quills in vertical stacks, comprising means for feeding the quills downwardly to a horizontally axial issuing position, a magazine box having a plurality of compartment spaces, support means for supporting said box beneath said issuing position for receiving said quills, said box being horizontally slidable on said support means and having guide means fixed to the side walls thereof for receiving a number of vertical stacks of quills, a plurality of stop members arranged for reciprocation along a horizontal path and positionable in vertically spaced sequence for vertically subdividing the total height between said issuing position and the bottom of said magazine box into a sequence of spaces for dropping said quills in a sequence of steps, and drive means operably linked to at least one of said stop members for reciprocating the latter, said one stop member being substantially rigidly linked to said drive means for movement in a horizontal direction, said one member having a vertically extending pusher portion adapted to engage a quill stacked in a full compartment for incrementally advancing said magazine box during reciprocation of said one stop member.

7. In the art of winding, an apparatus for stacking quills in vertical stacks, comprising means for feeding the quills downwardly to a horizontally axial issuing position, a magazine box having a plurality of compartment spaces, means for slidably supporting said box beneath said issuing position for receiving said quills, said box having guide means fixed to the side walls thereof for receiving a number of vertical stacks of quills, stop means arranged for reciprocation along a horizontal path and positionable in vertically spaced sequence for vertically subdividing the total height between said issuing position and the bottom of said magazine box into a sequence of spaces for dropping said quills in a sequence of steps, and drive means operably linked to said stop means for axially reciprocating the latter within said box, and an indicating device connected with said stop means for signaling the almost-filled condition of said magazine box.

8. In the art of winding, an apparatus for stacking quills in vertical stacks, comprising means for feeding the quills downwardly to a horizontally axial issuing position, a magazine box having a plurality of compartment spaces, means for slidably supporting said box beneath said issuing position for receiving said quills, said box having guide means fixed to the side walls thereof for receiving a number of quills and guiding same into vertical stacks, a plurality of axially reciprocable stop members positionable in vertically spaced sequence for vertically subdividing the total height between said issuing position and the bottom of said magazine box into a sequence of spaces for dropping said quills in a sequence of steps to limit the free fall of each quill downwardly, and drive means linked to said stop members for axially reciprocating the latter within said box, one of said stop members being provided with an indicating device for signaling the almost-filled condition of the magazine box, and electric circuit means operably connecting said one stop member to said spindle drive for effecting the stoppage of said winding station when said magazine is in said almost-filled condition.

9. Apparatus according to claim 1, including quill storage means fixedly positioned relative to said box supporting means and located between said issuing position and the bottom of said magazine box, and means for transferring said quills from said storage means into one of said vertical chambers of said box.

10. Apparatus according to claim 1, including an intermediate storage magazine fixedly located between said issuing position of said quills and said magazine box, said intermediate storage magazine having a receiving capacity for a number of quills corresponding approximately to one-half of the number of quills in an individual stack of said magazine box, and means for transferring said quills from said storage means into one of said vertical chambers of said box.

11. Apparatus according to claim 10, said transferring means comprising a dispensing member having manual actuation means for manually feeding the quills stored in said intermediate magazine to said magazine box.

12. In the art of winding, an apparatus for stacking quills into vertical stacks in a magazine box and for advancing the magazine box incrementally in a series of horizontal filling positions, said magazine box being equipped with guide means fastened to the side walls thereof defining compartmental spaces for containing respective vertical stacks of quills, said apparatus comprising means for feeding the quills downwardly to a horizontal axial quill issuing position over said box, means for supporting the magazine box at a defined horizontal limit position beneath said quill issuing position, a fixed horizontal quill arresting member disposed below said quill issuing position and extending only partially over the top of said box so as to leave uncovered thereby at least one of said spaces, horizontally reciprocable stop means having a plurality of horizontally extending members located in vertically spaced sequence between said issuing position and said box supporting means for incrementally limiting the free fall of each quill downwardly, a first one of said members being arranged above

said fixed arresting member for pushing a quill from the latter into one of said spaces, another of said members extending horizontally within said container for pushing engagement during reciprocating movement thereof with a quill in a filled stack so as to advance the magazine box incrementally horizontally from said defined limit position.

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