Jan. 30, 1968 J. L. JACKSON 3,366,125

APPARATUS FOR SEPARATING TOBACCO FROM THE PAPERS AND THE FILTER TIPS (IF ANY) OF IMPERFECT CIGARETTES

Filed July 12, 1965 6 Sheets-Sheet 1

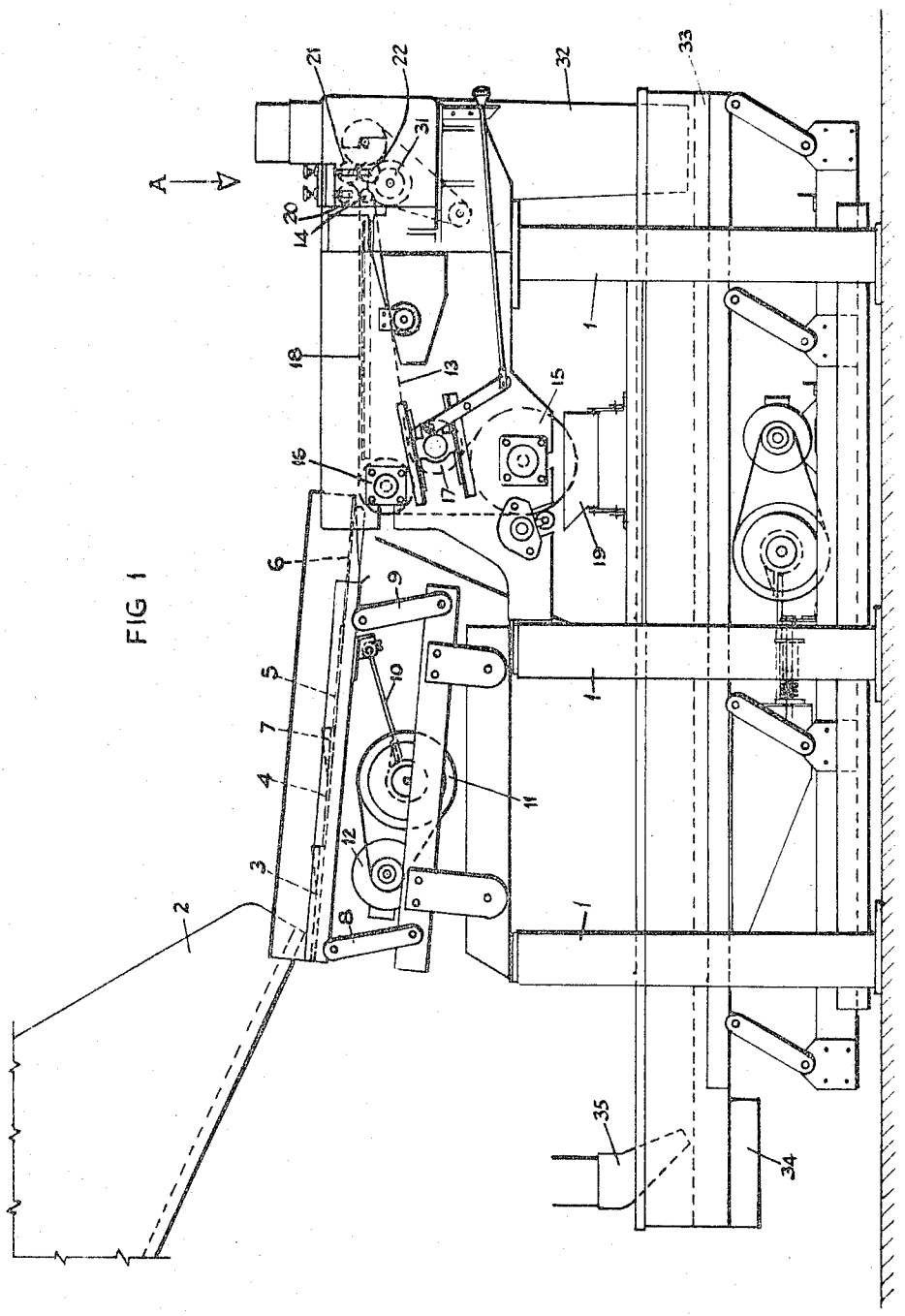
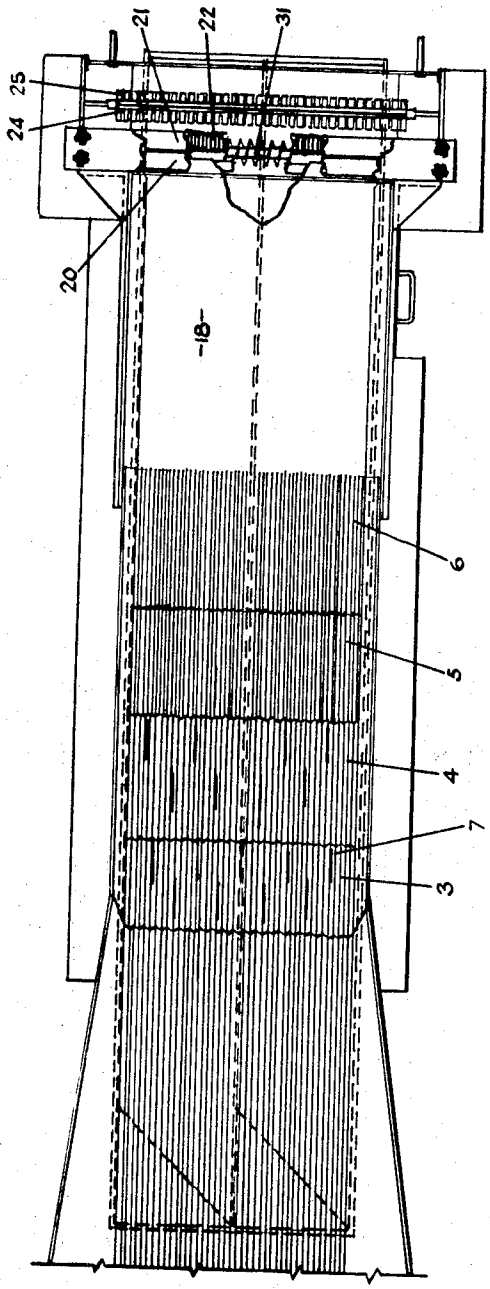


FIG 1

FIG 2



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Filed July 12, 1965 6 Sheets-Sheet 3

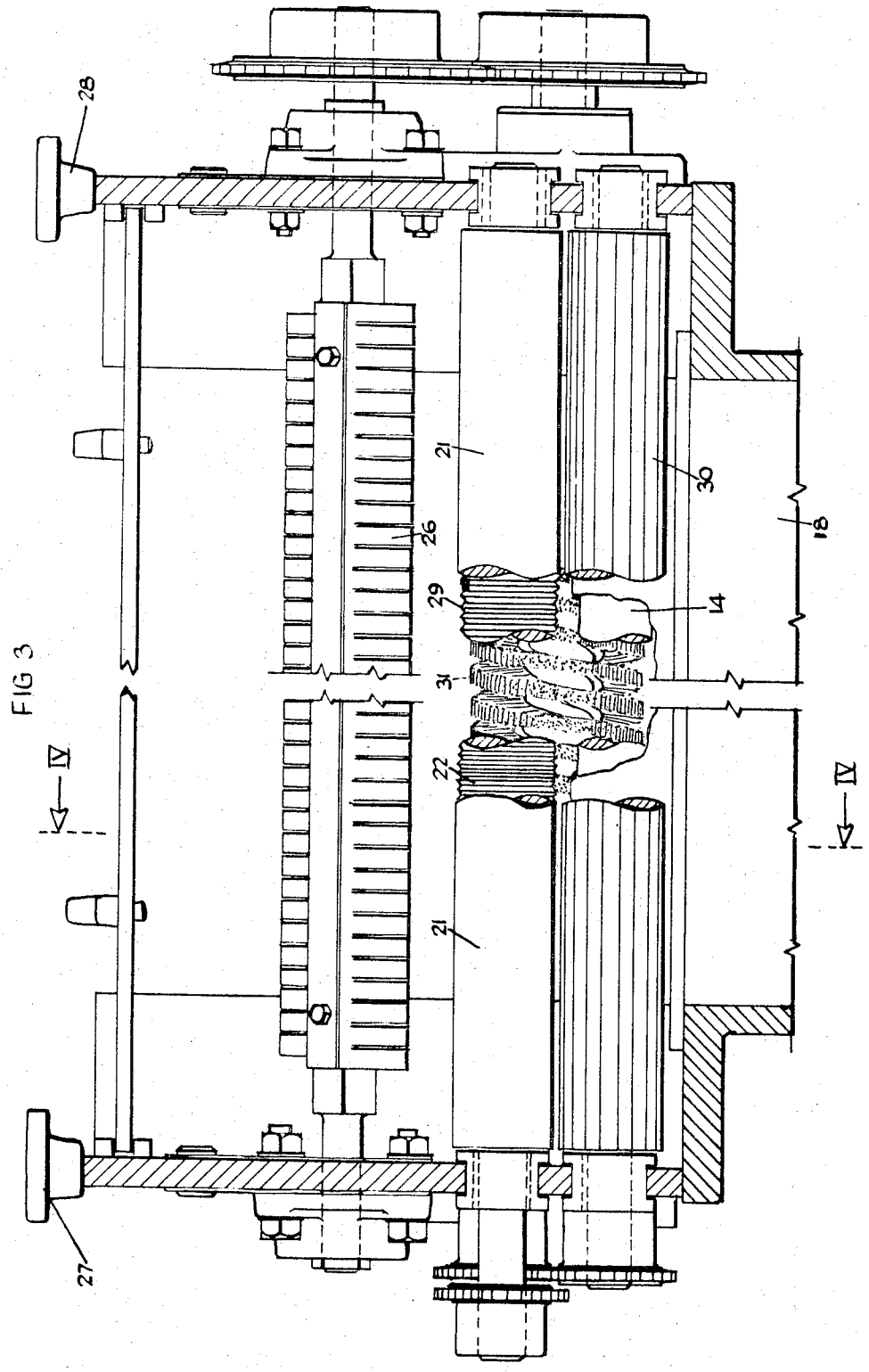

FIG 3

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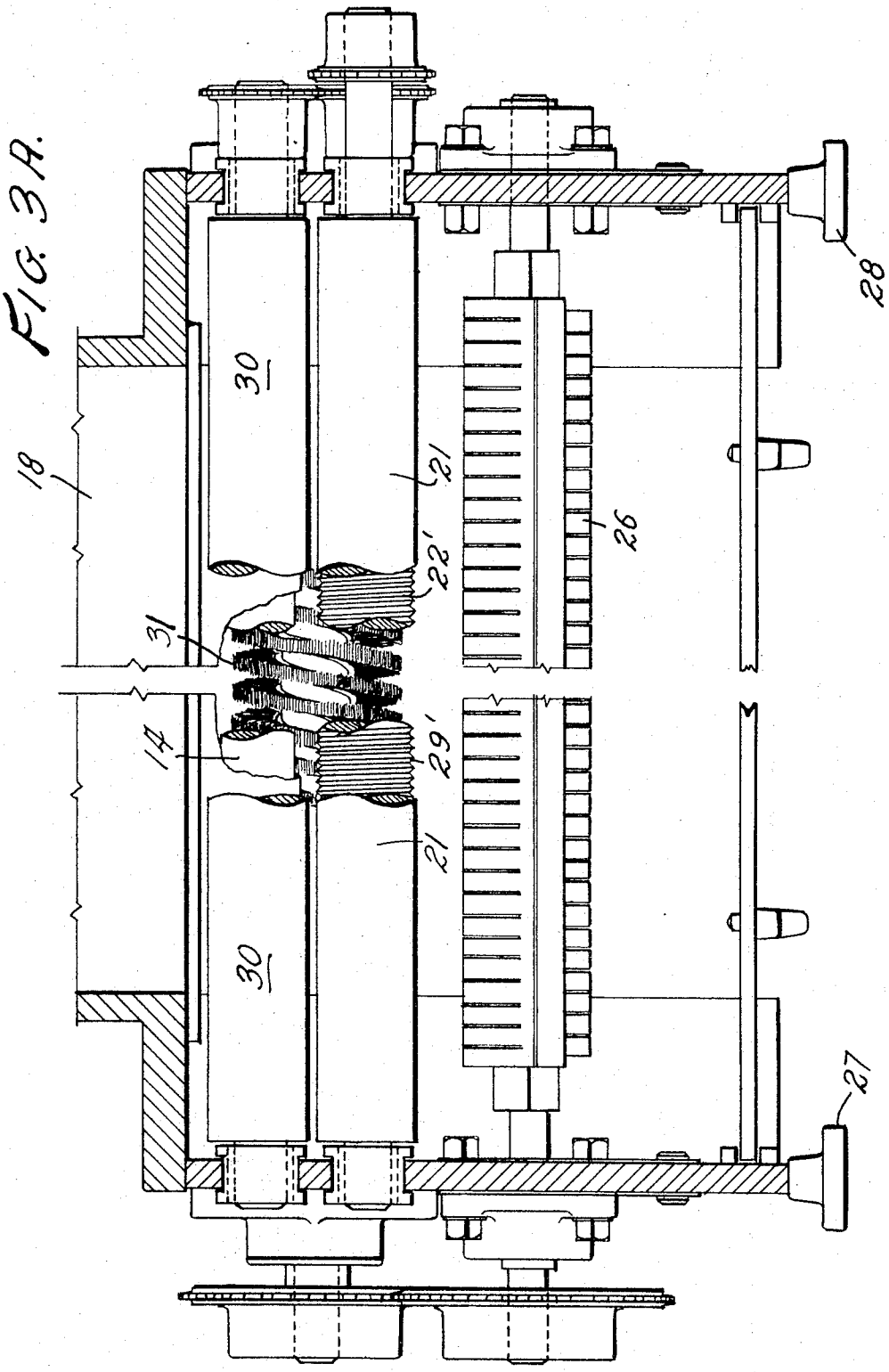
FIG. 3A.



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APPARATUS FOR SEPARATING TOBACCO FROM THE PAPERS AND THE FILTER TIPS (IF ANY) OF IMPERFECT CIGARETTES

Filed July 12, 1965 6 Sheets-Sheet 5

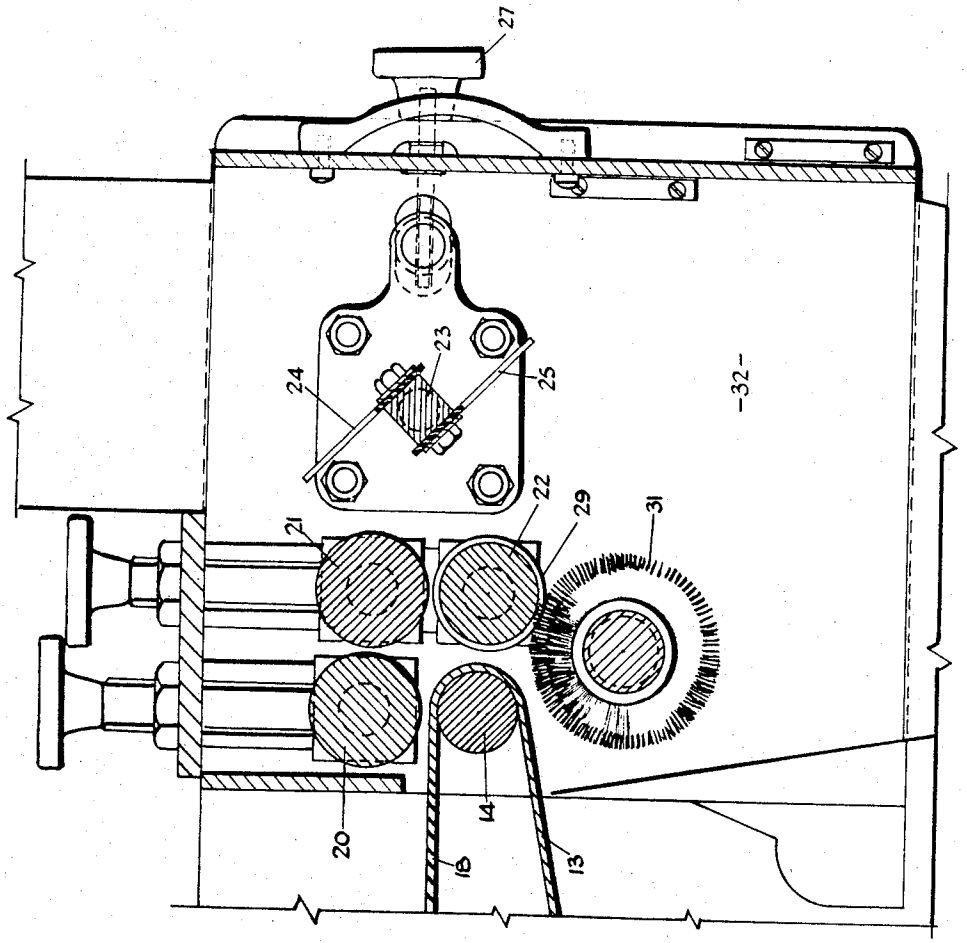
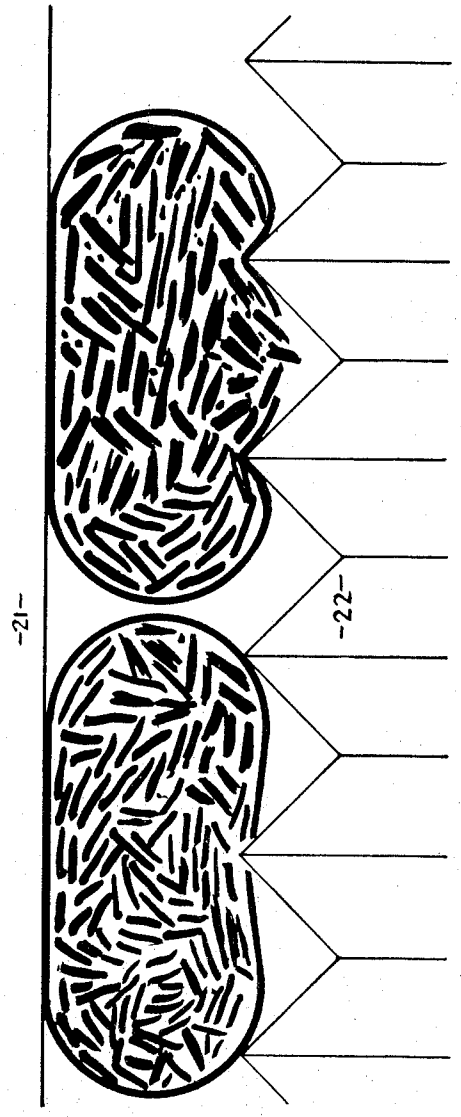


FIG 4

FIG 5



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3,366,125

APPARATUS FOR SEPARATING TOBACCO FROM THE PAPERS AND THE FILTER TIPS (IF ANY) OF IMPERFECT CIGARETTES

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20 Claims. (Cl. 131—96)

ABSTRACT OF THE DISCLOSURE

An apparatus for recovering tobacco from imperfect cigarettes. The apparatus includes two rollers, a first and second roller, a plurality of grooves and ribs extending around the first roller and a second roller mounted substantially parallel to the first roller and in close proximity thereto so that the second roller would apply pressure to imperfect cigarettes fed between the two rollers thereby urging the cigarettes toward the ribs of the first roller. A feeding mechanism feeds the cigarettes longitudinally between the two rollers so that the cigarettes' axes are approximately at right angles to the axes of the two rollers. The ribs and grooves of the first roller are shaped so that the cigarettes passing along the grooves and ribs are spaced from the bottoms of the grooves and a portion of the cigarettes projects beyond the edges of the grooves toward the second roller. The second roller is spaced from the first roller at such a distance that the said projecting portions of the cigarettes passing between the first and second rollers are engaged by the second roller and squashed toward the face of the grooves to rupture the paper of the cigarettes while the cigarettes are still spaced from the bottom of the grooves. Another device separates the tobacco from the other material of the ruptured cigarettes.

This invention relates to apparatus for separating tobacco from other materials such as the paper and the filter tips (if any) of imperfect cigarettes.

In the manufacture of cigarettes a proportion of damaged cigarettes are produced and it is desirable to recover the tobacco from such cigarettes for re-use.

It is an object of the present invention to provide apparatus for separating the other materials such as tobacco from the paper and filter tip (if any) and for recovering the three constituents.

According to one feature, the present invention consists in apparatus for recovering tobacco from imperfect cigarettes comprising a conveyor for feeding cigarettes longitudinally as a stream, a pressure roller co-operating with the conveyor at its delivery end adapted to feed the cigarettes from the conveyor longitudinally to grooves of a first or grooved and ribbed roller, a second roller substantially parallel to the said first roller, the ribs of said first roller being so shaped and dimensioned that cigarettes are spaced from the base of the grooves and a portion of the cigarettes projects beyond the edges of the ribs towards the second roller, said second roller co-operating with the grooved roller so as to engage projecting portions of cigarettes and squash them towards the base of the grooves, thereby rupturing the paper of the cigarettes at the spaced position whilst continuing the longitudinal feed of the cigarettes, and a beater for striking cigarettes emerging from between the grooved roller and its co-operating roller thereby detaching tobacco from the paper and tip (if any) of the ruptured cigarettes.

Preferably the conveyor runs in a substantially horizontal plane and its surface is wetted and the pressure roller is arranged above the delivery end of said conveyor so as to press the cigarettes downwardly into contact with the wetted surface to form a weakened wet line of moisture to weaken the cigarette paper during the feed of the cigarettes while the grooved roller is in line with the conveyor with its co-operating roller above it, so that the weakened wet line is spaced from the base of the grooves as the cigarettes are squashed during longitudinal feed.

Preferably also the pressure roller comprises a plurality of flattened areas extending parallel to its axis of rotation and rotates at a higher peripheral speed than the conveyor whereby said roller acts to engage cigarettes and move them with a wiping action towards grooves of the grooved roller, which, with its co-operating roller, runs at the same peripheral speed as the pressure roller.

The ribs of the grooved roller may be V-shaped.

An embodiment of the present invention is diagrammatically indicated in the accompanying drawings in which:

FIG. 1 is an elevation of a machine.

FIG. 2 is a plan.

FIG. 3 is an enlarged elevation taken in the direction of the arrow A in FIG. 1, parts of the mechanism being in section.

FIG. 3A is a view similar to FIG. 3 (but turned 180°) showing another embodiment of the invention wherein the ribs and grooves are helical.

FIG. 4 is an elevation taken on the line IV—IV of FIG. 3.

FIG. 5 is an enlarged view of the rollers **21**, **22** illustrating how the cigarettes are ruptured.

Referring to FIGS. 1 and 2, the machine comprises a framework **1** on which is mounted a chute **2**, and a vibratory grooved conveyor arranged in four stepped sections **3**, **4**, **5** and **6**. As will be seen in FIG. 2, the hopper **2** and conveyor **3** to **6** are grooved longitudinally, furthermore the conveyor **3** to **6** has mounted thereon directing guides **7**.

The conveyor **3** to **6** is mounted on parallel arms **8**, **9** and is adapted to be vibrated backwards and forwards by means of a connecting rod **10** mounted on the base of the conveyor and on a wheel **11**, said wheel being rotated by a motor **12**.

13 is a leather or similar conveyor mounted about rollers **14**, **15** and **16** and a jockey roller **17**, so that its upper stretch **18** moves left to right as viewed in FIGS. 1 and 2. The roller **15** is located so as to lead the conveyor through a water bath **19** so that said conveyor is constantly wetted.

Referring now particularly to FIGS. 3 and 4, a pressure roller **20** at the delivery end of the wetting conveyor, co-operates with the stretch **18** of the conveyor **13** at the roller **14**, said roller **20** rotating at a higher peripheral speed than the conveyor **13** so that it acts in co-operation with the conveyor to move cigarettes from the conveyor with a wiping action into the grip of a pair of rollers **21**, **22**. This arrangement also tends to present the cigarettes to the rollers **21**, **22** in a general longitudinal direction though they may previously have been bent.

The rollers **21**, **22** rotate at the same speed as the roller **20** and they act, as hereinafter explained, to rupture the paper of the cigarettes and also to project them into the path of a rotating beater **23**.

As will be seen in FIGS. 3 and 4, the beater **23** comprises two sets **24**, **25** of resilient metal blades **26** and their beating action on the ruptured cigarettes acts to

detach the tobacco from the paper and tip and separate the strands of tobacco.

The beater **23** is mounted for movement towards and away from the rollers **21, 22** by means of knurled nuts **27, 28** so that it may readily be set at a suitable position for striking the cigarettes. The rollers **20, 21** are also readily adjustable with regard to the stretch **18** and roller **22** respectively by means of knurled nuts (see particularly FIG. 4).

In connection with the action of the beater, it should be explained that when tips are incorporated with cigarettes, they are usually ensheathed in a tube of paper, and they are joined to the cigarettes with a second band of paper and such second band is generally a paper that is to a great extent water resistant so that when the cigarettes with filters are wetted the wetting is insufficient to weaken the paper ensheathing the tip whereby, when the cigarette paper is ruptured, the tip, although it becomes separated, it does not itself rupture and it falls clear for separation.

Referring again to the rollers **21, 22**, it will be seen from FIG. 3 that the lower one, **22**, is ribbed, the ribs **29** being normal to the axis of rotation of the roller, and the rollers **21, 22** are spaced apart a distance such that the paper of the cigarettes is ruptured as they pass therebetween. The ribs **29** are of V section, the crests of the V's being sharp edges. It has been found satisfactory to use a roller in which the crests are 4.8 mm. apart with the faces of the ribs arranged symmetrically at 90° to one another. The spacing between the rollers **21, 22** is readily adjustable as is the spacing between the roller **20** and stretch **18** hereinbefore referred to. The spacing is determined in each case by the diameter and nature, e.g. firmness, of the cigarettes. Average cigarettes vary between about 7 to 8.5 mm. in diameter, so the space between the roller **20** and the stretch **18** is set at about 5/6 mm. to provide the wiping action, and it has been found advisable to use ribs on the roller **22** whose height normal to the surface of the roller is about 2.4 mm., thus providing ribs whose crests are 4.8 mm. apart, i.e. less than the diameter of a cigarette to be ruptured.

Since, as above explained, a cigarette passing to the rollers **21, 22** is already compressed to say 6 mm. height, it follows that the setting between the crests of the roller **22** and the roller **21** must be slightly less than the compressed cigarette, e.g. 5 mm.

In any case the setting of both the roller **20** and the rollers **21, 22** is adjusted to suit the cigarettes being ruptured, and this adjustment may take place after the machine has been set in motion.

Cigarettes passing between the rollers **21, 22** are thus compressed between the smooth upper roller **21** and either a groove between two ribs of the roller **22** or a crest on the roller **22**. If they are compressed against a groove, this acts to stretch and rupture the wetted paper, while compression against a crest virtually cuts the paper.

It is important that filter tips are not broken otherwise the material of the tip may contaminate the tobacco, so the rollers **21, 22** are arranged so that pressure is insufficient to rupture the double sheath surrounding the tip, while as the outer band is water resistant it is weakened to a lesser degree than the cigarette paper, in fact hardly weakened at all.

The roller **20** that co-operates with the conveyor stretch **18** is preferably provided with a plurality of flats **30** so that as it rotates it presses the cigarettes against the conveyor **18** and moves them along it with the wiping action into the nip between the rollers **21, 22**. Beneath the roller **22** is a rotating, spirally arranged, brush **31** that acts to clean any bits adhering to the ribs **29**.

32 is a funnel for directing the detached tobacco, paper and tips to a vibrating trough **33**. The trough **33** is surmounted with a sieve, shown in dashed line in FIG. 1 that permits the tobacco to pass through to the bottom of the trough during passage of the constituents from right to left as viewed in FIG. 1. The tobacco passes through an orifice **34** for reprocessing.

In some instances the papers and tips may still have bits of tobacco adhering to them in which case they may be sucked up through a pipe **35**, which directs them to a further vibratory trough and sieve that acts in a similar manner to the trough **33**. This mechanism is not illustrated in the drawings.

FIGURE 3A shows an embodiment identical to that of FIGURE 3 in all respects except that the roller **22'** having helically arranged grooves **29'** replaces the roller **22** and perpendicular grooves **29** of FIGURE 3.

The operation of the machine is as follows:

The necessary electric motors are set in motion to operate the vibratory conveyor **3** to **6**, the wetting conveyor **13**, the rollers **20, 21, 22**, the beater **23**, the brush **31** and the sieves e.g. **33**, whereupon a quantity of imperfect cigarettes are tipped on to the grooves in the chute **2** down which they slide on to the conveyor **3** to **6**. Due to the grooves in said conveyor, the directing guides **7**, the stepped arrangement and its vibratory motion the cigarettes are fed along the conveyor and simultaneously arranged in a longitudinal direction in which condition they pass to the upper stretch **18** of the wetting conveyor **13**. This in turn feeds them beneath the roller **20** and so compresses the cigarettes and wets their lower sides. Due to the roller **20** running at a faster peripheral speed than the conveyor **18** and the flats on its surface, it acts to snatch the cigarettes from the conveyor with a wiping action and feed them longitudinally into the nip between the rollers **21, 22**. These feed the cigarettes forward, rupturing the paper at the wetted line so that they project into the path of the blades **26**, whereby the tobacco is detached from the paper and tip. Not only does the positive beating action effect detachment but also the draught of air assists and the draught also tends to dry the papers.

The constituents of the cigarettes then fall through the funnel **32** on to the vibratory trough **33** which separates the tobacco from the paper and tips and allows the tobacco to pass through the mesh of the sieve on to the trough for re-use. The tips and paper are moved from right to left on the sieve (see FIG. 1) and simultaneously vibrated so that adhering strands tend to pass through the sieve. The paper and tips may then be drawn up by a suction fan into the pipe **35** and be fed to another vibratory sieve where a similar action takes place to separate further strands of tobacco.

As previously mentioned, the band joining the tip to the cigarette is substantially water resistant and it has been found that if tipped cigarettes are fed by the grooved rollers tip first, the tips are struck by the blades **26** and removed. If on the other hand, the cigarettes are fed tobacco end first, the paper ruptures at the weakened line permitting the tobacco to be beaten out of the opened cigarette paper tube and the opened tube complete with attached tip falls to the sieve.

According to a modification, the beater, instead of comprising sets of blades **24, 25**, may comprise a plurality of rods arranged parallel to the rotary axis of the beater.

FIG. 5 is drawn at eight times the roller size to illustrate the rupturing action on the cigarettes. In each of the cigarettes illustrated **37** is the line where it is wetted. It will be seen that when the cigarettes arrive between the nip of the rollers **21, 22** they are flattened at the top and bottom by the wiping action on the conveyor **18**, and further flattened at the top by compression by the roller **21**. As such they arrive at the roller **22** either with the wetted line in line with a crest **38**, which acts to rupture the cigarette, or with the wetted line **37** between crests (as shown at the right in FIG. 5) in which case the fact that the wetted line is spaced from the base of the groove it provides no support for the cigarette at said line, hence it ruptures along the weakened line.

In the invention as described the ribs **29** on the roller **22** are arranged normal to the axis of rotation, but it is

to be understood that the ribs may be helically arranged. Furthermore the upper roller 21 may be ribbed instead of the lower one 22 or alternatively they may both be ribbed. In this alternative the ribs on the two rollers may be arranged opposite one another or the ribs of one may coincide with grooves of the other.

I claim as my invention:

1. Apparatus for recovering tobacco from imperfect cigarettes comprising: a first roller having a plurality of grooves and ribs positioned alternately along the surface of the first roller and extending circumferentially around the surface of the roller, a second roller substantially parallel to the first roller and positioned in close proximity to the first roller so that said imperfect cigarettes may be received between the first and second rollers, feeding means for feeding cigarettes longitudinally between the first and second rollers so that the axis of the cigarettes is substantially at right angles to the axes of the first and second rollers; said ribs and grooves being so shaped and dimensioned that cigarettes passing along the grooves and ribs are spaced from the bottoms of the grooves and a portion of the cigarettes projects beyond the edges of the grooves towards the second roller; and said second roller being spaced from the first roller at such a distance that the said projecting portions of the cigarettes passing between the first and second rollers are engaged by the second roller and squashed towards the base of the grooves, thereby rupturing the paper of the cigarettes while the cigarettes are still spaced from the bottom of the grooves; and separating means for separating the tobacco from the other materials of the ruptured cigarettes.

2. Apparatus as claimed in claim 1 wherein the said feeding means comprises a conveyor and a pressure roller positioned at the delivery end of the conveyor, said pressure roller being substantially parallel to the first and second rollers, said conveyor and pressure roller adapted to feed cigarettes between the first and second roller, and said separating means being a beater adapted to strike the cigarettes emerging from between the said first and second rollers.

3. Apparatus as claimed in claim 2 in which the surface of the said conveyor is wetted and the pressure roller is positioned above the delivery end of the conveyor to press cigarettes downwardly into contact with the wetted surface of the conveyor to form a weakened wet line on the paper of the cigarettes, said pressure roller and conveyor mounted to feed the cigarettes between the first and second rollers so that the weakened wet line is spaced from the bottom of the said grooves as the cigarette is squashed between the first and second rollers.

4. Apparatus as claimed in claim 3 in which the pressure roller comprises a plurality of flat surfaces extending parallel to its axis and said pressure roller rotates at a higher peripheral speed than that of the conveyor thereby moving the cigarettes with a wiping action from the conveyor to the first and second rollers, and wherein the first and second rollers both rotate at the same peripheral speed as that of the pressure roller.

5. Apparatus as claimed in claim 3 in which the ribs on the first roller are normal to the axis of rotation of the first roller.

6. Apparatus as claimed in claim 3 in which the ribs on the first roller are formed as a helix.

7. Apparatus as claimed in claim 2 in which the pressure roller comprises a plurality of flat surfaces extending parallel to its axis and said pressure roller rotates at a higher peripheral speed than that of the conveyor thereby moving the cigarettes with a wiping action from the conveyor to the first and second rollers, and wherein the first and second rollers both rotate at the same peripheral speed as that of the pressure roller.

8. Apparatus as claimed in claim 2 in which the ribs of the first roller are V-shaped.

9. Apparatus as claimed in claim 8 in which the height of the ribs normal to the axis of the first roller is approximately 2.5 mm., and the angle of the grooves between the faces of the ribs is approximately 90°.

10. Apparatus as claimed in claim 2 in which the ribs on the first roller are normal to the axis of rotation of the first roller.

11. Apparatus as claimed in claim 2 in which the ribs on the first roller are formed as a helix.

12. Apparatus as claimed in claim 1 wherein the separating means comprises a beater mounted to strike the cigarettes emerging from between the first and second rollers, thereby detaching the tobacco from the other materials of the ruptured cigarette.

13. Apparatus as claimed in claim 1 in which the ribs of the first roller are V-shaped.

14. Apparatus as claimed in claim 13 in which the height of the ribs normal to the axis of the first roller is approximately 2.5 mm., and the angle of the grooves between the faces of the ribs is approximately 90°.

15. Apparatus as claimed in claim 1 in which the ribs on the first roller are normal to the axis of rotation of the first roller.

16. Apparatus as claimed in claim 1 in which the ribs on the first roller are formed as a helix.

17. Apparatus as claimed in claim 1 wherein the said second roller also has a plurality of grooves and ribs positioned alternately along its surface.

18. Apparatus as claimed in claim 1 wherein the said feeding means comprises a conveyor and a pressure roller positioned at the delivery end of the conveyor and parallel to the first and second rollers, said conveyor and pressure roller adapted to feed cigarettes between the first and second roller.

19. Apparatus as claimed in claim 3 in which the ribs of the first roller are V-shaped.

20. Apparatus as claimed in claim 19 in which the height of the ribs normal to the axis of the first roller is approximately 2.5 mm., and the angle of the grooves between the faces of the ribs is approximately 90°.

References Cited

UNITED STATES PATENTS

1,956,925	5/1934	Legg	131—96
3,055,374	9/1962	Koch et al.	131—96
3,160,161	12/1964	Sandman	131—96

FOREIGN PATENTS

894,226	10/1953	Germany.

ALDRICH F. MEDBERY, *Primary Examiner.*