Dec. 12, 1967 J. E. O'NEAL ETAL 3,357,062

CARDING MACHINE AIR CONTROL MEANS

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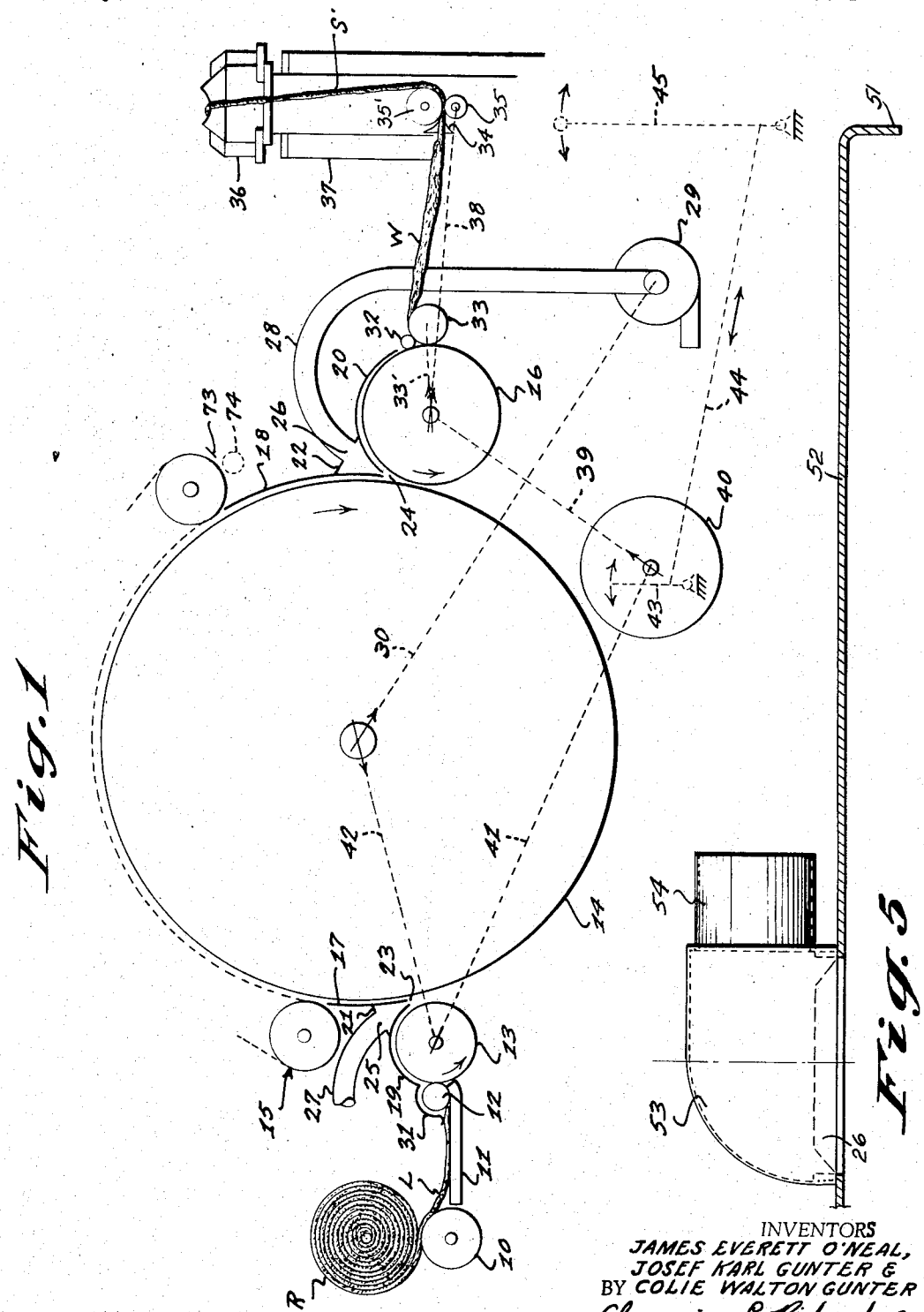


Fig. 1

Fig. 5

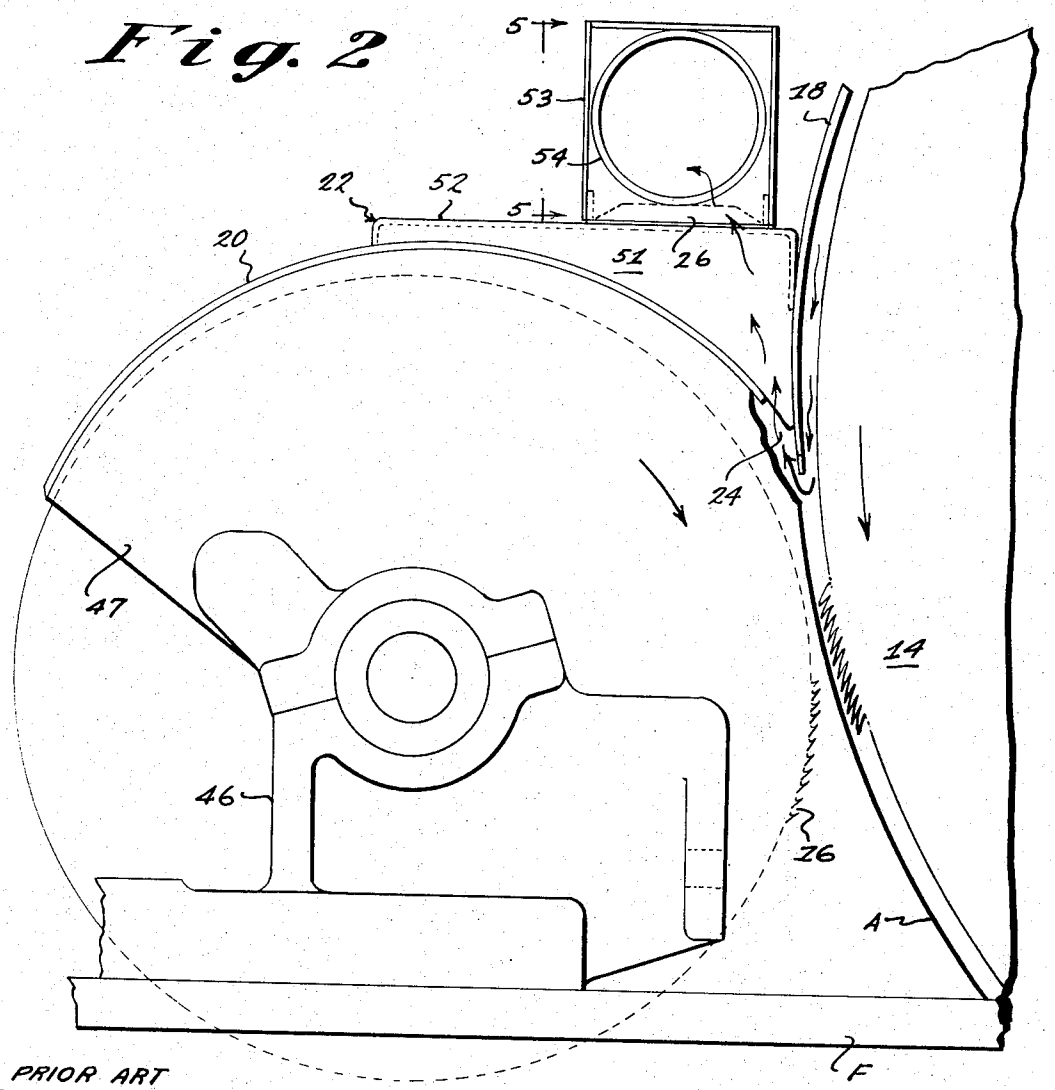
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CARDING MACHINE AIR CONTROL MEANS

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Fig. 2



PRIOR ART

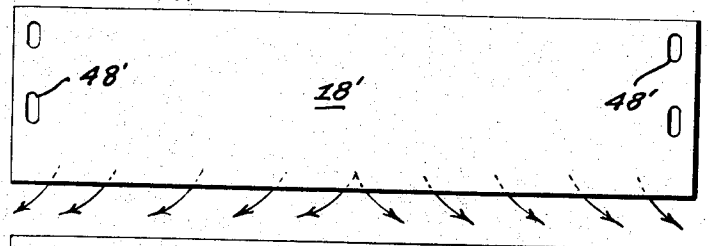


Fig. 3

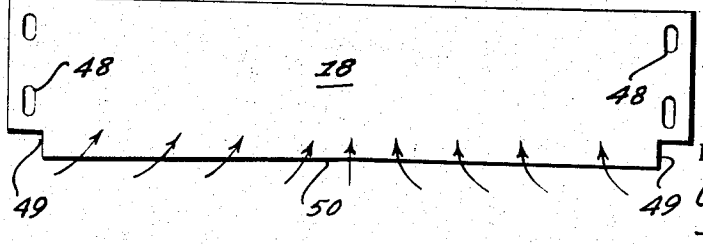


Fig. 4

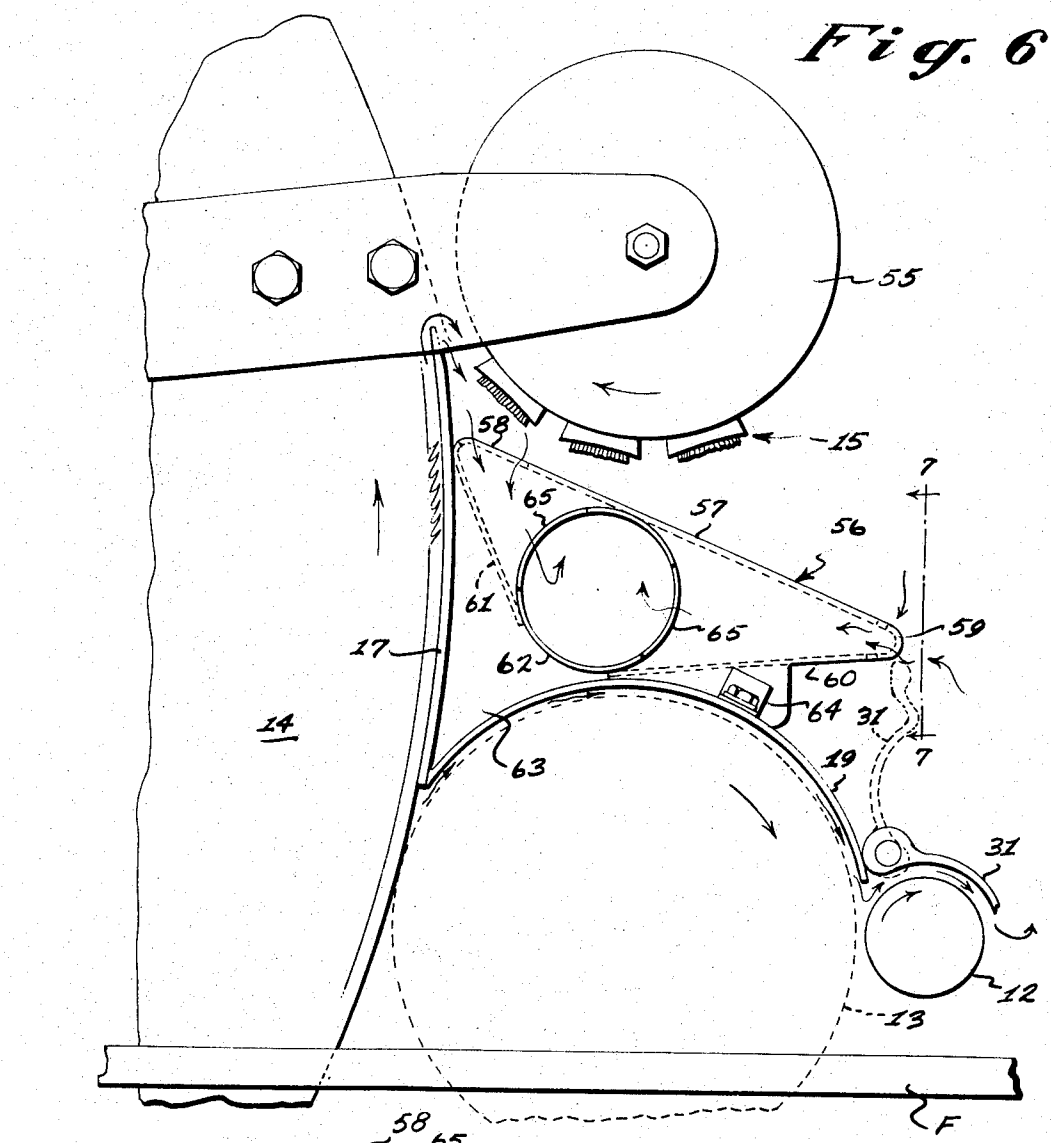
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CARDING MACHINE AIR CONTROL MEANS

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Fig. 6



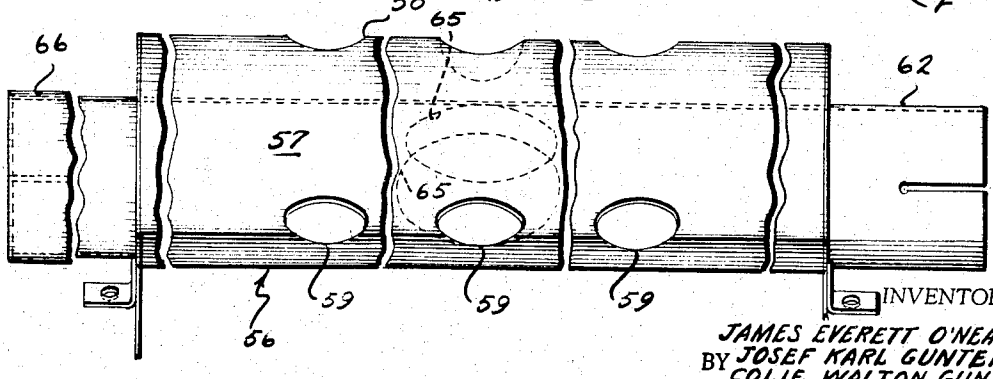


Fig. 7

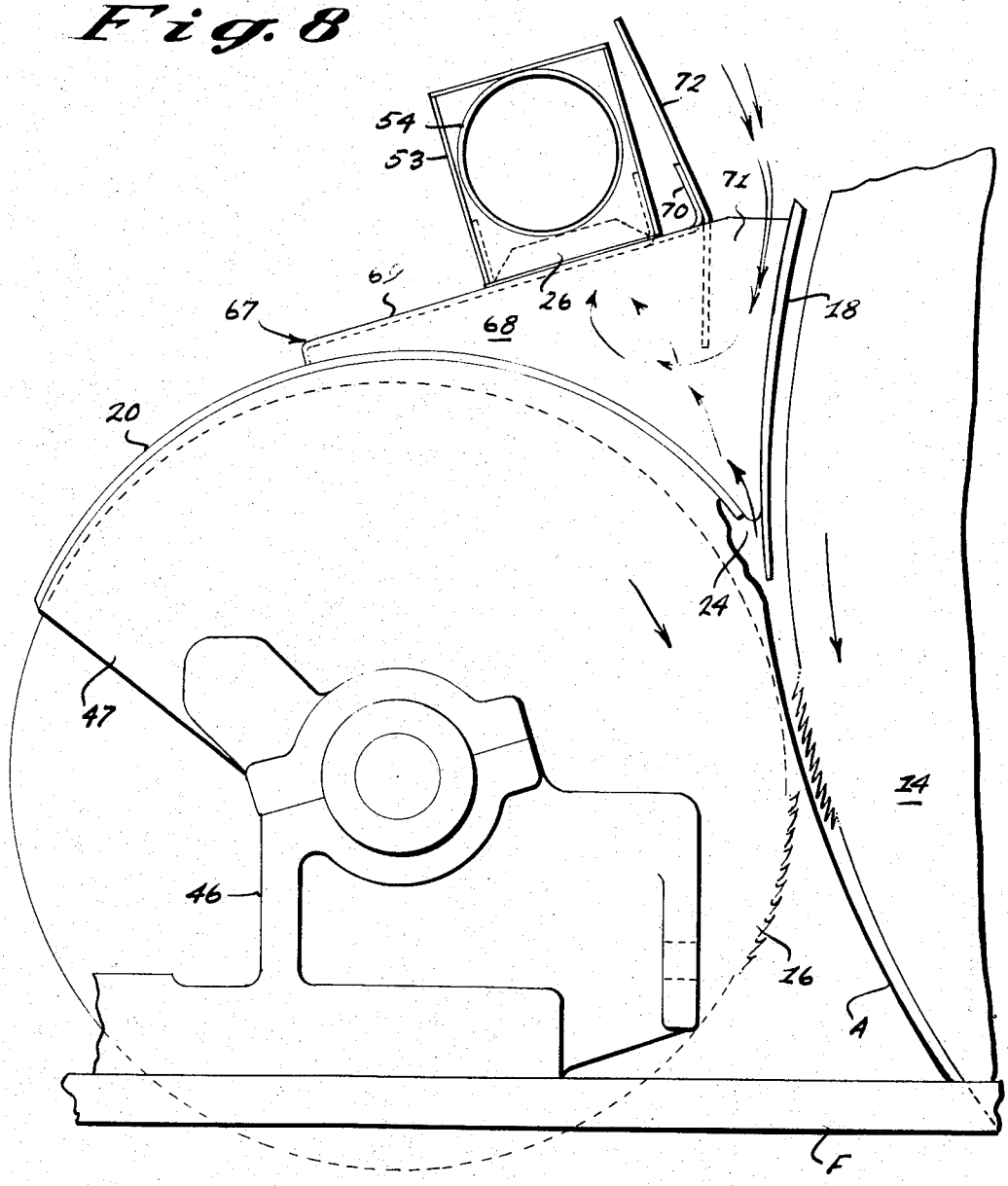
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Fig. 8



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CARDING MACHINE AIR CONTROL MEANS

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Filed Sept. 23, 1965, Ser. No. 489,590
5 Claims. (Cl. 19—107)

This invention relates to carding machines and in particular to improved arrangements of certain operating elements of such machines that greatly facilitate high operating speeds and substantially improve the results obtained by the carding operation.

This is a continuation-in-part of copending application Ser. No. 401,274, filed Oct. 2, 1964.

Generally described, the present invention is characterized first by an improved crush roll arrangement for acting on the carded web prior to gathering it into sliver so that any trash remaining therein is crushed to a condition in which it tends to be freed from the fiber during subsequent processing. The crush roll arrangement provided by the present invention is uniquely weighted by magnetic means to apply an exceptionally even crushing action across the entire carded web for dealing effectively with trash therein while handling the web to good advantage.

This crush roll arrangement is additionally notable in that one of its elements is disposed to serve also as a rotating take-off means for removing the carded web from the doffer roll of the carding machine.

In this latter connection, the present invention is further characterized by the use of a doffer roll of considerably smaller diametric size than the heretofore been conventional, and which acts by reason of its smaller size to doff the carded web from the carding cylinder with much less tendency toward nep formation and to provide a much increased extent of travel for the carded web as it is gathered into sliver so that the gathering angle of the web selvages is much more gradual than is commonly the case with consequent better formation of the sliver both from the standpoint of uniformity and toleration of high operating speeds. All of the foregoing features are disclosed and claimed in the previously noted copending application.

Additionally, the present invention provides uniquely for controlling the troublesome air currents produced by the carding cylinder in relation to the slower rotating doffer roll and the faster rotating lickerin roll operating thereat and for dealing with the fly generated by these air currents as claimed herein; as well as providing a particularly advantageous means for controlling the operation of the doffer roll as disclosed and claimed in our copending application Ser. No. 490,033, filed Sept. 24, 1965, now Patent No. 3,304,582.

The air control means of the present invention also provides effective action in maintaining the card flats clear of the generated fly and may be arranged at the doffer roll for concurrently collecting the flat strips, so as to eliminate any need for the so-called Thompson roll conventionally provided for this purpose, all as described at further length below in connection with the accompanying drawings, in which:

FIG. 1 is a diagrammatic illustration of a carding machine incorporating the improved arrangement of operating elements provided by the present invention;

FIG. 2 is a side elevation detail showing in more particular the arrangement of an air control means embodying the present invention at the doffer roll;

FIG. 3 is a plan detail of the prior art form of front plate conventionally employed for shrouding the carding

cylinder beyond the card flats and in advance of the doffer roll;

FIG. 4 is a further plan detail showing the differing form of front plate employed according to the present invention;

FIG. 5 is a side elevation detail of the fitting for the outlet opening substantially as seen from the position indicated at 5—5 in FIG. 2;

FIG. 6 is a side elevation detail showing in particular an embodiment of the air control means for the present invention arranged for use at the lickerin roll;

FIG. 7 is a front elevation of the air control manifold substantially as seen from the position indicated at 7—7 in FIG. 6; and

FIG. 8 is a further side elevation showing a modified embodiment of the FIG. 2 air control means.

Referring now in detail to the drawings and more particularly at first to FIG. 1, the reference character R indicates a lap roll of the fiber to be carded resting on a carrier roll **10** to have the lap L delivered therefrom over a feed plate **11** and beneath a feed roll **12** to a lickerin roll **13** for transfer to a carding cylinder **14** in suitable form for carding beneath an endless series of flats, as indicated generally at **15**, and subsequent removal by a doffer roll **16**, in the general manner that has been conventional carding practice for many years.

Handling of the fiber for carding in this manner requires rotation of the lickerin roll **13** at a relatively high speed in order to comb the leading edge or fringe of the lap L being fed and transfer fiber therefrom to form a considerably thinner layer on the cylinder **14** for carding beneath the flats **15**; while the doffer roll **16** is required to rotate so that its surface speed is substantially slower than that of the cylinder **14** in order to condense the carded web at doffing to prepare it with sufficient substance for subsequent taking-off and gathering into sliver.

By reason of these speed relations there are troublesome air currents created in the zone at which the faster rotating lickerin roll **13** diverges from the cylinder **14** and in the zone of convergence of the slower rotating doffer roll **16**; the lickerin roll **13** acting in this respect somewhat in the nature of a pump, while the doffer roll **16** has a damming effect, to produce high pressure conditions at both zones as a result of the air currents created or induced thereat.

To control these air currents it has heretofore been usual first to fit the cylinder **14** with arcuate cover plates (corresponding generally to those indicated at **17** and **18** in FIG. 1) so as to shroud the cylinder beyond the lickerin roll **13** to the flats **15** and from the flats **15** in advance of the doffer roll **16**; and, secondly, to dispose further arcuate cover plates (corresponding generally to those indicated at **19** and **20** in FIG. 1) over the lickerin and doffer rolls respectively, with a make-up piece or bonnet resting (generally as at **21** and **22** in FIG. 1) between the adjacently related cover plates **17** and **19**, and **18** and **20**, to enclose and contain the respective high pressure zones thereat. Under the best of circumstances, however, such an arrangement has allowed a certain amount of blow out from these zones with a resulting objectionable distribution of fly on and about the carding machine, and this condition worsens substantially at the higher operating speeds towards which carding practice has been tending in recent years.

According to the present invention, the difficulty with these high pressure zones above the lickerin and doffer rolls, respectively, is eliminated by terminating the adjacently related cover plates **17** and **19**, and **18** and **20**, short of converging abutment so that substantial slots are left between their adjacent edges, as at **23** and **24** in FIG. 1; by providing outlet openings, as at **25** and **26**

in FIG. 1, in the bonnets **21** and **22** to relieve the high pressure zones enclosed thereby; and by fitting the outlet openings **25** and **26** with conduit connections, as at **27** and **28** in FIG. 1, to receive and carry off for orderly collection all fly borne by the air exhausted through openings **25** and **26** from the high pressure zones being controlled.

To convey the entrained fly that is thus received by the conduit connections **27** and **28** a relatively low capacity blower unit may be employed as represented at **29** in FIG. 1 in relation to the connection **28**. A blower unit **29** having a capacity of 160 cubic feet per minute at 3400 r.p.m. has been found to serve the foregoing conveying function quite well when operated by a suitable drive connection from the cylinder **14**, as indicated at **30** in FIG. 1, at a ratio providing about 100 cubic feet per minute through the blower **29** when the cylinder speed is in the order of 250 r.p.m. The exhaust from the blower **29** may be handled in any convenient way for collecting the fly entrained therein. A suitable arrangement is to direct the blower exhaust through a further conduit connection (not shown) to a waste bin located within the base portion of the carding machine frame. Similar provision (not shown) is made for conveying and collecting the entrained fly received by the conduit connection **27** from the high pressure zone above the lickerin roll **13**.

It should also be noted that the arcuate cover plate **19** at the lickerin roll **13** preferably has a hinged cover member **31** extending therefrom over the feed roll **12** in place of the usual scavenger roll employed theretat; and that the arcuate cover plate **20** shrouding the doffer roll **16** extends thereover away from the point of doffing toward the point of take-off with a disposition forming a converging throat in relation to the doffer roll surface toward the take-off point (compare FIGS. 1 and 2) so that any tendency toward blow out beneath this cover plate **20** is directed to assist take-off.

The arrangement for take-off and subsequent handling of the carded web W to produce sliver S' is disclosed at length in the previously noted copending applications. Briefly described, this arrangement, as diagrammed in FIG. 1, comprises a rotating take-off roll **32** associated with a magnetic roll **33** to provide a crush nip for acting on the carded web W prior to gathering thereof through a trumpet at **34** and calender rolls **35** and **35'** to form the sliver S' for delivery to a coiler mechanism **36** by which it is deposited in a sliver can **37** for subsequent processing; the magnetic crush roll **33** and the calender rolls at **35** and **35'** being driven, as indicated at **33'** and **38**, from the doffer roll **16**, which in turn is connected as at **39** through a speed control pulley **40** for driving as indicated at **41** from the lickerin roll **13** to which a driving connection **42** runs from the carding cylinder **14**, and the speed control pulley **40** having a speed shifting means **43** arranged thereat for actuation through suitable linkage indicated at **44** from a control lever **45** located at the front of the carding machine for convenient manipulation from the positions adjacent the calender roll stand **35** at which an operator stands in putting-up an end.

The structural form of air control means arranged at the doffer roll **16** in the previously described FIG. 1 manner is illustrated more particularly in FIG. 2, in which a portion of the carding cylinder **14** is shown adjacent the doffer roll **16**, with the latter carried in bearing stands **46** of usual form mounted on the carding machine frame F. The bearing stands **46** also support a doffer roll cover structure **47** that is likewise of usual form except for incorporating the arcuate cover plate **20** at a disposition providing the previously noted converging throat relation with the doffer roll surface toward the point of take-off (compare FIGS. 1 and 2), and except for terminating the adjacent edge of the cover plate **20** short of abutment with the cover plate **18** shrouding the cylinder **14** so as to form the pressure relief slot **24** therebetween.

The cylinder shrouding cover plate **18** is also formed

specially at its adjacent edge to facilitate air pressure relief through the slot **24**. For comparison, FIG. 3 indicates the prior art form of cylinder cover plate at **18'** as being simply rectangular in plan, the illustrated plate portion **18'** being a bottom portion installed with attaching screws (not shown) at screw apertures **48'** on the card arches, indicated in FIG. 2 at A, below a stripping door (not shown) that has a top knife plate (not shown) arranged thereabove so as to cover the cylinder completely beyond the flats to the doffing point where a snug adjacent edge fit with the doffer cover is maintained. With this prior art arrangement, the tendency of the pressure zone generated in advance of the doffing point during operation is to cause lateral air flow toward each side of the card thereat, as indicated by the directional arrows in FIG. 3, with a consequent adverse influence at the selvages of the carded web that becomes more and more troublesome as operating speeds are increased.

FIG. 4 indicates the different special form of cylinder cover plate portion **18** employed adjacent the doffer roll **16** according to the present invention. This cover plate portion **18** differs first in that it has a lesser covering width so that its adjacent edge is withdrawn from the doffing point to a greater extent than usual. The usual cover plate portion **18'** has a covering width (i.e., a width in the direction of cylinder rotation) of about 7½ inches in relation to the conventional 50-inch diameter cylinder **14**. The differing plate portion **18** of the present invention is narrowed for substituted use to a covering width of about 6¼ inches so as to be withdrawn from the doffing point about 1 inch.

Secondly, below the screw apertures **48** provided therein for installation, the plate portion **18** differs further in having corner notches **49** formed at its lower edge **50** so that the plate **18** may be fitted between the card arches A toward its lower edge **50** to impede the lateral air flow tendency better at this lower edge. Additionally, and in the same connection, the lower edge **50** of the plate **18** is formed specially with a concave relief from the ends thereof adjacent the card arches towards a substantially central position with respect to the width of the carding machine so that the air current incident to air pressure release has an induced direction away from the sides of the carding machine in passing through the relief slot **24**, as indicated by the directional arrows in FIG. 4.

Having the cylinder and doffer cover plates **18** and **20** arranged in the foregoing manner, the FIG. 2 air control means at the doffer roll **16** is completed by a bonnet **22** that has end walls **51** shaped to seat at the respective exposed faces of the cover plates **18** and **20** and an edge-flanged top wall **52** extending between the end walls **51** to form the enclosing bonnet structure for receiving and controlling the air currents released through the relief slot **24** and the fiber fly borne therewith.

The previously mentioned outlet opening **26**, through which the enclosed high pressure zone is ultimately relieved and the entrained fly is carried away, is located in the bonnet top wall **52** at a substantially central position with respect to the width of the carding machine and is formed thereat for fitting with an elbow cap **53** (compare FIGS. 2 and 5) having an extending tubular throat portion **54** at which a suitable conduit connection **28** may be made from a blower **29** in the manner indicated by FIG. 1 to serve the previously described conveying function. The top wall outlet opening **26** and the elbow cap **53** fitted thereat are formed so that the latter may be installed with the tubular throat portion **54** thereof alternatively extending toward either side of the carding machine for connection readily to a blower **29** on either driving hand of the card.

When air control means of the same sort is provided at the lickerin roll **13**, the structural arrangement is a substantial counterpart of that just described for the doffer zone. As operating speed increases, however, it has been found best not to open the adjacent edges of the cylinder

and lickerin cover plates **17** and **19** as indicated at **23** in FIG. 1, but instead to arrange the air control means at the lickerin zone as illustrated in FIG. 6, in which the feed roll **12**, lickerin **13**, and adjacent portion of the cylinder **14**, are represented in relation to the card frame F, with the lickerin cover plate **19** having a cover member **31** hinged thereon for disposition over the feed roll **12**, and with the cylinder cover plate **17** being fitted snugly in adjacent edge relation to the lickerin cover plate **19** and reaching upwardly over the cylinder **14** in the usual manner to a position adjacent the path of the flats **15**.

With such an arrangement, the air currents induced at the rotating surfaces of the cylinder **14** and lickerin **13** discharge during normal operations at the top edge of the cylinder cover plate **17** in the region of the feed end pulley **55** for the flats **15**, and at the free end of the feed roll cover member **31** as it rides on the lap L being fed, so as continually to generate a certain amount of free fly around both discharge points that accumulates in a troublesome manner if it is allowed to do so.

Accordingly, the FIG. 6 air control means is arranged to deal with the generated fly by mounting a bonnet structure **56** at the top face of the lickerin roll cover **19** that is shaped to enclose a space of substantially triangular cross section between the cover plates **17** and **19** and beneath the flats **15** as they travel around the feed end pulley **55**.

More particularly, the longest leg or side **57** of the enclosed triangular space is arranged at the top of the bonnet structure **56** and is proportioned to reach from a vertex portion resting against the cylinder plate **17** just below the flats **15** to an opposite vertex portion at a downwardly inclined position just clear of the hinged feed roll cover member **31** when it is moved to the dotted line open position shown in FIG. 6, and a series of spaced inlet openings **58** and **59** are formed in the bonnet structure adjacent each of these vertex portions (compare FIGS. 6 and 7). The bonnet structure **56** is completed by remaining shorter legs or sides **60** and **61** of its triangular shape that reach to a tubular conduit member **62** which forms the third vertex portion of the structure and is disposed intermediately against the inner face of the longest bonnet side **57** with a lengthwise extent reaching through end walls **63** that are shaped to seat between the cylinder and lickerin cover plates **17** and **19** for supporting the bonnet structure **56** with the above-noted disposition, and that are fitted with bracket means **64** for attachment at the top face of the lickerin cover **17**. The foregoing components of the bonnet structure **56** are welded to secure them in the assembled relation described, and the tubular conduit member **62**, which extends through the enclosed triangular space when so assembled, has lateral apertures **65** formed midway of its length to open at each side thereof into the enclosed triangular space so that the suction pull of a blower (such as **29** in FIG. 1) when connected with conduit member **62** will impose a suction draft through the bonnet structure **56** to draw ambient fly continually through the inlet openings **58** and **59** for controlled collection. The tubular conduit member **62** extends similarly through each end wall **63** of the bonnet structure **56** so that a blower suction connection (not shown) can be made therewith at either side of the carding machine, the opposite end of the conduit member **62** being closed by a suitable cap as indicated at **66** in FIG. 7, that may be installed at either end as needed.

FIG. 8 shows a modified arrangement of air control means at the doffer section that corresponds in every respect with the FIG. 2 embodiment except for a varied form of bonnet structure **67**, in which the end walls **68** are shaped to seat between the cylinder and doffer cover plates **18** and **20** so that the bonnet top wall **69** has an upwardly inclined disposition toward the cylinder cover plate **18**. Additionally, the edge of the bonnet top wall **69** adjacent the cylinder cover plate **18** is flanged in spaced relation thereto, as at **70**, for opening a further substantial slot **71** thereat and a baffle member **72** is fixed at the top wall flange **70** along the entire extent thereof between the end walls **68** with a lateral reach extending both outwardly and inwardly of the bonnet structure **67**.

With the further slot **71** provided in the foregoing manner, the air control means may be effectively employed at the doffer section for concurrently collecting the flat strips which result from the conventional combing of the flats **15** just after they leave the cylinder **14** by an oscillating comb means at about the position indicated in FIG. 1 at **73**. This combing is done to remove the accumulation of waste picked up by the flats **15** during their active run from back to front of the card. The resulting flat strips are more or less uniform as they leave the flats **15** but are usually connected only by scattered fibers here and there so as not to form a solid sheet and not to have any regular pattern of connection.

Normally these flat strips are collected below the combing position on a so-called Thompson roll located about as indicated at **74** in FIG. 1. The Thompson roll is commonly about 2 inches in diameter, and is cloth covered so as to provide a scavenging action when revolved that picks up the flat strips quite readily. This pick up can be continued effectively until the loaded roll has reached a diameter of about 10 inches. The roll must then be removed and the flat strip accumulation thereon taken off by hand, which involves a considerable item of manual handling.

When an air control means of the FIG. 8 type is used, however, the Thompson roll becomes unnecessary, for the flat strips can be allowed simply to hang downwardly as they are combed from the flats **15** and to fall off as they will as they become entrained in the suction draft at the bonnet slot **71** for recovery therethrough and ultimate collection with the fly borne through the slot **24** by the doffing zone air pressure relief thereat. Provision of the further slot **71** together with the baffle member **72** thereat in the bonnet structure **67** has the additional advantage of fostering a helpful air turbulence having a good effect in preventing dead zones within the bonnet enclosed space so that an effective continual collection and carrying off of the entrained fiber is maintained without any difficulty with residual accumulations with the bonnet **67**. Accordingly, the FIG. 8 arrangement has a desirable and significant advantage in this latter respect whether or not it is employed also for eliminating Thompson roll use.

The present invention has been described in detail above for purposes of illustration only and is not intended to be limited by this description or otherwise except as defined in the appended claims.

We claim:

1. In a carding machine, the combination with a carding cylinder, and a doffer roll operating thereat to doff the cylinder, of arcuate cover plates respectively shrouding said cylinder and doffer roll in advance of the point of doffing but terminating short of abutment to leave a substantial slot therebetween adjacent the doffing point for releasing air pressure generated in advance of said doffing point at the surfaces of said cylinder and doffer roll, a bonnet disposed between said cover plates to enclose a space over said slot and having an outlet opening formed therein at a substantially central position with respect to the width of said carding machine, and means connected at said outlet opening for receiving and carrying off for collection all fly borne by the air released through said slot into the space enclosed by said bonnet, said arcuate cover plate shrouding said cylinder having the edge thereof adjacent said slot relieved concavely from the ends thereof adjacent the sides of said carding machine towards a substantially central position with respect to the width of said carding machine, whereby the air currents incident to said air pressure release have an induced direction away from the sides of said carding machine.

2. In a carding machine, the combination with a carding cylinder, and a lickerin roll operating thereat to feed

the cylinder, of a first arcuate cover plate shrouding said cylinder beyond said lickerin roll, a second arcuate cover plate shrouding the surface of said lickerin roll in adjacent converging relation to said first cover plate, a bonnet disposed between said cover plates to enclose a space thereat, said bonnet having converging sides forming respective inlet openings therein at locations related to the diverging edges of said first and second cover plates and having outlet means provided therein at a substantially central position with respect to the width of said carding machine, and means connected at said outlet means for impressing a suction draft thereat to draw through said inlet openings a significant portion of the fly resulting from the release at said diverging cover plate edges of the air pressure generated by the surfaces of said cylinder and lickerin roll, said outlet means being formed by a tubular conduit member extending through the space enclosed by said bonnet and emerging therefrom towards both sides of said carding machine, and said conduit member being laterally apertured at a substantially central position with respect to the width of said carding machine, said suction draft impressing means being connected at the emerging portion thereof at one side of said carding machine, and having the other emerging portion thereof fitted with a closure member.

3. In a carding machine, the combination defined in claim 2 and further characterized in that said bonnet has a three-sided configuration enclosing a space of substantially triangular cross section with said tubular conduit member attached intermediately of one bonnet side and arranged to form the juncture of the other two bonnet sides, and in that said respective inlet openings are arranged respectively adjacent the respective junctures of said other two bonnet sides with said one bonnet side.

4. In a carding machine incorporating a carding cylinder and a doffer roll operating at said cylinder to doff the same, the combination therewith of arcuate cover plates respectively shrouding said cylinder and doffer roll in advance of the point of doffing but terminating short of abutment to leave a first substantial slot between the adjacent converging edges of said cover plates in advance of said doffing point for releasing air pressure generated thereat incident to operating rotation of said cylinder and doffer roll, a bonnet disposed between the exposed faces of said cover plates to enclose a space over said first slot and having an outlet opening formed therein at a substantially central position with respect to the width of said carding machine, said bonnet being additionally formed to leave a second substantial slot between the adjacent edge portion thereof and the exposed face of the cover plate shrouding said cylinder, and means connected at said bonnet outlet opening for receiving and carrying off for collection all fly borne by the air released through said first slot into the space enclosed by said bonnet, said

bonnet further comprising end walls shaped to seat at the respective exposed faces of said cover plates and top wall extending between said end walls to form the enclosing bonnet structure, said outlet opening being formed in said top wall and the edge portion of said top wall adjacent said cylinder shrouding plate terminating in spaced relation thereto for forming said second slot, and a baffle member fixed at said adjacent top wall edge along the entire extent thereof between said end walls and reaching both outwardly and inwardly of the bonnet structure.

5. In a carding machine incorporating a carding cylinder and a doffer roll operating at said cylinder to doff the same, the combination therewith of arcuate cover plates respectively shrouding said cylinder and doffer roll in advance of the point of doffing but terminating short of abutment to leave a first substantial slot between the adjacent converging edges of said cover plates in advance of said doffing point for releasing air pressure generated thereat incident to operating rotation of said cylinder and doffer roll, a bonnet disposed between the exposed faces of said cover plates to enclose a space over said first slot and having an outlet opening formed therein at a substantially central position with respect to the width of said carding machine, said bonnet being additionally formed to leave a second substantial slot between the adjacent edge portion thereof and the exposed face of the cover plate shrouding said cylinder, and means connected to said bonnet outlet opening for receiving and carrying off for collection all fly borne by the air released through said first slot into the space enclosed by said bonnet, said arcuate cover plate shrouding said cylinder having the edge thereof adjacent said slot relieved concavely from the ends thereof adjacent the sides of said carding machine towards a substantially central position with respect to the width of said carding machine, whereby the air currents incident to said air pressure release have an induced direction away from the sides of said carding machine.

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DORSEY NEWTON, *Primary Examiner.*