This invention relates to skein winding machines for skeins of the kind comprising a plurality of loops adapted to be secured by a paper or like band with one end of the thread accessible for unwinding.

The expression "thread" is used herein to include thread or yarn of any material and size and the expression "band" is similarly generic to bands, loops, or other embracing devices for securing the loops of the skein in bunched or collected form through which the thread may be drawn for unwinding.

Hitherto, in machines for winding skeins of the kind referred to, the winding has been stopped for the severance, banding, doffing and other subsequent operations. Where relatively short skeins are being produced, the idle time of such machine becomes relatively disproportionate even where a plurality of winding stations are provided as the winding on the whole machine is stopped during the operation of doffing &c. at all the stations and before recommencing winding.

The object of the present invention is an improved method of and means for winding such skeins in a continuous operation, and without stopping the winding.

The invention comprises the method of winding skeins of thread of the kind comprising a number of loops adapted to be secured by a paper or like band, with one end of the thread accessible for unwinding, wherein skeins are wound in continuous and uninterrupted succession on a plurality of holders at a winding station, and the thread subsequently severed, and the holders progressed from the winding station in continuous operation.

The improved method may include doffing from the holders after progression from the winding station.

The improved method may include the use of a plurality of holders rotated through a cycle of stations for winding, banding, severing, and doffing in continuous operation.

According to the invention, a machine for the continuous winding of skeins according to the method aforesaid comprises a rotatable winding head and a skein holder having a plurality of skein holding members and means synchronised with the winding for indexing the skein holder to move the holding members round to successive stations and to present successive skein holding members to the winding head for continuous and interconnected winding of successive skeins and so that the connecting thread extends between adjacent skein holding members at the same end of the holder, a cutter for severing the completed skein from the next succeeding skein after the winding of the latter has been sufficiently established or completed, and mechanism for actuating the cutter synchronised with the winding of a succeeding skein.

Such machine may be characterised in that the skein holder comprises a rotatable drum with a plurality of skein holding arms, the cutter for severing the skein from its next succeeding skein being located at a station subsequent to the winding station leaving one or more holders with wound skeins thereon at an intermediate station or stations for banding or other operation on the skein; or further characterised in that the thread cutter comprises a movable cutter adapted to pick up the thread at the connection between two successive skeins with means for moving such cutter back along the last loop of the first-wound skein and means for operating the cutter in the length of such last loop so that it may be close to a band on the skein and so as to leave the end to the first loop of the succeeding skein long; or further characterised in that the cutter is moved in a circular path embracing one of the skein holding members so as to pick up the thread and bring the cutter into the desired severing position; or further characterised by doffing means comprising arms normally positioned behind the skein as it is progressed into a doffing station succeeding the severing station and means for moving said arms to push the skein off the skein holding arms in synchronised relation to the winding; or by means for traversing the winding head relative to the skein holding members during winding so as to give a flat skein.

In the accompanying drawings—

Fig. 1 is a plan of one example of a machine for the continuous winding of skeins and made in accordance with the invention.

Fig. 2 is an end elevation of the machine shown in Fig. 1.

Figs. 3 and 4 are fragmentary front elevations and end elevations to a larger scale. Fig. 5 is a fragmentary plan to a larger scale. Figs. 6 and 7 are fragmentary elevation and plan to a larger scale.

Fig. 8 is a fragmentary elevation, and Fig. 9 a section on 9—9 of Fig. 8 showing a portion of the indexing mechanism.

In the example of the invention shown in the drawings the improved winding machine comprises a table top of inverted L shape, arranged so that the operative may sit at 45° at the angle for the operation of fixing the bands on the skeins.
While the machine is working, along the base of the L and on top of the table is mounted an electric motor 11 having its pulley 1a connected by a driving belt 12 to the pulley 13 of a winding head which, through a worm (not shown) drives a worm wheel 14 on a shaft 15. The winding head shaft 16 which is driven from the shaft 15 through skew gears 1a and 1b has a through hole at the thread 17 and is slidably mounted in two arms 1a and 1b of a bearing bracket 18 and adapted to be reciprocated endwise (axially) by a fork 19 on a rocker shaft 19a engaging a groove in a cam 20, described later, to effect a winding traverse. The bracket 18 is mounted on a platform 21 having slots 21a (see Fig. 5) to permit sliding adjustment of the bracket, so that the position of the winding head may be adjusted for different lengths of skein. The winding head itself comprises a balanced flyer arm 22 having two eyes 22a, 22b through which the thread is led from a cop or spool not shown mounted on a holder positioned between the legs of the table and through the spindle 16 of the winding head. The cop may be located in any other suitable position.

In front of the winding head and in line with the inner edge of the base of the L is a skein holder consisting of a shaft 23 mounted in brackets 23a level with the shaft 16 of the winding head and carrying a pair of spaced bosses 24 and 25, each having eight spokes 24a and 25a to form eight skein holders. Along the arm of the L-shaped table is a further shaft 26, hereinafter termed the main shaft, which at one end is connected by a train or system of changeable spur wheels 27, 28 and 29 to a shaft shown by lay shaft 30 of grooved turn is driven by worm gearing 31 from the end of the shaft 15. The system of changeable spur pinions includes the usual slotted arm, not shown, pivot about the main shaft 26 and having a bearing stud, not shown, adjustable along the slot in the arm to carry the idle spur wheel 28. This gearing is arranged so that the pinion 29 is advanced one tooth for each revolution of the flyer and therefore the number of teeth on the gear 27 equals the number of turns of the flyer for one revolution of the shaft 28 and therefore 432 is the number of turns of thread in each skein. On the main shaft 26 and immediately adjacent to the spur wheels system aforesaid is the grooved cam wheel 20 below which is the rocker shaft 19a carrying a stud 19b located in the cam groove, such rocker shaft being mounted in bearing brackets 18c on the table and carrying at its other end the fork lever 19 aforesaid for traversing the winding head shaft 16. Adjacent the grooved cam 20 and on the main shaft 26 is a spiral quick drop cam 31, whilst below and slightly behind the skein holder shaft 23 is a doffing roller 32 (not shown in Fig. 1 but see especially Figs. 3, 4 and 5) mounted in the brackets 23a supporting the skein holder shaft, and having a pair of curved arms 32a positioned inside the spoke hubs 24, 25 of the skein holder. On the outer end of the doffing roller 32a is an arm 34a adapted to engage the periphery of the quick drop cam 32, the roller being held in contact with the cam by a tension spring 35 connected to a further arm 35a fixed to the doffing shaft 33 (see Figs. 3 and 4).

On the main shaft 26 is a worm (not shown) which is engaged with a worm wheel 23b rotatably mounted on the end of the skein holder.
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zontal rearwardly projecting pair of spokes 24a, 25a of the skein holder, and at the same time is traversed by the fork 19 under the action of the cam 20 to give a flat skein. According to the selection of the spur wheels 27, 26, 29, the main shaft 26 is rotated a complete turn for the predetermined number of loops to form the skein. When such number of turns have been wound, the holding pawl 35 will be tripped by its trip arm 42a. Meanwhile, rotation of the main shaft 26 will have rotated the worm wheel 25b on the skein holder shaft 23 through 3/4 of a turn moving the hook 23a in its groove to compress the spring 23d so that immediately on tripping of the holding pawl, the skein holder will be rotated through nearly 3/4 of a turn until the check pawl 40 stops such rotation. Further rotation of the main shaft releases the check pawl 40 so that the skein holder turns a little further to be located by the holding pawl thus completing its 3/4 turn and moving into its normal position for presenting the next pair of skein holding members to the flyer as determined by the holding pawl. All the while during such movement of the skein holder to its next station, the flyer arm is turning and without interruption of winding it commences to wind the next skein on the next presented pair of spokes. The movement of the skein holder is timed, relative to the flyer so that the length of thread connecting the two skeins extends between the skein holding members 24a, i.e. at the same end of the holder. This is essential to enable the pick up and severing mechanism described later to operate effectively. The flyer may make two or three turns while these next spokes are in their temporary position, as defined by the check pawl, and the initial turns of winding will occur during such period until the skein spokes assume their normal position.

The cutter and doffer mechanisms are actuated as follows. The cycle of movement of the cutter starts from a position in which its carrying arms 44a are horizontally disposed with the hook retracted as shown in Fig. 7. The position of the cutter is indicated at 45a in Fig. 3. Immediately after the skein holder has reached its new position, as determined by the check and holding pawls, the face grooved cam 47a turns the cutter shaft clockwise to the upper position for the hook as shown at 45b (Fig. 3). The peripheral groove cam 47b then advances the hook to its extreme extended position as shown in Fig. 4 above and on the inside of the rearwardly directed skein spoke 24a; then the hook and cutter are turned anti-clockwise by the action of the cam 47a so that the hook engages the thread which lies across between such spoke and the one above it and moves round behind it, as shown in Fig. 5, and at the same time the hook is slowly withdrawn by the action of the cam 47b but so that the hook reaches its final position as shown at 45c, Fig. 3, before its final stage of withdrawal movement for severance. Thus, severance occurs within the last turn of the first wound skein and so that the end there to is a substantially solidated position within the skein and close to the label which will have been fitted by the operative, as described later. The other end of the thread to the next wound skein is relatively long. The cutter is then turned back to its horizontal position at 45a, Fig. 3, during which movement the hook may be moved forward sufficiently to open it and ensure release of the ends, after which the hook is withdrawn, the cutter and hook being then in the position from which it started.

After severance, the skein holder is indexed to its next position, the severed skein being carried down in front of the doffer arms 33a and simultaneously with the commencement of movement of the hook for severing the next skein, the doffer arm shaft is released by its cam 32 and under the action of its spring 33, the shaft is turned and the doffer arms push off the severed skein. The doffer arms are moved back by their cam in time to be behind the next skein as the skein holder moves to the next position.

The skeins, as they are wound, are carried forward through three idle stage positions between the winding and severing positions, and whilst in such positions, the operative may affix one or more bands 55 (see Figs. 3 and 5) to each skein, according to the speed of the machine and the skill of the operative. A shelf 56 and damper 51 may be provided adjacent the skein holder so as to be readily accessible to the operative.

The invention is obviously not limited to all the details of the example above described, many of which may be modified without departing from the nature of the invention; for example, other arrangements of cams, or equivalent mechanisms could be employed for effecting movement of the several parts of the machine.

I declare that what I claim is:

1. A machine for the continuous winding of skeins of thread, comprising a rotatable winding head, a rotatable drum disposed in operative relation to said head and having a plurality of skein-holding arms arranged in pairs, and means synchronized with the winding but acting independently of the speed of rotation of the winding head for indexing the skein-holder drum immediately the winding head has completed a predetermined number of revolutions to move the holding members round to successive stations, said indexing means comprising a spring associated with the shaft of said drum, means for loading the spring as the winding progresses while holding the drum against rotation, means for releasing the drum on completion of the predetermined number of revolutions of the winding head thereby to permit instantaneous rotation of said drum by said spring to present the next pair of holding members to the winding head, thread severing means for severing a completed skein from the next succeeding skein and mechanism for actuating said severing means during any period of winding operation for another skein.

2. A machine for the continuous winding of skeins of thread, comprising a rotatable winding head, a rotatable drum disposed in operative relation to said head and having a plurality of skein-holding members, means synchronized with the winding but acting independently of the speed of rotation of the winding head for indexing the skein holder immediately the winding head has completed a predetermined number of revolutions to move the holding members round to successive stations to present successive skein-holding members to the winding head for continuous and interconnected winding of successive skeins and so that the connecting thread extends between adjacent skein-holding members at the same end of the holder, thread-severing means for severing a completed skein from the next succeeding skein, and mechanism for actuating said severing means during any period
of a winding operation for another skein, said
severing means comprising a movable blade and
a stationary cutter blade, said movable blade
adapted to pick up the thread at the connection
between two successive skeins with means for
moving such cutter blade back along the last
loop of the first-wound skein, and means for
operating the movable cutter blade relative to
the stationary blade in the length of such last
loop thereby to sever the thread at a predeter-
mined point on the skein and leave the end to
the first loop of the succeeding skein long, said
severing means being moved in a circular path
embracing one of the skein-holding members
so as to pick up the thread and bring the cutter
into the desired severing position.

3. A machine for the continuous winding of
skeins of thread, comprising a rotatable winding
head, a rotatable drum disposed in operative
relation to said head and having a plurality of
skein-holding members, means synchronized
with the winding but acting independently of
the speed of rotation of the winding head for
indexing the skein holder immediately the wind-
ing head has completed a predetermined num-
ber of revolutions to move the holding members
round to successive stations to present succe-
sive skein-holding members to the winding head
for continuous and interconnected winding of
successive skeins and so that the connecting
thread extends between adjacent skein-holding
members at the same end of the holder, thread-
severing means for severing a completed skein
from the next succeeding skein, and mechanism
for actuating said severing means during any
period of a winding operation for another skein,
doffing means comprising arms normally posi-
tioned behind the skein as it is progressed into
a doffing station succeeding the severing station,
and means for moving said arms to push the
skein off the skein holding members in synchro-
nized relation to the winding.

FRANK OSBORNE.

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