Feb. 25, 1969 K. NIMTZ ET AL 3,429,113

TWO-FOR-ONE TWISTING MACHINE

Filed July 25, 1967 Sheet 1 of 7

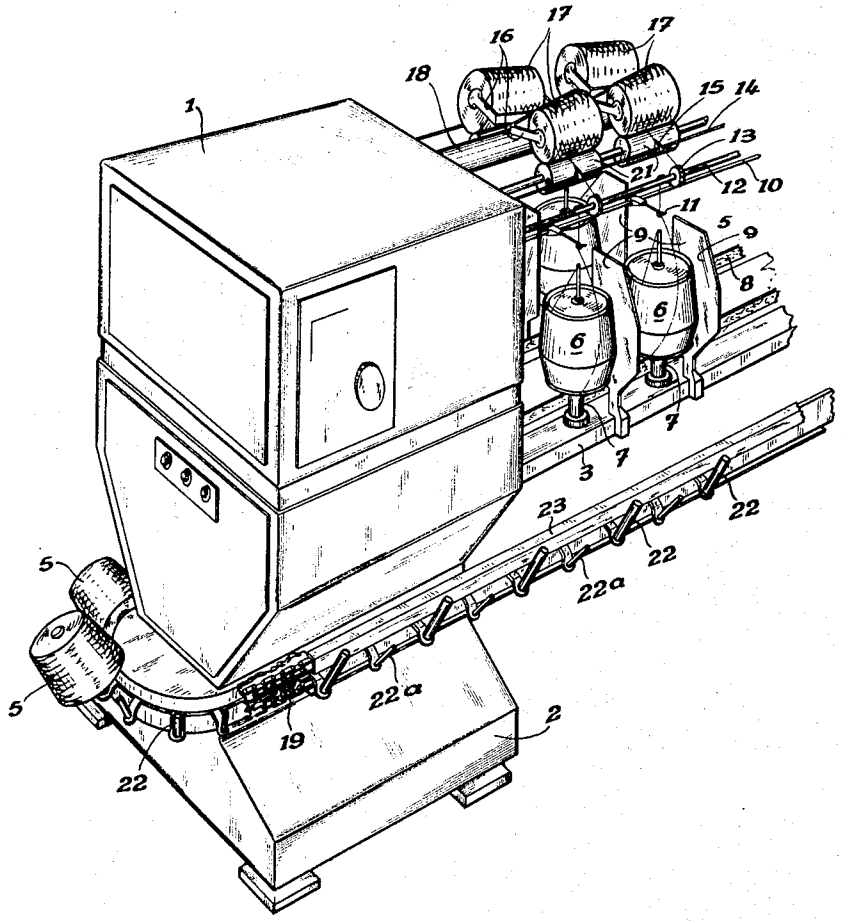

FIG. 1

INVENTORS

Klaus Nimtz

Gustav Franzen

By Walter Burky

Feb. 25, 1969 K. NIMTZ ET AL 3,429,113

TWO-FOR-ONE TWISTING MACHINE

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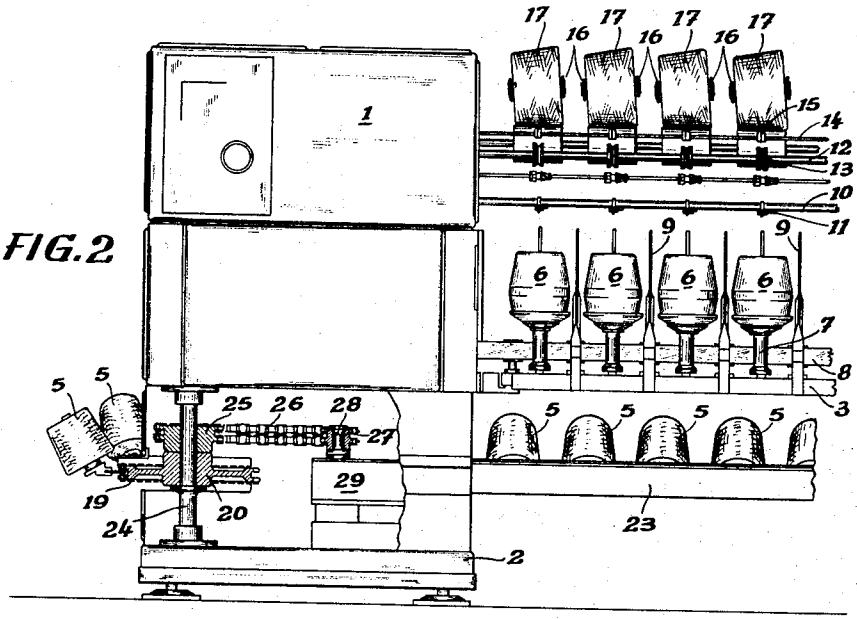
FIG. 2



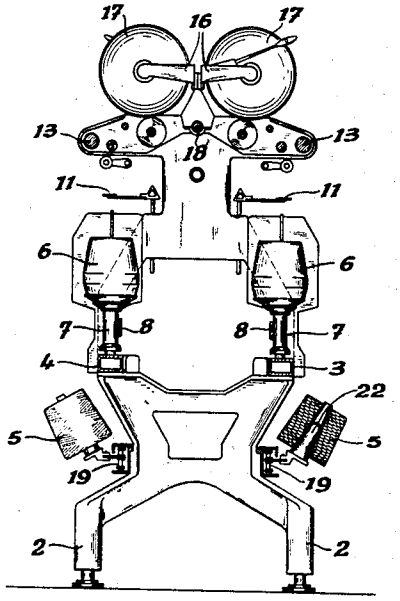


FIG. 3

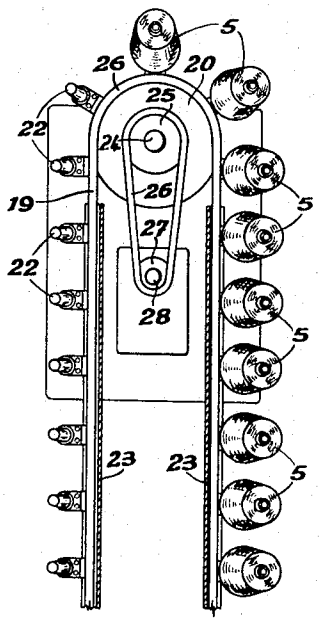


FIG. 4

INVENTORS

Klaus Nimtz

Gustav Franzen

By

Walter Beyer.

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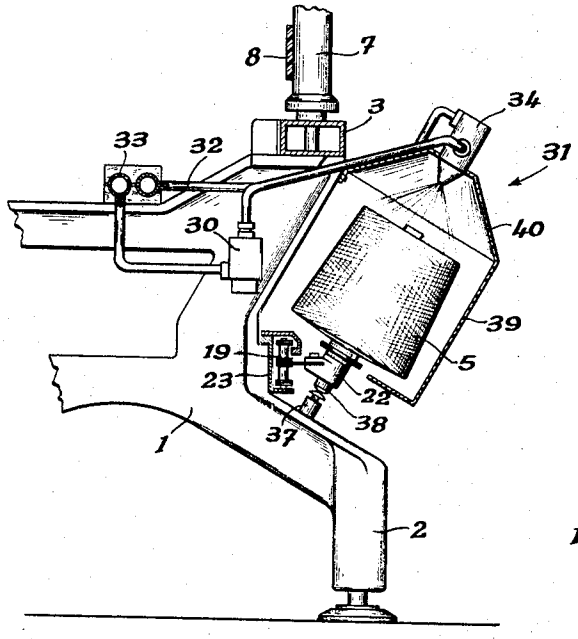

FIG. 6

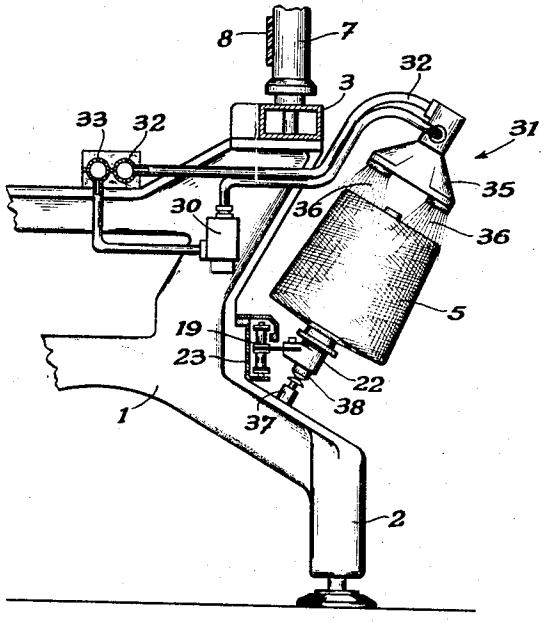

FIG. 5

INVENTORS

Klaus Nimtz

Gustav Franzen

By

Wyatt Berkey

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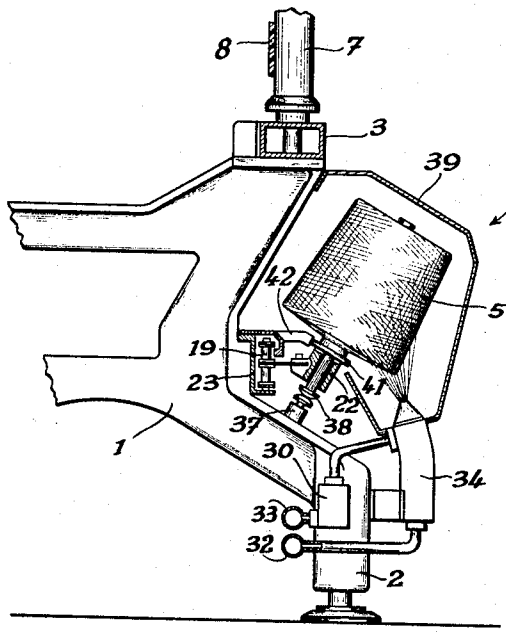

FIG. 7

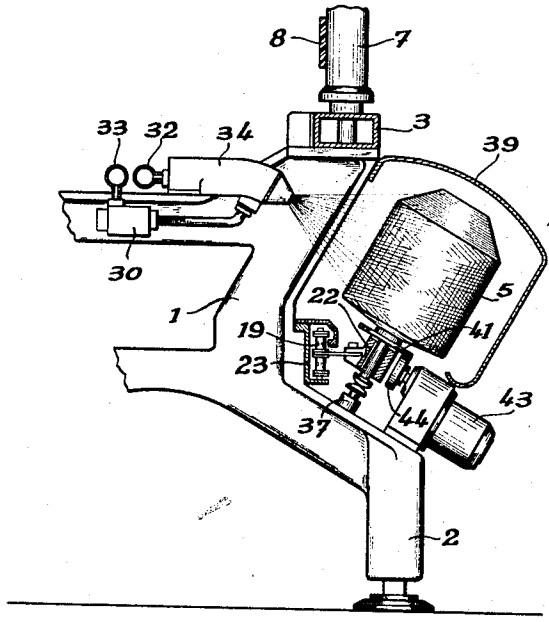

FIG. 8

INVENTORS
Klaus Nimtz
Gustav Franzen
By
Walter Ruby.

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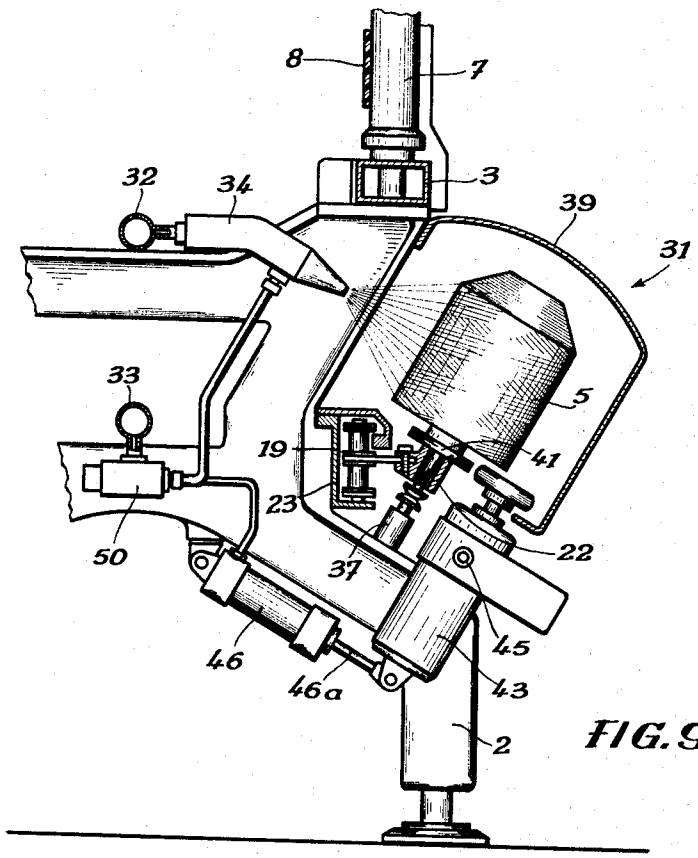

FIG. 9

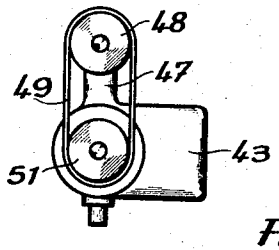

FIG. 10

INVENTORS
Klaus Nimtz
Gustav Franzen
By
Walter Becker.

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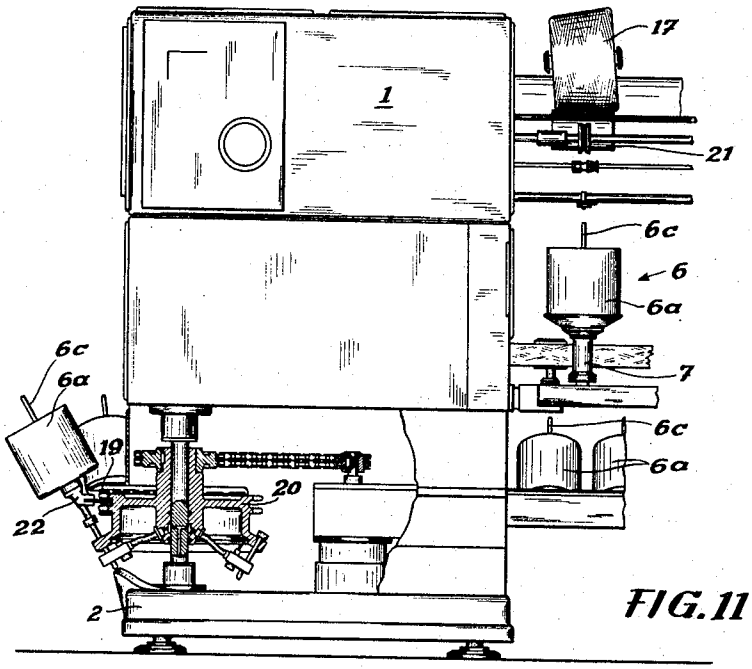

FIG. 11

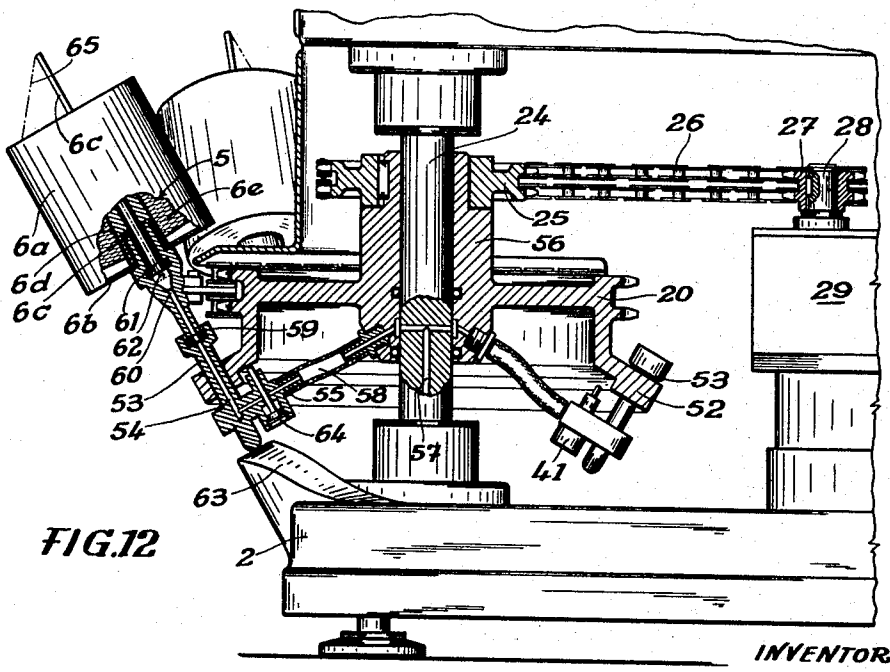

FIG. 12

INVENTORS

Klaus Nimtz
Gustav Franzen
By
Walter Berkey.

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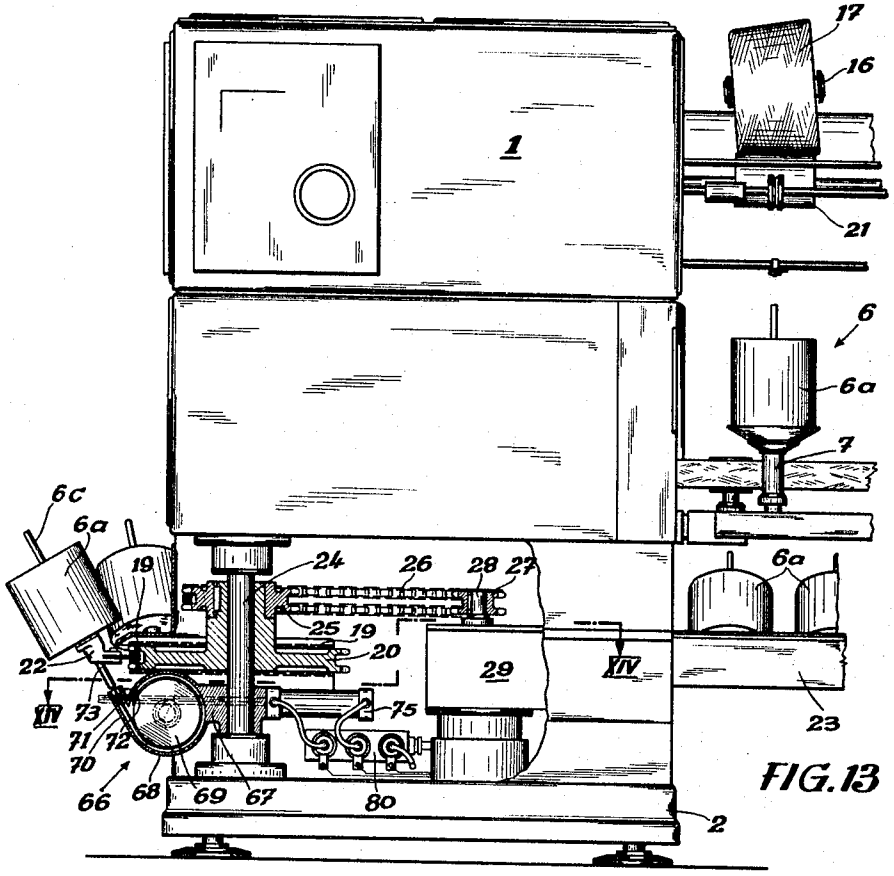

FIG. 13

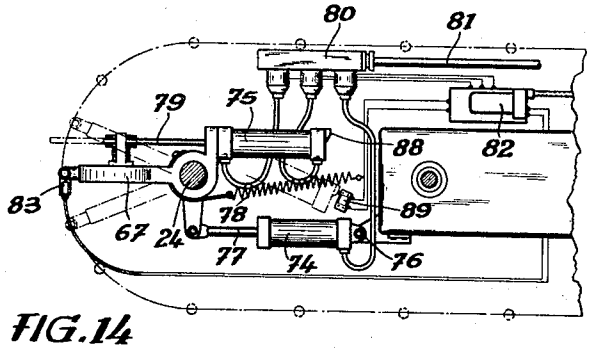

FIG. 14

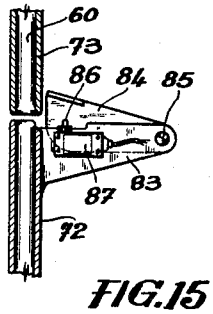

FIG. 15

INVENTORS
Klaus Nimtz
Gustav Franzen
By
Walter Berkey

United States Patent Office 3,429,113
Patented Feb. 25, 1969

3,429,113

TWO-FOR-ONE TWISTING MACHINE

Klaus Nimtz and Gustav Franzen, Krefeld, Germany, assignors to Palitex Project-Company G.m.b.H., Krefeld, Germany

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Claims priority, application Germany, July 29, 1966, P 40,091; Oct. 14, 1966, P 40,584; Dec. 16, 1966, P 41,016; July 13, 1967, P 42,587
U.S. Cl. 57—34 27 Claims
Int. Cl. D01h 7/86, 13/30, 9/14

ABSTRACT OF THE DISCLOSURE

Two-for-one twisting machine having a conveyor below spindle level with support means for receiving full bobbins and for conveying them along the machine to the respective spindles, together with automatic threading and treatment material supply devices.

The present invention relates to a two-for-one twisting machine. The economy of two-for-one twisting machines is in addition to the output per spindle per time unit also considerably affected by the required preparing time during which the individual spindle or the entire machine stands idle. As main operations during the preparing time there may be mentioned the placing of delivery bobbins on the spindle, the threading and knotting of the threads at the start of the spinning or twisting operation and during the operation in case of a thread break and the withdrawal of the finished wound-up bobbins and their replacement by empty bobbins. Furthermore, various types of yarns require a treatment with a reviving substance prior to the twisting operation, which likewise requires considerable time.

In addition thereto, there may be mentioned the preparing and idling time caused by the transporting of the delivery bobbins to the machine and by the transporting of the finished wound-up bobbins to another place. This transport is effected by transporting mandrel carriages which are moved at both longitudinal sides of the machine and are supposed to be available at the spot for the bobbin exchange.

If one operator operates a plurality of machines, which is usually the case, these transports require considerable time while the operator not only has to pull the carriage or has to push the same, but also has to load and unload said carriages for withdrawing the bobbins from the carriage and placing the same on the machine and vice versa. This loss of time can hardly be reduced by using as carriage a self-propelled carriage so that the operator does not have to walk back and forth but rides with the carriage.

The fact that the said supply and transport carriages or vehicles have to move between the machines brings about that correspondingly wide aisles have to be maintained between the machines. This in turn greatly influences the fixed costs because in addition to the floor space required for the machine when employing transporting vehicles, approximately twice the floor space has to be kept free for the operation of the machine. In this connection it should be kept in mind that two vehicles must be able unimpededly to pass each other.

Therefore, various suggestions have been made in order to simplify the operation of the machine, especially to facilitate the manual operation and to reduce the same.

According to a previous suggestion, the threading prior to the operation of a spindle is no longer effected on the spot, but instead a unit comprising a delivery bobbin, a protective basket and a hollow spindle shank is prepared

outside the machine and is then placed on the spindle rotor of the spindle.

In this connection also suggestions have been made in order to automate the exchange of such bobbin units. To this end, each bobbin carrier unit has associated therewith a prepared reserve unit which automatically is exchanged for another unit when the delivery bobbin has run empty or a thread break occurs. Such an arrangement brings about that the threading and exchange operations have no longer to be carried out manually when a delivery bobbin is empty or a thread break has occurred. The preparing operations can thus be carried out outside the machine without additional idling periods of the spindle.

It is an object of the present invention to provide a two-for-one twisting machine with loading possibilities which will make it possible to place the machines closer to each other and to considerably reduce the width of the aisles between the machines.

It is a further object of this invention to provide a two-for-one twisting machine in which the feeding of bobbins and bobbin units will be effected solely at one end of the machines.

It is a still further object of this invention to provide a two-for-one twisting machine which will make it possible that the withdrawal of the finished wound-up bobbins may likewise be effected from the said machine end or, if desired, from the other machine end.

It is another object of this invention to provide a two-for-one twisting machine in which the manual feeding of bobbins or bobbin units and the withdrawal of the processed material in relatively large containers or corresponding vehicles along the machines will no longer be necessary.

Still another object of this invention consists in the provision of a two-for-one twisting machine which will permit a uniform transport direction of bobbins from the winding room, the doubling room through the twisting room to the further processing or delivery room so that the movement of the transporting devices in opposite directions will be avoided.

It is also an object of this invention to provide a two-for-one twisting machine which will permit the automation of the transport between the individual machine installations and to reduce the preparing and operating time.

It is still another object of this invention to provide means in which the transport movement will enclose the wetting operation of the delivery bobbins with wetting means prior to their insertion into the machine, i.e. prior to their placement upon the spindle mandrel.

Still another object of this invention consists in the provision of a two-for-one twisting machine in which the transport movement of the units to the individual spindles will comprise the threading operation, for instance of the free thread end of a new delivery bobbin into the hollow spindle shank of a bobbin carrier unit, in such a way that no time on the part of the operator will be required inasmuch as the threading operation will be effected automatically in conformity with the feeding of the bobbin units.

These and other objects and advantages of the invention will appear more clearly from the following specification in connection with the accompanying drawings, in which:

FIG. 1 diagrammatically illustrates the transmission-near head end of a two-for-one twisting machine with rotating endless conveyor.

FIG. 2 is a partial side view of the machine according to FIG. 1 with some parts sectioned.

FIG. 3 is a transverse section through the machine of FIG. 2 showing a portion behind the transmission box.

FIG. 4 diagrammatically illustrates on an enlarged scale with regard to FIGS. 1 to 3 a top view of the

endless conveyor within the range of the transmission-near head end of the machine.

FIG. 5 is a partial enlargement of the cross section according to FIG. 3 with pick-up means and a reviving device which by means of brushes applies reviving means or substances onto a bobbin.

FIG. 6 is a partial enlargement similar to that of FIG. 5 with a reviving device in the form of a spray nozzle directed against the upper end face of a delivery bobbin.

FIG. 7 is a partial enlargement similar to that of FIG. 5 with a reviving device formed by a spray nozzle directed against the lower end face of the delivery bobbin, said reviving device also rotating the delivery bobbin.

FIG. 8 is a partial section similar to that of FIG. 7 with a reviving device which in addition to rotating the delivery bobbin acts upon the mantle surface of the delivery bobbin forming a cross-winding bobbin.

FIG. 9 is a partial section similar to that of FIG. 8 with a different device for rotating the delivery bobbin during the reviving operation.

FIG. 10 is a top view of the driving device for the delivery bobbin according to FIG. 9.

FIG. 11 is a view, partly in section, of the transmission-adjacent head end of a two-for-one twisting machine with rotating endless conveyor with pick-up means similar to that of FIG. 2 and an automatic threading device at the head end.

FIG. 12 illustrates on an enlarged scale a cutout from the head end of the machine according to FIG. 11 with the automatic threading device in section.

FIG. 13 is a view and partly a section of the transmission-adjacent head end of a two-for-one twisting machine with circulating endless conveyor with pick-up means similar to that of FIG. 11 and with a threading device with needles at the head end of the machine.

FIG. 14 is a transverse section through the machine along the line XIV—XIV of FIG. 13.

FIG. 15 is an enlarged longitudinal cutout through the upper end of the pipe section of the threading device according to FIG. 13 during the coupling with the lower end of a bobbin receiver.

The two-for-one twisting machine according to the present invention is characterized primarily in that an endless conveyor continuously or stepwise moves around the machine frame below the spindle range at different speeds and is equipped with pick-up means for the feeding of the delivery bobbins with or without bobbin carrier units of the spindles and, if desired, for the withdrawal of winding-up bobbins spaced from each other in conformity with the spindle spacing or spindle division.

The distribution of the delivery bobbins may be effected stepwise at the rhythm or the rate at which an operator is in a position to withdraw the empty sleeves or the empty carrier units from the spindle and to replace the same by a new delivery bobbin with or without carrier unit while simultaneously removing finished wound-up bobbins and replacing the same by winding-up bobbins which, for instance, are additionally placed upon the endless conveyor. To this end, it may be provided according to the invention that the endless conveyor is additionally equipped with pick-up means for picking up the winding-up bobbin sleeves.

If desired, the endless conveyor may move once around the machine frame and then stop. During this movement, the endless conveyor is continuously loaded inasmuch as the delivery bobbins with or without carrier units and winding-up bobbin sleeves are placed upon the pick-up means of which one with one delivery bobbin is following a rotation of the endless conveyor associated with one of the spindles so that the operator will find a delivery bobbin with or without carrier unit ready for exchange against the empty sleeve or the entire unit and, if desired, a winding-up bobbin sleeve for exchange of the finished winding-up bobbin. This is particularly advantageous when differently dyed sections are to be processed on a machine side. Inasmuch as the endless conveyor is adapted to be driven at different speeds, it is possible that the pick-up means, for instance at high speed, pass the head end of the machine the delivery bobbins or units of which have not been employed at the spindles. When a new pick-up member to be charged reaches the head end of the machine, this head end passes by the preparing station at a slow speed so that the exchange operations can be effected.

It is thus realized that between the machines only a relatively narrow aisle is required for the operator. The operator no longer has to carry out any heavy transporting operation but is limited to the proper insertion of a delivery bobbin or an entire bobbin carrier unit and to the withdrawal of the finished winding-up bobbin.

According to the present invention, the endless conveyor may be designed as an endless chain or endless belt which rotates about wheels journalled in the head ends of the machine frame, at least one of said wheels being adapted to be drivingly connected to a prime mover or a transmission. Thus, for instance, the driving wheel may be located below the machine drive proper in the spindle box of the latter so that a space and drive provided anyhow will be available for the purpose involved.

In view of the fact that the endless chain or belt between the wheels with the delivery and winding-up bobbins has to sustain considerable loads, it is possible in conformity with the present invention to give the endless chain or belt over the length of the machine in slide rails and to support said chain or belt from below in order to prevent a hanging down or twisting of said chain or belt.

The above mentioned pick-up or receiving means in the form of mandrels, bolts for insertion of the bobbins or also cup-shaped bodies which are provided with a bore for receiving the lower sleeve end of a bobbin or the hollow spindle shank of a bobbin carrier unit when not a bobbin alone is exchanged but a bobbin carrier unit comprising a delivery bobbin, a protective pot and a hollow spindle shank which unit is detachably to be mounted on the spindle rotor.

Preferably, according to the invention, the pick-up or receiving means are inclined outwardly and extend upwardly on the endless conveyor means which means that they occupy a position which facilitates the servicing by the operator inasmuch as the bobbins will occupy a position in which they can be easily grasped, and the receiving means are likewise in a handy position when finish wound bobbins are to be placed and empty sleeves are to be withdrawn.

Inasmuch as many types of yarns, prior to the twisting operation, require a pretreatment with wetting agents, the two-for-one twisting machine according to the invention may approximately at the level of the delivery bobbins placed upon the receiving means of the endless conveyor be provided with at least one reviving device which distributes reviving substances, wetting agents, or the like, upon the mantle surface and/or at least an end face of the delivery bobbin passing by.

The delivery bobbin is thus during its transport around the two-for-one twisting machine subjected to a reviving process so that special working operations between the winding shop and the twisting shop do not have to be interposed and that special devices separate from the two-for-one twisting machine are not required. The reviving device is advantageously arranged directly behind the station at which the endless conveyor is being loaded with delivery bobbins.

More specifically, according to the present invention, the reviving device may be provided with at least one spray nozzle directed toward the delivery bobbin passing by or may be provided with brushes, rollers, or the like engaging the surface of the delivery bobbins passing by. Whereas in the first instance during the movement of the delivery bobbin past the reviving device, the reviving substance is sprayed upon the surface or an end surface

and the delivery bobbin as a whole is subjected to the resulting mist, the application of the reviving means to the surface of the delivery bobbin is effected mechanically in the second instance.

According to a further development of the invention, the delivery bobbin may, while passing by the reviving device, rotate at least once about its axis so that a spraying or covering of the entire surface of the delivery bobbin will be obtained without the necessity of arranging spray nozzles all the way around.

According to a further feature of the present invention, the delivery bobbin may within the range of the reviving device actuate a contact causing the reviving device to dispense a wetting agent onto the delivery bobbin so that the reviving device will dispense a wetting agent only when the delivery bobbin is in the immediate vicinity of the reviving device. In this way, the reviving substance is limited to the quantity which is necessary under all circumstances whereby the losses are reduced to a minimum.

More specifically, the reviving device may be connected to a source of compressed air which by means of said contact is caused to introduced wetting agents into the reviving device and to allow said wetting agents to be dispensed either through the spray nozzles or into the brushes, rollers, or the like, when, as in the last mentioned instance, the reviving substance is not sprayed but directly applied.

Inasmuch as the wetting agents are in the form of a mist, there may, in order to avoid damage to the breathing organs of the operator, be provided a conduit which surrounds the delivery bobbin in spaced relationship thereto and while extending in the direction of movement of said endless conveyor protects the surroundings of the delivery bobbin. The entrance and exit opening of said conduit are closed by closing means adapted to be pushed toward the side by the delivery bobbin when the latter enters and leaves the conduit so that the reviving operation is effected within the conduit while the operator in the vicinity of said conduit is not subjected to the influence of the reiving operation.

When the two-for-one twisting machine is equipped with spindles from which for purposes of exchanging the delivery bobbin the latter can be lifted off the spindle rotor together with the bobbin carrier unit, it is possible in conformity with the present invention to provide a threading device at least at one head end of the machine. This creates the possibility of preparing such units at the provided head ends of the machine so that a threading operation through the hollow spindle shank at the individual twisting stations will be superfluous. Also this feature greatly cuts down the necessary movements of the operator who, as a rule, attends to a plurality of machines.

The above arrangement is realized according to the present invention by providing the receiving means with a conduit extending axially while the receiving means during their rotation about the head end of the machine are adapted to be coupled with a suction connection from below which suction connection in its turn communicates with a suction blower.

When a receiving means starts passing by the head end of the machine and carries a bobbin carrier unit comprising a protective head with the protective pot bottom and also comprising a hollow spindle shank and a new delivery bobbin or a partly unwound delivery bobbin, as is the case when a thread breaks, the thread to be connected to the hollow spindle shank from the top and to be withdrawn from the delivery bobbin is sucked downwardly through said hollow spindle shank. When later the bobbin carrier unit is lifted off the respective receiving means and placed upon the spindle rotor with slotted rotary dish, for instance in conformity with U.S. Pat. No. 3,276,197, it is merely necessary to pull the thread end radially outwardly out of the thread storage disc and to place said thread end onto the winding-up bobbin through the thread guiding member located above said spindle while said thread end passes the running-ahead roller and the thread traversing guide.

More specifically, according to the invention, a plurality of suction connections with spindle division spacing are in a rotor in the head end of the machine held from below for axial displacement toward the receiving means. In this way, with a plurality of bobbin carrier units which simultaneously pass by the head end of the machine, the threading operation will be effected without the necessity of stopping the endless conveyor or without a reduction in the conveyor speed.

According to a further feature of the invention, the rotor may be formed by the sprocket wheel of the chain on which the receiving means are mounted so that the rotor simultaneously has two functions which greatly simplifies the machine construction.

According to the invention, the suction connections may axially displaceably extend downwardly through a flange of the rotor and during the rotation about the head end of the machine may move onto a guide which displaces the suction connections from below against the receiving means so that the connection between the suction connection and the receiving means or the hollow spindle shank is effected and that the suction air draws the thread through the hollow spindle shank.

In order to be able to maintain the length of the sucked-in thread end relatively constant, it is possible according to the present invention to provide the receiving means in their conduit with a screen. This screen will prevent the thread from entering the suction connection and furthermore will prevent the sucked-in thread end from becoming too long because the sucked-in thread will at a certain length at least partially close the screen.

According to a further feature of the present invention, the suction connections may be connected to a common suction conduit extending centrally into the hub of the rotor so that all suction connections will become effective through a single suction conduit the suction blower of which is located in the machine or the said conduit is connected to a blower which is common to a plurality of machines. For purposes of controlling the suction operation at the respective times, the suction connections may respectively be provided with a valve which automatically opens the suction conduit, for instance, when the suction connection reaches the guiding means, and automatically closes the suction connection conduit after having passed around the head of the machine. Practically in this way all valve movements are covered which correspond directly to the movements of the suction connection in axial direction. Moreover, it is assured that the suction of the suction blower becomes effective only in the respective suction connection which is in operation.

In addition to the above mentioned pneumatically effective threading device, it is also possible according to the invention to provide means which bring about the threading of the thread by a threading needle. To this end, the receiving means which are axially provided with a passage are adapted, while moving around the head end of the machine, successively to be coupled with a pipe section extending from below through which the threading needle of the threading device can move to the upper end of the hollow spindle shank of the bobbin carrier unit. Thus, when a new delivery bobbin at the head end of the machine is placed upon the bobbin carrier unit on a receiving means, the pipe section of the threading device is able already during the placing operation from below to engage the receiving means whereby the threading needle can pass through the receiving means up to the upper end of the hollow spindle shank. The pulling of the thread through the hollow spindle shank is effected subsequently during the rotation of the receiving means about the head end of the machine in an automatic manner inasmuch as the threading needle pulls the free thread end of

the full delivery bobbin through the hollow spindle shank.

More specifically, the threading device may be arranged at the free end of a pivot arm which parallel to the endless chain periodically rotates at the head end of the machine. According to another arrangement, a plurality of threading devices may be arranged on a pivotal star from which the threading needle, after being coupled to the respective receiving means, moves through the latter and through the hollow spindle shank.

For purposes of automatically moving the threading device and the threading needle during rotation about the head end of the machine, the periodic pivoting movement of the pivot arm and simultaneously the displacement of the threading needle into the hollow spindle shank may be effected by a pressure fluid operable cylinder piston unit.

The threading device according to the invention may consist of a disc rotatably journalled in a housing. The threading needle is, while being wound around said disc, connected to the circular circumference of said disc at that end thereof which is opposite to the threading ear and is adapted in response to a rotation of said disc to be moved outwardly through a pipe section arranged tangentially to said housing.

This embodiment of a threading device is particularly advantageous in connection with a two-for-one twisting machine according to the invention in which the endless conveyor is arranged below the spindle range on the machine frame and in which the space is consequently rather limited. This advantage is seen in the fact that the threading needle is, after threading operation, in a space saving manner located on the circumference of the circular disc. The principle of this threading device may, of course, be employed also in connection with such constructions which have only manual threading devices.

As mentioned above, the endless conveyor may serve not only for feeding delivery bobbins and winding-up bobbin sleeves, but may also be used for transporting winding-up bobbins and for withdrawing empty delivery bobbin sleeves.

According to the present invention, it is also possible above the winding-up bobbin placements to provide a continuously or stepwise movable endless conveyor for depositing the winding-up bobbins. In this way the withdrawal of the winding-up bobbins is facilitated and also their withdrawal from the bobbin frame is simplified.

When an endless conveyor is provided which consists of an endless conveyor belt, it may receive the finished winding-up bobbins, and the danger is eliminated that finished winding-up bobbins are mistakenly used instead of delivery bobbins to be placed on the machine inasmuch as the delivery and withdrawal are completed separately while the delivery of the delivery bobbins and the withdrawal of the finished winding-up bobbins is effected at the respective machine end and, therefore, transport movements with vehicles between the machines will be superfluous.

Referring now to the drawings, FIG. 1 illustrates the transmission adjacent head end of a machine according to the invention which comprises the transmission box generally designated **1** and provided with a machine base **2**, furthermore the spindle rail **3** on one side of the machine and the spindle rail **4** on the other side of the machine. Said spindle rails support the spindles **6** which receive the delivery bobbins **5** and the whorl **7** of which is adapted to be engaged and driven by a tangential belt drive **8**. Between the individual spindles **6**, partitions **9** are provided.

Above said spindles **6** there extend supporting members **10** with thread guiding elements **11**, furthermore the shaft **12** with the running-ahead rollers **13** and the traversing thread guiding rail **14** with the traversing thread guides **15**. Above these elements there are arranged the friction rollers **21** and the bobbin frame **16** with the winding-up bobbins **17** or the sleeves thereof. There is furthermore provided between the elements of both sides of the machine a supporting beam **18** which forms a part of the machine frame and has the bobbin frame **16** connected thereto. The machine construction described so far corresponds to that of standard machines.

In conformity with the present invention, below the range of the spindles **6** there is provided an endless conveyor **19** in the form of a chain adapted to circulate about the sprocket wheel **20** which is journalled in the transmission box **1** and is driven. The chain **19** carries the receiving members **22** which are spaced from each other in conformity with the spacing between the spindles. Between the receiving members **22** there are respectively arranged additional mandrels **22*a*** for receiving bobbin sleeves which can be inserted into the bobbin frame for purposes of carrying out a new winding-up operation. These additional mandrels **22*a*** may also serve for receiving empty bobbin sleeves for moving the same away. A sprocket wheel (not shown) which corresponds to the sprocket wheel **20** is provided at the other machine end so that a circulation of the chain **19** will be possible. Between the sprocket wheel **20** at both head ends of the machine, the chain **19** is guided in and supported by rails **23** so that a lateral deviation of the chain **19** and a hanging through of the chain will be prevented. The receiving members **22** and **22*a*** mounted on said chain **19** are inclined toward the outside in order to facilitate the withdrawal of delivery bobbins and the placing of winding-up bobbins and sleeves thereon.

As will be seen from FIG. 1, at the head end of the machine, delivery bobbins **5** and winding-up bobbins are slipped on which by means of the circulating chain **19** are distributed around the machine in such a way that after one complete circulation or turn of the chain **19**, each spindle **6** will have associated therewith one delivery bobbin **5** and one winding-up bobbin sleeve. The operator going from spindle to spindle will then remove the empty sleeve from the spindle **6** and replace the same by a new delivery bobbin **5** while the finished winding-up bobbin **7** is withdrawn from the bobbin frame **16** and replaced by an empty winding-up bobbin sleeve.

After all spindles **6** have been again equipped with new bobbins and sleeves, the chain **19** is put into circulation so that at one machine end the finished winding-up bobbin **17** can be withdrawn.

FIGS. 2 and 3 illustrate the structure of the invention in two further views and sections. FIG. 2 shows how the sprocket wheel **20** is journalled in the transmission box **1**, namely upon the vertical shaft **24** which additionally carries the sprocket wheel **25** forming the driving wheel for the sprocket wheel **20**. The sprocket wheel **25** is passed around by the chain **26** which is driven by the sprocket wheel **27** keyed to a shaft **28** of a drive generally designated **29**. The drive is in a manner not shown in the drawings derived from the drive for the machine and is driven by a separate motor.

As will be evident from FIG. 3, the endless conveyor does not practically increase the width of the machine. FIG. 3 furthermore shows that the machines can now be mounted very close together because only that aisle width is necessary which is required by the operator in order to be able to carry out the above mentioned working steps between two adjacent machines on one machine.

The drive for the sprocket wheel **20** which is shown in FIG. 2 is again diagrammatically illustrated in FIG. 4. As will be seen from FIG. 4, the chain **19** between the chain wheels arranged at the head ends of the machine is guided in rails **23** and supported thereby.

As shown in FIGS. 5 to 9, within the range of the chain **19** the machine is at one area equipped with a reviving device generally designated **31**. Preferably, the said reviving device is arranged directly behind that head end of the machine at which the delivery bobbins **5** are slipped onto the receiving members **22**. By means of this reviving device, the reviving operation can advantageously be carried out during the transport of the deliv-

ery bobbins 5 to the individual spindles 6, without requiring manual handling.

According to FIG. 5, the reviving device 31 comprises brush carrier means 35 with two brushes 36 which are so arranged that they strike the respective delivery bobbin 5 passing by at the upper end face thereof and cover the same with a wetting agent. A compressed air conveying conduit 33 extends alongside the machine frame. This compressed air conveying conduit 33 conveys the wetting agent from conduit 32 conveying said wetting agent to the brush head 35. The compressed air conveying conduit 33 forms, for instance in the form of a mixing battery with a magnetic valve, a dosing device 30 which conveys the wetting agent from conduit 32 to the brush head 35.

The release of a certain quantity of wetting agent by the dosing device 30 is effected by a pressure contact 37 which actuates the contact pin 38 on the receiving members 22 when the delivery bobbin 5 moves within the range of the reviving device 31.

The connection between the pressure contact 37 and the dosing device 30 may be established electrically, mechanically or pneumatically in any standard manner. It is merely important that the movement of the delivery bobbin 5 itself through the contact pin 38 of the receiving members 22 within the range of the reviving device 31 brings about the release of a wetting agent to the brushes 36 and through the latter to the delivery bobbin 5.

According to the embodiment of FIG. 6, the reviving device 31 is equipped with a spray nozzle 34 which is directed against the upper end face of the delivery bobbin 5. Said spray nozzle 34 becomes active in the same manner by means of the dosing device 30 in cooperation with a pressure contact 37 and the contact pin 38 on the bobbin receiving member 22.

In order to protect the operator in the neighborhood of the sprayed wetting agent, the delivery bobbin 5 is within the range of the reviving device 31 surrounded by a conduit or duct which is composed primarily of the hood 40 and the duct body 39. The inlet and outlet of said duct may be closed by an apron (not shown) which is adapted automatically to be pushed to the side by the delivery bobbin 5 while it passes through the inlet or outlet. The delivery bobbin 5 may with an intermittent movement of the endless conveyor 19 stay for a certain period of time within the duct 39, 40 which forms a mist chamber so that said delivery bobbin 5 will be exposed for a certain time to the reviving operation. As a rule, however, a continuous passing of the bobbin through the duct 39, 40 will suffice in order to sufficiently wet the surface of the delivery bobbin 5 with a wetting agent. Wetting substance not absorbed by the delivery bobbin 5 is collected by the duct walls and can be returned to a supply container. For purposes of increasing the formation of mist, it is, of course, possible, instead of one nozzle, to provide a plurality of nozzles, for instance upper nozzles and lower nozzles, or to distribute the nozzles along a circular arc.

FIG. 7 shows an arrangement according to which the reviving device 31 operating with a spray nozzle 34 which is likewise surrounded by a duct 39 is directed toward the lower end face of the delivery bobbin 5 which, however, in contrast to the embodiment of FIG. 6, is rotated so that the entire lower end face is exposed to the spray from the nozzle. To this end, the rotatably arranged receiving member 22 is provided with a friction disc 41 which, within the range of the reviving device 31, engages a friction rail 42 and by the latter is rotated so that the delivery bobbin can carry out a corresponding rotation with the result that the entire lower end face of the delivery bobbin is acted upon by the wetting agent.

According to the embodiment of FIG. 8, the reviving device 31 in the form of a spray nozzle 34 is directed toward the mantle surface of the delivery bobbin 5 formed as crosswinding bobbin which also with this embodiment is rotated when passing by the reviving device 31. Again the rotatably journalled receiving member 22 is provided with a friction disc 41 engaged at an angle thereto by the friction disc 44. Disc 44 is driven by a motor 43 and is keyed to the driving axle thereof. Also with this embodiment, a covering duct 39 is provided.

The embodiment shown in FIG. 9 differs from that of FIG. 8 primarily by the type of the drive for the rotation of the delivery bobbin 5 within the range of the reviving device 31 operating with a spray nozzle 34. When the delivery bobbin 5 passes by the reviving device 31, the said bobbin will with the friction disc 41 of the receiving member 22 come into the range of the circulating belt 49 according to FIG. 10. Belt 49 is looped around the reversing rollers 51 and 48 supported by the frame 47 which together with the motor 43 is pivotally journalled on the machine frame for pivoting about the pivot 45. The housing of the motor 43 has linked thereto a piston rod 46 the piston of which is reciprocable in the cylinder 49. By means of the piston 46 which is operated by compressed air from the conduit 33 through the control valve 50, the frame 47 with the reversing rollers 51 and 48 and the friction belt 49 can be pivoted toward the friction disc 41 so that the latter and consequently also the delivery bobbin 5 will be rotated. This embodiment is particularly suitable with a non-continuous circulation of the chain 19 in order to assure that during the passage of the bobbin through the duct 39 and during the operation of the reviving device 31, the delivery bobbin 5 will be turned about its axis at least once.

The reviving device 31 as well as the drives for the rotation of the delivery bobbin 5 about its axis become effective in response to the actuation of the pressure contact 37 so that the release of a wetting agent will be effected only when the reviving device 31 faces a delivery bobbin 5. In the same manner as chain 19, also the reviving device 31 associated therewith can be employed not only in connection with two-for-one twisting machines but also on other multi-station machines used for processing yarn.

In order further to reduce the preparing time on two-for-one twisting machines, there is, in conformity with the present invention, providing a threading device in cooperation with the transporting device around the machine to the individual spindles 6. With such a machine, not only individual delivery bobbins 5 are slipped upon the receiving members 22 but entire delivery bobbin carrier units are with the respective receiving members 22 and the chain 19 transported around the machine. By "delivery botton carrier units" there are to be understood units which in conformity with FIG. 12 comprise a protective pot *6a* with protective pot bottom *6b* and the hollow spindle shank *6c*. For twisting, the delivery bobbin 5 is slipped onto the hollow spindle shaft *6c* which comprises the sleeve *6d* and the yarn body *6e*. Whereas in the bobbin carrier unit with empty delivery bobbin 5 only the empty sleeve *6d* remains on the hollow spindle shank *6c*, the delivery bobbin carrier units are employed on the spindle rotor with the whorl 7 and therewith form the spindle 6.

The operation of the two-for-one twisting machine according to FIGS. 11–14 is as follows: At the head end of the machine, delivery bobbins 5 are inserted into the bobbin carriers *6a–6c* passing to said head end by means of chain 19, after the empty bobbins have been removed therefrom. The bobbin carrier units *6a–6e* which have been newly loaded are distributed around the machine by the circulating chain 19, and more specifically in such a way that after one circulation of the chain 16 each spindle 6 has associated therewith a delivery bobbin carrier unit *6a–6e* and if additional mandrels are employed, also has associated therewith a winding-up bobbin sleeve. The operator will then from each spindle rotor remove the bobbin carrier *6a–6e* with the empty sleeve *6d* and replace the same by a bobbin carrier unit *6a–6e* fed by chain 19 and provided with a full delivery bobbin 5. The

empty bobbin carrier units thus are exchanged for full bobbin carrier units.

According to a previous suggestion, this may be effected automatically by providing in the aisles an automatically operating exchanging device instead of the operator. The last-mentioned device requires that the thread has been threaded properly. This threading may be effected by a pneumatic threading device shown in FIG. 12 in section and on an enlarged scale. As will be seen from FIGS. 11 and 12, the sprocket wheel **20** is provided with a radially protruding inclined downwardly directed flange **52** which is provided with suction connections **53** which are displaceable axially in bores on the circular circumference, said bores being spaced from each other in conformity with the spacing between the spindles. The suction passage **54** of the suction connection **53** continues inwardly into the passage **55** which is connected to the suction connection **57** coaxially arranged with regard to the wheel hub **56** of the sprocket wheel **20**. This connection is effected by means of an elastic hose **58** which does not interfere with the axial displaceability of the suction connection **53**.

The upper free end of the passage **54** is, similar to the suction connection **53** widened and in the widened portion has a sealing ring **59**. Furthermore, a sealing ring **61** is inserted into the passage **60** of the receiving means **22** whereby between the lower end of the hollow spindle shank **6c** and the passage **60** in the receiving device **22** as well as between the lower end of the receiving means **22** and suction connection **53** opposite relative thereto, there is formed a seal. The screen **62** in passage **60** of the receiving means **22** limits the thread lengths sucked therethrough and prevents the entering of the thread into the suction connection **53**.

For purposes of axially displacing the suction connection **53** toward the lower end of a receiving member **22**, there is provided a guiding means **63** extending along a semi-circle on the transmission box base **2** and rising to a certain height and then dropping from said height.

When the sprocket wheel **20** turns, the suction connections **53** which in the starting position, due to their own weight, move downwardly will when moving onto the guiding means **63**, i.e. when rotating about the head end of the machines be displaced upwardly and will snugly from below engage the respective receiving means **22** pertaining thereto. During this upward movement, the valve slide **64** which extends transversely through the passage **55** is displaced downwardly and thus has freed the path through passages **54** and **55**. Consequently, the suction air of the suction passage **57** in the freed passages **54** and **55** of the respective suction connections **53** can become effective. The thread **65** introduced from above into the hollow spindle shank **6c** will through the hollow spindle shank **6c** be sucked downwardly. Thread **65** will with some windings thereof rest on the screen **62** in the passage **60** so that after the withdrawal of the bobbin carrier unit **6a–6e** from the receiving means **22**, a thread end will freely hang out from the bobbin carrier unit **6a–6e**, and this end will be available for connection to the winding-up bobbin **17** when placing the bobbin carrier unit **6a–6e** onto the spindle rotor of a spindle **6**. Instead of a valve slot or valve spool **64** there may, of course, also be employed any other suitable valve, if desired, a mechanically or electromagnetically controlled valve the impulse emission of which is desired from the axial displacement of the suction connection **53**. The suction passage **57** may in a manner (not disclosed) be connected to a separate blower of the machine, but if desired, may also be connected to a central blower which is common to a plurality of machines.

FIGS. 13–15, in contrast to FIGS. 11 and 12, show a mechanical threading device **66** according to which a needle carries out the threading operation. More specifically, the device **66** is arranged at the free end of the pivot arm **67** which periodically circulates together with the endless chain **19** and the sprocket wheel **20**. Arm **67** is provided with a hub at its other end by means of which it extends around the shaft **24** of the sprocket wheel **20** and thus is able to circulate parallel thereto.

The threading device **66** comprises a disc **69** rotatably journalled within the housing **68** and having a threading needle **34** wound upon its semi-circular circumference. The threading needle **70** consists either of a spring steel or a synthetic wire having one end provided with a threading eye or with hooks **71** while the other end is connected to the circumference of the circular disc **69**. The hooks **71** of the needle **70** will in moved-in condition of the threading needle **70** be located in the pipe section **72** which tangentially leads into the housing **68**. The threading device **66** is arranged in spaced relationship to its axis of rotation, viz. shaft **24** in such a way and the pipe section **72** is inclined to the vertical at such an angle that the pipe section **72** is adapted to be coupled to the pipe **73** of the respective receiving member **22**. Thus, the passage of the pipe section **72** and the passage of the respective receiving means **22** will in coupled condition form a straight line. This instant is shown, for instance, in FIG. 15. When the threading device **66** is coupled in axial alignment with a receiving member **22** circulating together with the chain **19**, the threading needle **70** will in view of the rotation of disc **69** in clockwise direction be displaced into the receiving member **22** and subsequently up to the upper end of the hollow spindle shank **6c**. Since the receiving member **22** circulates continuously with chain **19** about the head end of the machine, the pivot arm **67** must carry out a periodic pivot movement during each threading operation. For purposes of controlling these movements, the embodiment shows pressure piston-cylinder units **74** and **75**. The unit **74** which at **76** is linked to the machine frame and can carry out only a pressing operation, is by means of the piston rod **72** connected to the hub of the pivot arm **67** pivotable about the shaft **24**. The return pivot movement of the pivot arm **67** is effected through the tension spring **78** which is likewise connected to the hub of the pivot arm **67**. The turning of the circular disc **69** of the threading device **66** is effected by the reciprocatory movement of the piston rod **79** of the unit **75** the free end of which is formed by a rack which meshes with a pinion coaxially arranged and rotating with the circular disc **69**. The compressed air conduits of the units **74** and **75** end in the compressed air distributing system **80** which is connected to a central compressed air conduit **81**.

The operational movements of the threading needle and thus of the circular disc **69** of the threading device **66**, and furthermore the pivot movement of the pivot arm **67** about the shaft **24** must be effected in conforming with the movement of the respective receiving member **22**. To this end, an electric control is provided which receives impulses through the solenoid **82**.

The individual movements are released or controlled by an electric switch **83** which is connected to the pipe section **72** of the threading device **66**. The switch **83** is shown in FIG. 15. When the lower end of pipe **73** of the respective receiving member **22** passes over the inclined upwardly directed lever **84** of switch **83**, the latter is tilted upwardly about the pivot **85** until it actuates the pressure contact **86** of the microswitch **87**. Subsequently, through the solenoid **82** the individual control movements are initiated; the pivot arm **67** pivots from the dot-dash line position through the solid-line position again to the dot-dash line position whereas through the intervention of the piston rod **79** of unit **75** the circular disc **69** displaces the threading needle **70** into the hollow spindle shank **6c**.

The end of the tilting movement of the pivot arm **67** and the returning of the threading needle **70** into the threading device **66** is again brought about by an electric switch. To this end, at the rearward end of the unit **75** which is connected to the hub of the pivot arm **67** and is tilted therewith, there is provided a cam **88** which at the

end of the pivot movement actuates the electric switch **89** connected to the machine frame. This switch **89** is connected to the solenoid **82** through which the return movements of the individual elements of the device will be initiated.

By means of this mechanically effective threading device **66** an automatic threading through the hollow spindle shank of the delivery bobbin thread end placed upon the hollow spindle shank **6***c* will be assured. The operational movements of the exchange of the delivery bobbin **5** for the empty bobbin sleeve **6***d* and the subsequent threading is advantageously effected in such a way that shortly ahead of the end of the machine, the operator withdraws the empty bobbin sleeve **6***d* and inserts a new delivery bobbin **5** into the bobbin carrier **6***a*–**6***c* while the threading needle **70** with its hooks **72** protrudes from the upper end of the hollow spindle shank **6***c*. With the same manual movement, therefore, the operator can hook the thread end of the delivery bobbin **5** to the hook **72**. The subsequent threading operation is effected automatically.

According to a further movement of the illustrated embodiments, there also exists the possibility of providing a non-illustrated endless conveyor above the winding-up bobbin **17** on the machine frame. This additional endless conveyor will be able to receive the winding-up bobbins **17** when they have been completely wound up so that by means of this last-mentioned endless conveyor the completely wound-up bobbins can be conveyed to a machine end. This will likewise facilitate the exchange operations and eliminate the danger that delivery bobbins and completely wound-up bobbins are confused.

In each instance the design of the two-for-one twisting machine according to the present invention brings about the advantage that adjacent machines can be placed close to each other inasmuch as only a very narrow aisle is required. Moreover, the loading and also the withdrawal of bobbins and sleeves is possible in the same direction so that unilaterally the winding shop may precede a group of machines arranged adjacent to each other whereas the succeeding devices and shops such as dyeing shop will be able in the same working direction to receive the completely wound-up bobbins. Furthermore, the operator does not have to carry out any transporting labor and can exclusively attend to the fast starting of the individual spindles. Considerable preparing time is saved so that the operator can attend to more machines that was possible with heretofore known two-for-one twisting machines.

As will be evident from the above, the arrangement of the endless conveyor creates the possibility of transporting delivery bobbins or delivery units comprising a protective pot, a protective pot bottom, the hollow spindle shank and also the delivery bobbin with bobbin sleeve, from one machine end to the individual spindles to be loaded without the employment of manual labor or the employment of a vehicle. If fully suffices to move the delivery bobbins by means of a vehicle or a conveyor belt to one head end of the machine from where the delivery bobbins or units by means of an endless conveyor are distributed around the machine to the range of the spindles. The arrangement of the endless conveyor below the spindle range brings about the advantage that in addition to facilitating the servicing and handling, the delivery bobbins placed in readiness are located outside the upwardly directed driving wind of the spindles and are located within the range of the lowest room temperature. When air conditioning or air humidification is provided, the delivery bobbins are located outside the interior of the machine in the direct range of action of the machine.

It is, of course, to be understood, that the present invention is, by no means, limited to the particular embodiments illustrated in the drawing but also comprises any modifications within the scope of the appended claims.

What is claimed is:

1. A two-for-one twisting machine having a frame and a plurality of spindles disributed along the frame at a first level and adapted for receiving delivering bobbins, a plurality of bobbin frames distributed along the frame at a second and higher level and adapted for receiving winding-up bobbins; and an endless conveyor member on said frame below said first level, said conveyor having support means distributed therealong at substantially the same longitudinal spacing as said spindles, said support means being adapted to support full replacement bobbins for said spindles, and drive means for driving said conveyor member to move the support means thereon around said frame.

2. A two-for-one twisting machine according to claim **1** in which said conveyor member also comprises means for receiving and supporting free winding-up bobbins.

3. A two-for-one twisting machine according to claim **1** in which said conveyor member also comprises means for receiving and supporting empty bobbin sleeves for said bobbin frame.

4. A two-for-one twisting machine according to claim **1** in which said endless conveyor member is a chain, and sprockets at the ends of said frame about which the chain is entrained, said drive means comprising means for driving at least one of said sprockets.

5. A two-for-one twisting machine according to claim **4** in which slide rail means are mounted on said frame and support said chain along the reaches thereof extending between said sprockets.

6. A two-for-one twisting machine according to claim **1** in which at least one reviving device is provided adjacent outwardly and upwardly on said conveyor member.

7. A two-for-one twisting machine according to claim **1** in which at least one reviving device is provided adjacent said conveyor member and is operable for supplying treatment material to full delivering bobbins as they are conveyed past the reviving device by said conveyor member.

8. A two-for-one twisting machine according to claim **7** in which said treatment material is liquid and is sprayed on said full delivering bobbins.

9. A two-for-one twisting machine according to claim **7** in which said treatment material is liquid and is applied directly to said full delivering bobbins.

10. A two-for-one twisting machine according to claim **7** which includes means for causing each full delivering bobbin to rotate at least one revolution while passing the reviving device.

11. A two-for-one twisting machine according to claim **7** which includes control means operated by one of each said full delivering bobbin and the support means therefor for making said reviving device effective for supplying treatment material to the respective full delivering bobbin.

12. A two-for-one twisting machine according to claim **11** in which said reviving device is pressure operable, a source of compressed air, and said control means when operated causing the supply of treatment material to said device and the supply of compressed air from said source to said device to effect dispensing of the material from the device to the respective bobbin.

13. A two-for-one twisting machine according to claim **7** which includes a duct within which said reviving device is mounted and through which said conveyor member moves, and deflectable means at the ends of the duct for closing the ends thereof while permitting said conveyor member and bobbins thereon to pass therethrough.

14. A two-for-one twisting machine according to claim **1** in which each spindle comprises a spindle rotor adapted to receive a delivery bobbin carrier unit, said full delivery bobbins are supplied to the support means of said conveyor member together with their said carrier units, and a threading device at at least one end of said frame.

15. A two-for-one twisting machine according to claim **14** in which said threading device comprises a passage extending axially through said support means, and suction means at said one end of the frame adapted to be coupled to said passage while the respective said support means travels about the adjacent one of said sprockets.

16. A two-for-one twisting machine according to claim

15 in which a plurality of suction means are provided spaced the same distance as said support means, a rotor coaxial with said adjacent sprocket supporting said suction means and rotatable with the sprocket, and means for axially displacing said suction means on said rotor to cause them to engage said support means and disengage therefrom.

17. A two-for-one twisting machine according to claim 16 which includes a common suction connection for said suction means located centrally of said rotor and connected to all of said suction means.

18. A two-for-one twisting machine according to claim 17 in which each suction means includes a valve operable automatically to open the suction means when in engagement with a respective support member and to close the suction means when disengaged from the support member.

19. A two-for-one twisting machine according to claim 16 in which said rotor forms a part of the said sprocket.

20. A two-for-one twisting machine according to claim 16 in which said means for axially displacing said suction means comprises stationary cam means adjacent said rotor and engaging said suction means.

21. A two-for-one twisting machine according to claim 15 in which each said support means includes a screen in the said passage thereof.

22. A two-for-one twisting machine according to claim 14 in which said threading device comprises a hollow pipe section adapted to be coupled to said support means from below during travel thereof about one end of the frame, said support means having an axial passage therethrough, and a threading needle moveable from said pipe section upwardly through the passage in said support means.

23. A two-for-one twisting machine according to claim 22 which includes arm means at said one end of the frame pivoted coaxially with the adjacent sprocket and oscillatable so as to follow a respective said support means during at least a portion of its travel about said sprocket.

24. A two-for-one twisting machine according to claim 23 in which said arm means is multiarmed and has a respective threading device on each arm.

25. A two-for-one twisting machine according to claim 23 which includes fluid motors for actuating said arm means and said threading needle.

26. A two-for-one twisting machine according to claim 23 which includes a housing on said arm means, a disc rotatable in the housing, said housing having a tangentially directed opening, said threading needle being attached at one end to said disc and being wound thereabout and having its eye end displaceable through said opening upon rotation of said disc.

27. A two-for-one twisting machine according to claim 1 which includes a further conveyor member adjacent said second level for receiving filled winding-up bobbins from said bobbin frame.

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DONALD E. WATKINS, *Primary Examiner.*

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