Nov. 25, 1969 J. GOEMANN ETAL 3,479,913

CUTTING MECHANISM FOR CIGARETTE MACHINES OR THE LIKE

Filed Dec. 5, 1967 2 Sheets-Sheet 1

Fig.1

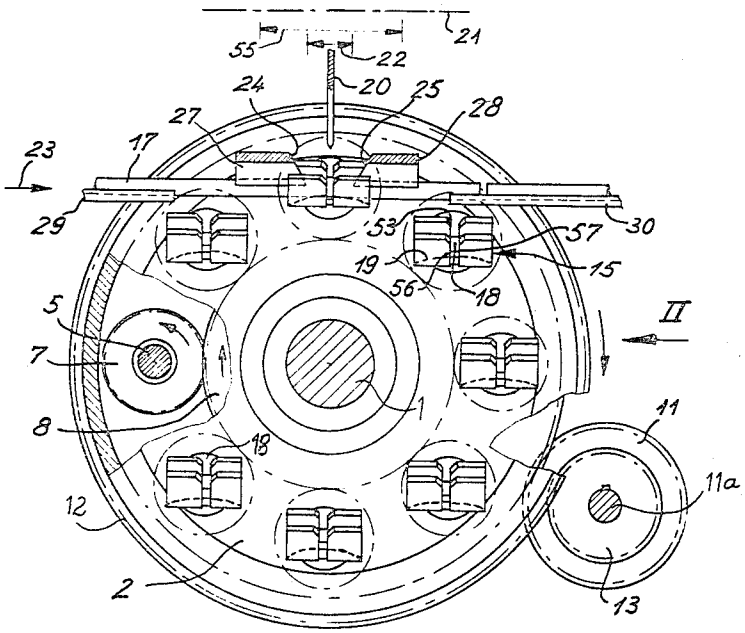
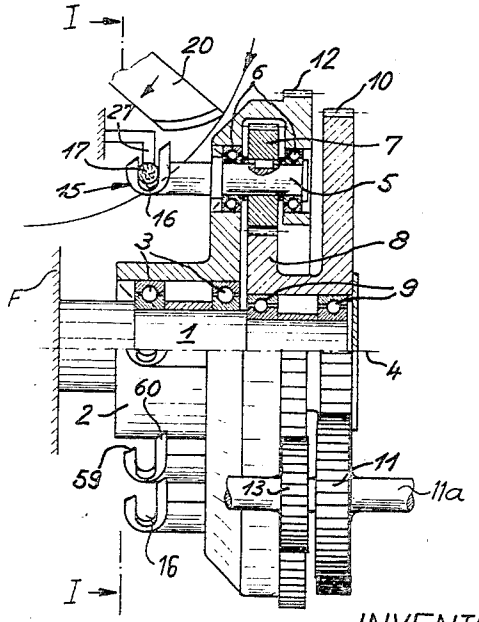


Fig.2



INVENTORS:

BY

ATTORNEY

Nov. 25, 1969 J. GOEMANN ETAL 3,479,913

CUTTING MECHANISM FOR CIGARETTE MACHINES OR THE LIKE

Filed Dec. 5, 1967 2 Sheets-Sheet 2

Fig. 3

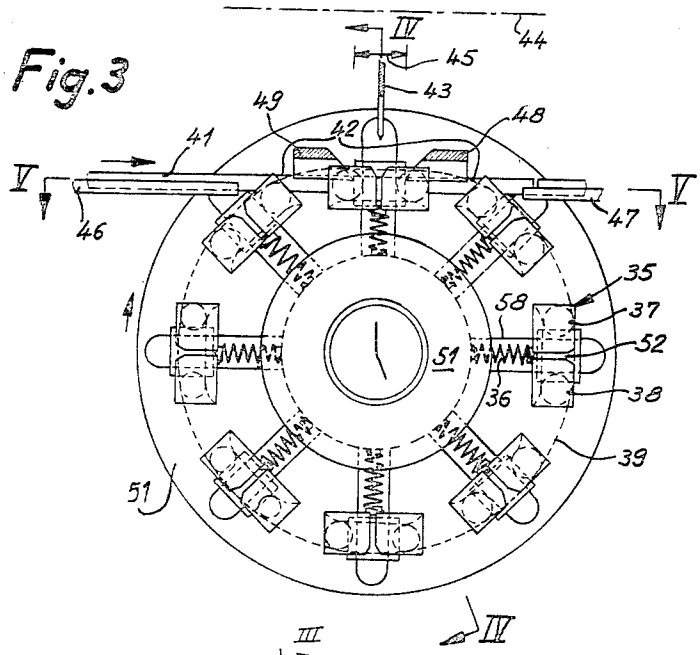


Fig. 5

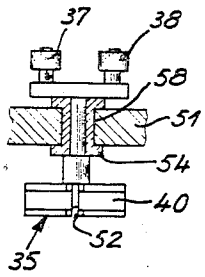
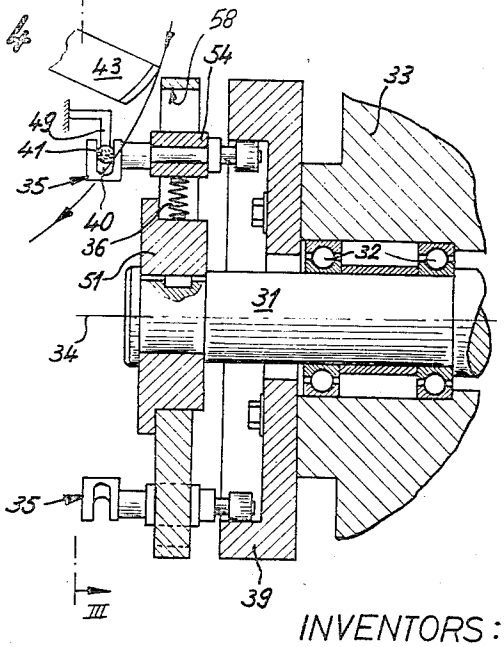


Fig. 4



INVENTORS:

BY

ATTORNEY

United States Patent Office 3,479,913
Patented Nov. 25, 1969

3,479,913

CUTTING MECHANISM FOR CIGARETTE MACHINES OR THE LIKE

Juergen Goemann and Wolfgang Grimm, Hamburg, Germany, assignors to Hauni-Werke Koerber & Co. K.G., Hamburg-Bergedorf, Germany

Filed Dec. 5, 1967, Ser. No. 688,043
Claims priority, application Germany, Dec. 15, 1966, H 61,303
Int. Cl. B26d 1/56
U.S. Cl. 83—310 17 Claims

ABSTRACT OF THE DISCLOSURE

A cutting mechanism wherein an orbiting knife blade reciprocates along the path for a wrapped tobacco rod issuing from a continuous rod cigarette or cigar machine to sever the rod while moving in the direction of rod travel. During severing, the rod is supported by successive trough-shaped sockets orbiting about the fixed axis of a driven support which moves the sockets at the speed of and in the same direction as the rod. Sockets which engage the rod during severing are aligned with the rod by a planetary gearing or by a cam whose face is tracked by followers provided on the sockets.

Background of the invention

The present invention relates to improvements in cutting mechanisms of the type used in rod cigarette machines or the like for severing of wrapped tobacco rods or analogous elongated bodies which travel lengthwise. More particularly, the invention relates to improvements in that part of a cutting mechanism which supports the travelling rod during severing by the cutting edge of a knife while the knife travels with and moves its cutting edge across the path of the rod.

Summary of the invention

It is an object of our invention to provide a novel and improved cutting mechanism which is simple, compact and more reliable than presently known cutting mechanisms.

Another object of the invention is to provide a cutting mechanism which does not strike against or otherwise affect movements of the travelling tobacco rod or a like elongated body.

A further object of our invention is to provide a cutting mechanism which can be used in presently known cigarette machines or like apparatus for sensing of wrapped tobacco rods or analogous bodies and which can properly support a substantial length of the moving body during severing.

An additional object of the invention is to provide a cutting mechanism which is assembled of simple parts, wherein the speed of the rod-supporting or engaging members can be readily synchronized with the speed of the rod, and which can properly guide the travelling rod prior, during and subsequent to severing.

A concomitant object of the invention is to provide novel rod-supporting and rod-guiding members for use in a cutting mechanism of the above outlined character.

Our invention is embodied in a cutting mechanism which, in addition to a customary reciprocable and rotary knife or cutter, comprises guide means for guiding a

wrapped tobacco rod or a like elongated body along a straight path wherein the body advances lengthwise at a predetermined speed, a support in the form of a disk or wheel adjacent to the path of the travelling body and rotatable about a fixed axis, a plurality of supporting members (hereinafter called sockets or back supports) articulately mounted on the support and rotatable therewith to move along an endless path a portion of which is adjacent to the path for the elongated body, drive means for rotating the support to move the sockets at the speed of the elongated body, at least during travel along the aforementioned portion of the endless path, and aligning means for maintaining the sockets in parallelism with the straight path during travel along the portion of the endless path so that the sockets support the elongated body in the region where the latter is severed by the knife.

The aligning means may comprise planet pinions rotatably mounted on the support and rigid with the sockets, a sun wheel meshing with the planet pinions and mounted coaxially with the support, and means for rotating the sun wheel to thereby rotate the planet pinions counter to the direction of rotation of the support at such a speed that the inclination of sockets remains unchanged, i.e., that the sockets remain parallel with the path for the elongated body during travel along the entire endless path.

It is also possible to use aligning means which includes a fixed cam and roller followers carried by the sockets and tracking the face of the cam. The face of the cam can be provided with a flat which is parallel to the path for the elongated body and the sockets are then movable radially of their support and are biased to maintain their followers in engagement with the cam face.

The novel features which are considered as characteristic of the invention are set forth in particular in the appended claims. The improved cutting mechanism itself, however, both as to its construction and its mode of operation, together with additional features and advantages thereof, will be best understood upon perusal of the following detailed description of certain specific embodiments with reference to the accompanying drawing.

Brief description of the drawing

FIG. 1 is a partly front elevational and partly sectional view of a cutting mechainsm which embodies one form of our invention, the view being taken in the direction of arrows as seen from the line I—I of FIG. 2;

FIG. 2 is an end elevational view of the cutting mechanism as seen in the direction of arrow II in FIG. 1 but with the upper portion of the mechanism partly broken away;

FIG. 3 is a partly front elevational and partly vertical sectional view of a second cutting mechanism as seen in the direction of arrows from the line III—III of FIG. 4;

FIG. 4 is a sectional view of the second cutting mechanism as seen in the direction of arrows from the line IV—IV of FIG. 3; and

FIG. 5 is a fragmentary horizontal sectional view as seen in the direction of arrows from the line V—V of FIG. 3.

Description of the preferred embodiments

Referring first to FIGS. 1 and 2, there is shown a cutting mechanism for use in cigarette machines or cigar machines. The cutting mechanism comprises a rigid carrier or support 2 which is mounted on a fixed shaft 1

supported by the frame F of a rod cigarette machine. The support **2** has a hub which rotates on two antifriction bearings **3** and its fixed axis of rotation is indicated by the phantom line **4**. This support **2** carries eight equidistant planet pinion shafts **5** whose axes are parallel to the fixed axis **4**, and each planet pinion shaft **5** is mounted in a pair of antifriction bearings **6**. Planet pinions **7** on the shafts **5** mesh with a sun wheel **8** which is mounted on antifriction bearings **9** having inner races surrounding the shaft **1**. The sun wheel **8** is rigid or integral with a driver gear **10** which is rotated by a pinion **11** mounted on a shaft **11***a*. The latter further carries a second pinion **13** which meshes with a spur gear **12** of the support **2**. The planet pinion shafts **5** extend beyond the left-hand face of the support **2**, as viewed in FIG. 2, and their outer end portions are rigid with sockets or back supports **15** each of which resembles a trough and can receive a portion of a wrapped tobacco rod **17** while such portion is being severed by a knife or cutter **20**. The grooves of the sockets **15** are denoted by numerals **16**, and each of these grooves has an open upper side in each position of the respective planet pinion shaft **5**. The diameters of the central portions of grooves **16** are the same as that of the tobacco rod **17**. As shown in FIG. 2, each socket **15** has two inclined top faces **59**, **60** flanking the respective groove **16**, and the outer (left-hand) top face **59** is located at a level below the inner top face **60**. The top faces **59**, **60** of each socket **15** are located in a common plane. Each socket **15** is further provided with a centrally located transverse slot **18** which halves the respective socket. The vertical inner faces **56**, **57** flanking the slots **18** are bevelled at their upper ends, as at **53**. Furthermore, the bottom surfaces **19** of the grooves **16** are curved downwardly and outwardly toward the ends of the sockets. This is indicated in FIG. 1 by broken lines. Thus, the depth of each groove **16** is greatest at both axial ends of the respective socket **15**. The planet pinions **7** mesh with the sun wheel **8** in such angular positions that each of the sockets **15** extends exactly horizontally or, better to say, in exact parallelism with the axis of the tobacco rod **17**. FIG. 1 shows that the cutting station is adjacent to the uppermost socket **15** because the straight path along which the cigarette rod **17** advances lengthwise is located at a level above the fixed axis **4**. This uppermost socket **15** supports the rod **17** from below while the knife **20** segregates from the leading end of the rod a section of unit length or multiple unit length. The knife **20** rotates about a horizontal axis **21** which is indicated by a phantom line. Furthermore, the knife **20** reciprocates back and forth in the longitudinal direction of the axis **21** so that it severs the tobacco rod **17** at a time when it moves in the same direction and at the same speed as the rod. The drive means for imparting to the knife **20** oscillatory and rotary movements are well known in the the art of cutting mechanisms for use in rod cigarette machines and, therefore, such drive means are not shown in the drawing. It suffices to say that the knife **20** can move back and forth to the extent indicated by a double-headed arrow **55**. The arrow **23** indicates the direction of lengthwise travel of the tobacco rod **17**, and the arrow **22** indicates the zone in which the knife **20** moves during penetration into the rod. During severing, the knife **20** travels in the direction indicated by arrow **23** and its cutting edge simultaneously orbits about the axis **21**. This cutting edge is remote from the tobacco rod **17** when the knife **20** is located to the left or to the right of the cutting zone indicated by the arrow **22**. FIG. 2 shows the knife **20** in an angular position in which its cutting edge is about to penetrate into the material of the tobacco rod **17**. During penetration into the rod, the knife **20** is guided by a suitably inclined surface **24** provided on a stationary upper guide **27** and, when the knife moves beyond the cutting zone **22** and moves away from the severed rod **17**, it slides along the inclined surface **25** of a second stationary upper guide **28**. The upper guides **27**, **28** also serve to support the rod **17** from above during severing and thus cooperate with the uppermost socket **15**. The manner in which the guide **27** engages the wrapper of the rod **17** from above is illustrated in FIG. 2. Two stationary lower guides **29**, **30** support the rod **17** from below upstream and downstream of the guides **27**, **28**. The grooves of the lower guides **29**, **30** register with the groove **16** of that socket **15** which is immediately adjacent to the inner guides **27**, **28**. The surfaces **24**, **25** taper away from each other in a direction away from the straight path defined by the guides **27–30**. The guides **27**, **28** engage the cigarette rod **17** in a region opposite the uppermost socket **15** and the lower guides **29**, **30** flank that portion of the endless path for the sockets **15** which is adjacent to the path of the rod **17**.

In the embodiment of FIGS. 1 and 2, the support **2** moves the sockets **15** along a substantially circular endless path the uppermost portion of which is adjacent to the path for the rod **17**. The parts **5–11** constitute aligning means for the sockets **15** in that they insure that each socket moves in parallelism with the rod **17** during travel along the top portion of its endless path. This aligning means is actually a drive which moves the sockets **15** with reference to the support **2**.

The operation is as follows:

The gear **13** drives the support **2** by meshing with the gear **12**, and the gear **11** drives the gear **10** to rotate the sun wheel **8**. The sun wheel **8** rotates the planet pinions **7** at such a speed that the sockets **15** remain in horizontal positions in all angular positions of the support **2**. Furthermore, the rotational speed of sockets **15** about the axis **4** is identical with forward speed of the cigarette rod **17** (arrow **23**). Such rotational speed is imparted to the support **2** by pinion **13**. The pinion **11** drives the sun wheel **8** at a speed which suffices to rotate each planet pinion **7** through 360 degrees during each full revolution of the support **2**; therefore, the angular position of each socket **15** remains unchanged. The planet pinions **7** rotate in a counterclockwise direction, as viewed in FIG. 1, whereas the support **2** rotates in a clockwise direction, both such directions being indicated by arrows. The distance between the highest points of surfaces **19** in the grooves **16** in those sockets which are located directly above or below the sun wheel **8** and the fixed axis **4** is selected in such a way that the wrapper of the rod **17** is engaged by the surface **19** in the groove **16** of the uppermost socket without any shock, i.e., that the socket cannot displace the rod from its predetermined path and cannot cause vibration of the rod during engagement with its wrapper. The drive for the support **2** is further synchronized with the drive means for the knife **20** so that the slot **18** in the uppermost socket **15** registers with the knife while the latter travels in the zone **22** so that the cutting edge of the knife can penetrate into the slot to insure that the rod **17** is severed completely through and yields a section of desired length. The knife **20** moves its cutting edge to the lower end position at the very moment when the slot **18** of the uppermost socket **15** is located exactly midway between the ends of the cutting zone **22**.

FIGS. 3 to 5 illustrate a second cutting mechanism which comprises a support or carrier **51** keyed to a horizontal drive shaft **31** whose fixed axis is indicated by the line **34**. The shaft **31** is mounted in antifriction bearings **32** installed in a stationary machine frame **33**. The support **51** is provided with equidistant radial ways **58** for sockets **35**. These sockets are turnable in holders **54** which are movable radially in the respective ways **58**. The holders **54** are biased radially outwardly by helical springs **36** installed in the innermost portions of the ways **58**. The turnability of sockets **35** in the respective holders **54** is limited to a small angle, and each of these sockets can turn about an axis which is parallel to the fixed axis **34** of the shaft **31**. Each socket **35** carries two roller followers **37**, **38** which track the internal face of a fixed aligning cam **39**. With the sole exception that their top faces are parallel to the axis **34**, the configuration of

sockets 35 is identical with that of the sockets 15. Their slots are shown at 52 and their grooves at 40. The slots 52 are located midway between the respective roller followers 37, 38.

The cam 39 has a circumferentially complete internal face which is of circular outline excepting for a flat 42 below the cutting station where it flattens in a manner as best shown in FIG. 3. The tobacco rod 41 is supported from below by lower guides 46, 47 and from above by upper guides 48, 49. The knife 43 is identical with the knife 20 of FIGS. 1 and 2, the axis about which this knife rotates being indicated by the phantom line 44 and the double-headed arrow 45 denoting the zone in which the cutting edge of the knife 43 penetrates into the rod 41. The guides 46 to 49 are identical with or clearly analogous to the guides 27–30 shown in FIG. 1. In this embodiment of our invention, the face of the cam 39 defines an endless path for the sockets 35 and a portion (along the flat 42) of this path is immediately adjacent to the path for the rod 41. The cam 39, the followers 37, 38 and the holders 54 constitute aligning means which serve to maintain the uppermost socket 35 in parallelism with the rod 41 while the uppermost socket travels along the flat 42.

When the cutting mechanism of FIGS. 3 to 5 is put to use, the support 51 is driven at such a speed (clockwise, as viewed in FIG. 3) that the bottom surfaces of grooves 40 in the sockets 35 travel at the exact speed of the rod 41. The followers 37, 38 roll along the internal face of the cam 39 and determine the radial positions of respective sockets 35 as well as the angular positions of such sockets with reference to the support 51. When the followers 37, 38 of a socket 35 track the circular portion of the face on the cam 39, the groove 40 of this socket extends tangentially of the cam face. When the followers 37, 38 reach the flat 42, the respective socket 35 changes its position with reference to the support 51 and moves into exact paralellism with the rod 41. Thus, and as shown in FIG. 3, the uppermost socket 35 moves radially toward the fixed axis 34 of the drive shaft 31. During such radial movement, the uppermost socket 35 also changes (temporarily) its angular position with reference to the support 51. The respective spring 36 stores energy and biases the uppermost socket 35 with a greater force to insure that the followers 37, 38 track the flat 42. When the uppermost socket 35 assumes the position shown in FIG. 3, it is located at a minimal distance from the fixed axis 34 and its groove 40 is exactly parallel with the direction of tobacco rod travel. The slot 52 of the uppermost socket 35 is then located midway between the ends of the cutting zone 45, i.e., the position of this uppermost socket is then analogous to that of the uppermost socket 15 shown in FIG. 1.

The provision of flat 42 on the internal face of the cam 39 is of advantage because the uppermost socket 35 shares the movement of the rod 41 along a substantial portion of the path defined by the guides 46 to 49. Thus, the uppermost socket 35 is in requisite supporting engagement with the wrapper of the rod 41 during the entire period which is required by the knife 43 to form a clean cut while its cutting edge travels in the zone 45.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can, by applying current knowledge, readily adapt it for various applications without omitting features which fairly constitute essential characteristics of the generic and specific aspects of our contribution to the art and, therefore, such adaptation should and are intended to be comprehended within the meaning and range of equivalence of the claims.

What is claimed as new and desired to be protected by Letters Patent is set forth in the appended claims.

1. In a cutting mechanism for a wrapped tobacco rod or a like elongated body which travels lengthwise at a predetermined speed, a combination comprising guide means for guiding an elongated body along a straight path; a support adjacent to said straight path and rotatable about a fixed axis; a plurality of sockets articulately mounted on said support and rotatable therewith to move along an endless path a portion of which is adjacent to said straight path; drive means for rotating said support to move said sockets at said predetermined speed during travel along said portion of said endless path; and aligning means for maintaining said sockets in parallelism with said straight path during travel along said portion of said endless path so that said sockets engage and support the elongated body travelling along said straight path.

2. A combination as defined in claim 1, wherein each of said sockets resembles a trough and is turnable with reference to said support about an axis which is parallel to said fixed axis.

3. A combination as defined in claim 2, wherein said aligning means comprises second drive means for rotating said sockets about the respective axes and relative to said support.

4. A combination as defined in claim 3, wherein said first mentioned drive means is arranged to rotate said support in a first direction and said second drive means rotates said sockets in a second direction counter to said first direction.

5. A combination as defined in claim 4, wherein said second drive means comprises a sun wheel rotatable about said fixed axis and planet pinions each rigid with one of said sockets and meshing with said sun wheel.

6. A combination as defined in claim 5, wherein each of said planet pinions comprises a shaft journalled in said support and having an end portion extending from said support and affixed to the respective socket.

7. A combination as defined in claim 5, wherein said second drive means further comprises means for rotating said sun wheel independently of said support.

8. A combination as defined in claim 1, wherein each of said sockets is movable radially with reference to said fixed axis and said aligning means comprises means for moving said sockets radially during travel along said portion of said endless path.

9. A combination as defined in claim 8, wherein said endless path is a substantially circular path and said portion thereof extends in parallelism with said straight path.

10. A combination as defined in claim 8, wherein said sockets are turnable with reference to said support about axes which are parallel with said fixed axis and said aligning means comprises stationary cam means having a cam face defining said endless path and follower means provided on said sockets and arranged to track said face.

11. A combination as defined in claim 10, wherein each of said follower means comprises a plurality of follower disposed one behind the other as considered in the direction of rotation of said support.

12. A combination as defined in claim 10, wherein said aligning means further comprises holders reciprocable with reference to said support radially toward and away from said fixed axis and each turnably supporting one of said sockets, and means for biasing said holders radially toward and away from said fixed axis and each turnably supporting one of said sockets, and means for biasing said holders radially of said fixed axis to maintain said follower means in engagement with said cam means.

13. A combination as defined in claim 12, wherein said cam means is of annular shape and said face is an internal face of said cam means, said biasing means comprising resilient means for urging said holders away from said fixed axis.

14. A combination as defined in claim 10, wherein each of said sockets has a centrally located slot in a plane including said fixed axis and wherein each of said follower means comprises two roller followers disposed at the opposite sides of and at the same distance from the respective slot.

15. A combination as defined in claim 1, wherein said guide means comprises stationary guide means engaging the elongated body in a region opposite said portion of said endless path.

16. A combination as defined in claim 16, wherein said stationary guide means comprises two adjacent but spaced guides having surfaces tapering away from each other in a direction away from said straight path, and further comprising rotary knife means arranged to sever longitudinally spaced portions of the elongated body between said surfaces of said guides.

17. A combination as defined in claim 1, wherein, said guide means comprises stationary guides adjacent to said

straight path and flanging said portion of said endless path to support the elongated body at the same side as said sockets.

References Cited

UNITED STATES PATENTS

639,677 12/1899 Gilliland ---------- 131—65

JAMES M. MEISTER, Primary Examiner

U.S. Cl. X.R.

83—327, 337, 450