April 25, 1950 J. H. SENIOR ET AL 2,505,690

TEXTILE FIBER OPENING APPARATUS

Filed March 21, 1947 2 Sheets-Sheet 1

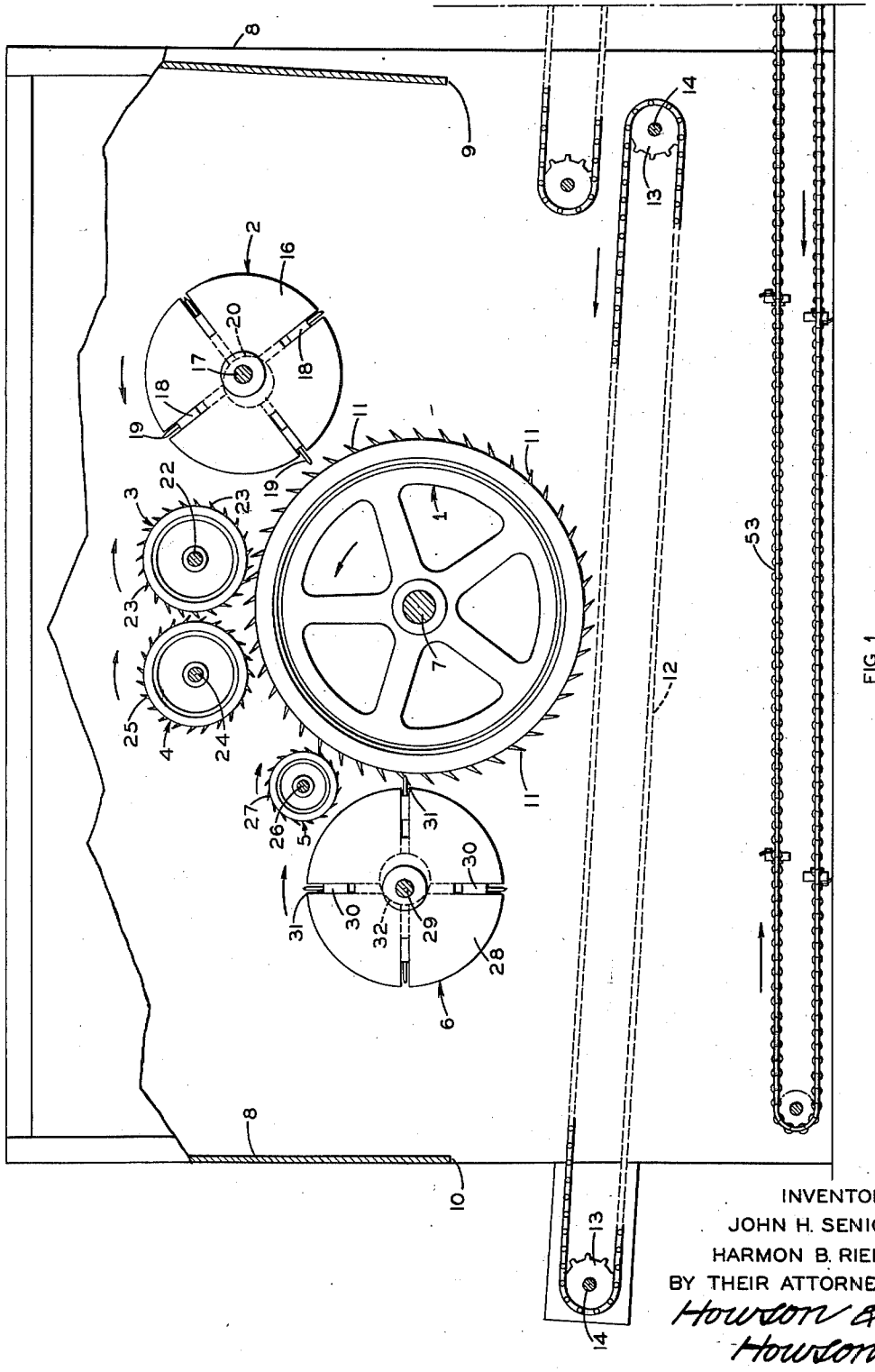


FIG. 1.

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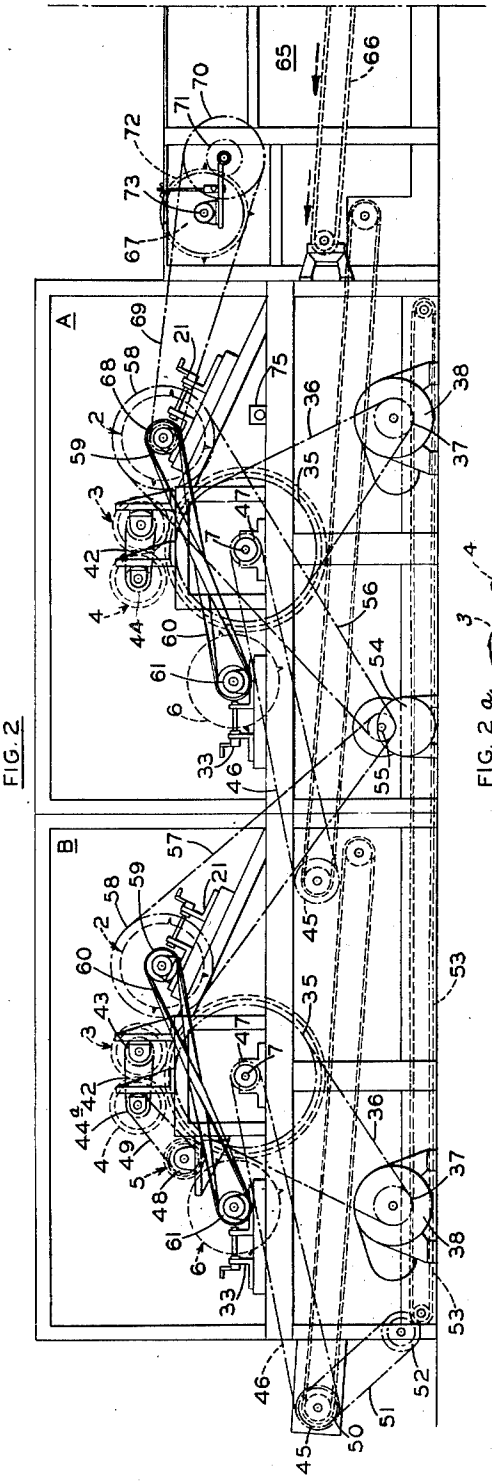


FIG. 2

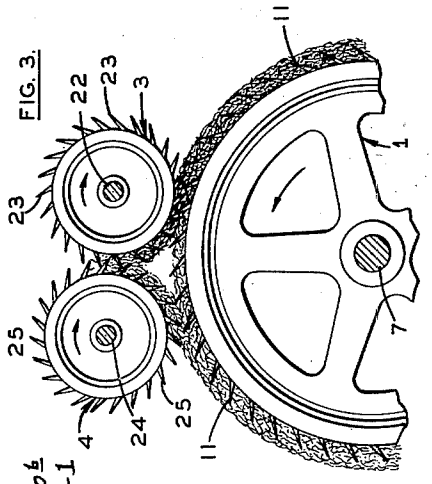


FIG. 3.

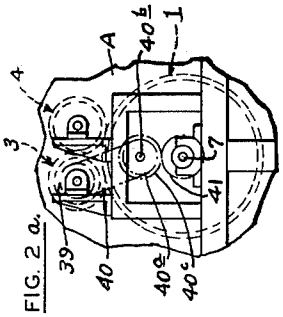


FIG. 2a.



FIG. 4.

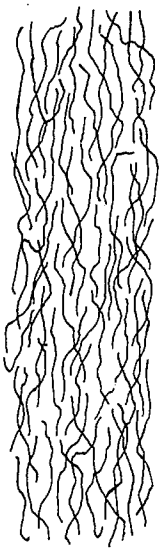


FIG. 5.

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UNITED STATES PATENT OFFICE

2,505,690

TEXTILE FIBER OPENING APPARATUS

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Application March 21, 1947, Serial No. 736,384

18 Claims. (Cl. 19—80)

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This invention relates to new and useful improvements in apparatus for processing textile fibres and more particularly to apparatus for opening wool and similar fibres preparatory to scouring or otherwise processing them.

Present day practice for opening wool and similar fibres preparatory to scouring or other treatment involves a number of different operations and several different pieces of equipment or apparatus usually are required. Usually the practice consists in feeding bags or bales of wool to a bale breaker in the number and fibre combination desired. The wool is fed to the bale breaker by fleeces or clumps torn off in hand size, and the stock is then subjected to the action of an oscillating comb or its equivalent which produces a chopping action on the fibres tending to break up the larger clumps into smaller increments. This action of the comb effects only a very little opening of the fibres in the smaller increments into which the larger clumps are broken, and the fibres are then conducted to a machine known as a picker which operates to effect some smaller additional opening of the clumps of fibres.

In these pickers the fibres are gripped by a series of fluted feed rolls which push the fibres against a larger cylinder having pins on its peripheral surface which tear the larger clumps of fibres, breaking them into smaller pieces and delivering them by centrifugal force to the discharge side of the picker. These smaller clumps of fibres then are conducted to a cylinder opener which may consist, for example, of two or more sets of high speed drum cylinders, having spikes secured in their peripheral surfaces, together with fluted feed rolls which operate to force the fibres against the first cylinder which spins it to the second cylinder turning in an opposite direction and from which it is then spun to the discharge side. The fibres processed as described are not particularly satisfactory since large lumps and various sizes of clumps can easily pass through the high speed cylinders with no opening action on the individual fibres taking place, and the tearing action of the cylinders tends to break down the fibres so that no uniformity in the opening thereof is effected because of the high speed and the very little contact obtained.

From the opener the wool may be conducted to a machine known as a willow or duster where

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it is tumbled about and a large volume of air blown through it at high speed for the purpose of removing from the fibres any sand or dirt that has been shaken loose from them. This essentially is a cleaning operation intended to remove as much foreign matter from the fibres as possible prior to scouring but the effectiveness of such cleaning operation depends entirely upon the extent to which the fibres have been opened by the preceding treatment afforded by the breaker, picker and wool opener device.

Present practices for opening fibres, such as that just described, involve installations of several pieces of rather complicated machinery, and furthermore, are rather harsh in their treatment of the textile fibres in addition to being limited in the amount of wool that can be processed in a given period of time. Other disadvantages and difficulties also are present in such methods of opening fibres. One of these is the build-up of fibre greases on the machinery. It is generally accepted that this build-up of grease is due to the beating or slapping of the fibres by the speed of the machinery and the depositing of this grease from the fibres on the working parts of the machine. Present day equipment usually requires a shutdown for the purpose of removing greases from the machinery at least once a day and sometimes as frequently as twice in an eight hour working shift. Apart from this, it is generally recognized in the industry that present day methods of opening fibres, cause the fibres to be torn, broken, twisted and noiled due to the high speed action of the machinery and by the harsh handling of the fibres thereby.

With the foregoing in mind, the principal object of the present invention is to provide novel apparatus, adapted to replace the customary bale breaker, picker and cylinder opener, which embodies novel features of construction and arrangement of parts operable to produce a materially greater production capacity than heretofore and at the same time provide a substantially increased opening of the textile fibres by a considerably more gentle treatment thereof.

Another object of the invention is to provide apparatus or equipment of the character set forth having a production capacity up to nearly three times the production capacity of present day fibre opening equipment.

Another object of the invention is to provide

apparatus of the type described which embodies novel features of construction and is arranged to provide a substantially higher production capacity at substantially lower operating speeds than heretofore.

Another object of the present invention is to provide apparatus or equipment for opening textile fibres wherein the build-up of fibre greases upon the working parts of the machinery is substantially minimized and whatever grease is deposited thereon is wiped off by the following fibres and carried out of the machine.

A further object of the present invention is to provide novel apparatus and equipment as set forth, embodying novel features of construction and arrangement operable to minimize any tendency of the textile fibres being broken, twisted or nolled.

A further object of the invention is to provide novel apparatus or equipment as described, in which the textile fibres are conveyed in a straight forward manner and which is devoid of reciprocal combs or other complex and difficult motion parts that require frequent adjustment and incur considerable maintenance and wear.

A still further object of the present invention is to provide textile fibre opening apparatus or equipment of the type described embodying speed control means which is arranged and operable to control closely the rate of production of the machinery.

A further object of the present invention is to provide textile fibre opening apparatus or equipment of the character set forth wherein all of the working parts have rotary motion and are provided with adjustable clearances, thereby permitting a uniform quality of opening to be obtained over a wide range of types of fibres.

Still a further object of the present invention is to provide equipment or apparatus of the type described, having the advantages and characteristics set forth, which is of comparatively simplified construction, and entirely efficient and effective in operation and use.

These and other objects of the present invention and the various features and details of construction and operation thereof are hereinafter fully set forth and described with reference to the following drawings, in which:

Fig. 1 is a diagrammatic side elevational view of a textile fibre opening machine made according to the present invention;

Fig. 2 is a side elevational view of an installation of fibre opening apparatus comprising two of the fibre opening units of Fig. 1 together with suitable mechanism for driving the same and feeding the fibres thereto;

Fig. 2a is a fragmentary elevational view from the opposite side of unit A of the apparatus shown in Fig. 2.

Fig. 3 is a detached fragmentary view illustrating the operation of the main cylinder and associated worker and stripper rolls upon the fibres; and

Figs. 4 and 5, respectively, are schematic views representing a comparison between similar textile fibres before and after being opened by the apparatus of the present invention.

Referring now to the drawings and more particularly to Fig. 1 thereof, a textile fibre opener unit made according to the present invention may comprise a main cylinder 1, doffer cylinder 2, worker roll 3, stripper 4, a second worker roll 5 and a second stripper cylinder 6. However, in

certain cases hereinafter described, the second worker roll 5 may be omitted from a particular unit or units.

The main cylinder 1 is secured upon a horizontal shaft 7 which has its opposite ends journaled in opposite side walls of a casing or housing structure 8 that is adapted to entirely enclose the opener unit with the exception of inlet and discharge openings 9 and 10 provided in the end walls thereof. The main cylinder 1 and shaft 7 are rotationally driven in the counterclockwise direction with respect to Fig. 1 of the drawings, and suitably secured to the peripheral surface of the cylinder are a plurality of relatively coarse spikes 11 which are arranged in predetermined courses both circumferentially and lengthwise of the cylinder 1 and project angularly outward from the surface of the cylinder in the general direction of rotation thereof.

Arranged below the main cylinder 1 is an endless conveyor 12 that is slightly inclined with respect to the horizontal and adapted to travel in a direction opposite or contrary to the direction of rotation of the main cylinder 1. The conveyor 12 may be driven by means of pulleys 13, 13 mounted on shafts 14, 14 journaled in the side walls of the housing 8 and driven at a preselected speed from exteriorly of the housing.

The raw textile fibres to be opened, for example, wool or the like, are deposited upon the conveyor 12 and are carried thereby toward and against the main cylinder 1 where they are impinged on the spikes or pins 11 thereof and carried upwardly thereby. It is to be noted that relatively close clearance is provided between the surface of the conveyor 12 and the ends of the pins or spikes 11 on the main cylinder 1 and, by virtue of this arrangement, together with the fact that the conveyor 12 moves in a direction opposite the direction of travel of the cylinder 1, insures the main cylinder picking up a substantially deep or thick layer of fibres which is of uniform depth across the entire length of the face of the main cylinder. As this relatively thick layer of fibres is carried upward by the main cylinder, excess fibres over and above a predetermined thickness or depth upon the cylinder 1 are removed by the doffer 2 and thrown thereby back upon the conveyor 12 to be again fed to the main cylinder 1.

The doffer cylinder 2 preferably is of the retractable pin type and may be constructed, for example, as shown and described in United States Letters Patent No. 2,372,543. Briefly such a cylinder may comprise a shell 16 secured on a shaft 17 having its ends journaled in the opposite sides of the unit housing 8. Mounted in the shell 16 for radial sliding movement with respect to the shaft 17 are pin bars 18, each having a series of pins 19 projecting outwardly therefrom, and an eccentric member 20 is associated with the shaft 17 and arranged to project and retract the pin bars 18 and pins 19 carried thereby.

With reference to Fig. 1, it is to be noted that the doffer cylinder 2 is rotationally driven in the counterclockwise direction and hence moves in the opposite direction to travel of the main cylinder 1 at the point of tangency between them. In the present instance, the construction and arrangement of the eccentric 20 of the doffer cylinder is such that the pins 19 on the bars 18 are fully projected at the point of tangency to the main cylinder 1. It is to be noted, also, that the pins 19 of the doffer cylinder 2 do not inter-

cept or lap the spikes 11 of the main cylinder 1 and suitable mechanism such as indicated at 21 in Fig. 2 of the drawings is provided for adjustably positioning the doffer cylinder 2 relative to the main cylinder 1 so that the clearance between the pins 19 and spikes 11 may be varied as desired to regulate the depth or thickness of the layer of fibres that will be left on the main cylinder 1 by the doffer 2 to be conveyed to the worker roll or cylinder 3.

The worker roll or cylinder 3 is fixed on a shaft 22 which has its ends journaled in the opposite side walls of the housing 8. The worker 3 and its shaft 22 are rotationally driven in the clockwise direction with respect to Fig. 1 of the drawings and hence at the point of tangency between them the said worker 3 and main cylinder 1 travel in the same direction. The worker roll 3, however, is driven at a speed of rotation providing a peripheral speed in feet per minute which is substantially less than the peripheral speed in feet per minute of the main cylinder 1. Secured to the peripheral surface of the worker 3 is a plurality of pins 23 which project angularly from said peripheral surface in a direction trailing the direction of rotation of said roll 3 so that at the common tangent of the main cylinder 1 and the worker roll 3 the angular disposition or relationship of the main cylinder spikes 11 and the worker roll pins 23 is substantially the same. In the illustrated embodiment of the invention the pins 23 on the worker roll 3 are finer than the spikes 11 on the main cylinder 1 and are approximately one-half the size thereof.

For most uses of the opener, the pins 23 of the worker 3 intercept or lap the spikes 11 of the main cylinder 1 as relative rotation thereof takes place thereby producing a combing action upon the fibres on the main cylinder in the general direction of their movement. However, the extent to which the pins 23 of the worker 3 intercept or lap the spikes 11 of the main cylinder will vary depending upon the requirements of the particular work and to provide for this variation the worker roll 3 is mounted so that it may be adjusted relative to the main cylinder 1 and between positions in which the ends of the pins 23 are tangent to the ends of the cylinder spikes 11 and in which the pins 23 intercept or lap the spikes 11 of the cylinder 1 to the maximum extent permissible by the length of the shorter pins 23 of the worker roll 3. The fact that at the point of tangency or interception between the worker 3 and main cylinder 1 their dirction of travel is in the same direction, insures a gentle opening of the fibres without tearing or breaking them, the opening of the fibres actually being accomplished by the difference in the peripheral speeds of travel of the two rolls or cylinders 1 and 3.

The stripper 4 is mounted circumferentially of the main cylinder 1 adjacent the worker roll 3 and has its shaft 24 suitably journaled in the opposite side walls of the housing 8. As in the case of the worker 3, the stripper 4 is driven in the clockwise direction with respect to Fig. 1 of the drawings at a speed of rotation somewhat faster than the worker 3. Associated with the surface of the stripper 4 is a plurality of pins 25 which are arranged in courses both circumferentially and axially thereof and project at an acute angle from the peripheral surface of the stripper cylinder in the general direction of rotation thereof.

By this arrangement of the pins 25 on the stripper cylinder 4 it will be apparent that, at the point of tangency between the stripper 4 and worker 3, the pins 25 will be traveling in the opposite direction from the pins 23 of the worker 3 so that the fibres impinged or impaled on the pins 23 of the worker 3 will be stripped off by the pins 25 of the stripper 4. As the pins 25 of the stripper 4 strip the fibres from the worker roll 3, the direction of rotation of the stripper 4 is such as to deposit or transfer the fibres from said stripper back onto the spikes 11 of the main cylinder 1. The peripheral speed of the stripper 4 is slightly greater than that of the worker 3 but is still substantially less than the peripheral speed of the main cylinder 1 and hence the fibres removed from the worker 3 by the stripper 4 will be carried away from the latter by the main cylinder 1. This action is diagrammatically illustrated in Fig. 3 of the drawings.

From the stripper 4 the textile fibres may be conveyed by the main cylinder 1 to a second worker roll 5 which is secured on a shaft 26 that is journaled in the side walls of the housing 8 and rotationally driven in the clockwise direction with respect to Fig. 1 of the drawings so that, at the point of tangency between them the worker 5 and main cylinder 1 travel in the same direction. The worker roll 5 has secured thereto a plurality of pins 27 which project angularly from the peripheral surface of the roll in a direction trailing its direction of rotation so that at the point of tangency of the main cylinder and the worker roll 5, the angular disposition or relationship of the main cylinder spikes 11 and the worker roll pins 27 is substantially the same and the resulting combing action produced upon the fibres in the manner previously described effects a further opening of the fibres. The worker roll 5 is adapted to be driven at a peripheral speed substantially less than that of the first worker 3 thus providing a working interval on the fibres of appreciably longer duration than the first worker with the result that a more complete working of the fibres, which have been partially opened by the action of the first worker, is obtained without damage to the fibres. Also, this differential in speed between the first and second worker rolls is desirable in order to prevent the opening and working effected by the first worker from possibly being nullified by the second worker if it operated at the same speed as the first worker. Moreover, this difference in speed assures that even if the pins of the second worker should line-up and start at the same openings or workings produced by the first worker, the longer duration of action afforded by the slower speed of the second worker will give more complete results. Furthermore, in the illustrated embodiment of the invention, it will be observed that the said worker 5 and its pins 27 are smaller, respectively, than the worker 3 and its pins 23. As in the case of the first worker 3, the stripper roll 4 and the second worker roll 5 preferably are adjustably mounted with respect to the main cylinder in order that the extent of lap of the pins and spikes thereof may be varied depending upon the requirements of the particular work.

The now relatively open textile fibres are conveyed by the main cylinder 1 to a second stripper 6 which functions to strip textile fibres from both the second worker 5 and from the main cylinder 1 and to deposit these textile fibres upon the delivery end of the conveyor 12 whence they are carried out of the unit. Preferably the sec-

ond stripper 6 also is of the retractable pin type and may be constructed, for example, in accordance with United States Patent No. 2,372,543. Briefly such a cylinder or roll 6 may comprise a shell 28 secured on a coaxial oscillatory arranged shaft 29 and having radially slidable pin bars 30 each provided with a series of pins 31 projecting outwardly therefrom, an eccentric member 32 being associated with the shaft 29 and arranged to project and retract the pin bars 30 and pins 31 carried thereby in the manner described in said patent.

With reference to Fig. 1, it is to be noted that the stripper 6 is rotationally driven in the clockwise direction and hence moves in the same direction of travel as the main cylinder 1 at the point of tangency between them. In the present instance, the construction and arrangement of the eccentric 32 of the doffer cylinder is such that the pins 31 are fully projected at the point of tangency to the main cylinder 1. It is to be noted, also, that the pins 31 of the stripper 6 are intended to intercept or lap the spikes 11 of the main cylinder 1 and suitable mechanism, such as indicated at 33 in Fig. 2 of the drawings, is provided for adjustably positioning the stripper 6 relative to the main cylinder 1 so that the extent of lap of the pins 31 and spikes 11 may be varied as desired.

Apart from the foregoing, it is important to note that the stripper 6 is mounted and has its pins 31 arranged and operable so that they intercept or lap the pins 27 of the second worker 5 as well as the spikes 11 of the main cylinder 1. With this construction the stripper 6 operates to strip the fibres from both the second worker 5 and the main cylinder 1. Furthermore, at the underside of the stripper 6, it is desirable that its pins 31 be substantially entirely retracted so that the fibres stripped from the worker 5 and main cylinder 1 are completely disengaged from the pins 31 and deposited on the conveyor 12 as described.

By way of explanation and illustration of the relatively slow operating speeds of the rolls and cylinders in a unit embodying the present invention, it may be pointed out that in a typical installation, the main cylinder 1 may have a peripheral speed of approximately 100 feet per minute at about 10 R. P. M. in which event the other rolls or cylinders of the unit might be driven at about the following peripheral speeds:

	Feet per minute
Doffer 2	750
Worker 3	19
Stripper 4	25
Worker 5	12
Stripper 6	750

it being understood, of course, that the figures given are examples only, and that these speeds will vary widely in different installations depending upon the nature of the fibres being treated, production capacities desired, and numerous other features.

In many cases the nature of the fibres to be opened will be such as to require more work upon the fibres than is afforded in a single unit of apparatus such as disclosed in Fig. 1 of the drawings. In such cases, therefore, two or more such units are combined and arranged in series to perform successive opening work upon textile fibres fed therethrough, and a typical installation involving two opener units arranged in series is shown in Fig. 2 of the drawings in association

with suitable mechanism for feeding the raw textile fibres to the opener. As previously pointed out herein, in certain installations of fibre opening apparatus embodying the present invention the second worker 5 may be eliminated and a typical example of such an arrangement exists in installations embodying a plurality of opener units in which cases it is customary to eliminate the second worker 5 from all of the opener units except the last or final unit. Thus, with reference to Fig. 2 of the drawings, the first unit designated A of the installation, does not embody the second worker 5 and the second or final unit designated B is shown with the second worker 5 arranged and operable therein as previously described.

Apart from this variation in make-up of the individual opener units, Fig. 2 of the drawings illustrates a typical arrangement of the drives for the several elements of one or more units. Referring to Fig. 2 of the drawings, and particularly to opener unit A thereof, the main cylinder 1 has a large sprocket 35 fixed on its shaft 7 and this sprocket 35 is rotationally driven in counterclockwise direction with respect to Fig. 2 by means of a chain or the like 36 driven from a relatively small sprocket 37 fixed on the shaft of a motor or other suitable source of rotary power 38. The worker roll or cylinder 3 is rotationally driven in the clockwise direction by a sprocket 39 which is driven by a chain 40 from a sprocket 40*a* on a short shaft 40*b*, the latter having a gear 40*c* thereon that is meshed with and driven by a gear 41 on the shaft 7 of the main cylinder 1. The stripper 4 is driven in the same direction but at a faster speed than the worker 3 by means of a chain 42 which passes about sprockets 43 and 44 secured respectively on the shafts 22 and 24 of the worker 3 and stripper 4, the said sprockets 43 and 44 being of slightly different diameters so that the peripheral speed of the stripper 4 will be slightly greater than that of the worker 3 as previously described. The conveyor 12 is driven by a sprocket 45 from a chain 46 which is in turn driven by a relatively small sprocket 47 also on the shaft 7 of the unit main cylinder.

An identical drive arrangement is provided in the unit B of the installation, as shown in Fig. 2 of the drawings, the only difference being that the second worker 5 (which is not present in unit A) is driven by an associated sprocket 48 from a chain 49 driven by a double sprocket 44*a* associated with the stripper 4, the sprocket 48 associated with the worker 5 having a diameter slightly larger than the stripper sprocket 44 so that the second worker 5 is driven at a peripheral speed substantially less than that of the stripper 4. In addition to the foregoing, there is associated with the conveyor 12 of the opener unit B a sprocket 50 which is utilized to drive a chain 51 and through it a sprocket 52 that operates through suitable gearing to drive a conveyor 53 extending lengthwise beneath the opener units A and B at the bottom of the housing 8 and functions to collect and remove dust, dirt and other foreign matter which are shaken from the textile fibres undergoing processing.

The drive for the doffer cylinders 2 and strippers 6 of the units A and B have yet to be described, and reference to Fig. 2 of the drawings will disclose that these elements of both opener units A and B are driven from a common or single motor 54 which drives a double pulley 55 to in turn drive a pair of belts 56, 57 that, in turn, drive

pulleys 58, 58 associated with the respective doffer cylinders 2 of the opener units A and B. Also secured on the shafts 17 of the doffer cylinders 2 of the respective sections A and B, are pulleys 59, 59 which operate through suitable belts 60, 60 and pulleys 61, 61 to rotationally drive the strippers 6 of each unit, the arrangement being such that the strippers 6 are driven at the same peripheral speed as the doffers 2.

As shown in Fig. 2 of the drawings, there is provided at the intake end of the installation a feed hopper 65 in which the raw textile fibres to be opened are deposited. Positioned adjacent the bottom of the hopper 65 is a feed conveyor 66 which operates to support the textile fibres deposited in the hopper 65 and advance the same in the direction indicated by the arrows so that they are deposited upon the conveyor 12 of the first opener unit of the installation. Disposed above the conveyor 66 just outwardly adjacent the inlet opening to the unit A is a beater 67, preferably of the retractable pin type constructed, for example, as disclosed in the aforesaid Patent No. 2,372,543, which functions to break down roughly piled fibres on the conveyor 66 and thereby affect feed of a more or less uniform layer of the fibres from the conveyor into the first unit of the apparatus. This beater 67 may be driven from a sprocket 68 on the shaft 17 of the doffer 2 by a chain 69 which drives a sprocket 70 having associated therewith a gear 71 that is meshed with a relatively larger gear 72 on the shaft 73 of the beater 67.

Each of the motors 38 of the opener units A and B includes suitable variable speed devices which are constructed and arranged to provide a change of peripheral speed of the rolls and cylinders within the range of approximately 3 to 1. Also, in some installations it may be desirable to drive the doffers 2 and strippers 6 from the motors 38 instead of the motor 54 as described which may be of the constant speed type.

In a typical operation of apparatus constructed and arranged as herein described, the raw fibres to be opened are deposited in the hopper 65 upon the conveyor 66 by some suitable means such as, for example, a chute or another conveyor. The raw fibres are deposited by the conveyor 66 onto the conveyor 12 by which they are conveyed toward the main working cylinder 1. Preferably, the amount or depth of the fibres on the conveyor 12 to be carried to the main cylinder 1 is controlled, for example, by means of a photoelectric cell 75 which is arranged to sight across the mass or bed of fibres and operates to permit only a certain height or depth of fibres on the conveyor 12 by controlling the feed conveyor 66.

As the fibres are conveyed toward the main cylinder 1 they are impaled on the spikes 11 thereof and carried upward and over the main cylinder by its direction of rotation. The close clearance between the main cylinder 1 and the conveyor 12 as well as the fact that the conveyor and the main cylinder are travelling in opposite directions insures a large and uniform quantity of fibres in substantial depth across the face of the main cylinder. As the fibres are carried upward on the main cylinder 1 the retractable pin doffer 2 operates to doff-off excess fibres above a predetermined depth fixed by the setting of the doffer 2 through its adjusting means 21. The doffed fibres are then thrown back upon the conveyor 12 to be again carried forward to the cylinder 1. This doffing operation insures the delivery of a uniform depth of fibres to the first worker 3. It is reiterated that the pins 19 of doffer 2 do not lap or intercept the spikes 11 of the main cylinder and the clearance between these pins determines the depth of the layer of fibres which is to be carried on to the working roll 3.

At the worker 3 the spikes 11 of the main cylinder 1 and the pins 23 of the worker lap or intercept and opening work on the clumps of fibres is accomplished by the gentle combing action upon the fibres produced by the engagement thereof by the pins of the worker moving in the same direction but at a slower speed. As stated, the working roll 3 is adjustable from a tangent position of the pins 23 with respect to the spikes 11 of cylinder 1 down to full lap or interception depending on the requirements of the work. It will be noted that at the point of lap or interception the direction of travel is the same on the main cylinder 1 and the worker 3 thereby insuring a gentle opening of the fibres without tearing or breaking them, the opening of the fibres being effected by the difference in speed between the cylinder 1 and roll 3.

The stripper cylinder 4 has its pins 25 intercepting the pins 23 of the first worker 3 and it will be apparent that due to the slope of said pins, whatever fibres have been impaled on the pins of the worker 3 will be stripped off by the intercepting pins of the stripper 4. It should be noted that as the fibres are stripped from the worker 3, the direction of rotation of the stripper 4 and its pins 25 in relation to the main cylinder 1 and its spikes 11 is such as will deposit the fibres from the stripper 4 back onto the spikes 11 of the main cylinder 1. The peripheral speed of the stripper 4 is greater than that of the worker 3, but is less than the speed of the main cylinder 1, and hence the fibres will be carried away from the stripper by the main cylinder.

The fibres then pass onto the second worker 5. At this point the pins 27 of the worker and the main cylinder again intercept and the worker is adjustable in the same manner as the worker 3. Here the second and finer work of opening the fibres is accomplished and, as in the case of the worker 3, the travel of the worker 5 and the main cylinder 1 are in the same direction with resulting gentle combing of the fibres by engagement thereof by the pins moving in the same direction but at a substantially slower rate of speed, eliminating breaking and tearing of the fibres. After being subjected to the action of the worker 5, the stripper 6 operates to strip the fibres from both the worker 5 and main cylinder 1 and deposit said fibres again onto the conveyor 12 by which they are discharged out of the apparatus or into a succeeding opener unit. In opener units which do not embody a second worker roll 5, the operation of such units will be as described herein except for the operations performed by the said worker 5.

In Figs. 4 and 5 of the drawings, there is illustrated by comparative sketches, the opening effect upon a small clump of wool fibres produced by apparatus embodying the present invention. Fig. 4 shows the fibres prior to opening and Fig. 5 shows the fibres after opening wherein the spaces or interstices between all of the fibres is generally opened with only very little misalignment of the fibres from their original positions, a result indicative of gentle work on the fibres devoid of tearing or breaking them. It will be noted further that the opening of the fibres generally is in the direction which corresponds to the through

axis of the apparatus from feed to delivery end and not crosswise of the machine.

From the foregoing description, it will be observed that the present invention provides novel apparatus which replaces the customary bale breaker, picker and cylinder opener, and embodies novel features of construction and arrangement of parts operable to produce a materially greater production capacity than heretofore and at the same time provides a substantially increased opening of the textile fibres by a considerably more gentle treatment thereof. The invention also provides apparatus or equipment of the character set forth having a production capacity up to nearly three times the production capacity of present day fibre opening equipment while operating at substantially lower speeds than heretofore and thereby minimizing any tendency for the fibres to become broken, twisted or nol'ed.

Furthermore, the present invention provides textile fibre opening apparatus or equipment of the type described embodying speed control means which is arranged and operable to control closely the rate of production of the machinery, and wherein all of the working parts have rotary motion and are provided with adjustable clearances, thereby permitting a uniform quality of opening to be obtained over a wide range of types of fibres. In addition, the present invention provides equipment or apparatus of the type described, having the advantages and characteristics set forth, which is of comparatively simplified construction, and entirely efficient and effective in operation and use.

While a particular embodiment of the present invention has been illustrated and described herein, it is not intended that the invention be precisely limited to such disclosure and changes and modifications may be made therein and thereto within the scope of the following claims.

We claim:

1. In textile fibre opening apparatus, a fibre conveying cylinder arranged to be rotationally driven in a preselected direction at a relatively slow peripheral speed and having spikes projecting angularly from its peripheral surface in the general direction of rotation thereof, and operable to convey a relatively deep layer of textile fibres thereon, a worker roll adjacent the conveyor cylinder arranged to be rotationally driven in the opposite direction thereto at a peripheral speed substantially less than the speed of the cylinder and having pins trailing angularly from its peripheral surface arranged to lap the spikes of the cylinder and cooperate therewith to effect an opening of the textile fibres on said cylinder, and a stripper roll adjacent said cylinder and worker roll arranged to be rotationally driven in the opposite direction to said cylinder at a peripheral speed slightly faster than said worker and having pins projecting angularly from its peripheral surface in the general direction of rotation of the stripper arranged to lap the pins of said worker roll and the spikes of said main cylinder to thereby strip the fibres from the worker and deposit the same again upon the cylinder.

2. In textile fibre opening apparatus, a fibre conveying cylinder arranged to be rotationally driven in a preselected direction at a relatively slow peripheral speed and having spikes projecting angularly from its peripheral surface in the general direction of rotation thereof, and operable to convey a relatively deep layer of textile fibres thereon, a worker roll adjacent the cylinder arranged to be rotationally driven in the opposite direction thereto at a peripheral speed substantially less than the speed of the cylinder and having pins trailing angularly from its peripheral surface arranged to lap the spikes of the cylinder and cooperate therewith to effect an opening of textile fibres on said cylinder, a stripper roll adjacent said cylinder and worker roll arranged to be rotationally driven in the opposite direction to said cylinder at a peripheral speed slightly faster than said worker roll and having pins projecting angularly from its peripheral surface in the general direction of rotation of said stripper arranged to lap the pins of said worker roll and the spikes of said main cylinder to thereby strip the fibres from the worker and deposit the same again upon the cylinder, and a doffer adjacent the cylinder in advance of the worker roll arranged to be rotationally driven in the same direction as the cylinder at a relatively high peripheral speed and having pins projecting from its peripheral surface operable to doff-off from the cylinder textile fibres thereon in excess of a predetermined depth.

3. In textile fibre opening apparatus, a fibre conveying cylinder arranged to be rotationally driven in a preselected direction at a relatively slow peripheral speed and having spikes projecting angularly from its peripheral surface in the general direction of rotation thereof, and operable to convey a relatively deep layer of textile fibres thereon, a worker roll adjacent the cylinder arranged to be rotationally driven in the opposite direction thereto at a peripheral speed substantially less than the speed of the cylinder and having pins trailing angularly from its peripheral surface arranged to lap the spikes of the cylinder and cooperate therewith to effect an opening of textile fibres on said cylinder, a stripper roll adjacent said cylinder and worker roll arranged to be rotationally driven in the opposite direction to said cylinder at a peripheral speed slightly faster than said worker roll and having pins projecting angularly from its peripheral surface in the general direction of rotation of said stripper arranged to lap the pins of said worker roll and the spikes of said cylinder to thereby strip the fibres from the worker and deposit the same again upon the cylinder, a doffer adjacent the cylinder in advance of the worker roll arranged to be rotationally driven in the same direction as the cylinder at a relatively high peripheral speed and having pins extending from its peripheral surface operable to doff-off from the cylinder textile fibres thereon in excess of a predetermined depth, and means to adjust said doffer relative to the cylinder to vary the depth of the fibres left on said cylinder.

4. In textile fibre opening apparatus, a fibre conveying cylinder arranged to be rotationally driven in a preselected direction at a relatively slow peripheral speed and having spikes projecting angularly from its peripheral surface in the general direction of rotation thereof, and operable to convey a relatively deep layer of textile fibres thereon, a worker roll adjacent the cylinder arranged to be rotationally driven in the opposite direction thereto at a peripheral speed substantially less than the speed of the cylinder and having pins trailing angularly from its peripheral surface arranged to lap the spikes of the cylinder and cooperate therewith to effect an opening of textile fibres on said cylinder, a stripper roll adjacent said cylinder and worker roll arranged to be rotationally driven in the opposite direction to said cylinder at a peripheral

speed slight faster than said worker roll and having pins projecting angularly from its peripheral surface in the general direction of rotation of said stripper arranged to lap the pins of said worker roll and the spikes of said cylinder to thereby strip the fibres from the worker and deposit the same again upon the cylinder, and a second stripper roll adjacent said cylinder arranged to be rotationally driven in the opposite direction thereto at a relatively high peripheral speed and having pins extending from its peripheral surface arranged to lap the spikes of the cylinder to thereby strip the fibres therefrom.

5. In textile fibre opening apparatus, a fibre conveying cylinder arranged to be rotationally driven in a preselected direction at a relatively slow peripheral speed and having spikes projecting angularly from its peripheral surface in the general direction of rotation thereof, and operable to convey a relatively deep layer of textile fibres thereon, a worker roll adjacent the cylinder arranged to be rotationally driven in the opposite direction thereto at a peripheral speed substantially less than the speed of the cylinder and having pins trailing angularly from its peripheral surface arranged to lap the spikes of the cylinder and cooperate therewith to effect an opening of textile fibres on said cylinder, a stripper roll adjacent said cylinder and worker roll arranged to be rotationally driven in the opposite direction to said cylinder at a peripheral speed slightly faster than said worker roll and having pins projecting angularly from its peripheral surface in the general direction of rotation of said stripper arranged to lap the pins of said worker roll and the spikes of said cylinder to thereby strip the fibres from the worker and deposit the same again upon the cylinder, a second stripper roll adjacent said cylinder arranged to be rotationally driven in the opposite direction thereto at a relatively high peripheral speed and having pins extending from its peripheral surface arranged to lap the spikes of the cylinder to thereby strip the fibres therefrom, and conveyor means to receive the fibres stripped from said cylinder by said second stripper roll.

6. In textile fibre opening apparatus, a fibre conveying cylinder arranged to be rotationally driven in a preselected direction at a relatively slow peripheral speed and having spikes projecting angularly from its peripheral surface in the general direction of rotation thereof, and operable to convey a relatively deep layer of textile fibres thereon, a worker roll adjacent the cylinder arranged to be rotationally driven in the opposite direction thereto at a peripheral speed substantially less than the speed of the cylinder and having pins trailing angularly from its peripheral surface arranged to lap the spikes of the cylinder and cooperate therewith to effect an opening of textile fibres on said cylinder, a first stripper roll adjacent said cylinder and worker roll arranged to be rotationally driven in the opposite direction to said cylinder at a peripheral speed slightly faster than said worker roll and having pins projecting angularly from its peripheral surface in the general direction of rotation of said stripper arranged to lap the pins of said worker roll and the spikes of said cylinder to thereby strip the fibres from the worker and deposit the same again upon the cylinder, a doffer adjacent the cylinder in advance of the worker roll arranged to be rotationally driven in the same direction as the cylinder at a relatively high peripheral speed and having pins extending from its peripheral surface operable to doff-off from the cylinder textile fibres thereon in excess of a predetermined depth, and a second stripper roll adjacent said cylinder and following said first stripper roll, arranged to be rotationally driven in the opposite direction to the cylinder at a relatively high peripheral speed and having pins extending from its peripheral surface arranged to lap the spikes of the cylinder to thereby strip the fibres therefrom.

7. In textile fibre opening apparatus, a fibre conveying cylinder arranged to be rotationally driven in a preselected direction at a relatively slow peripheral speed and having spikes projecting angularly from its peripheral surface in the general direction of rotation thereof, and operable to convey a relatively deep layer of textile fibres thereon, a worker roll adjacent the cylinder arranged to be rotationally driven in the opposite direction thereto at a peripheral speed substantially less than the speed of the cylinder and having pins trailing angularly from its peripheral surface arranged to lap the spikes of the cylinder and cooperate therewith to effect an opening of textile fibres on said cylinder, a first stripper roll adjacent said cylinder and worker roll arranged to be rotationally driven in the opposite direction to said cylinder at a peripheral speed slightly faster than said worker roll and having pins projecting angularly from its peripherfal surface in the general direction of rotation of said stripper aranged to lap the pins of said worker roll and the spikes of said cylinder to thereby strip the fibres from the worker and deposit the same again upon the cylinder, a second stripper roll adjacent said cylinder following the first stripper roll arranged to be rotationally driven in the opposite direction to the cylinder at a relatively high peripheral speed and having pins extending from its peripheral surface arranged to lap the spikes of the cylinder to thereby strip the fibres therefrom, and conveyor means operable to feed textile fibres into engagement with the spikes of the cylinder at one side of the latter and at the other side thereof to receive the fibres stripped from said cylinder by said second stripper.

8. In textile fibre opening apparatus, a fibre conveying cylinder arranged to be rotationally driven in a preselected direction at a relatively slow peripheral speed and having spikes projecting angularly from its peripheral surface in the general direction of rotation thereof, and operable to convey a relatively deep layer of textile fibres thereon, a worker roll adjacent the cylinder arranged to be rotationally driven in the opposite direction thereto at a peripheral speed substantially less than the speed of the cylinder and having pins trailing angularly from its peripheral surface arranged to lap the spikes of the cylinder and cooperate therewith to effect an opening of textile fibres on said cylinder, a stripper roll adjacent said cylinder and worker roll arranged to be rotationally driven in the opposite direction to said cylinder at a peripheral speed slightly faster than said worker roll and having pins projecting angularly from its peripheral surface in the general direction of rotation of said stripper arranged to lap the pins of said worker roll and the spikes of said cylinder to thereby strip the fibres from the worker and deposit the same again upon the cylinder, and a second worker roll adjacent the cylinder following said stripper roll arranged to be rotationally driven in the opposite direction to said cylinder

at a peripheral speed less than the first worker and having pins trailing angularly from its peripheral surface arranged to lap the spikes of the cylinder and cooperate therewith to effect a further opening of the fibres.

9. In textile fibre opening apparatus, a fibre conveying cylinder arranged to be rotationally driven in a preselected direction at a relatively slow peripheral speed and having spikes projecting angularly from its peripheral surface in the general direction of rotation thereof, and operable to convey a relatively deep layer of textile fibres thereon, a worker roll adjacent the cylinder arranged to be rotationally driven in the opposite direction thereto at a peripheral speed substantially less than the speed of the cylinder and having pins trailing angularly from its peripheral surface arranged to lap the spikes of the cylinder and cooperate therewith to effect an opening of textile fibres on said cylinder, a stripper roll adjacent said cylinder and worker roll arranged to be rotationally driven in the opposite direction to said cylinder at a peripheral speed slightly faster than said worker roll and having pins projecting angularly from its peripheral surface in the general direction of rotation of said stripper arranged to lap the pins of said worker roll and the spikes of said main cylinder to thereby strip the fibres from the worker and deposit the same again upon the cylinder, a second worker roll adjacent the cylinder following said stripper arranged to be rotationally driven in the opposite direction to said cylinder at a peripheral speed less than the first worker and having pins trailing angularly from its peripheral surface arranged to lap the spikes of the cylinder and cooperate therewith to effect a further opening of the fibres, and a doffer adjacent the cylinder in advance of the first worker roll arranged to be rotationally driven in the same direction as said cylinder at a relatively high peripheral speed and having pins extending from its surface operable to doff-off from the cylinder textile fibres carried thereon in excess of a predetermined depth.

10. In textile fibre opening apparatus, a fibre conveying cylinder arranged to be rotationally driven in a preselected direction at a relatively slow peripheral speed and having spikes projecting angularly from its peripheral surface in the general direction of rotation thereof, and operable to convey a relatively deep layer of textile fibres thereon, a worker roll adjacent the cylinder arranged to be rotationally driven in the opposite direction thereto at a peripheral speed substantially less than the speed of the cylinder and having pins trailing angularly from its peripheral surface arranged to lap the spikes of the cylinder and cooperate therewith to effect an opening of textile fibres on said cylinder, a stripper roll adjacent said cylinder and worker roll arranged to be rotationally driven in the opposite direction to said cylinder at a peripheral speed slightly faster than said worker roll and having pins projecting angularly from its peripheral surface in the general direction of rotation of said stripper arranged to lap the pins of said worker roll and the spikes of said cylinder to thereby strip the fibres from the worker and deposit the same again upon the cylinder, a second worker roll adjacent the cylinder following said stripper arranged to be rotationally driven in the opposite direction to said cylinder at a peripheral speed less than the first worker and having pins trailing angularly from its peripheral surface arranged to lap the spikes of the cylinder and cooperate therewith to effect a further opening of the fibres, a doffer adjacent the cylinder in advance of the worker roll arranged to be rotationally driven in the same direction as the cylinder at a relatively high peripheral speed and having pins extending from its peripheral surface operable to doff-off from the cylinder textile fibres thereon in excess of a predetermined depth, and means to adjust said doffer relative to the cylinder to vary the depth of the fibres left on said cylinder.

11. In textile fibre opening apparatus, a fibre conveying cylinder arranged to be rotationally driven in a preselected direction at a relatively slow peripheral speed and having spikes projecting angularly from its peripheral surface in the general direction of rotation thereof, and operable to convey a relatively deep layer of textile fibres thereon, a worker roll adjacent the cylinder arranged to be rotationally driven in the opposite direction thereto at a peripheral speed substantially less than the speed of the cylinder and having pins trailing angularly from its peripheral surface arranged to lap the spikes of the cylinder and cooperate therewith to effect an opening of textile fibres on said cylinder, a stripper roll adjacent said cylinder and worker roll arranged to be rotationally driven in the opposite direction to said cylinder at a peripheral speed slightly faster than said worker roll and having pins projecting angularly from its peripheral surface in the general direction of rotation of said stripper arranged to lap the pins of said worker roll and the spikes of said cylinder to thereby strip the fibres from the worker and deposit the same again upon the cylinder, a second worker roll adjacent the cylinder following said stripper roll arranged to be rotationally driven in the opposite direction to said cylinder at a peripheral speed less than the first worker and having pins trailing angularly from its peripheral surface arranged to lap the spikes of the cylinder and cooperate therewith to effect a further opening of the fibres, and a second stripper roll adjacent said cylinder following said second worker roll arranged to be rotationally driven in the opposite direction to the cylinder at a relatively high peripheral speed and having pins extending from its peripheral surface arranged to lap the pins of the second worker and the spikes of the cylinder to strip the fibres therefrom.

12. In textile fibre opening apparatus, a fibre conveying cylinder arranged to be rotationally driven in a preselected direction at a relatively slow peripheral speed and having spikes projecting angularly from its peripheral surface in the general direction of rotation thereof, and operable to convey a relatively deep layer of textile fibres thereon, a worker roll adjacent the cylinder arranged to be rotationally driven in the opposite direction thereto at a peripheral speed substantially less than the speed of the cylinder and having pins trailing angularly from its peripheral surface arranged to lap the spikes of the cylinder and cooperate therewith to effect an opening of textile fibres on said cylinder, a stripper roll adjacent said cylinder and worker roll arranged to be rotationally driven in the opposite direction to said cylinder at a peripheral speed slightly faster than said worker roll and having pins projecting angularly from its peripheral surface in the general direction of rotation of said stripper arranged to lap the pins

of said worker roll and the spikes of said cylinder to thereby strip the fibres from the worker and deposite the same again upon the cylinder, a second worker roll adjacent the cylinder following the stripper arranged to be rotationally driven in the opposite direction to said cylinder at a peripheral speed less than the first worker and having pins trailing angularly from its peripheral surface arranged to lap the spikes of the cylinder and cooperate therewith to effect a further opening of the fibres, a second stripper roll adjacent said cylinder following said second worker roll arranged to be rotationally driven in the opposite direction to the cylinder at a relatively high peripheral speed and having pins extending from its peripheral surface arranged to lap the pins of the second worker and the spikes of the cylinder to thereby strip the fibres therefrom, and a doffer adjacent the cylinder in advance of the worker roll arranged to be rotationally driven in the same direction as the cylinder at a relatively high peripheral speed and having pins projecting from its peripheral surface operable to doff-off from the cylinder textile fibres thereon in excess of a predetermined depth.

13. In textile fibre opening apparatus, a fibre conveying cylinder arranged to be rotationally driven in a preselected direction at a relatively slow peripheral speed and having spikes projecting angularly from its peripheral surface in the general direction of rotation thereof, and operable to convey a relatively deep layer of textile fibres thereon, a worker roll adjacent the cylinder arranged to be rationally driven in the opposite direction thereto at a peripheral speed substantially less than the speed of the cylinder and having pins trailing angularly from its peripheral surface arranged to lap the spikes of the cylinder and cooperate therewith to effect an opening of textile fibres on said cylinder, a stripper roll adjacent said cylinder and worker roll arranged to be rotationally driven in the opposite direction to said cylinder at a peripheral speed slightly faster than said worker roll and having pins projecting angularly from its peripheral surface in the general direction of rotation of said stripper arranged to lap the pins of said worker roll and the spikes of said cylinder to thereby strip the fibres from the worker and deposit the same again upon the cylinder, and a second worker roll adjacent the cylinder following said stripper roll arranged to be rotationally driven in the opposite direction to said cylinder at a peripheral speed less than the first worker and having pins trailing angularly from its peripheral surface arranged to lap the spikes of the cylinder and cooperate therewith to effect a further opening of the fibres, a second stripper roll adjacent said cylinder arranged to be rotationally driven in the oppostie direction thereto at a relatively high peripheral speed and having pins extending radially of its peripheral surface arranged to lap the pins of the second worker and the spikes of the cylinder to thereby strip the open fibres from said worker and cylinder, and conveyor means operable to feed textile fibres into engagement with the spikes of the main cylinder at one side of the latter and at the other side thereof to receive the fibres stripped from said second worker and cylinder by said second stripper.

14. In textile fibre opening apparatus, a fibre conveying cylinder arranged to be rotationally driven in a preselected direction at a relatively

slow peripheral speed and having spikes projecting angularly from its peripheral surface in the general direction of rotation thereof, and operable to convey a relatively deep layer of textile fibres thereon, a worker roll adjacent the cylinder arranged to be rotationally driven in the opposite direction thereto at a peripheral speed substantially less than the speed of the cylinder and having pins trailing angularly from its peripheral surface arranged to lap the spikes of the cylinder and cooperate therewith to effect an opening of textile fibres on said cylinder, a stripper roll adjacent said cylinder and worker roll arranged to be rotationally driven in the opposite direction to said cylinder at a peripheral speed slightly faster than said worker roll and having pins projecting angularly from its peripheral surface in the general direction of rotation of said stripper arranged to lap the pins of said worker roll and the spikes of said main cylinder to thereby strip the fibres from the worker and deposit the same again upon the cylinder, a doffer adjacent the cylinder in advance of the worker roll arranged to be rotationally driven in the same direction as the cylinder at a relatively high peripheral speed and having pins projecting from its peripheral surface operable to doff-off from the cylinder textile fibres thereon in excess of a predetermined depth, and conveyor means operable to feed textile fibres into engagement with the spikes of the cylinder and to receive the fibres stripped from said cylinder by said doffer.

15. In textile fibre opening apparatus, a fibre conveying cylinder arranged to be rotationally driven in a preselected direction at a relatively slow peripheral speed and having spikes projecting angularly from its peripheral surface in the general direction of rotation thereof, and operable to convey a relatively deep layer of textile fibres thereon, a worker roll adjacent the cylinder arranged to be rotationally driven in the opposite direction thereto at a peripheral speed substantially less than the speed of the cylinder and having pins trailing angularly from its peripheral surface arranged to lap the spikes of the cylinder and cooperate therewith to effect an opening of textile fibres on said cylinder, a stripper roll adjacent said cylinder and worker roll arranged to be rotationally driven in the opposite direction to said cylinder at a peripheral speed slightly faster than said worker roll and having pins projecting angularly from its peripheral surface in the general direction of rotation of said stripper arranged to lap the pins of said worker roll and the spikes of said main cylinder to thereby strip the fibres from the worker and deposit the same again upon the cylinder, a second worker roll adjacent the cylinder following said stripper arranged to be rotationally driven in the opposite direction to said cylinder at a peripheral speed less than the first worker and having pins trailing angularly from its peripheral surface arranged to lap the spikes of the cylinder and cooperate therewith to effect a further opening of the fibres, a doffer adjacent the cylinder in advance of the first worker roll arranged to be rotationally driven in the same direction as said cylinder at a relatively high peripheral speed and having pins extending from its surface operable to doff-off from the cylinder textile fibres carried thereon in excess of a predetermined depth, and conveyor means operable to feed textile fibres into engagement with the

spikes of the cylinder to receive the fibres stripped from said cylinder by said doffer.

16. In textile fibre opening apparatus, a fibre conveying cylinder arranged to be rotationally driven in a preselected direction at a relatively slow peripheral speed and having spikes projecting angularly from its peripheral surface in the general direction of rotation thereof, and operable to convey a relatively deep layer of textile fibres thereon, a worker roll adjacent the cylinder arranged to be rotationally driven in the opposite direction thereto at a peripheral speed substantially less than the speed of the cylinder and having pins trailing angularly from its peripheral surface arranged to lap the spikes of the cylinder and cooperate therewith to effect an opening of textile fibres on said cylinder, a stripper roll adjacent said cylinder and worker roll arranged to be rotationally driven in the opposite direction to said cylinder at a peripheral speed slightly faster than said worker roll and having pins projecting angularly from its peripheral surface in the general direction of rotation of said stripper arranged to lap the pins of said worker roll and the spikes of said main cylinder to thereby strip the fibres from the worker and deposit the same again upon the cylinder, a second worker roll adjacent the cylinder following said stripper arranged to be rotationally driven in the opposite direction to said cylinder at a peripheral speed less than the first worker and having pins trailing angularly from its peripheral surface arranged to lap the spikes of the cylinder and cooperate therewith to effect a further opening of the fibres, a doffer adjacent the cylinder in advance of the first worker roll arranged to be rotationally driven in the same direction as said cylinder at a relatively high peripheral speed and having pins extending from its surface operable to doff-off from the cylinder textile fibres carried thereon in excess of a predetermined depth, a second stripper roll adjacent said cylinder following said second worker roll arranged to be rotationally driven in the opposite direction to the cylinder at a relatively high peripheral speed and having pins extending from its peripheral surface arranged to lap the pins of the second worker and the spikes of the cylinder to strip the fibres therefrom, and conveyor means operable to feed textile fibres into engament with the spikes of the cylinder at one side of the latter and at the other side thereof to receive the fibres stripped from said cylinder by said second stripper.

17. In textile fibre opening apparatus, a fibre conveying cylinder arranged to be rotationally driven in a preselected direction at a relatively slow peripheral speed and having spikes projecting angularly from its peripheral surface in the general direction of rotation thereof, and operable to convey a relatively deep layer of textile fibres thereon, a worker roll adjacent the cylinder arranged to be rotationally driven in the opposite direction thereto at a peripheral speed substantially less than the speed of the cylinder and having pins trailing angularly from its peripheral surface arranged to lap the spikes of the cylinder and cooperate therewith to effect an opening of textile fibres on said cylinder, a first stripper roll adjacent said cylinder and worker roll arranged to be rotationally driven in the opposite direction to said cylinder at a peripheral speed slightly faster than said worker roll and having pins projecting angularly from its peripheral surface in the general direction of rotation of said stripper arranged to lap the pins of said worker roll and the spikes of said cylinder to thereby strip the fibres from the worker and deposit the same again upon the cylinder, a doffer adjacent the cylinder in advance of the worker roll arranged to be rotationally driven in the same direction as the cylinder at a relatively high peripheral speed and having pins extending from its peripheral surface operable to doff-off from the cylinder textile fibres thereon in excess of a predetermined depth, a second stripper roll adjacent said cylinder and following said first stripper roll, arranged to be rotationally driven in the opposite direction to the cylinder at a relatively high peripheral speed and having pins extending from its peripheral surface arranged to lap the spikes of the cylinder to thereby strip the fibres therefrom, and conveyor means operable to feed textile fibres into engagement with the spikes of the cylinder at one side of the latter and at the other side thereof to receive the fibres stripped from said cylinder by said second stripper.

18. In textile fibre opening apparatus, a fibre conveying cylinder arranged to be rotationally driven in a preselected direction at a relatively slow peripheral speed and having spikes projecting angularly from its peripheral surface in the general direction of rotation thereof, and operable to convey a relatively deep layer of textile fibres thereon, a worker roll adjacent the cylinder arranged to be rotationally driven in the opposite direction thereto at a peripheral speed substantially less than the speed of the cylinder and having pins trailing angularly from its peripheral surface arranged to lap the spikes of the cylinder and cooperate therewith to effect an opening of textile fibres on said cylinder, a stripper roll adjacent said cylinder and worker roll arranged to be rotationally driven in the opposite direction to said cylinder at a peripheral speed slightly faster than said worker roll and having pins projecting angularly from its peripheral surface in the general direction of rotation of said stripper arranged to lap the pins of said worker roll and the spikes of said cylinder to thereby strip the fibres from the worker and deposit the same again upon the cylinder, a second worker roll adjacent the cylinder following the stripper arranged to be rotationally driven in the opposite direction to said cylinder at a peripheral speed less than the first worker and having pins trailing angularly from its peripheral surface arranged to lap the spikes of the cylinder and cooperate therewith to effect a further opening of the fibres, a second stripper roll adjacent said cylinder following said second worker roll arranged to be rotationally driven in the opposite direction to the cylinder at a relatively high peripheral speed and having pins extending from its peripheral surface arranged to lap the pins of the second worker and the spikes of the cylinder to thereby strip the fibres therefrom, a doffer adjacent the cylinder in advance of the worker roll arranged to be rotationally driven in the same direction as the cylinder at a relatively high peripheral speed and having pins projecting from its peripheral surface operable to doff-off from the cylinder textile fibres thereon in excess of a predetermined depth, and conveyor means operable to feed textile fibres into engagement with the spikes of the cylinder at one side of the latter and at the other side

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thereof to receive the fibres stripped from said cylinder by said second stripper.

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