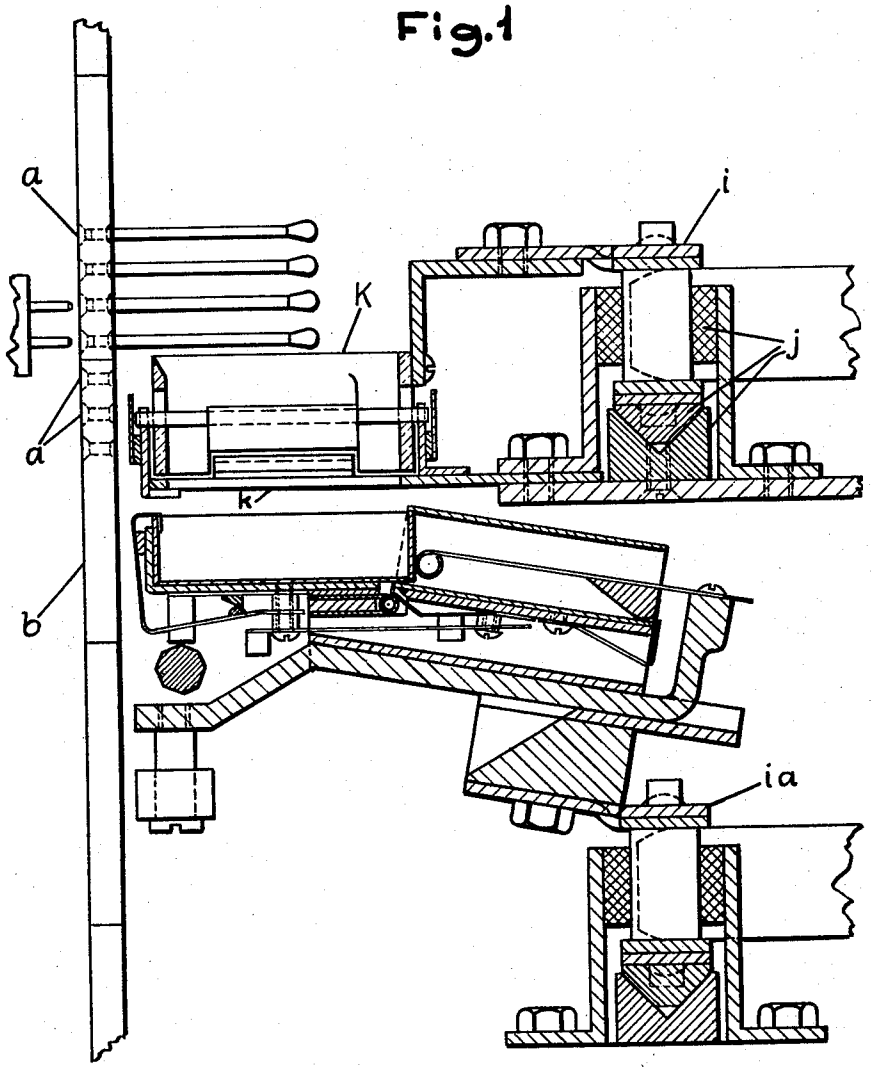
Feb. 3, 1959 A. HJELM ET AL 2,871,637

DEVICE FOR FILLING MATCHES INTO BOXES

Filed March 22, 1955 5 Sheets-Sheet 1

Fig.1



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Fig.2

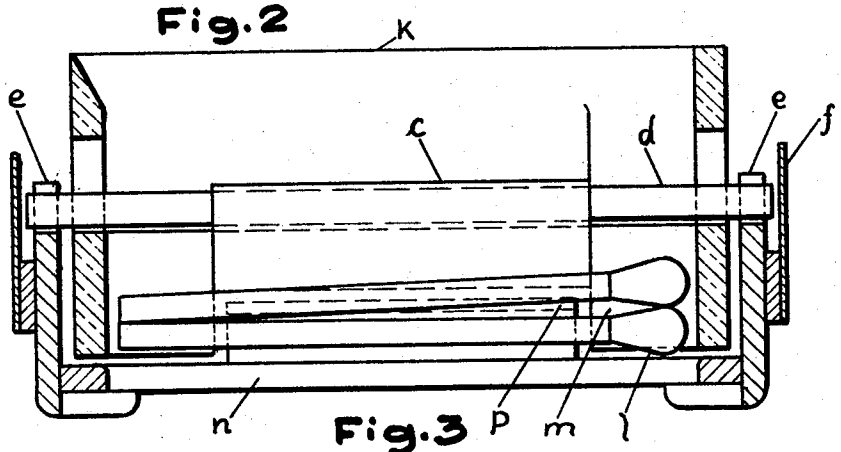


Fig.3

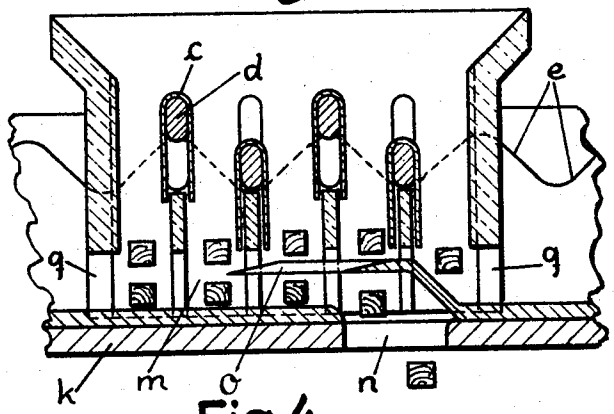
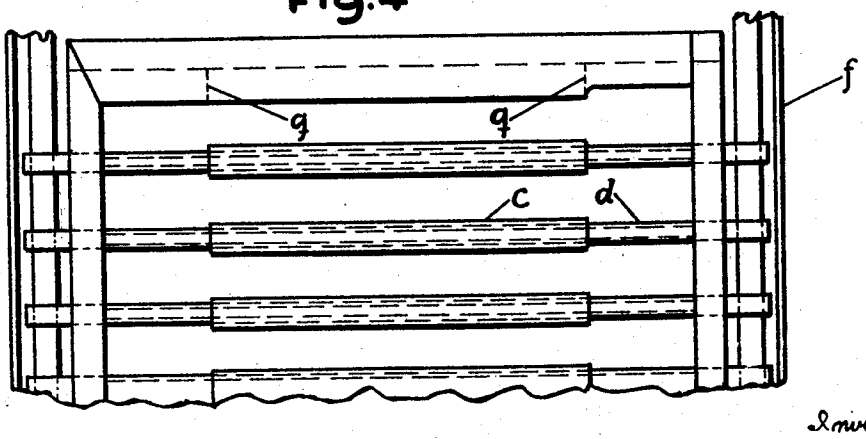


Fig.4



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DEVICE FOR FILLING MATCHES INTO BOXES

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Fig.5

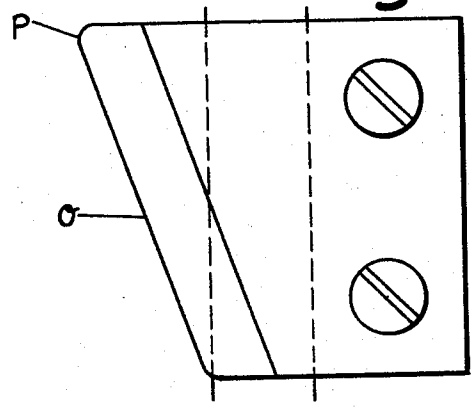
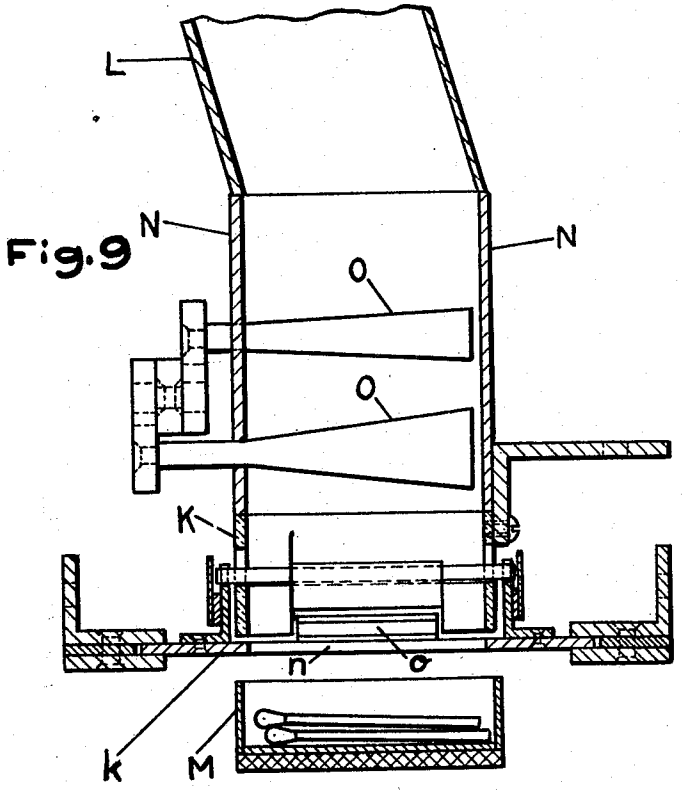


Fig.9



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DEVICE FOR FILLING MATCHES INTO BOXES

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Fig.6

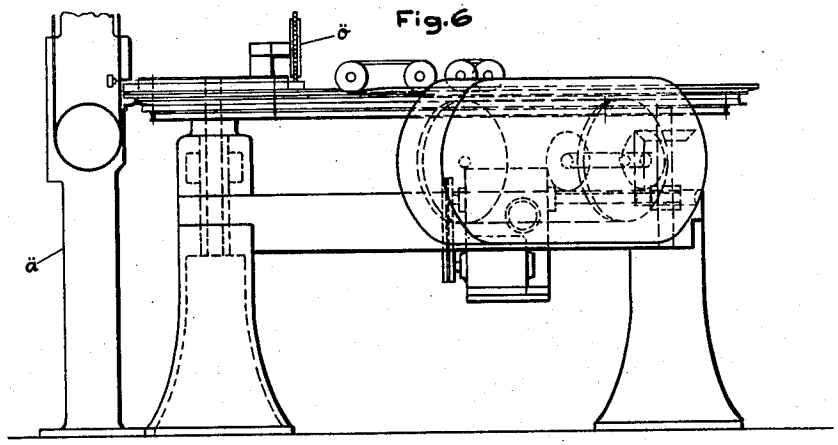
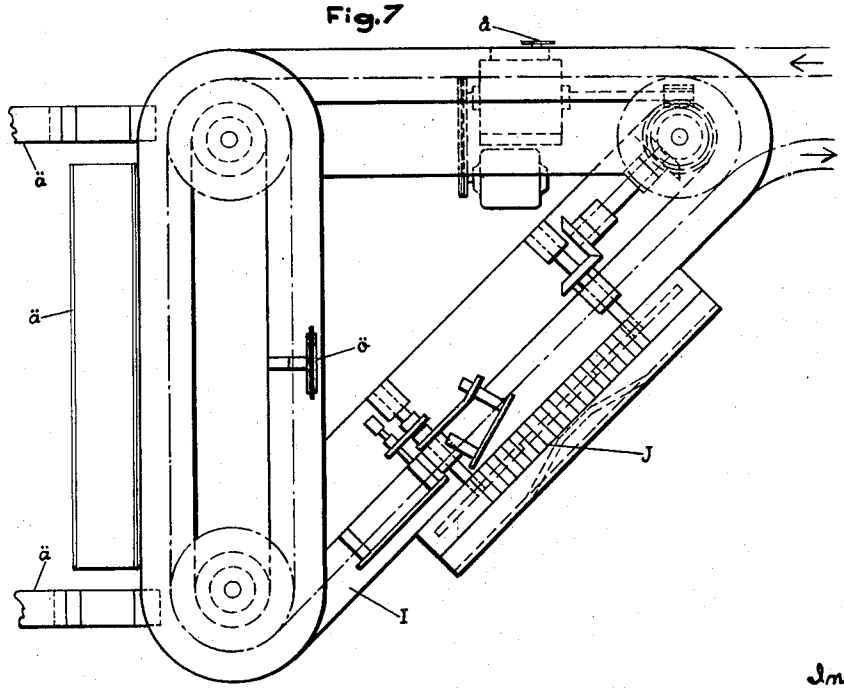


Fig.7



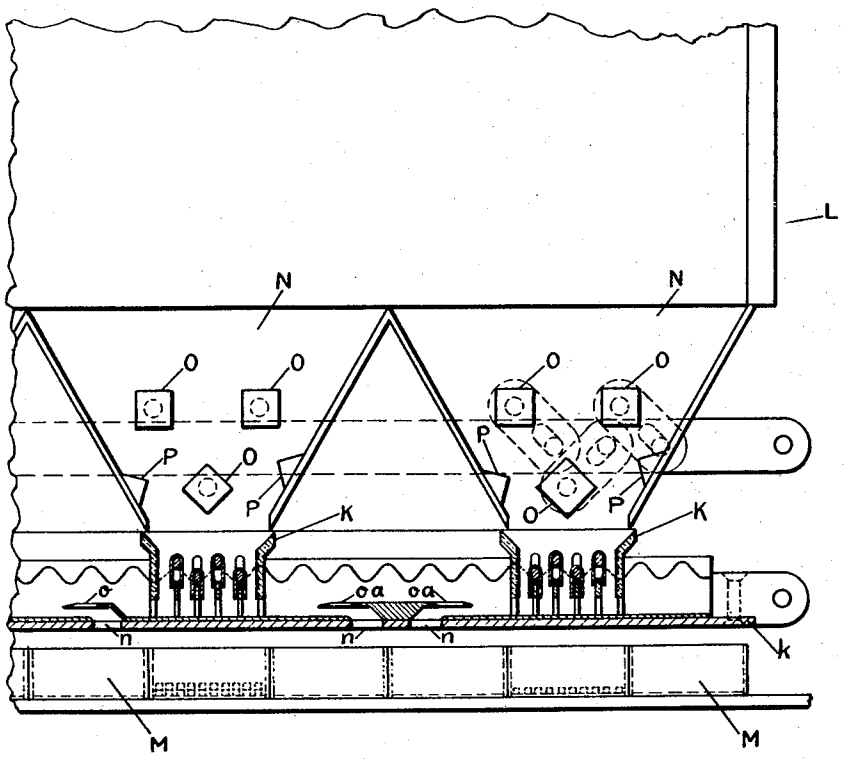
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DEVICE FOR FILLING MATCHES INTO BOXES

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Fig.8



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DEVICE FOR FILLING MATCHES INTO BOXES

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Application March 22, 1955, Serial No. 496,034

Claims priority, application Sweden March 25, 1954

6 Claims. (Cl. 53—26)

For filling matches into boxes specially constructed filling machines are generally used. The operation of these machines is characterized in that the matches, which have been piled in a magazine, are fed into channels and are divided by means of a cutting device into suitable portions for the match boxes. These portions cut off are then fed into the boxes by means of movable pistons. These machines have a relatively low capacity.

In those cases when the matches are finished in so-called automatic match machines, the filling of the matches into the boxes can, when standard manufacture is concerned, preferably be done directly in combination with the ejection of the finished matches from the automatic machine in such a way that the matches fall into smaller magazines, which pass in front of the ejector, or directly into the inside boxes. By synchronizing the speed between the ejector and the passing magazines or inner boxes, it will be possible to obtain a fixed number of ejections for each magazine or inside box and thereby feed a fixed number of sticks into each inner box.

Both of the abovementioned devices suffer from drawbacks, when it is a question of getting a fixed number of sticks into the boxes. In the filling machines only an approximate number of sticks can be counted on to get into the boxes, as one here has portioning by volume, within which a considerable variation of the number per portion must be considered.

In situations where the filling is combined directly with the automatic match machine, it is not possible to get a fixed number of sticks, owing to the fact that the efficiency of the automatic machine varies and will never be 100%, which is the condition for getting the number of sticks fixed at a synchronized speed between the ejector and the chain or device which supports the portioning magazines or the inner boxes.

In the automatic match machines the matches are carried in such a way that their ends are inserted into small holes in the carrier plates which constitute the match carrying elements of the automatic match machine.

At the insertion of the wooden material for the matches, some of the small holes will often be empty. The number of empty holes always varies depending on the quality, the unevenness and the purity of the wooden materials. On account of this there are neverceasing variations when the number of sticks in the boxes is concerned.

By means of auxiliary devices, for instance by adding missing sticks from reserve magazines etc., it has been tried to eliminate the inconveniences in such a way that mechanical devices have been installed, which by "perceivers" or tentacles ascertain that the stick-carrying small holes are filled with match materials. If this is not the case, the perceivers go into the empty holes, releasing impulses for adding the corresponding missing sticks from the reserve magazines. Light means may also be used, which through empty holes, owing to the passage of the light through them, acts for instance upon selenium cells in such a way as to produce electrical impulses for gaining the same purpose.

These devices have, however, proved to be expensive, complicated and damageable. Dust etc. often prevents the function, and if fire arises in the automatic machine, the various small elements of the devices are damaged and put out of function.

Both these methods of filling suffer consequently from great drawbacks, and the former method suffers above all from a great risk of fire owing to a relatively hard treatment at the portioning and the work of the pistons at the filling.

The present invention has for its purpose to eliminate these drawbacks entirely and in a relatively cheap and effective way bring about a fixed number of matches into the respective boxes, either directly from or in combination with the automatic match machine, or by means of special box filling machines.

This new device above all has for its purpose to eliminate the direct consequences of the fact that some of the match-carrying small holes in the automatic machine are not occupied in that way that the box filling device itself, which is concerned here, is not synchronously combined with the ejector itself in the automatic machine but combined with the machine as a whole, so that its speed can be permanently variable in relation to that of the automatic machine by putting a so-called speed variator between the automatic machine and the filling device.

In the enclosed drawing an example is shown of a construction of the device according to the invention.

Fig. 1 shows a sectional view of the device positioned in front of the automatic machine, and combined with a device for collecting the matches into boxes.

Fig. 2 shows a longitudinal sectional view of a portioning cup provided with movable partitions.

Fig. 3 shows a cross section of the same portioning cup.

Fig. 4 shows the same portioning cup seen from above.

Fig. 5 shows a dividing knife seen from above.

Fig. 6 shows a side view of how a combined portioning and filling device in connection with the ejector from the automatic machine can be constructed.

Fig. 7 shows the same device in a ground plane.

Fig. 8 shows a device for filling and portioning matches from match magazines into match boxes in a front section.

Fig. 9 shows the same device in a side section.

The filling device consists of a number of smaller match magazines or portioning cups, which are combined with each other on a chain with a pitch corresponding to the widths of the match boxes.

According to the drawing the portioning cups K are so constructed that they consist of rectangular boxes of a suitable material, for instance some metal or plastic. Their lengths are dependent on the lengths of the matches, and are made so that the matches may be easily positioned therein. The widths are dependent on the widths of the matchboxes. The portioning cups can be thinner in their lower parts, and do not have bottom closing portions. By equipping the portioning cups with partitions, they are divided into longitudinal channels, the widths of which are dependent on the thicknesses of the matches. The number of channels may be varied according to the widths of the portioning cups.

At those ends of the portioning cups, where the composition heads are received, the channels between the partitions are widened, so that the heads of the matches may be easily accommodated.

The upper portions of the partitions of the portioning cups consist of U-shaped embracing covers *c* of a suitable material, such as metal etc. These covers *c* are suspended from rods or pins *d* which are made of flattened steel wires or the like and are longer than the length of the portioning cups, the ends of the rods projecting through slots in the short sides of the portioning cup, and resting upon a pair of horizontally disposed bars *e*

having a wave-shape upper surface. When the portioning cups move relative to the bars, the U-shaped covers of the partitions are simultaneously brought into the same oscillatory motion. By adapting the arched curves so that the steel rods in the portioning cup come into different positions, for instance when one rod is brought upwards the rod being beside is brought downwards, the partitions will move among themselves in upwardly and downwardly motions.

The U-shaped covers need not extend along the length of the whole partitions but may be fixed onto the steel rods and so adapted that they will be shorter than the partions above all along the sections of the channels, where the composition heads of the matches are positioned. Also the opposite ends of the partition rods can to a suitable extent be free from covers.

The covers of the partitions may be guided in such a way that either outside the portioning cups the flattened steel rods are prevented from moving too much whereby their ends are prevented from too large a displacement through longitudinal plates *f* running along the chain, or one can preferably provide the fixed partition itself, round which the covers move up and down, with small guides, which lead the covers in their right positions.

These motions of the covers of the partitions play a decisive role in feeding down and arranging in parallel the matches that are ejected from the automatic machine, as the relatively swiftly upwardly and downwardly moving partition covers owing to their alternating motions have the capacity of bringing swiftly in order the matches in the channels between the walls.

It has been proved that this work is done rapidly and correctly, even if the ejected matches during the ejecting from the automatic machine should land obliquely down into the portioning cups.

The portioning cups are, as mentioned above, so placed that the longitudinal sides of adjacent cups are located close to each other. The upper portions of the longitudinal sides are directed outwardly, so that two walls of portioning cups lying beside each other form an angle the point of which is directed upwardly, so that, if matches would be so pushed out that they land on the edge between two portioning cups, the matches will fall into either one or the other portioning cup and will be transported by the upwardly and downwardly moving partition covers.

As mentioned above, the portioning cups are open at their bottoms, i. e. they are open below.

The portioning cups are mounted on a chain *i*, so that they are effectively guided by guide means (*j*). By the motion of the chain the portioning cups are moved forwardly over a fixed bottom, for instance a steel plate *k*. The portioning cups do not drag against this bottom owing to their mounting on the chain, but are spaced apart from the bottom steel plate with a slight interspace.

The matches in the portioning cups will on the other hand drag against the bottom plate. In order to prevent the composition heads from dragging against the bottom plate, there is provided a longitudinal cavity or a countersink on that side where the composition heads (*l*) lie (Fig. 2).

Between the matches in the cup channels which in the abovementioned manner have been piled upon each other, on account of the fact that the composition heads are considerably wider than the sticks themselves, interspaces *m* are formed, which will be largest near the heads to be reduced and be reduced to zero between the head-free ends of the matches. The interspaces between the matches formed in this way play the most important role, when it is the question of using this filling device for obtaining a fixed number of sticks in the match boxes.

In the bottom plate *k* openings or rectangular holes *n* for the matches to fall down through are made, and over these openings feeding knives *o* are placed in that way that a knife is placed over each opening. The knives are so constructed that with a rounded and thinned point *p* they

hit the openings *m* between the matches that are formed on account of the composition heads. The knives are so bent at their rear parts that connection is obtained with the bottom plate, and so that they reach over the openings in a way that the matches, which have been partitioned by the knife and thereby are lying on the underside of this, through the motion of the portioning cup are fed through that hole over which the corresponding knife is operating.

The portioning cups can pass the knives on account of the fact that cut-outs *q* have been made in the longitudinal sides and the partitions of the portioning cups. These cut-outs are so dimensioned that the knives can pass easily, but also so that they are shorter than the matches themselves, and the height is dependent on the height of the knives, to enable these to pass freely without the matches losing their lateral positions in the channels.

One can in this way by means of the knives from below skim off layer after layer of matches in the channels between the partitions. If the channels are varied in number, for instance, if thinner matches are concerned or thicker ones, or another number owing to wanted number of sticks, this will give a suitable base for obtaining a fixed number of sticks in the boxes, as it is possible to get multiples of the number of channels to correspond with the wanted number of sticks in the boxes.

In the exemplifying embodiment there are five channels in each portioning cup. If there are eight knives with the same number of holes for the matches to fall down through, there will be forty matches in each box; if there are ten holes, the number of matches will be fifty, etc.

By varying the number of channels and knives it will be possible to obtain all numbers of sticks in the boxes wanted within the match making industry.

It has been found that these devices function quite satisfactorily also at a great and swift filling speed, and it is possible to obtain fixed numbers of sticks at a hitherto unknown box-filling capacity.

Owing to the fact that the motion of the above described portioning cups is correlated to that of the collecting devices, whether either these consist of collecting cups, or magazines, or inner boxes for matches, the matches will fall swiftly from the holes in the bottom plate one by one, while the collecting devices move, down into these, and this will result in match after match following parallelly with certain short intervals.

By varying the distances of the holes a little bit from each other, such an interspace between these holes could be obtained that the matches from one skimming off fall between matches from an earlier one, etc., so that an even box filling or distribution of the matches in that way can be done in the boxes or the collecting devices. By exposing the boxes to vibration one can make sure that the matches lay themselves side by side and in that way fill the boxes in an even and nice manner.

When a large number of sticks is desired in the match boxes, it may be advantageous to raise the dividing knives and the corresponding openings in the portioning cups for the passage of the knives, so that for instance two or more sticks simultaneously can be separated from each channel. Through this it is gained that the number of holes and knives in the bottom plate can be reduced.

The abovementioned device or method can give a nearly fixed desired number of sticks in the boxes, and it has been found that great speed at the filling can be reached, and the risks of fire on account of forced portioning are eliminated.

A condition for obtaining a fully satisfactory result is, however, that the synchronization of the speed with the outpushing of the matches from the automatic match machine during the work of the machine can be varied

so that, in cases when the small holes in the automatic machine are filled up with matches, the speed of the passing portioning cups is so great that they can take up all matches coming from the automatic machine, or that the speed of the portioning cups can be varied relatively fast, as the production of the automatic machine varies, on account of the fact that a larger or smaller number of holes in the carrier plates of the automatic match machine are empty.

It is important that the portioning cups always are provided with a surplus of matches, so that always a larger number of them are present than what is wanted in the boxes. Before the device is started for the first time, the portioning cups must therefore be filled, for instance by hand. In that way it is possible to be sure that the number of sticks in the channels will be sufficient for the multiples that are wanted. The matches left after the feed of the boxes remain in the portioning cups and will be a reserve for the next filling, so that always a surplus of matches are to be found in the portioning cup.

By having a speed variator *å* (see Figs. 6 and 7) between the automatic match machine *ä* and the portioning device, the speed of the latter can be varied so that always a satisfactory number of sticks are found in the portioning cups. One can, for instance, place "feelers" *ö* consisting for example of arms working synchronously with the chain, which arms go down and feel if a sufficient number of sticks are in the portioning cups to prevent that shortage arises, and which before passing in front of the automatic machine give impulses, for instance electrically, which regulate the speed of the variator and the portioning cups which pass the automatic machine, so that the numbers of reserve sticks in the portioning cups are held tolerably even but always with sufficient surpluses.

The collecting elements collaborating with the portioning device, i. e. inner match boxes, or collecting cups, from which the portions later can be transported to inside boxes, must be synchronously connected with the portioning device in such a way that the inner boxes or collecting cups run synchronously with the portioning cups so that another chain *ia* (Fig. 1) with the same interspace between its collecting elements carries these with the same speed as that of the chain *i* under the bottom plate and the portioning device with their dividing knives and holes.

As earlier mentioned, the collecting elements of the portioned and counted matches can be varied, as one preferably can fill direct into match boxes, or the counted matches can be collected in boxes or portioning magazines, to be slid over into match boxes later.

In those cases, when it is not necessary to fill the boxes directly in combination with the outpusher of the automatic machine, or in those cases, when matches are produced in other, not combined, machines, the matches are obtained in piles or magazines, and the filling must then be done in the way stated in the preamble, by means of separate box filling machines. In these machines the matches are brought down into channels, where they are divided into portions by dividing knives etc. to be forced into the boxes by means of pistons. These machines give a variable number of sticks, which can cause great troubles on markets, where taxes or duties are based on fixed numbers of sticks.

Furthermore these machines work with forced portioning and piston work and are sources of innumerable accidents during the work due to fire.

By using portioning devices as described above, all forced treatment of the matches is eliminated.

On account of the fact that the matches in cases like this are collected in magazines, when portioning or counting the matches shall be done, the portioning cups K (Figs. 8 and 9) with their movable oscillating partitions, which have been described above, are fixed, in relation to the stick magazines L of the filling machine, and the bottom plate *k* of the portioning cups with its dividing knives *o* and rectangular holes *n* on the other hand are movable in relation to the portioning cups. The result of the filling will, however, be the same, as the dividing knives *o* each time such a knife passes a portioning cup will separate a fixed number of matches, and the sticks separated in this way will fall one by one down into inside boxes M, or possibly portioning magazines synchronously passing under the movable bottom plate.

The bottom plate *k* (Figs. 8 and 9) can be continuously movable in the direction in which the boxes are transported in correspondence with the knife *o*, or the bottom plate can be given a motion to and fro which corresponds to the double knives *oa*. In the latter case the portioning knives *oa* can be made so that they part or separate one or more layers of matches at each movement to and fro, while the inner boves M pass synchronously in one direction and in that way a fixed number of sticks are apportioned at each movement made by the bottom plate.

By stopping or filling some of the channels between the partitions, or by reducing the number of channels in one, for instance the last portioning cup in the filling device, under which the inside boxes or the portions collecting elements pass, it will be possible, besides multiples, also to obtain addition of certain numbers of sticks, for example if one works with five cups and wishes forty-three sticks, one can take ten sticks from four cups each and only three from three channels in the last portioning cup.

One can vary the counting of the numbers of sticks with help of the number of channels and various heights of the dividing knives.

The piles of matches, which are delivered to the box filling device, either come from an automatic machine or from an ordinary so-called emptying or match removing machine, generally have a fixed width. The stick magazine L (Figs. 8 and 9) of the filling device is fixed according to this width. This width is then divided into channels in the filling device, so that the wanted number of channels N (Figs 8 and 9) which number is made as great as possible lead down towards the portioning device in such a way that several portioning devices work within the width area of the match magazines in the machine.

For feeding the matches in a regular stream down into the portioning cups, for instance square turnable pins O (Figs. 8 and 9) can be used in the channels towards the portioning.

These pins are made so that their sides are widened towards that side of the stick magazine channel, where those ends of the matches which are free from composition heads. The widening is substantially in accordance with the widening which is imparted to all the matches of a box through the larger width of the composition heads in relation to that of the matches themselves.

One can also in certain cases, especially when broad feeding channels are used, facilitate a regular feeding of the matches by placing small shelves or brake projections P, for example a bent plate of metal, on the sides of the feeding channels at the side of the lowest turning pin O.

By turning the cornered and edged pins O to and fro, for instance 45°, it has been found that the matches from the stick magazine are properly fed down into the portioning cups, from which the matches are removed into the inner boxes M by the moving knives *oa*.

By using a match box filling machine of this kind, one will, if the matches are satisfactorily produced, reach a safe filling, a fixed number of sticks in the boxes, and a very great capacity, and the risk of fire in the machines through frictions, forced portioning, piston work, etc. is eliminated.

Having now described our invention, what we claim as new and desire to secure by Letters Patent is:

1. The method of filling matches into boxes comprising the steps of arranging the matches side by side in a vertical plane with their heads at the same end, said matches being at a slight angle with respect to each other to form spaces therebetween due to the cooperation of said heads, inserting a knife edge into one of said spaces at a desired level to remove one or more matches from the arrangement, and transporting the removed matches to suitable boxes or collecting elements.

2. An apparatus for filling matches into boxes comprising a bottomless portioning cup, partition means subdividing said cup into a plurality of vertical channels in which a plurality of matches may be arranged side by side with their heads at the same end so that said matches are at a slight angle with respect to each other with spaces therebetween, means for vertically reciprocating said partitions, a horizontal plate reciprocably secured beneath said cup, knife means secured to said plate, said plate having rectangular openings beneath said knife means to receive matches, and means for moving said plate and knife means transversely to the planes of said vertical channels, whereby said knife means grasps one or more layers of matches and transports the matches through said openings to said boxes.

3. An apparatus for filling matches into boxes as defined in claim 2 in combination with an automatic match producing machine, said match producing machine having chain means connected to said portioning cups and knife means, said chain means being of variable speed with respect to the production of the automatic match producing machine so that the number of matches in said portioning cup is maintained substantially constant.

4. An apparatus for filling matches into boxes as defined in claim 2 having at least two portioning cups located side by side, said plate extending below each of said portioning cups and having double-edged knife means secured thereto intermediate said portioning cups, so that upon one direction of reciprocatory movement of said plate and knives matches are removed from one of the portioning cups, and upon opposite movement of said plate and knives matches are removed from another of the portioning cups.

5. An apparatus for filling matches into boxes as defined in claim 4 including feed channels directing matches to each of said portioning cups, and pin means rotatably mounted in said feed channels parallel to said plate and said matches in said vertical channels, said pin means having an edged cross-sectional configuration and being tapered so that the smaller ends are at that end of the vertical channels that the match heads are positioned, whereby the feeding of the matches to said portioning cups is facilitated.

6. An apparatus for filling matches into boxes as defined in claim 5 including brake projections on the walls of said feed channels to further facilitate the feeding of the matches to said portioning cups.

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