

[54] FIBER FEEDING ARRANGEMENT
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[57] ABSTRACT

A fiber feeding device having an uplift apron and a feed apron at its lower reach. In front of the uplift apron is an area defined at its upper level by a level control which senses the height of fibers and an sharply angularly disposed front boundary member by which a fiber roll tumbling reserve area is developed. The level control starts and stops the feed apron which is otherwise driven only concurrently with the drive of the lift apron and at a reduced speed to keep from overfeeding the lift apron and to keep the fibers in the reserve area at a substantially constant amount to effect improved fiber opening and feeding of a constant amount of fibers by the lift apron.

7 Claims, 2 Drawing Figures

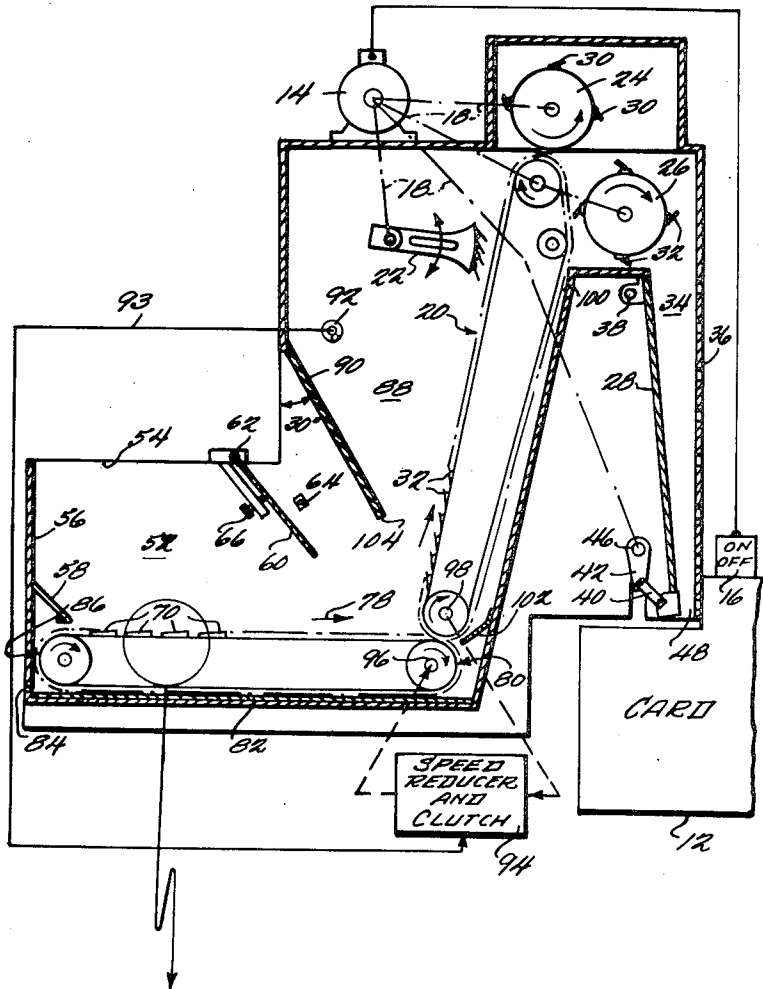


Fig. 1

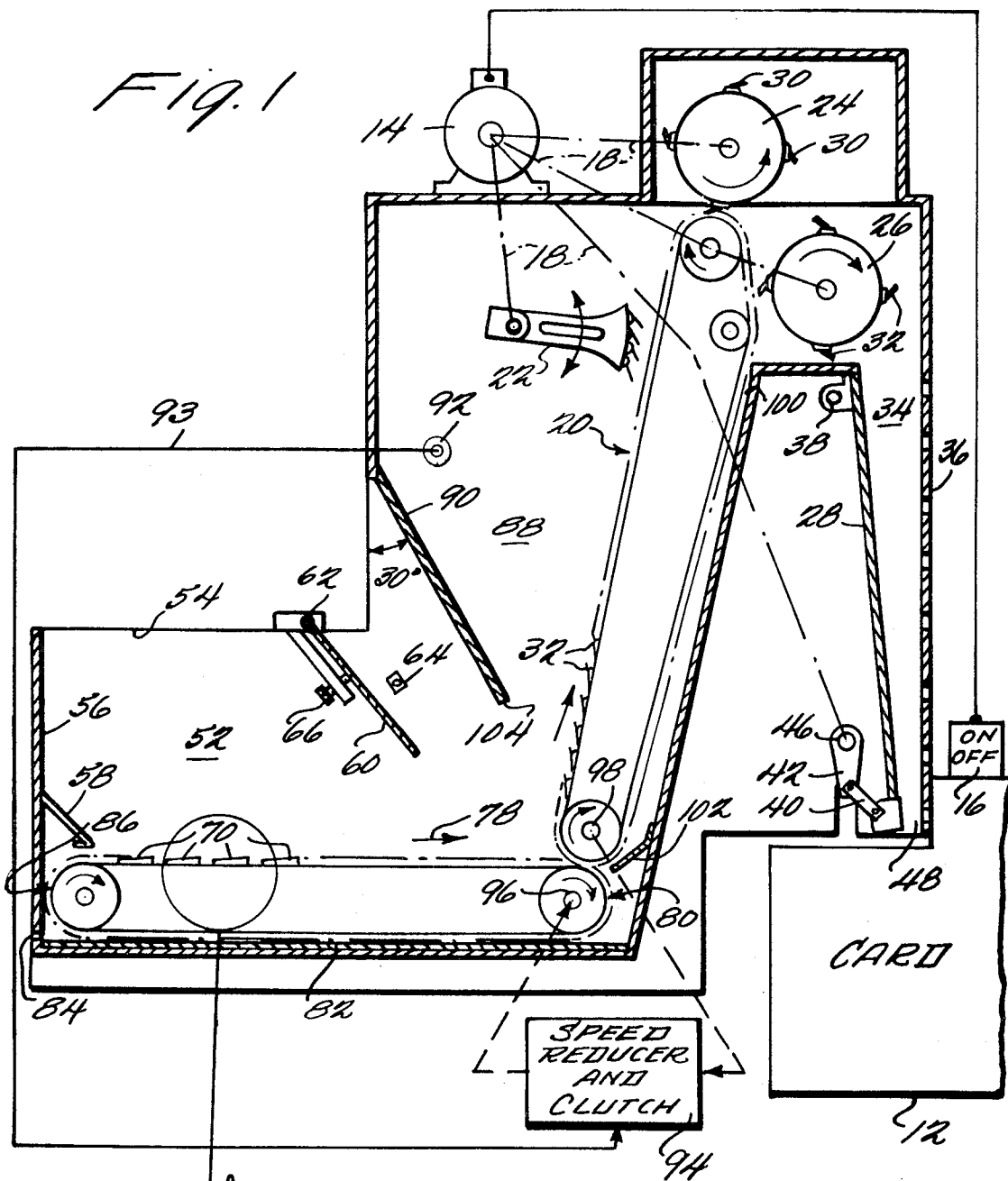
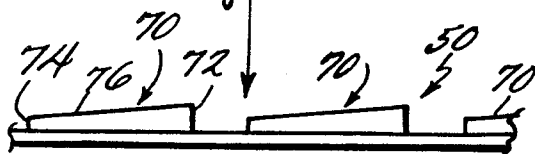


Fig. 2

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FIBER FEEDING ARRANGEMENT

This invention relates to equipment for handling fibers, particularly textile fibers, of the type which normally include a spiked lift apron for feeding fibers as in a direct cart feeder or feeder-weighing unit.

Examples of prior direct card feeders of the general type described herein are set forth in the copending Wise application Ser. No. 169,120, filed Aug. 4, 1971, as a continuation of the now abandoned Ser. No. 745,066, filed June 13, 1968 and assigned to the same assignee as this application. An example of the prior feeder-weigher units of the type generally described in this application may be found in the commonly assigned Lytton U.S. Pat. No. 2,995,783. The present invention is directed to an improvement in those types of feeders, and particularly to the novel features herein described and claimed for maintaining the volume or amount of fibers fed by a lift apron as uniform and constant as possible.

The provision of such features in a fiber feeder is the main object of this invention, for which other objects and advantages will become more apparent by the following detailed description of embodiments of the invention, in conjunction with the drawings, in which:

FIG. 1 is a cross-sectional side view, partially diagrammatic, of a web forming type of feeder feeding a card, and

FIG. 2 is an enlargement of the encircled part of the feed apron in FIG. 1.

The embodiment of this invention, as set forth in FIG. 1, is included in a web former 10 of the type generally disclosed and claimed in the aforesaid commonly assigned Wise application Ser. No. 169,120, filed Aug. 4, 1971. The web formed by the device 10 is directly fed to a card 12, which controls the web former motor 14 via the on-off switch 16, all as set forth in that prior Wise application. The starting and stopping of the operation of card 12 thereby automatically starts and stops motor 14, which, as shown by dash lines 18, controls the operation of the lift apron 20, Sargent-type oscillating comb 22, the upper and lower doffers 24 and 26 and shaker plate 28. Again, the operation of these elements by motor 14 is similar to that described in the aforesaid Wise application, the upper doffer or kick roll 24 being added thereby as an optional feature which allows the equipment to be used with relatively long staples (e.g., above 3 inches) and/or heavily tinted long or short staples. Kick roll 24 has spaced around its periphery a plurality of rows of combs or spikes 32 on lift apron 20, to remove fibers from the lift apron as they reach the upper thereof. Kick roll 24 rotates in a counter clockwise direction, as viewed in FIG. 1, and throws the doffed fibers downwardly toward the lower doffer 26, which also rotates clockwise. By use of its combs or spikes 32, doffer 26 receives the fibers from doffer 24 and may, if desired, help strip the rear side of lift apron 20 of remaining fibers, throws the fibers further down into the tapered shaft of column 34. This column is bound on its opposite ends by the sides (not shown) of web former 10, and by shaker plate 28 on its rear side and an apertured front plate or screen-like device 36 containing a multiplicity of apertures extending the full width and height of column 34, for example, as shown in FIG. 8 of the aforesaid Wise application. Shaker plate 28 is pivoted at its upper end on shaft 38, and its lower end is connected by link 40 to arm 42 which is oscillated about shaft 46 by motor 14 in the

manner fully described in the aforesaid Wise application. Therefore, shaker plate 28, as its lower end generally oscillates in the horizontal direction on pivot point 38 compacts the fibers in column 34 to form at outlet 48, a web which is uniform in thickness and density. This web has those characteristics by virtue of the air being expressed or expelled from the column of fibers through the multiplicity of apertures in front plate 36 upon compression of the fibers by forward movement of shaker plate 28. The web at outlet 48 is fed into card 12 in the conventional manner explained in the aforesaid Wise application.

Web former 10 and its cooperation with card 12, as above described is generally in accordance with the structure and operation described in the aforesaid Wise application. The special area of improvement in the instant application relates to the portion of web former 10 now describe in conformation with at least certain portions of the web former as described above.

Below lift apron 20 is a feed apron 50, which receives fibers that are tumbled into the initial reserve or hopper area 52 through opening 54 by manual or other means. Reserve area 52 is bound on opposite ends by the respective sides of web former 10, and on the front side by a vertical center plate or cover 56 and sloping stock guide 58 which is secured thereto. The reserve area 52 is also defined by a stock gate 60 disposed above substantially the central portion of feed apron 50. Stock gate 60 extends the full width of reserve area 52 and is pivoted at its upper end in any convenient manner about point 62. Its angle of slope in the downward and downstream or forward directions is adjustable between permanent stop 64 and an adjustable stop 66. The lower end 68 of stock gate 60 is thereby adjustable between vertical heights above feed apron 50 in the range of approximately 7 to 12 inches, by which is regulated the amount of fibers from reserve area 52 that are conveyed downstream (i.e., rightwardly in FIG. 1) toward the downstream reach of apron 54 upward lifted by apron 20. Stock gate 60 prevents the fibers in reserve area 52 from ballooning and preventing too large a hump of fibers from being conveyed by feed apron 50 to lift apron 20.

While lift apron 20 contains spikes 32 for positive conveyance of fibers presented to it by feed apron 50, it has been found that the feed apron cannot employ such spikes, because spikes allow substantially no slippage between the fibers and apron 50. Therefore, apron 50 employs transverse pusher slats 70, which are spaced from each other all along the endless length of feed apron 50. As shown in more detail in FIG. 2, which is an enlargement of the encircled portion of feed apron 50, slats 70 are somewhat saw-toothed shaped in that their forward edge 72 is about twice as tall as their rearward edge 74, with the upper face 76 being flat and sloping accordingly slightly upwardly in a downstream direction. These slats are made of wood, for example, and as representative of suitable dimensions, the slats are approximately spaced 3 inches on centers, with approximately an inch or more between the slats, and the forward edge 72 is approximately one-half inch tall. The fibers are edged downstream in the direction of arrow 78 in FIG. 1 by the forward edges 72 of slats 70, but the fibers on feed apron 50 exceeds that which lower end 68 of stock gate 60 will allow through when it is pivoted by those fibers to its maximum counter clockwise extent against stop 64.

Any fibers on feed apron 50, that are fed through the gap between stock gate end 68 and apron 50, but which are not caught by spikes 32 of the lift apron may be carried on around the downstream reach 80 of feed apron 50, into a stock return channel 82 formed by a removable tray 84. The stock in this channel and tray is generally returned by the lower stretch of feed apron 50, past its upstream reach 86 and back under guide 58 and thereby into the reserve area 52 again for further feeding to the lift apron 20. The fiber retriever 84 is useful also to keep clean the floor of the building in which the equipment is used, whenever the fibers are returned to the upper side of apron 50.

Those fibers fed by apron 50, which are caught by spikes 32 of lift apron 20, are carried upward thereby and combed by comb 22. The fibers which are combed off the lift apron are returned to a second reserve area 88, which is bound on one side by approximately the middle third of the front side of apron 20. The opposite ends of reserve area 88 are bound by the sides (not shown) of web former 10, and the side of area 88 opposite lift apron 20 is defined by a front cover or boundary member 90, which is disposed at an angle of approximately 30° relative to the vertical. Reserve area 88 is also defined on its upper side substantially by an electric eye 92 which forms a level control of the fibers in reserve area 88.

Fibers are fed by apron 50 to lift apron 20 and thereby into the reserve area 88 upon sensing by electric eye 92 that the fibers in reserve area 88 do not cover the eye. Of course, associated with the eye, on the opposite side of web former 10 is a source of signal to which the eye is sensitive, for example, light. When the beam of light is broken by fibers in reserve area 88, feed apron 50 is stopped. This is effected by operating a speed reducer and clutch assembly 94 to prevent the shaft 96, about which is drawn the downstream reach 80 of apron 50, from being driven by a gear or other suitable connection secured to the lower spiked apron shaft 98. Alternatively, when the light beam is not broken, the signal on line 93 energizes the speed reducer and clutch assembly 94 accordingly, so as to cause apron 50 to feed fibers downstream into the path of the spikes 32 on lift apron 20. This resupplies fibers into reserve area 88, and in accordance with this invention causes the fibers that are fed by the lift apron and doffers 24 and 26 into column 34 to be of a constant amount of uniformly open fibers. Any fibers which are not stripped from the lift apron by the doffing thereof and those fibers which overflow column 34 are urged into the return channel 100 on the rear side of lift apron 20, and by guide 102, back to the front side of lift apron 20.

It has been found that the positioning of the front cover or boundary member 90 and electric eye 92, relative to lift apron 20 and feed apron 50 is especially important in causing the invention to be fully appreciated. The idea behind the invention is not only to keep the amount of fibers in reserve area 88, but to keep those fibers tumbling and generally in a cross sectional shape of a roll. That is, FIG. 1 shows the preferred relative positions of boundary member 90, electric eye 92, lift apron 20 and comb 22 in relation to feed apron and stock gate 60. The 30° angle of boundary member 90 relative to the vertical has been found to aid in keeping the fiber roll in reserve area 88 at or near an optimum continuously, so as to cause a maximum uniformity in

the fibers doffed from lift apron 20. The angle of boundary member 90 relative to the vertical must be sufficiently sharp such that the fibers in area 88 do not just tend to rest on member 90, but instead tend to drop downwardly. Then, the length of member 90 is such that its lower end 014 presents a horizontal gap relative to spikes 32 such that the fibers that slide down member 90 do not fall through the gap but are caught by spikes 32 and carried upward. At the same time, however, that gap cannot be so narrow or the end 104 so low as to cause fibers being fed therethrough to bridge the gap and not enter into reserve area 88 effectively. The width of that gap, therefore, needs to be enough to allow fiber bundles, such as humps or chunks or the like, to go into the gap without locking or otherwise choking down the lift apron. Representative dimensions which have been found suitable to effect these goals of this invention are, from lower end 104: horizontally to spikes 32, 7 ± 2 inches approximately; to apron 50, approximately $18 \frac{1}{2}$ inches, Electric eye 92, which aids in keeping the correct amount of fibers in reserve area 88, is disposed as shown, about one-fourth inch away from the front side of web former 10 horizontally to spiked apron 20, i.e., just a couple of inches or so above and in the area of about 6 or 7 inches to the right of the top end of member 90. An apron speed reduction of 16:1 prevents overfeed.

Various modifications may be made to the equipment shown in FIG. 1, if desired. For example, instead of employing both doffers 24 and 26, a single roll doffer positioned in a conventional location and rotating counter clockwise instead of clockwise, may be used, especially when long staples or heavy tinted staples are not a problem. Furthermore, instead of the single or dual doffer system operating into a shaker arrangement for forming a web, such may be employed with a weigh pan and conventional arrangement for effecting weight of the fibers as set forth, for example, in the above Lytton U.S. Pat. No. 2,995,783. In any event, the invention is not intended to be limited to a particular type of arrangement fed by the lift apron, since the main features of this invention are related to keeping the amount of fibers fed by the lift apron as constant as possible, as has been above described.

Further modifications of this invention will become apparent to those of ordinary skill in the art upon reading the foregoing disclosure, but it is to be appreciated that the described improvements are exemplary and not limitative, the scope of the invention being defined by the appended claims.

What is claimed is:

1. In a device for handling fibers, the improvement comprising:

- a movable, inclined, spiked, endless lift apron having an upper reach and a lower reach and front and rear sides respectively movable upwardly and downwardly about said reaches,
- combing means adjacent the front side of said lift apron for combing the fibers lifted thereby,
- doffer means adjacent the upper reach and said rear side for doffing combed fibers from said lift apron near said upper reach,
- a movable horizontally disposed endless feed apron having a downstream reach adjacent and beneath said lower reach of said lift apron and an upstream reach substantially spaced from said downstream reach,

means defining a hopper area and including a stock gate for receiving fibers and presenting same to said feed apron,

said stock gate being disposed above said feed apron and inclined downwardly and downstream with its lower end being movable within a predetermined distance range above said feed apron to prevent the fibers received by said feed apron and moved downstream thereby from ballooning and causing the fibers fed to said lift apron to be too great a volume,

said feed apron including spaced slats extending transversely of said feed apron and shaped to slippingly move the fibers received by the said feed apron downstream under said stockgate,

means for driving said lift apron so as to cause its said front side to move upwardly as aforesaid,

means defining a fiber roll tumbling reserve area in front of approximately the middle third of said front side of said lift apron including an electric eye and a front boundary member disposed at an angle of substantially 30° relative to the vertical with its upper end adjacent said electric eye and being downwardly inclined toward said lift apron and spaced therefrom and from the feed apron predetermined amounts so as to prevent fiber bridging between said lift apron and the lower end of said boundary member but to allow fiber clumps and the like therethrough and to prevent fibers in said tumbling area from falling back down onto said feed apron,

said electric eye being disposed above and adjacent the upper end of said boundary member at substantially the height of said middle third of said lift apron so as to define substantially the upper limit of said tumbling reserve area, and

means effectively driven by said driving means but controlled by said electric eye for operating said feed apron to cause fibers thereon to be moved downstream toward said lift apron only when the fibers in said roll tumbling reserve area do not cover but expose said electric eye.

2. In a device for handling fibers, the improvement comprising:

a movable, inclined, spiked, endless lift apron having an upper reach and a lower reach and front and rear sides respectively movable upwardly and downwardly about said reaches,

a movable horizontally disposed endless feed apron having a downstream reach adjacent and beneath said lower reach of said lift apron and an upstream reach substantially spaced from said downstream reach,

means defining a hopper area for receiving fibers and presenting same to said feed apron,

said defining means including a stock gate at the downstream side of said hopper area for preventing the fibers received by said feed apron and moved downstream thereby from ballooning and causing the fibers fed to said lift apron to be too great a volume for handling by the lift apron,

means for driving said lift apron so as to cause its said front side to move upwardly as aforesaid,

means for developing a fiber roll tumbling reserve area in front of said front side of said lift apron including a level control for sensing the height of said roll and an angularly disposed front boundary

member downwardly inclined toward said lift apron and spaced therefrom and from the feed apron predetermined amounts so as to prevent fiber bridging between said lift apron and said boundary member and to prevent fibers in said tumbling area from falling back down onto said feed apron while allowing fiber clumps and the like to pass into said reserve area from said stock gate, and

means effectively driven by said driving means but controlled by said level control for operating said feed apron to cause fibers thereon to be moved downstream toward said lift apron only when the fibers in said roll tumbling reserve area do not extend to said level control so as to keep the fibers in said reserve area at a substantially constant amount and the resultant fiber roll therein continuously tumbling for improved fiber opening and feeding by said lift apron of a constant amount of fibers.

3. The improvement of claim 2 wherein said level control includes an electric eye.

4. The improvement of claim 2 wherein said feed apron includes spaced slats extending transversely of said feed apron and shaped to slippingly move the fibers received by the said feed apron downstream into said lift apron.

5. In a device for handling fibers, the improvement comprising:

a movable, inclined, spiked, endless lift apron having an upper reach and a lower reach and front and rear sides respectively movable upwardly and downwardly about said reaches,

a movable horizontally disposed endless feed apron having a downstream reach adjacent and beneath said lower reach of said lift apron and an upstream reach substantially spaced from said downstream reach,

means defining a hopper area for receiving fibers and presenting same to said feed apron,

means for driving said lift apron so as to cause its said front side to move upwardly as aforesaid,

means for developing a fiber roll tumbling reserve area in front of said front side of said lift apron including a level control for sensing the height of said roll and under said level control an angularly disposed front boundary member downwardly inclined sharply from a point frontward of said level control toward said lift apron and spaced therefrom and from the feed apron predetermined amounts so as to prevent fiber bridging between said lift apron and said boundary member and to prevent fibers in said tumbling area from falling back down onto said feed apron while allowing fiber clumps and the like to pass into said reserve area from said feed apron, and

means effectively reducing feed apron speed driven only concurrently with said driving means and controlled by said level control for operating said feed apron to cause fibers thereon to be moved downstream toward said lift apron at a slower speed than the uplift of said lift apron to prevent overfeed of said lift apron and to be so moved downstream only when the fibers in said roll tumbling reserve area do not extend to said level control and only while said driving means drives said lift apron as aforesaid, so as to keep the fibers in said reserve area at a substantially constant amount and the resultant

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fiber roll therein continuously tumbling for improved fiber opening and feeding by said lift apron of a constant amount of fibers.

6. A fiber handling device as in claim 5 wherein said hopper area defining means includes means for preventing the fibers received by said feed apron and moved downstream thereby from ballooning and causing the fibers fed to said lift apron to be too great a vol-

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ume for handling by the lift apron.

7. A fiber handling device as in claim 5 wherein said feed apron includes spaced slats extending transversely of said feed apron and shaped to slippingly move the fibers received by the said feed apron downstream into said lift apron.

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