April 12, 1960 G. DEARSLEY 2,932,300

CIGARETTE MACHINE

Filed Nov. 14, 1956

2 Sheets-Sheet 1

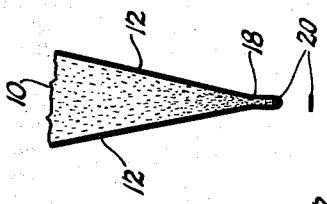


FIG. 2

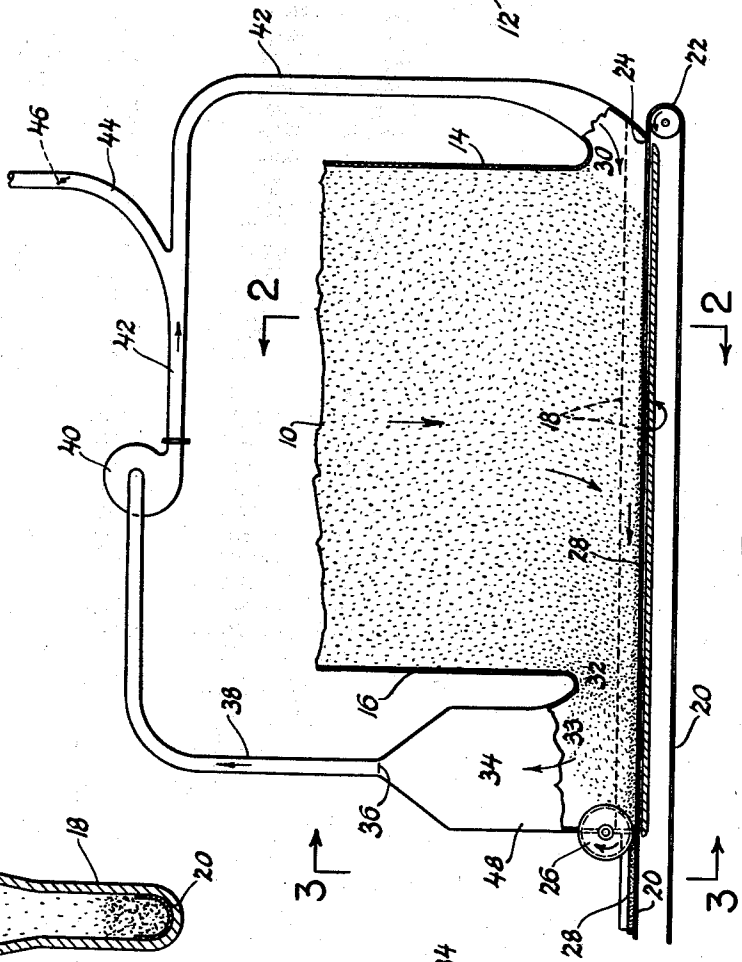


FIG. 1

FIG. 4

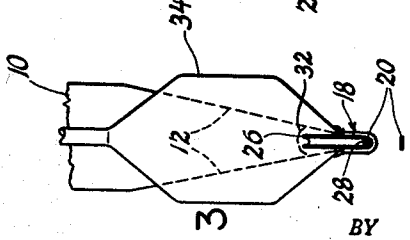


FIG. 3

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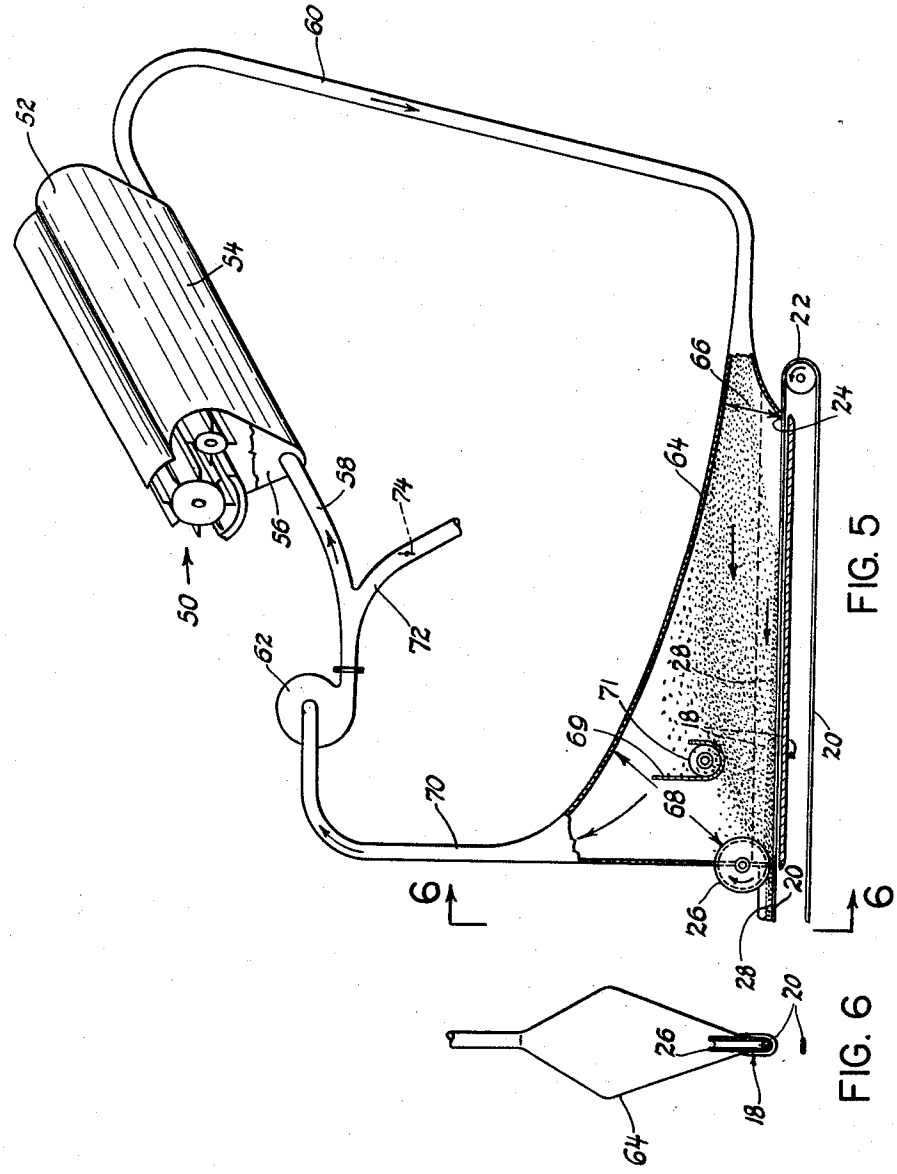


FIG. 5

FIG. 6

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CIGARETTE MACHINE

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14 Claims. (Cl. 131—110)

This invention relates to improvements in cigarette making machines and is more particularly concerned with the manner of depositing tobacco onto the conveyor belt on continuous cigarette paper web of a cigarette rod forming machine.

One of the criticisms frequently made with respect to the quality of cigarettes is, that if existing cigarette machines are operated at speeds producing in excess of 1200 to 1300 cigarettes per minute, the quality of the cigarettes, i.e., density and the uniformity of the cigarettes fabricated deteriorates rapidly with increase in speed.

It was found that this falling off in quality is largely due to the uneven distribution of tobacco in the rod forming trough. This maldistribution is a result of the sudden and violent change in direction of the tobacco particles from a vertical falling motion to a horizontal belt motion, when the tobacco is fed by gravity onto the belt or cigarette paper web moving in the bottom of the trough at relatively high velocity.

Many attempts have been made to avoid this difficulty by imparting a horizontal component to the falling tobacco particles by means of hurling screws, chute vanes, moving belts in the sides of the trough, etc. However, these devices have achieved only limited success at best. Also compressed air jets have sometimes been employed which however create a dust problem exteriorly of the apparatus due to the high pressure air used, and also may cause separation to an undesirable extent of the finer tobacco particles or shorts from the longer tobacco strands.

It is accordingly a primary object of the invention to provide in a cigarette making machine means whereby the quality and firmness of the cigarettes can be maintained or even improved, at cigarette making speeds far in excess of those presently employed.

A more specific object of the invention is to accelerate the tobacco particles to such an extent as to enable them to arrive on the rod forming belt with a horizontal velocity component approaching or being equal to that of the belt.

Another object of the invention is to prevent tobacco dust from escaping into the operating room.

A further object of the invention is to avoid disruption of the cigarette stream at the point where the tobacco leaves the rod forming chute or chamber.

Still another object of the invention is to prevent disruption of the uniformity of the shreds in the tobacco stream at the point where the air stream disengages from the tobacco shower.

An additional object of the invention is to maintain in the finished cigarette rod the same separation and distribution of the tobacco shreds as to size which has been established by the tobacco picker mechanism.

A further object of the invention is to produce individual cigarettes of more uniform weight than heretofore possible when operating at high cigarette making speeds.

Still another object of the invention is to make the tobacco picker mechanism independent as to location from the rod forming mechanism.

Other objects and features of the invention will appear as the description of the particular physical embodiment selected to illustrate the invention progresses. In the accompanying drawings, which form a part of this specification, like characters of reference have been applied to corresponding parts throughout the several views which make up the drawings.

Fig. 1 is a diagrammatic representation of an elevational sectional view of a tobacco feeder chute and rod forming mechanism associated with apparatus according to the present invention.

Figs. 2 and 3 are sectional views and end views taken respectively on lines 2—2 and 3—3 of Fig. 1.

Fig. 4 is an enlarged section through the rod forming trough and conveyor belt.

Fig. 5 is a diagrammatic representation of an elevational section of another embodiment of the invention wherein the tobacco picking mechanism is independently situated with respect to the tobacco rod forming mechanism.

Fig. 6 is an end view of Fig. 5 taken on line 6—6.

Referring now to Figs. 1 and 4, the picked tobacco is showered from a feed mechanism (not shown) of standard conventional construction through a chute 10 having converging side walls 12 and end walls 14 and 16. Side walls 12 terminate in a U-shaped trough 18 into which the tobacco falls. As shown in Fig. 4 the bottom of trough 18 carries an endless travelling conveyor belt 20 or continuous cigarette paper web, upon which the tobacco filler is built up as the belt or paper passes beneath the shower in the direction indicated by the arrow (see Fig. 1). The conveyor belt 20 rotates about pulley 22, enters trough 18 at 24, forms into a U-shape as it glides over the surface of trough 18 and passes with the tobacco filler beneath a compressor wheel 26 at the far end of the tobacco shower.

The tobacco shreds, as they are hurled downwardly by a conventional picker mechanism or as they drop by gravity through the chute 10, encounter the conveyor belt 20 while the latter is travelling at considerable speed, which varies with the rate of output of the machine. When the tobacco lands on the tape 20 it must be accelerated to the conveyor speed. During this acceleration considerable sliding and bouncing of the tobacco takes place causing build-ups and voids along the tobacco rod 28, being formed. The density of tobacco in the continuous rod therefore varies along the length of the rod and when the rod is cut into cigarette lengths the cigarettes are found to be unevenly filled and to vary greatly in individual weight.

It is quite obvious that if a horizontal movement can be imparted to the falling tobacco particles to cause them to arrive on the conveyor belt with a velocity component substantially equal to that of the belt, both as regards magnitude and direction, then the change in direction will take place smoothly, resulting in a more uniform tobacco stream and hence more uniform individual weights.

In addition to the various mechanical devices that have been employed to impart the desired acceleration to the tobacco particles before they come into contact with the conveyor belt 20, compressed air has been used by being discharged through numerous air nozzles, or openings arranged along the sides of chute 10 or trough 18. However, although the desired acceleration of the tobacco could readily be achieved in this manner, great difficulty was experienced in disengaging the air stream from the tobacco. The present invention successfully meets this problem.

In accordance with the invention an air stream is introduced through opening 30 provided in wall 14, at a velocity and volume to impart to the tobacco particles a horizontal component in the direction of belt travel that is substantially equal to the velocity of the conveyor belt 20. The carrier air leaves the chute 10 through air opening 32 in end wall 16 and enters an expansion chamber 34 having a cross sectional flow area substantially in excess of that of opening 32 as illustratively shown in Fig. 3. Accordingly the carrier air flows into a zone of reduced velocity within expansion chamber 34 that is substantially lower than the velocity maintained in the tobacco shower within chute 10.

The lower velocity prevailing in expansion chamber 34 results in ready disengagement of the residual tobacco particles from the air stream which passes upwardly through outlet 36 and conduit 38 into the suction inlet of fan 40. The outlet of fan 40 is connected to the inlet opening 30 in end wall 14 by way of conduit 42 to complete the air flow circuit. The outlet of fan 40 may also be connected to an existing dust suction system (not shown), of the cigarette making machine, by way of conduit 44 which will place the entire air flow circuit comprising conduit 42, chute 10, expansion chamber 34, conduit 38 and fan 40 under subatmospheric pressure.

Fan 40 may be of the variable speed type permitting control of the carrier air flow by controlling the speed of fan 40. In addition an adjustable valve or damper 46 is provided in conduit 44 to control and maintain a desired negative pressure in the above described conveying system.

Thus the invention provides for a clean running machine effectively preventing any dust leakage to the outside, for the whole length of the trough 18 as well as the tobacco feeding chute 10 will be under a slight negative pressure at all times.

Furthermore, the herein disclosed inventive system may be used as a means of removing all fine dust from the tobacco, thus improving the quality of the cigarettes produced.

According to another feature of the invention the compressor wheel 26 provided at the rod finishing end of the tobacco stream is adapted to function as an air lock. Wall 48 of expansion chamber 34 is fitted snugly around the sides and top of wheel 26 while the wheel periphery having a U-shaped profile rolling over the tobacco rod 28 at the linear speed thereof, effectively seals the interior of the expansion chamber against air leaking into the chamber 34 at the point where the tobacco rod 28 and conveyor belt 20 pass through wall 48, thereby effectively preventing any disturbance of the tobacco at this crucial point.

According to a further feature of the invention the carrier air after having accelerated the tobacco shreds substantially to the speed of conveyor belt 18 and deposited the tobacco thereon, sharply veers off at 33 at right angle into a low pressure, low velocity zone, thereby causing remaining cigarette particles to drop out not only by force of gravity but also by an additional centrifugal force caused by the upward sweep of the air current.

Accordingly the conveying air leaves expansion chamber 34 in a condition free of tobacco shreds and without causing any turbulence and disturbance of the tobacco layer already deposited in trough 18 and about to pass under compressor wheel 26.

In Figs. 5 and 6 there is illustrated another embodiment of the invention which in diagrammatic form discloses another important feature of the invention.

In existing cigarette making machines the feed must of necessity have the final picker located above the tobacco delivering chute 10. In consequence thereof a large portion of the feeder mechanism must be situated above the level of the final picker section leaving waste space approximately four feet high below the feed mechanism.

The embodiment illustratively shown in Figs. 5 and 6 successfully meets this problem, since in the organization disclosed therein the position of the feed mechanism is quite independent of the rod forming apparatus and thus may be placed close to it or in a more remote position. In practice, it is convenient to place the feeder in proximity to the rod former with the final picker section to the side thereof or towards the rear. In any case it would be preferred to lower the feeder almost to floor level.

Thus the final picker section 50 being a portion of a conventional feed mechanism (not shown) delivers the tobacco shreds into a suitably shaped box 52 having converging sides 54 forming a trough and having end walls 56 to which are connected conduits 58 and 60. Conduit 58 communicates with the pressure side of a fan 62 which may be of the variable speed type, and delivers a stream of air to box 52 for the purpose of picking up the tobacco and conveying it through conduit 60 to the inlet opening of a tobacco delivering chute or chamber 64. This chamber closed at the top is similar to chute 10 in as much as it has converging sides 66 terminating in the conventional U-trough 18 carrying endless conveyor belt 20 as described earlier herein above in connection with Figs. 1 through 4.

Chamber 64 has a cross sectional flow area which progressively increases in direction of air flow indicated by arrow, from a relatively small cross section at 66 to a substantially larger cross section at 68.

The air entrained tobacco travels through conduit 60 at a velocity sufficiently high to prevent settling out and drifting of the tobacco shreds. Upon entering chamber 64 the velocity is substantially but gradually reduced as indicated by enlarging of the flow area shown at 66 to permit the tobacco to descend onto the moving belt 20. While the air travels through the chamber 64 the cross sectional flow area is thus enlarged in a progressing manner until a maximum area is reached at 68 approximately opposite the compressor wheel 26. In this enlarged region the air turns upwardly shedding in a slow velocity zone the remaining tobacco particles and enters conduit 70 leading to the inlet suction side of fan 62 thereby completing the air flow cycle.

As in the embodiment earlier described herein in connection with Figs. 1 through 4, the outlet of fan 62 can be connected to a dust extracting system by way of conduit 72. Thus the entire air flow cycle including box 52, conduit 60, tobacco delivery chamber 64, through 18, conduit 70, fan 62 and conduits 58 and 72 can be maintained under sub-atmospheric pressure which may be controlled by air valve or damper 74 provided in conduit 72. In this manner tobacco dust will be prevented from escaping into the operating room and will be absorbed by the conventional dust extraction system.

The organization as above described and as illustrated in Figs. 5 and 6 permits complete flexibility of design regarding the position of the feed mechanisms. It delivers the tobacco into the U-shaped trough 18 with the desired forward motion and disengages the tobacco from the air stream without any noticeable turbulence or disturbance of the cigarette filler already deposited on the moving belt 20.

In addition a winnowing effect of the tobacco is achieved within the chamber 64, for the stem particles having a greater density will be carried further along toward the compressor wheel 26 than the lighter strands of tobacco, thus achieving a desired separation. A stem collecting box may be mounted in chamber 68 to collect winnowed stems. This stem box may be mounted in the chamber 68 in any suitable manner. If desired a stem removing screw can be provided in the box, in a manner similar to that shown in my copending application Serial Number 463,920 filed October 22, 1954.

The invention hereinabove described may therefore be varied in construction within the scope of the claims, for the particular device selected to illustrate the invention is but one of many possible embodiments of the same. The invention, therefore, is not to be restricted to the precise details of the structure shown and described.

What is claimed is:

1. In a cigarette making machine a belt surface moving in a substantially level plane, means causing tobacco particles to descend upon said moving belt surface, means causing a gas stream to deflect the normal path of said descending particles in direction of said belt travel in an atmosphere of predetermined static pressure, an exit chamber of increased volumetric capacity to cause a zone of lower than said predetermined static pressure, and having a conduit to bleed out the air wherein said static pressure is maintained lower than atmospheric pressure.

2. In a cigarette maker, the combination of a picker roller discharging picked tobacco into a duct conveying a stream of air, a valve to bleed the air to cause a static pressure lower than atmospheric, a belt disposed in the bottom of said duct to seal the duct and convey the tobacco, means continuously to move said belt in direction of said air stream for receiving said tobacco upon the belt surface over a predetermined distance of travel, and wall means defining a cross sectional flow area of said duct at the downstream end of said distance that is larger than the cross sectional flow area of said duct at the upstream end of said distance.

3. In a cigarette rod forming device, a trough having a bottom including an axially moving belt, means to shower tobacco particles into said trough and onto said moving belt surface, means causing the air carrying said descending tobacco particles to accelerate by suction in the direction of said belt's travel while said particles descend onto said belt surface, a conduit to exhaust out any accumulation of air, to keep the static pressure, within said trough, lower than atmospheric and a part opening into a chamber of enlarged cross sectional flow area to receive said carrier air at substantially reduced velocity.

4. In a cigarette maker, the combination of a picker roller discharging picked tobacco into a duct conveying a stream of air, a belt disposed in the bottom of a portion of said duct to seal said duct and convey the tobacco, means continuously to move said belt in the direction of said air stream for receiving a shower of said tobacco upon the belt's surface, and wall means defining a cross sectional flow area of said portion that increases in the direction of belt travel to a point where the static pressure in said flow area is lower than atmospheric pressure.

5. Apparatus having the features specified in claim 4 wherein said wall means define a cross sectional flow area that is a minimum at the upstream end of said duct portion and a maximum at the downstream end thereof having a gradual transition from the minimum cross-section to the maximum cross section.

6. In a cigarette making apparatus, conduit means to convey at a given axial velocity a stream of gas in a system having a conduit to bleed out excess air to cause an environmental pressure lower than atmospheric pressure and descending tobacco particles, said conduit means including an interiorly disposed belt surface moving in direction of said gas flow for receiving said descending particles, and an extension of said conduit means at the downstream end thereof, said extension having a substantially enlarged cross sectional flow area causing a corresponding reduction of said given gas velocity.

7. In a cigarette maker, in combination a gradually expanding enclosed chamber under a static pressure lower than atmospheric pressure, a trough disposed within said chamber said trough having a bottom including a moving conveyor belt for receiving a shower of tobacco entrained in an air stream, means forming an exit for said conveyor belt and tobacco through a wall of said chamber, and rotating air lock means associated with said wall and

operatively engaged with said conveyor belt and tobacco at the point of exit through said wall.

8. An apparatus having the features specified in claim 7 wherein said air lock comprises a wheel disposed in slidingly fitting relation with said wall adjacent and above said exit to compress said tobacco while passing through said wall.

9. In a cigarette making machine a tobacco feed conduit having two converging side walls the lower ends thereof terminating in a trough having a longitudinally moving bottom, means to feed tobacco particles entrained in air through said conduit and onto said moving trough bottom and to move said air and entrained tobacco particles by suction in the direction of travel of said bottom at a given air velocity while said tobacco particles descend onto said bottom to form a rod, wall means arranged to expand said duct into a chamber of enlarged flow area wherein said given air velocity is substantially reduced, means forming an outlet for said tobacco conveying trough through the end wall of said chamber, and a roller disposed in tangent relation with said tobacco rod and having an axis of rotation parallel to said end wall said end wall fitting closely around the sides and top of said roller, and said roller rotating at substantially the same peripheral speed as the linear speed of said tobacco rod while compressing the tobacco into said trough to prevent disturbance of said rod formed tobacco by air leaking through said outlet.

10. A tobacco conveying mechanism for a cigarette rod making machine comprising a tobacco delivery chute having two end walls, a rod trough affixed to the lower end of said chute including a paper strip adapted to receive and convey said tobacco in direction of rod feed, air and air borne tobacco conveying means conveyed in a static pressure lower than atmospheric to prevent any tobacco leakage from the tobacco conveying mechanism including means forming an air entrance aperture in the proximity to the rod trailing end wall of said chute and an exit aperture for air and said tobacco rod in the proximity to the rod finishing end wall of said chute, and an air receiving chamber having a substantially enlarged flow area directly above and adjacent said rod finishing end to permit ready disengagement of the tobacco shorts from said conveying air in an atmosphere of reduced velocity.

11. A cigarette making machine comprising in combination a tobacco feed mechanism, a chute arranged to receive tobacco shreds discharged from said feed mechanism and to deliver the tobacco onto a continuous moving web of cigarette paper, air suction means arranged to impart at a predetermined velocity acceleration to the tobacco in the direction of travel of the cigarette paper and having an outlet to reduce the pressure so as to lower the pressure below atmospheric, to prevent any leakage of tobacco, and conduit means having a substantially enlarged cross-flow area to convey said air after the said acceleration has taken place away from the proximity of said moving web at a substantially reduced velocity.

12. A machine according to claim 11 wherein said conduit means are arranged to deflect the air away from said paper web in an upward direction substantially normal to the direction of travel of said cigarette paper web.

13. A cigarette making machine comprising in combination a tobacco feed mechanism, a chute arranged to receive tobacco shreds discharged from said feed mechanism and to deliver the tobacco onto a continuous moving web of cigarette paper, air flow means disposed adjacent the lower end of said chute and at the upstream side thereof with respect to paper travel and arranged to impart at a predetermined velocity movement to the tobacco shreds in the direction of travel of said cigarette paper, conduit means having an enlarged cross sectional flow area adjoining the far side and lower end of said chute and a damper to withdraw therefrom said air at a

substantially reduced velocity, whereby residual tobacco shreds become easily disengaged from said air current by gravitational force, said conduit means are organized to withdraw said air from said chute upwardly and in a direction substantially normal to the direction of cigarette paper travel and under sub-atmospheric pressure.

14. In a cigarette maker having the features provided for in claim 8 wherein a stem box is positioned to collect stems winnowed from said tobacco shower.

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