

[54] **METHOD AND APPARATUS FOR THE FABRICATION OF CONDENSER YARNS**
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[22] Filed: **Oct. 24, 1972**
[21] Appl. No.: **300,253**

[30] **Foreign Application Priority Data**
Oct. 25, 1971 Japan..... 46-84482
[52] **U.S. Cl.**..... **57/24, 57/156, 139/11, 139/291 C**
[51] **Int. Cl.**..... **D03d 41/00, D02g 3/42**
[58] **Field of Search** **57/24, 143, 77.3; 28/1 CS, 28/72 CS; 139/291 C, 127 P, 1 R, 11; 66/195**

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Primary Examiner—John Petrakes

[57] **ABSTRACT**
A method and an apparatus for concurrently fabricating a number of condenser yarns having two or more wadder filaments twisted upon each other and twiner elements which are twined between and around the wadder filaments. The wadder filaments fed in a number of groups are shed and receive a twiner filament in shed in manners similar to the feeding of warps and wefts in a usual loom. Upon beating of the twiner filament onto the wadder filaments, the twiner filament is cut to a number of twiner elements which are allocated respectively to the individual groups of the wadder filaments. The wadder filaments thus carrying the twiner elements are then twisted upon each other so that the twiner elements are twined between and around the wadder filaments thus spun.

9 Claims, 3 Drawing Figures

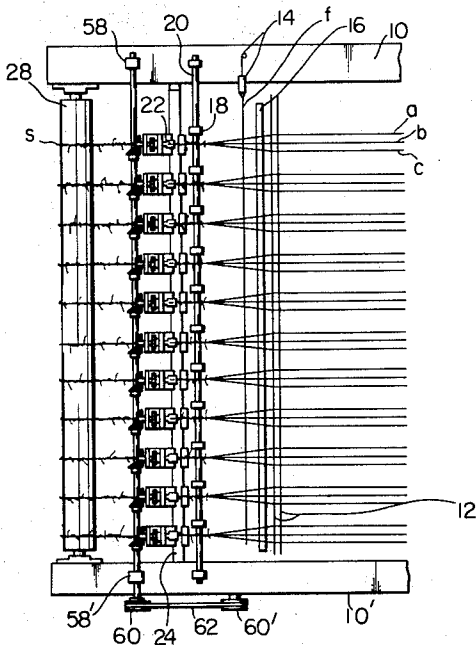


Fig. 1

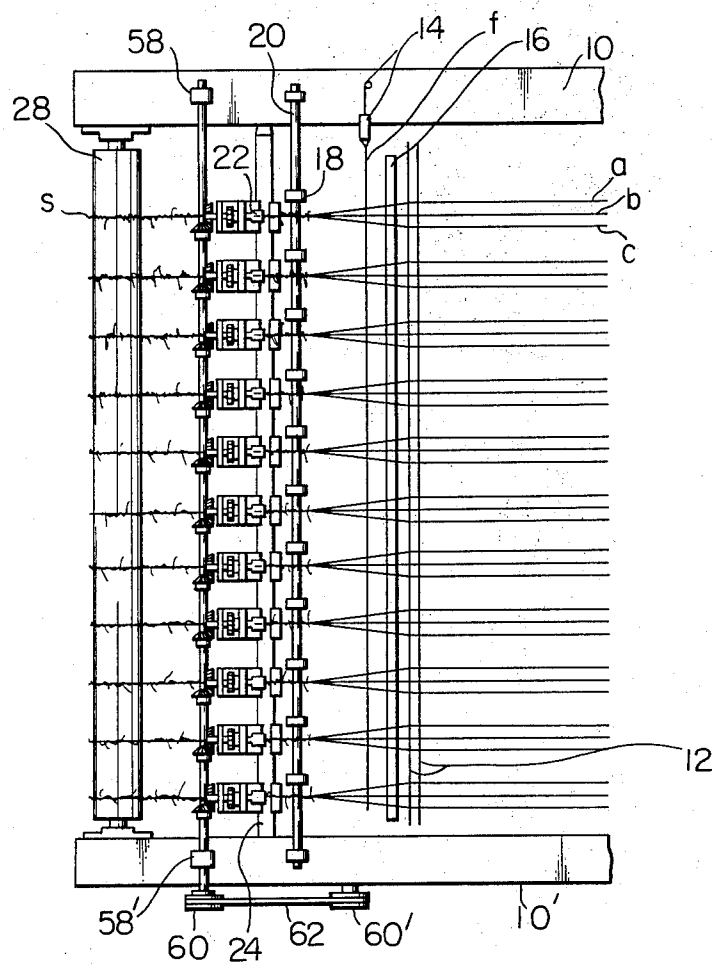


Fig. 2

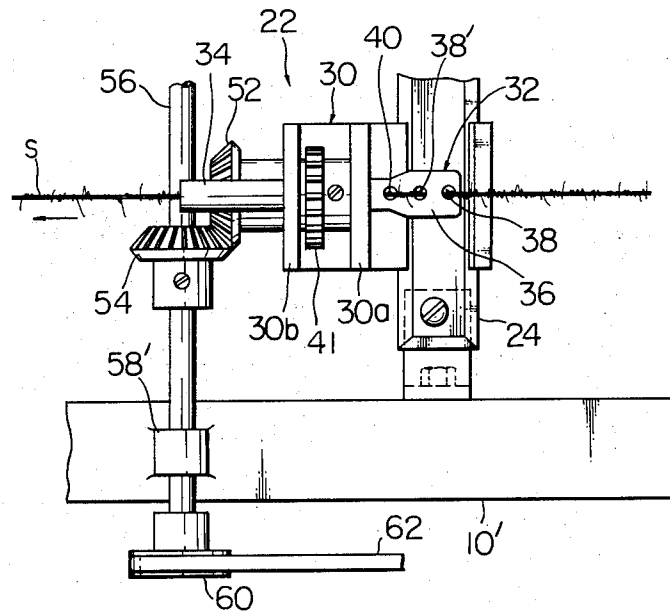
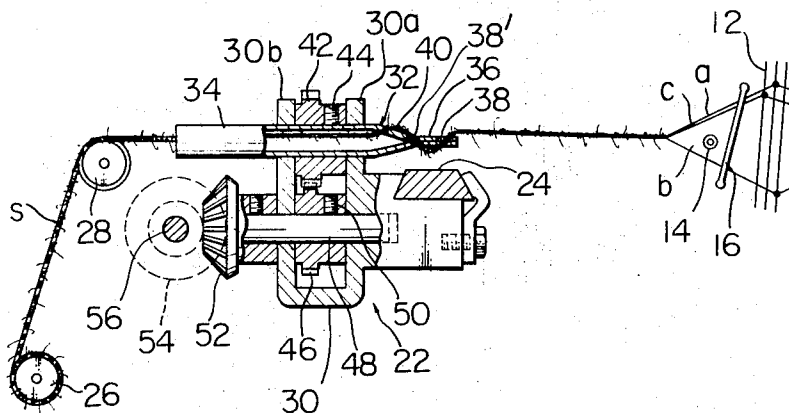


Fig. 3



METHOD AND APPARATUS FOR THE FABRICATION OF CONDENSER YARNS

The present invention relates to a method of and an apparatus for fabricating condenser yarns, that is, yarns each consisting of usually three or four wadder filaments which are twisted around each other with a number of fine or short twiners twined about the wadder filaments.

Several types of condenser yarns are presently known, finding major applications for ornamental or decorative purposes. No practically feasible method and apparatus are, however, available which are adapted for the production of the condenser yarns on a large-scale commercial basis.

An object of the present invention is to provide a new and useful method for fabricating the condensing yarns on a quantity production basis.

Another object is to provide an apparatus which is specifically adapted to put such a method into practice in an economically beneficial manner.

In the method according to the present invention, numeral sets of wadder filaments are first fed continuously in rows and are passed through healds which are operative to shed the wadder filaments. At least one twiner filament is cyclically fed into the shed of the wadder filaments and is beaten up to combine with the individual wadder filaments by the action of a reed. The twiner filament thus extending throughout the entire coverage of the rows of wadder filaments is then cut to a number of short segments or twiner elements which are respectively carried on the individual sets of wadder filaments. The wadder filaments of each set thus carrying the twiner elements are twisted around each other as they advance forwardly so that the twiner element interlaced between the wadder filaments is closely twined around and between the wadder filaments thus spun.

The method of the above described nature may be carried out advantageously by the use of an apparatus which basically comprises, in combination, first feeding means for continuously feeding numerous sets of wadder filaments in rows, healds for shedding the wadder filaments, second feeding means for feeding at least one twiner filament into the shed of the wadder filaments, a reed operative to beat up the twiner filament onto the wadder filaments, cutting means for cutting the twiner filament to a number of short segments or twiner elements which are respectively interlaced in the individual sets of wadder filaments, and twisting means for twisting the wadder filaments of each set around each other as they advance forwardly for causing the twiner elements twined between and around the wadder filaments thus spun. The second feeding means may be of the character which comprises at least one fluid jet nozzle from which the twiner filament entrained on a jet stream of fluid is projected in cycles into the shed of the wadder filaments, as is the case with a loom of the fluid jet or shuttleless type in which wefts are inserted into a shed of warps as entrained on a jet stream of water.

The twisting means of the apparatus above described may comprise in one preferred embodiment a plurality of rotary spinning members for respectively receiving the individual sets of wadder filaments carrying the twiner element, each of the rotary spinning members having an axial bore and apertures substantially in

alignment with the path of the wadder filaments to be passed therethrough and being rotatable about its axis which is in line with the path of the filaments, a plurality of gearing units which are respectively in driving engagement with the rotary spinning members, and driving means for driving through the gearing units the spinning members for rotation about their axes whereby the wadder filaments with the twiner elements entering the bores in the individual spinning members through the apertures therein are spun as they pass through the bores.

More detailed features of the method and those of the apparatus according to the present invention will become apparent from the following description taken in conjunction with the accompanying drawings in which:

FIG. 1 is a schematic plan view showing an overall construction of an apparatus embodying the present invention;

FIG. 2 is a top plan view showing, on an enlarged scale, a preferred example of a spinning mechanism which forms part of the apparatus shown in FIG. 1; and

FIG. 3 is a vertical sectional view of the spinning mechanism illustrated in FIG. 2.

Referring now to the drawings, first to FIG. 1, one preferred form of apparatus in accordance with the present invention is shown. The apparatus comprises a pair of spaced parallel frame structures 10 and 10' which are held stationary. A number of sets of wadder filaments are continuously fed in parallel to these frame structures 10 and 10' in a manner similar to the feeding of warps in an ordinary loom viz., from a usual back-rest roller or directly from a suitable supply package such as a cone or a cheese, though not illustrated in the drawings. Each set of wadder filaments is herein shown as containing three filaments *a*, *b* and *c* by way of example. This however not limitative of the present invention and as such the number of the wadder filaments in each set may be selected as desired. The wadder filaments *a*, *b* and *c* are then shed by means of healds 12 as customary.

A fluid jet nozzle 14 communicating with a source of a jet fluid (not shown) through a suitable pipeline is mounted on the frame structure 10. A twiner filament *f* is supplied to this fluid jet nozzle 14 from a suitable measuring and storing device (not shown) positioned anterior to the nozzle and is projected in cycles into the shed of the individual sets of wadder filaments *a*, *b* and *c* throughout the entire coverage of the wadder filaments in a manner similar to the feeding of a weft into the shed of the warps in a usual loom. Where desired, the fluid jet nozzle 14 serving as the feeding means for the twiner filament *f* may be replaced with a suitable mechanical feeding means such as gripper of the usual construction. The twiner filament *f* thus passed through the shed of the wadder filaments *a*, *b* and *c* is then beaten up by a reed 16 in a manner which is customary in the art of weaving.

A plurality of cutting elements such as heat cutters 18 are mounted on a common cutter carrier 20 extending transversely of the frame structures 10 and 10' and secured at both ends to the frame structures. The heat cutters 18 are arrayed on the carrier 20 in a manner to be in association with the individual sets of wadder filaments and are adapted to cut the twiner filament *f* to a number of short segments or twiner elements, each of

the twiner elements thus prepared being interlaced between the wadder filaments *a*, *b* and *c* of each set. The fluid jet nozzle 14 operates cyclically to feed the twiner filament *f* into the shed of the wadder filaments *a*, *b* and *c* so that each set of wadder filaments has interlaced therein a number of twiner elements when leaving the associated heat cutter 18.

The sets of wadder filaments *a*, *b* and *c* thus carrying the twiner elements are then fed to a plurality of spinning units 22 carried on a common support structure 24 which is fast on the frame structures 10 and 10'. The wadder filaments *a*, *b* and *c* in each set are twisted around each other as they are passed through the associated spinning unit 22 so that the twiner elements interlaced between the individual wadder filaments are twined therearound. A plurality of condensing yarns *s* result in this manner from the spun wadder filaments *a*, *b* and *c* with the twiner filaments twined between and around the wadder filaments. The condenser yarns *s* are then drawn to and wound on a take-up roller 26 (FIG. 3) through a feed roller 28 which is journaled on the frame structures 10 and 10'.

A preferred construction of the spinning unit 22 above mentioned is illustrated in detail in FIGS. 2 and 3.

Referring to FIGS. 2 and 3, the spinning unit 22 includes a bracket 30 which is securely mounted on the support structure 24 which is common to the number of spinning units. The bracket 30 has a pair of walls 30*a* and 30*b* which are spaced apart from each other in a direction aligned with the direction of advancement of the incoming filaments. A rotary spinning member 32 is rotatably mounted on the bracket 30 through the spaced walls 30*a* and 30*b*, extending substantially in alignment with the path of the incoming filaments. The spinning member 32 includes a tubular body portion 34 having an axial bore opened at its outlet end and merging at the opposite end into a flattened portion 36. The flattened portion 36 of the spinning member 32 has formed therein two apertures 38 and 38' which are spaced apart from each other in the axial direction of the spinning member 32, while the tubular body portion 34 of the member 32 has formed therein an aperture 40 which is adjacent to the flattened portion 36 and which is substantially aligned with the apertures 38 and 38'. The set of wadder filaments fed to the spinning member 32 together with the twiner elements is first passed through the anterior aperture 38 in the flattened portion 36 from one side of the portion and is then passed through the posterior aperture 38' from the other side of the flattened portion. The filaments are thereafter passed into the axial bore in the tubular body portion 34 through the aperture 40 therein, thereby being twisted upon each other as the spinning member 32 rotates about its axis which is substantially in line with the direction of advancement of the filaments as seen in FIG. 3.

A gear 42, which is herein shown as being in the form of a usual spur gear, is positioned between the spaced walls 30*a* and 30*b* of the bracket 30 and is securely carried on the tubular body portion 34 of the spinning member 32 by suitable fastening means such as a pin 44, thereby being rotatable with the spinning member 32. The gear 42 is in constant mesh with a drive gear 46 which is also positioned between the walls 30*a* and 30*b* of the bracket 30 and is securely carried on a shaft 48 through a suitable fastening means such as a pin 50

as illustrated in FIG. 3. The shaft 48 thus carrying the drive gear 46 extends outwardly of the wall 30*b* of the bracket 30 on the outlet side of the spinning unit 22 and carries at its leading end a bevel gear 52. This bevel gear 52 is in constant mesh with a driving bevel gear 54 which is mounted on a drive shaft 56. As seen in FIG. 1, this drive shaft 56 is common to the driving bevel gears of all of the spinning units 22 and is rotatably supported on the frame structures 10 and 10' through bearings 58 and 58', respectively. The drive shaft 56 is driven for rotation about its axis by a suitable driving arrangement which may include, by way of example, grooved pulleys 60 and 60' and an endless belt 62 passed thereon. When, thus, the drive shaft 56 is driven to rotate, the rotational force is carried over to the spinning member 32 through a gear train of the driving gear 54, driven bevel gear 52, shaft 48, drive gear 46 and driven gear 42. The multiplicity of spinning members 32 are in this manner concurrently driven to rotate about their axes so that a number of condenser yarns *S* are fabricated concurrently.

It will now be appreciated from the foregoing description that the method and apparatus according to the present invention are advantageous for the fabrication of a number of condensing yarns on a large-scale commercial basis with use of a single set of production equipment which is simple in construction. Using the wadder filaments of different colours in carrying out the method herein disclosed will suit the purpose of preparing condensing yarns of variegated appearances.

It is apparent that the embodiment herein shown and described is solely for the purpose of illustrating the present invention and, thus, various variations and modifications may be incorporated in the construction of the apparatus without departing from the spirit and scope of the invention which should be interpreted from the appended claims.

The arrangement, for example, for twisting the wadder elements may be modified in different manners where desired. In one of such modified twisting arrangements, at least one pin may be mounted on a rotatable tubular body supported on the bracket. The pin may have a portion projecting rearwardly outwardly from the rearmost end of the tubular body or extending forwardly within the tubular body so that the wadder filaments which have been admitted into or are about to enter the tubular body are hooked by the pin. The wadder filaments thus hooked by the pin are twisted around each other with the twiner elements intertwined thereon as the pin is rotated with the tubular body. Or otherwise, the tubular body which is also rotatable on the bracket may accommodate therein suitable gripping means adapted to positively maintain the direction of advancement of the wadder filaments which have entered the tubular body. Such gripping means may comprise a pair of leaf springs which are mounted within the tubular body in a face-to-face relationship to each other so that the wadder filaments are pressed upon between the opposed leaf springs by reason of the frictions of the springs as the wadder filaments are passed through the tubular body.

Also, the gearing arrangement using the two mating bevel gears as previously described may be replaced with a power transmission arrangement in which the tubular body to pass the wadder filaments has a flange positioned on the front portion of the tubular body and

in which an endless belting is passed on the tubular body, the belting being prevented from being moved forwardly by the constraint of the flange on the tubular body. The belting is passed at the opposite turning end on a pulley which is mounted on a drive shaft. Where the drive shaft is positioned transversely to the direction of the passage of the wadder filaments, the belting should be appreciably twisted at its portions intermediate the opposite turning ends so that the driving force from the cross drive shaft is transferred substantially perpendicularly to the tubular body.

What is claimed is:

1. A method of concurrently fabricating a plurality of condenser yarns, comprising the steps of continuously feeding a plurality of sets of wadder filaments in rows, shedding said wadder filaments, feeding at least one twiner filament in cycles into the shed of said wadder filaments, beating up said twiner filament onto said wadder filament, cutting said twiner filament in said cycles to a plurality of twiner elements, each of the twiner elements being interlaced between the wadder filaments of each of said sets, and twisting the wadder filaments of each set around each other by a plurality of twisting means which are respectively driven by a plurality of driving means driven by drive means which is common to and engages the plurality of driving means for causing the twiner elements there on to be twined between and around the wadder filaments thus spun.

2. A method as claimed in claim 1, in which said twiner filament is fed into said shed of the wadder filaments by entraining the twiner filament on a jet stream of fluid spurting into said shed.

3. An apparatus for concurrently fabricating a plurality of condenser yarns comprising, in combination, first feeding means for continuously feeding a plurality of sets of wadder filaments in rows, a heald for shedding said wadder filaments, a second feeding means for cyclically feeding at least one twiner filament into the shed of said wadder filaments, a reed which is operative to beat up said twiner filament onto said wadder filaments, a plurality of cutting means for cutting in said cycles said twiner filament to a plurality of twiner elements for causing each of the twiner elements to be interlaced between the wadder filaments of each of said sets, and a plurality of twisting means for respectively twisting the corresponding sets of wadder filaments around each other for causing the twiner elements to be twined between and around the corresponding sets of wadder filaments, a plurality of driving means for respectively driving said plurality of twisting means, and drive means for driving said plurality of driving means which is common to and engages said plurality of driv-

ing means.

4. An apparatus as claimed in claim 3, in which said twisting means comprising a plurality of rotary spinning members which are positioned to respectively receive said sets of wadder filaments with said twiner elements carried thereon, each of said rotary spinning members having an axial bore and apertures substantially in alignment with a path of the allocated set of wadder filaments and being rotatable about its axis which is substantially in alignment with said path, each of said sets of wadder filaments with said twiner elements carried thereon being admitted into said axial bore through said apertures, said driving means comprising a plurality of gearing units which are respectively in driving engagement with said spinning members, and said drive means carrying in place part of said gearing units for driving through said gearing units said spinning members for rotation about their respective axes whereby the individual sets of wadder filaments carrying said twiner elements are spun as they pass through the axial bores in the allocated spinning members.

5. An apparatus as claimed in claim 4, in which each of said spinning member comprises a tubular body portion which is opened at its outlet end and a flattened portion into which said tubular body portion merges at its inlet portion, at least one of said apertures being formed in said tubular body portion and the rest of said apertures being formed in said flattened portion.

6. An apparatus as claimed in claim 4, in which each of said gearing units comprises a driven gear mounted on said spinning member for rotation therewith, a driving gear which is in constant mesh with said driven gear and rotatable with a shaft extending in a direction substantially parallel to the direction of advancement of said wadder filaments, a driven bevel gear which is carried on said shaft for rotation therewith, and a driving bevel gear which is in constant mesh with said driven bevel gear and constantly driven by said driving means.

7. An apparatus as claimed in claim 6, in which said driving means comprises a drive shaft carrying the plurality of driving bevel gears.

8. An apparatus as claimed in claim 3, in which said second feeding means comprises at least one fluid jet nozzle communicating with a source of a jet fluid for projecting said twiner filament into said shed by entraining the twiner filament on a jet stream of fluid spurting from said nozzle.

9. An apparatus as claimed in claim 3, further comprising a cutter carrier which is common to and carries said plurality of cutting means.

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