March 29, 1927. 1,622,812

H. SCHNEIDER

DOFFING MECHANISM FOR SPINNING, TWISTING, AND LIKE MACHINES

Filed July 30. 1924 4 Sheets-Sheet 1

Fig. 1

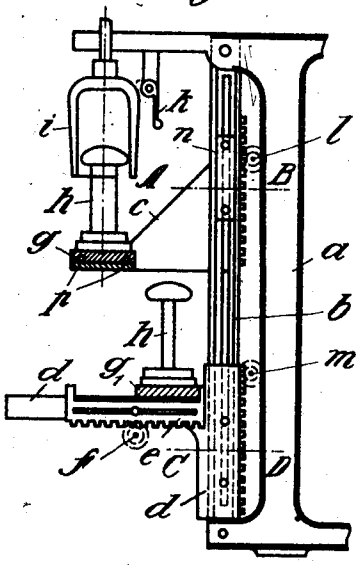


Fig. 2

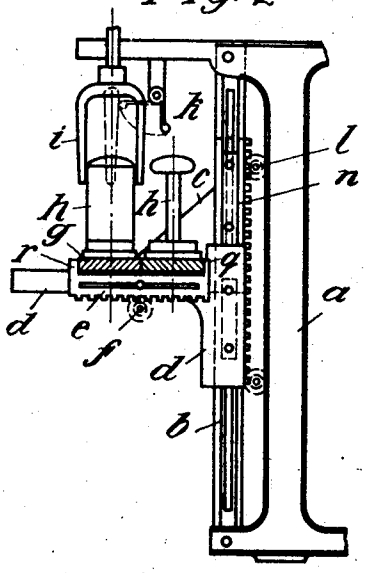


Fig. 3

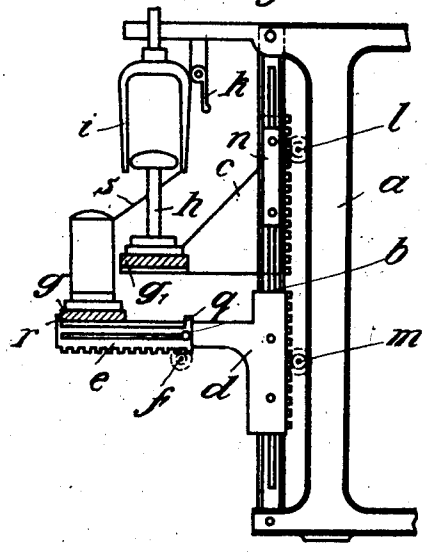


Fig. 4

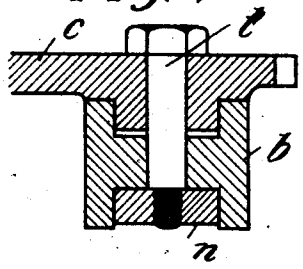
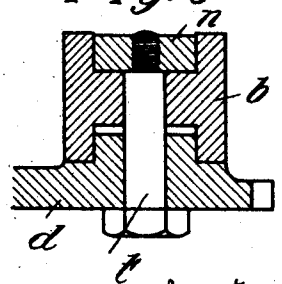


Fig. 5



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DOFFING MECHANISM FOR SPINNING, TWISTING, AND LIKE MACHINES

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Fig. 6

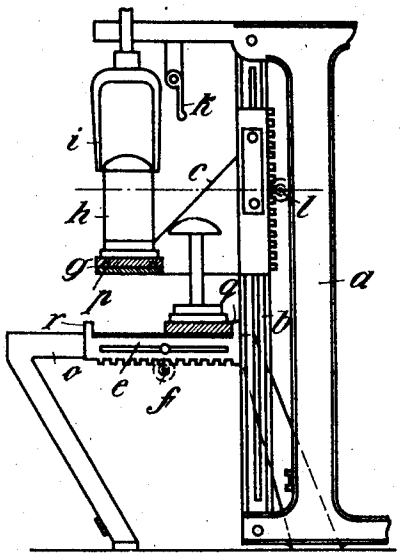


Fig. 7

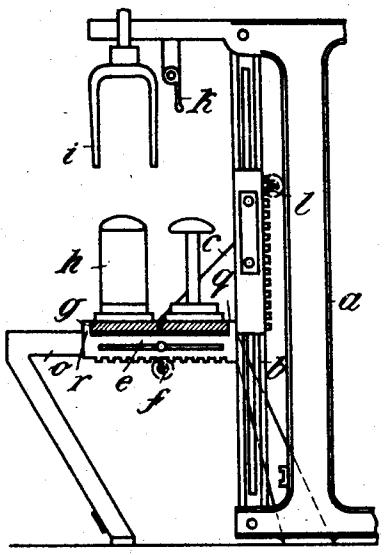


Fig. 8

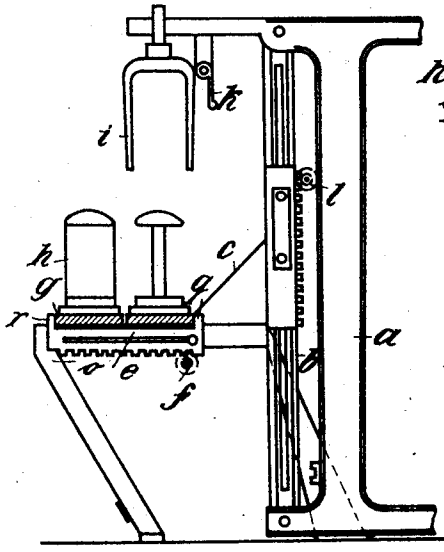
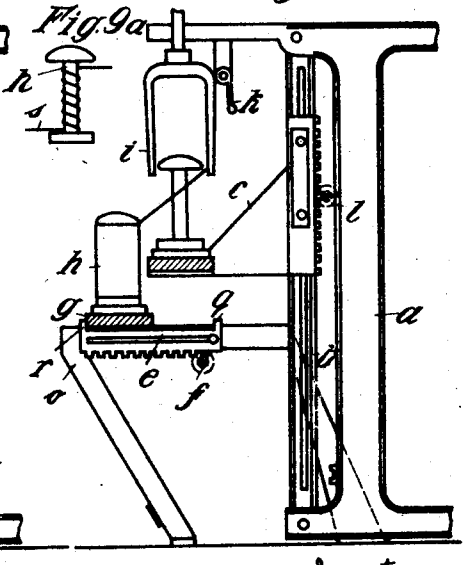


Fig. 9

Fig. 9a



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DOFFING MECHANISM FOR SPINNING, TWISTING, AND LIKE MACHINES

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Fig. 10

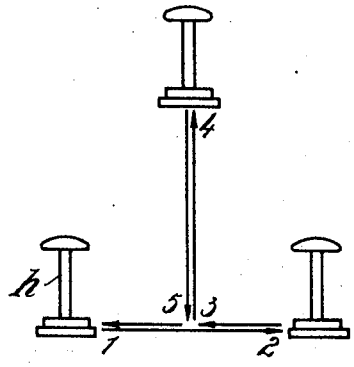


Fig. 11

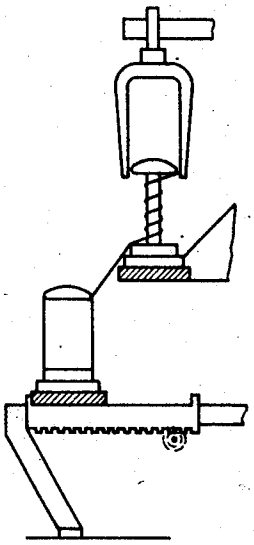
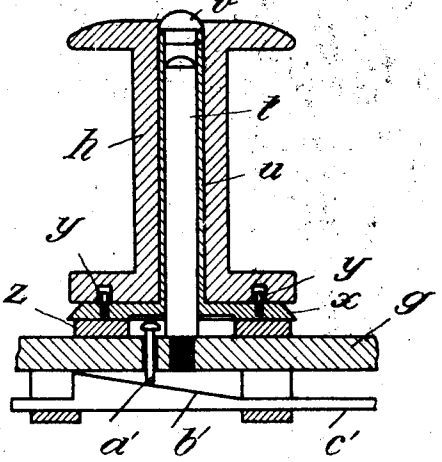


Fig. 12



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DOFFING MECHANISM FOR SPINNING, TWISTING, AND LIKE MACHINES

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Fig. 13

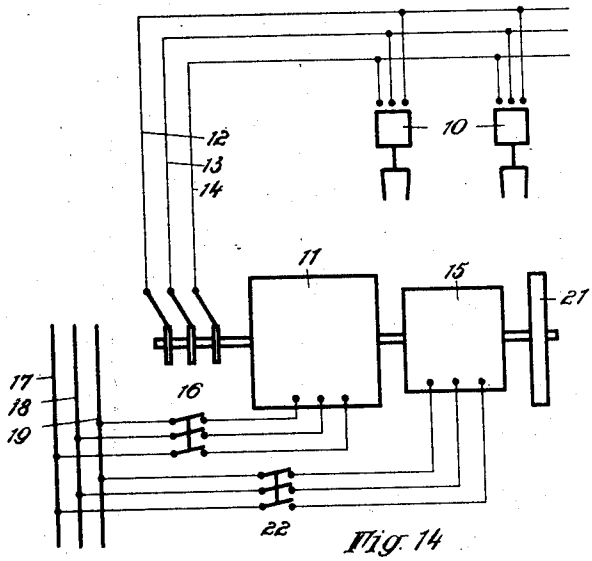


Fig. 14

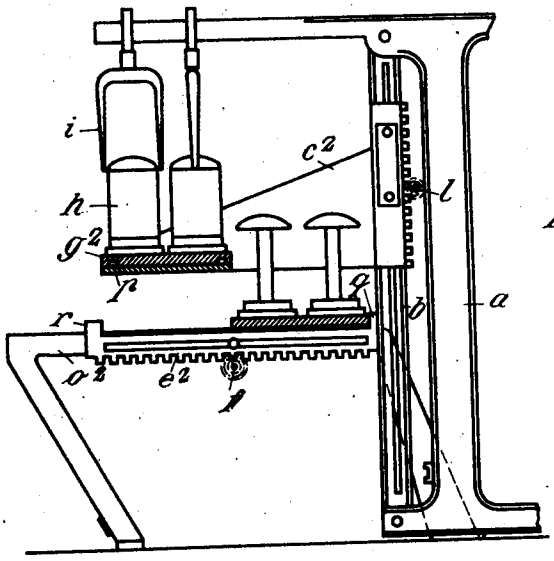
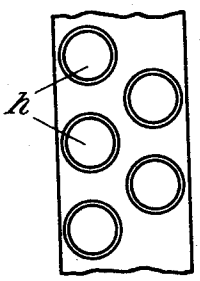


Fig. 15



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Patented Mar. 29, 1927. 1,622,812

UNITED STATES PATENT OFFICE.

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DOFFING MECHANISM FOR SPINNING, TWISTING, AND LIKE MACHINES.

Application filed July 30, 1924, Serial No. 729,130, and in Germany February 5, 1924.

This invention relates to improvements in and appertaining to doffing mechanism for spinning, twisting and like machines for the production of yarns or threads and more particularly to the type of machines known as flyer frames and having detachable duplicate and interchangeable rails.

The hitherto known doffing mechanisms with bobbin spindle rails for spinning, twisting and like machines are as a rule built in between the vertical standards of the framework of the machine. The division of the bobbin spindle rail must therefore correspond with the spacing of the standards intermediate the two end frames. This is in many cases very inconvenient, but was generally accepted. It has, however, already been suggested to place the front edges of the machine standards in the rear of the bobbin spindle rails, when the rails are in their working position. In spite of this the doffing mechanism has been allowed to remain on the standards themselves as heretofore and if not every standard at least every every other standard has been equipped with the appropriate parts for attaching the mechanism. Besides the doffing mechanism a second mechanism for the lifting motion of the spindle rail must also be provided.

In order to avoid unfavorable compromises between the division of the spindle rail and the spacing of the standards and the like, according to my invention special guide rails are placed in front of the standards independent of the spacing of the standards. A further advantage of this construction is that the manufacture of special guide rails is simpler than the otherwise necessary machining of the standards. The machine designer is furthermore no longer dependent upon the pitch of the spindles when arranging the standards, but may place them so that the greatest possible strength of the construction is obtained. The spindle rail guides may then on their part be so arranged, that the division of the spindle rails is effected in the most convenient manner.

A further advantage is obtained by each guide rail serving for the doffing motion as well as for the lifting motion. In this manner simplifications and consequently savings in the construction of the machine are attained. The guide rails may have any suitable cross-section and tubes, for instance, may be employed for this purpose. It is, however, advisable to provide separate guide faces for the doffing and the lifting motion on the common guide rail. The slides for the two mechanisms moving along these common guide rails may then overlap and longer slides with better guidance may be used than permissible if the two slides move along the same guide face.

In the drawings affixed to this specification and forming part thereof several embodiments of my invention are illustrated by way of example.

Figs. 1 to 3 show the improved mechanism in side elevation with the working parts in three different positions,

Figs. 4 and 5, illustrate two cross-sections of the guide rail and of the two slides employed for the doffing and lifting motion,

Figs. 6 to 9 show a modified doffing mechanism in different positions,

Fig. 9[a] shows the position of a thread wound on an empty bobbin,

Fig. 10 is a diagram of the movements of the bobbin during doffing,

Fig. 11 the position of the full and the empty bobbin, as well as the position of the thread when a special manner of tying is employed,

Fig. 12 is a vertical section of a device for facilitating the starting of the bobbins,

Fig. 13 represents the wiring diagram for an electric flyer device,

Fig. 14 shows in a view similar to Fig. 6 an arrangement of flyers and bobbins in staggered relation, and

Fig. 15 shows a plan view of the staggered bobbins.

Similar reference characters indicate like parts throughout the several views of the drawings.

Referring to the drawings, *a* represents one of the standards of the machine and *b* a guide-rail mounted upon or between the standards *a*. Upon the guide-rail are supported on different slide faces firstly the bracket carrier *c* for the bobbin rail and secondly a movable slide *d* for doffing purposes. Both the bracket *c* and the slide are in their rear formed as or provided with racks, which are engaged by pinions *l* and *m* the rotation of which cause the lifting and the doffing motion. On the horizontal arm of the slide *d* a carriage *e* is mounted, which is provided on its under side with a rack with which a pinion *f* gears. The carriage is furthermore provided with the detents *r* and *q*. The arms of the flyer are indicated

by the letter *i* and the bobbins or the like by the letter *h*.

The arrangement of the two slide faces for the bracket carrier *c* and the slide *d* is clearly shown in the Figures 4 to 5, which show horizontal sections through the guide-rail *b* along the lines 4—4 and 5—5 of Figure 1. The bracket carrier *c* is guided along one face of the guide rail *b*, which is H-shaped in cross-section and the slide *d* on the other face, counterplates *n* connected by cross-bolts *t* being employed.

Figure 1 shows the bobbins *h* in the spinning position, i. e. they are moved up and down by the lifting mechanism comprising the bracket *c* and the rack operated by turning the pinion *l* alternately clockwise or counter-clockwise until the bobbin has received its full complement of yarn. The spinning frame is then stopped and the slide *d* with the second bobbin rail *g'* is raised by turning the pinion *m* to such an extent that the bobbin rail *g'* together with rail *g* passes beyond the heads of the holding pins *p*. The parts then take up the positions according to Figure 2 with both bobbin rails supported by slide *d*. By putting the hinged rail *k* against the flyer arms *i* which may be in any position all the arms are brought into the position shown in broken lines. By turning the pinion *f* the carriage *e* can be moved to the left, the projection or nose *q* carrying the bobbin rails *g* and g^1 along until the rail g^1 with the empty bobbins takes up the spinning position between the flyer arms. Now the slide *d* is lowered to such an extent that the winding spaces of the full and the empty bobbins overlap each other by a small amount. The rail g^1 is thereby deposited upon the holding pins *p* on the bracket *c*, their position being shown in Figure 3. By a few revolutions of the arms *i* the yarn *e* is wound a few times around the stems of the empty bobbins, the full bobbins supplying the necessary length of thread. Now the yarn is severed for which purpose a suitable knife may be used, when the motors have been stopped, for instance by arresting the arms *i* by means of the rail *k*.

The spinning process is then commenced again. The full bobbins are replaced by empty ones during the spinning, the slide *d* is lowered to its extremest position and the rail *g* with the empty bobbins is moved by means of the carriage *c* and the nose *r* towards the right into the rear-position (such as shown in Fig. 1 at g^1) ready for use. The carriage *e* is then moved towards the left a sufficient distance until the nose *q* comes in contact with the rail *g*. The initial position of the parts illustrated in Figure 1 is then reached again.

In the present case the bobbin rails describe the square path already known. This manner of operation is however, only possible, if the spinning frame has only a single row of flyers. With two rows of flyers in staggered arrangement such as is shown in Fig. 14, a lateral motion of the bobbins at the level of the arms can no longer be carried out. According to this invention the doffing is here carried out in such a manner, that the rail with the full bobbins is deposited upon the slide below the flyer arms, whereupon the side motion is carried out and ultimately the rail with the empty bobbins is raised again into the spinning position. After the full bobbins have been replaced by the empty ones the reserve rail is again moved towards the right into the rear position of readiness. Each bobbin rail thus describes along its entire path the figure of an inverted T as shown by the arrows in Fig. 10. This manner of doffing has the further advantage, that instead of the vertically movable slide a simpler and cheaper stationary bracket may be provided.

This arrangement will be more fully explained with reference to the Figures 6 to 9. Referring to these figures *a* is again a standard of the machine frame, *b* a guide rail, *c* the bracket for the bobbin rail *g* and *o* a stationary bracket upon which the carriage *e* with rack is adapted to slide horizontally. This slide is operated by the pinion *f* and the noses *r* and *q* serve for carrying the bobbin rails along, as already described with reference to Figures 1 to 3.

Similar elements, such as *g*, *c*, *o*, and *e* are indicated by similar but indexed reference characters g^2, e^2, o^2, and e^2 in Figure 14, where the staggered bobbins are indicated by *h*, *h'*, the different steps to be described with relation to Figures 6 to 9, similarly applying to the form shown in Figure 14.

Figure 6 shows the bobbin *h* in its lowest spinning position. The vertically reciprocating motion is effected as in the before described construction by suitably operating pinion *l*. As soon as the bobbin has received its full complement of yarn the bracket *c* is lowered by means of its rack and the pinion *l* until the bobbin rail *g* rests upon the stationary bracket *o*. The movable bracket *c* is moved a little below this position, so that the holding pins *p* become disengaged from the bobbin rail *g*. The parts then take up the position shown in Figure 7.

Now the carriage *e* is moved towards the left by means of the pinion *f*, the nose *q* carrying along the bobbin rail *g* with the full bobbins and the rail *g'* with the empty bobbins, see Figure 8. Now the bracket *c* is again raised by turning the pinion *l*. The pins *p* engage the bobbin rail *g'* and this rail is raised into the lowest spinning position. This position is shown in Figure 9. The winding spaces of the full and

empty bobbins hereby overlap by a small amount. By a few revolutions of the flyer arms *i* the yarn *s* is then wound upon the empty bobbin. This takes place in such a manner, that one or two convolutions are put upon the empty bobbin by the flyer and by the rotation of the empty bobbin caused hereby several convolutions are wound off the full bobbin and on to the empty bobbin. The starting of the yarn winding upon the empty bobbin *h* is shown in Figure 9a. By means of the rail *k* the arms *i* are then again arrested, so that the operative can sever the yarn *s* at the place where it passes from the empty to the full bobbin. Now the ordinary spinning operation takes place with the co-operation of the drive for raising and lowering the bobbin. The operative now replaces the full bobbin by empty ones and returns the reserve rail into the position of readiness when the other bobbins are at or near the upper-spinning position.

The movements carried out by an individual bobbin during the doffing will now be described with reference to the diagram shown in Figure 10. The empty bobbin is here inserted on the left-hand side (in front of the operator) in the position 1 in place of the removed full bobbin. It is then moved towards the right into the position 2 (position of readiness in the rear) then pushed into the position 3, then raised into the position 4 and there wound with yarn. The full bobbin when lowered from the position 4 into the position 5, is pushed towards the left together with the empty bobbin, the full bobbin thereby arriving at position 1 (original position 1 of the empty bobbin). The reversed T-figure, which the bobbin describes during the doffing operation will be clearly understood from the diagram without further description.

The pushing of the reserve rail under the bobbins which are in the operative position at the time or near the upper spinning position demands a certain amount of attention on the part of the operator.

It is, however, possible to carry out the transverse motion at any time and for this purpose to dispose the carriage track as low as desired, if the winding start is confined to a few convolutions only. In mechanically driven spinning frames this causes, however, some difficulties. The conditions become more favourable in frames with electrically driven flyers and self-braking bobbins. The starting of the bobbin winding may then be effected by feeding the motors with a few periods of alternating current (period impulse). For this purpose the generator is excited for a short time. It thus depends upon the attention of the operative and this method demands a certain amount of skill, which is rendered entirely unnecessary by the hereafter described arrangement.

In case the flyer motors are supplied with current from a slip-ring asynchronous machine 11 (Fig. 13) whose slip rings are connected to the conductors 12, 13 and 14 that lead to the flyer motors 10, it is possible to produce a limited number of periods by exciting the stator a suitable length of time. These periods decrease automatically in amplitude if the rotor is enabled to freely accelerate to its asynchronous speed. The asynchronous generator 11 is driven by means of a motor 15 for producing the current for the flyer motors 10. Motor 15 however, is not thrown into circuit when the yarn windings are started on the bobbins and the asynchronous machine acts as a motor thrown into circuit without load when its stator is excited. It will quickly accelerate up to its asynchronous speed, whereby the periods of the current supplied from the slip rings of the flyer motors 10 commence with the periodicity of the line frequency and decrease so far as their amplitude is concerned, gradually to zero (period impulse with decreasing amplitude). In case the frequency of the current supplied thru mains 17, 18 and 19 is too high or in case the masses of the generator 11 and motor 15 to be accelerated are too great the aggregate 11, 15 may first be brought to a certain speed by means of motor 15. Then, by simultaneous switching, the motor current is interrupted at switch 20 and generator 11 is excited by closing switch 16. In that case the period impulse does not commence with the line periodicity but at a correspondingly lower periodicity (for instance 30, in case the aggregate 11, 15 was previously brought up to half the asynchronous speed at a line frequency of 60). In this manner fewer turns of yarn may be wound on the bobbin for starting than would be possible when exciting the generator 11 at standstill. Inversely, considerably more starting windings may be put onto the bobbin if the generator is previously brought to a certain speed opposite to the direction of its rotor field or if its inertia is increased by providing a fly wheel 18 on its shaft.

In the lowered position of the full bobbin an effect limiting the number of convolutions is furthermore obtained by the thread which leads off the full bobbin and which rests upon the edge of the empty bobbin foot thereby causing an additional braking action upon the empty bobbin. The braking action is set up on the one hand by the friction of the yarn upon the foot of the bobbin and furthermore by the bobbin being more strongly forced against the supporting friction washer by the drag of the yarn.

A corresponding position of the empty bobbin with the yarn winding started is shown in Figure 11, which will be readily understood from the above explanation.

How many convolutions are at the start wound upon the empty bobbin depends upon the strength of the yarn spun and the braking strain when starting. If the yarn is weak it is advisable to lay only a few convolutions around the empty bobbin, so that the convolutions can slip slightly when the flyers are started and that consequently a smaller drag or pull upon the yarn is produced when the bobbins are accelerated.

When starting spinning, twisting and similar machines with flyers and self-braking bobbins, it is necessary to accelerate the bobbins up to the normal speed. The flyer must consequently during this period perform more work and transmit it through the yarn to the bobbin. Still more unfavourable are the conditions in spinning machines with mechanical doffing arrangements, where during the starting of the winding not only the empty bobbins, but also the full bobbins must be rotated.

According to this part of my invention lifting pins, noses, cams, fingers or the like are movably arranged underneath the bobbins or their brake feet in order to facilitate the starting of the bobbins. By means of these parts the bobbins are raised, rest upon a smaller contact surface and the braking action upon the bobbins is thereby considerably reduced. It is furthermore advisable to arrange the pins, noses, cams or the like as near as possible to the axis of rotation or to dispose them in this axis itself, so that the braking takes place upon as small a lever arm as possible. An embodiment of this part of my invention is shown in Figure 12.

Referring to this figure g is the bobbin rail 60 a dead spindle upon which a tube u with cap v and brake plate x is arranged. The bobbin h is coupled with the brake plate x by driver pins y and a friction ring z, which may be fixed upon the brake plate or the rail g. Into the rail g a round headed pin 61 is inserted adjacent to the dead spindle the pin resting with its tower end upon the inclined plane 62. This plane is provided on a bar 63 c', which is adapted to be moved in the direction of the spindle or bobbin rail.

When this bar 63, is moved towards the right the inclined plane 62 raises pin 61. This pin abuts with its round head against the brake x and raises it so that the friction ring z is thrown out of action. It is obvious, that it will then require less effort to turn the bobbin, dragging on pin 61, than with the full surface of the friction ring z exerting its braking action. By employing a material with a low coefficient of friction for the pin 61 the friction may be reduced to a minimum.

The lifting of the bobbin may also take place by a pin or the like disposed in the axis of the bobbin. The spindle t is then provided with a bore in which the pin is journaled, which abuts at its upper end against the cap v.

Other modifications within the ambit of my claims will suggest themselves to those skilled in the art.

What I claim is:—

1. In doffing mechanism for spinning, twisting and like machines in combination, bobbin rails disposed in front of the machine frames and special guide rails for the spinning and doffing motion, disposed independent from the spacing of the machine standards.

2. In doffing mechanism for spinning, twisting and like machines in combination, bobbin rails disposed in front of the machine frames and common guide rails for the doffing and spinning motion.

3. In doffing mechanism for spinning, twisting and like machines in combination, bobbin rails disposed in front of the frames and common guide rails with separate guide faces for the spinning and doffing motion.

4. In a doffing mechanism for spinning, twisting and like machines with two rows of flyers in staggered arrangement in combination, bobbin rails disposed in front of the machine frames, special guide rails for the spinning motion and a stationary horizontal carriage track for the doffing motion.

5. In a doffing mechanism for spinning, twisting and like machines with two rows of flyers in staggered arrangement in combination, bobbin rails disposed in front of the machine frames, special guide rails for the spinning motion and a stationary horizontal carriage track for the doffing motion, each bobbin rail describing a movement of the shape of an inverted T.

6. In a doffing mechanism for spinning, twisting and like machines with two rows of flyers in staggered arrangement in combination, bobbin rails disposed in front of the machine frames, special guide rails for the spinning motion and a stationary horizontal carriage track for the doffing motion, said horizontal track being located so high that in the lowest spinning position the winding spaces of the full and empty bobbins overlap by a small amount only.

7. In machanism for starting the winding of yarn upon self-braking bobbins in spinning, twisting and like machines with electrically driven flyers in staggered arrangement in combination, bobbin rails disposed in front of the machine frames, special guide rails for the spinning motion and a stationary horizontal carriage track for the doffing motion, filled bobbins disposed so low under the empty bobbins that after delivery of a short period rush automatically decreasing in amplitude the yarn unwound from the full bobbin is adapted to pass across the foot

of the empty bobbin and to exert an additional brake action upon said empty bobbin.

8. In mechanism for starting the winding of yarn upon self-braking bobbings in spinning, twisting and like machines with electrically driven flyers in staggered arrangement in combination, bobbin rails disposed in front of the machine frames, special guide rails for the spinning motion and a stationary horizontal carriage track for the doffing motion, filled bobbins disposed so low under the empty bobbins that after delivery of a short period rush automatically decreasing in amplitude the yarn unwound from the full bobbin is adapted to pass across the foot of the empty bobbin and to exert an additional brake action upon said empty bobbin, said period rush being so chosen in relation to the starting period number and the total number of the periods that a more or less tight adhesion of the yarn upon the empty bobbin is attained.

9. Doffing mechanism for spinning, twisting and like machines in combination, bobbin rails disposed in front of the machine frames, special guide rails for the spinning and doffing motion, and means for facilitating the starting of the bobbin.

10. In doffing mechanism for spinning, twisting and like machines in combination, bobbin rails disposed in front of the machine frames, special guide rails for the spinning and doffing motion, and a pin adapted to raise the bobbin and reduce the braking action between bobbin and rail.

11. In doffing mechanism for spinning, twisting and like machines in combination, bobbin rails disposed in front of the machine frames, special guide rails for the spinning and doffing motion and a pin disposed as near as possible to the axis of rotation of the bobbin and adapted to raise the bobbin and reduce the braking action between bobbin and rail.

12. In a doffing mechanism for spinning, twisting and like machines in combination, bobbin rails disposed in front of the machine frames, guide rails for the doffing and spinning motion and a stationary horizontal carriage track for the doffing motion.

In testimony whereof I affix my signature.

HEINRICH SCHNEIDER.