Nov. 26, 1935. N. H. NELSON 2,022,088

METHOD OF AND APPARATUS FOR MANUFACTURING PAPER MATCHES

Filed July 24, 1933 3 Sheets-Sheet 1

FIG. 1

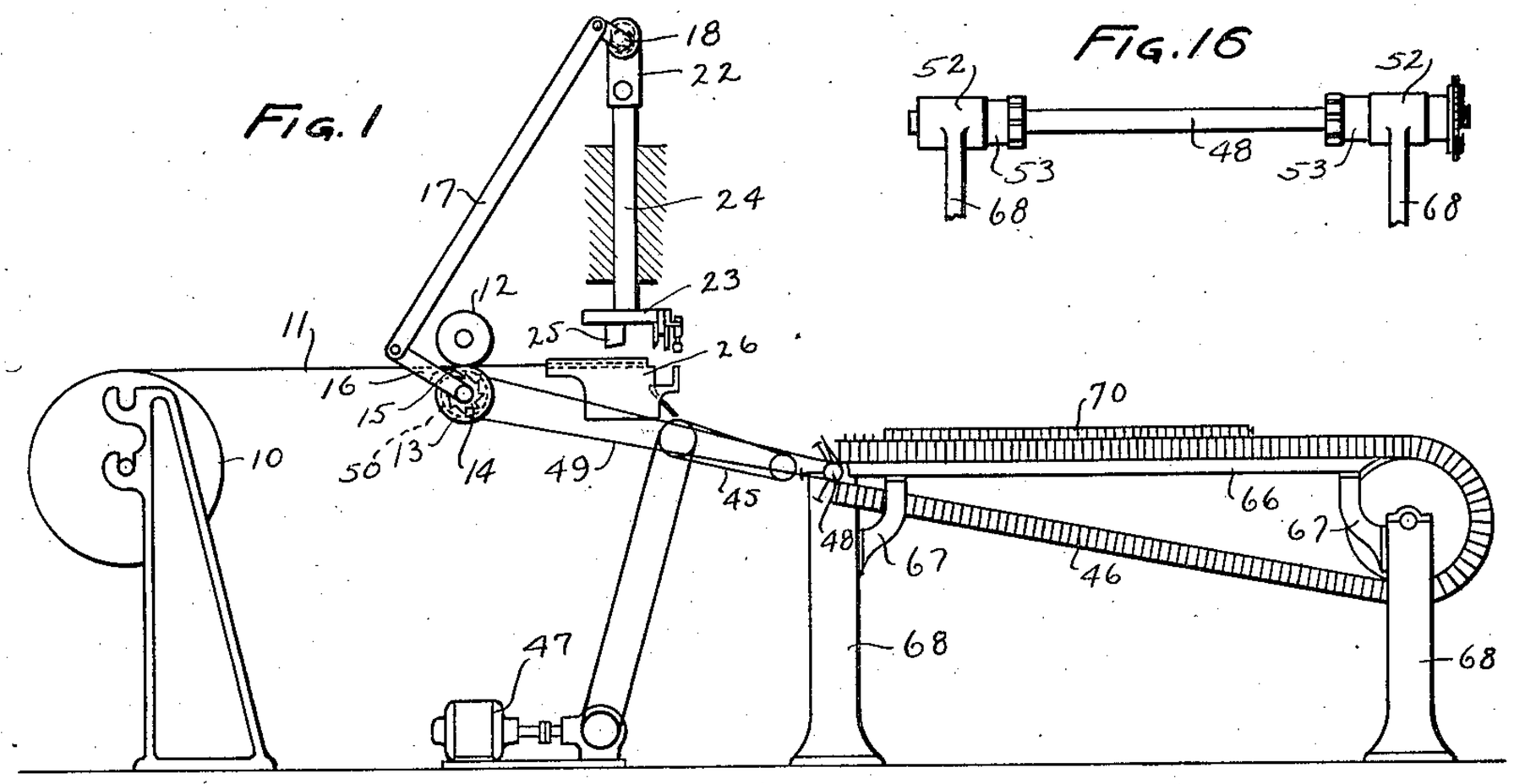


FIG. 16

FIG. 2

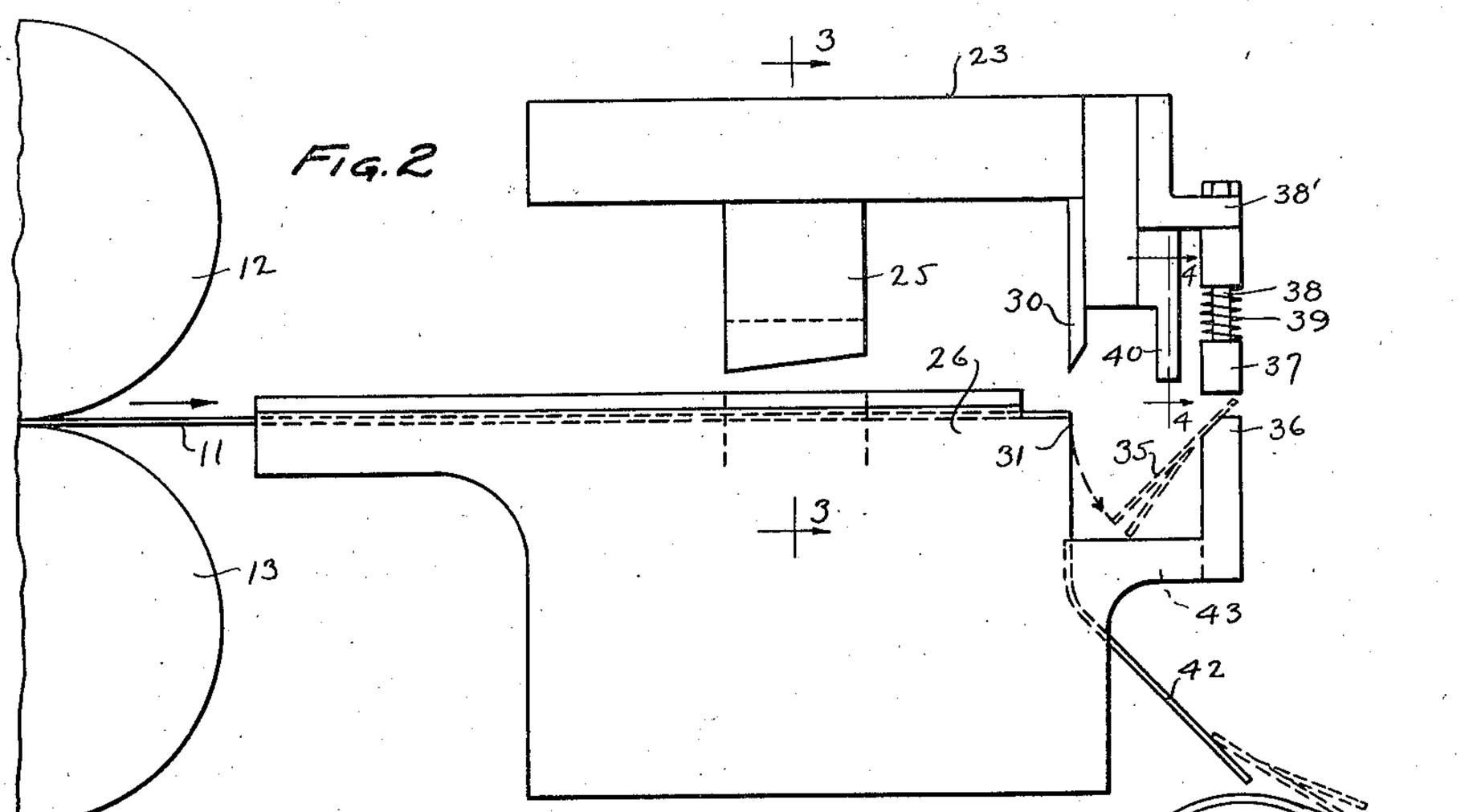


FIG. 3

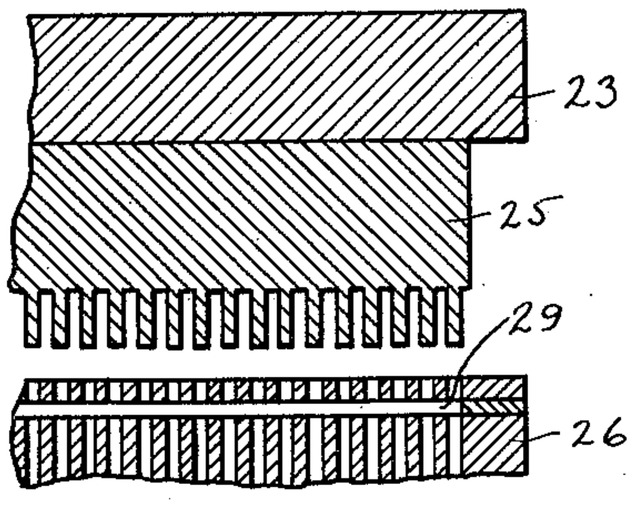
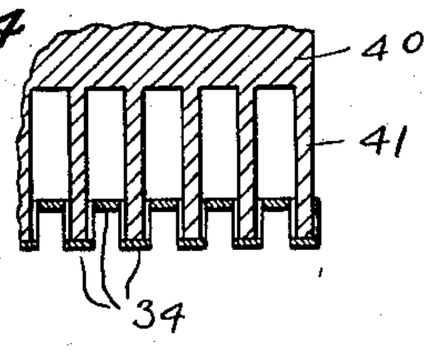


FIG. 4



Inventor
Nels H. Nelson

By Maréchal and Noe
Attorneys

Nov. 26, 1935. N. H. NELSON 2,022,088

METHOD OF AND APPARATUS FOR MANUFACTURING PAPER MATCHES

Filed July 24, 1933 3 Sheets-Sheet 2

Fig. 5

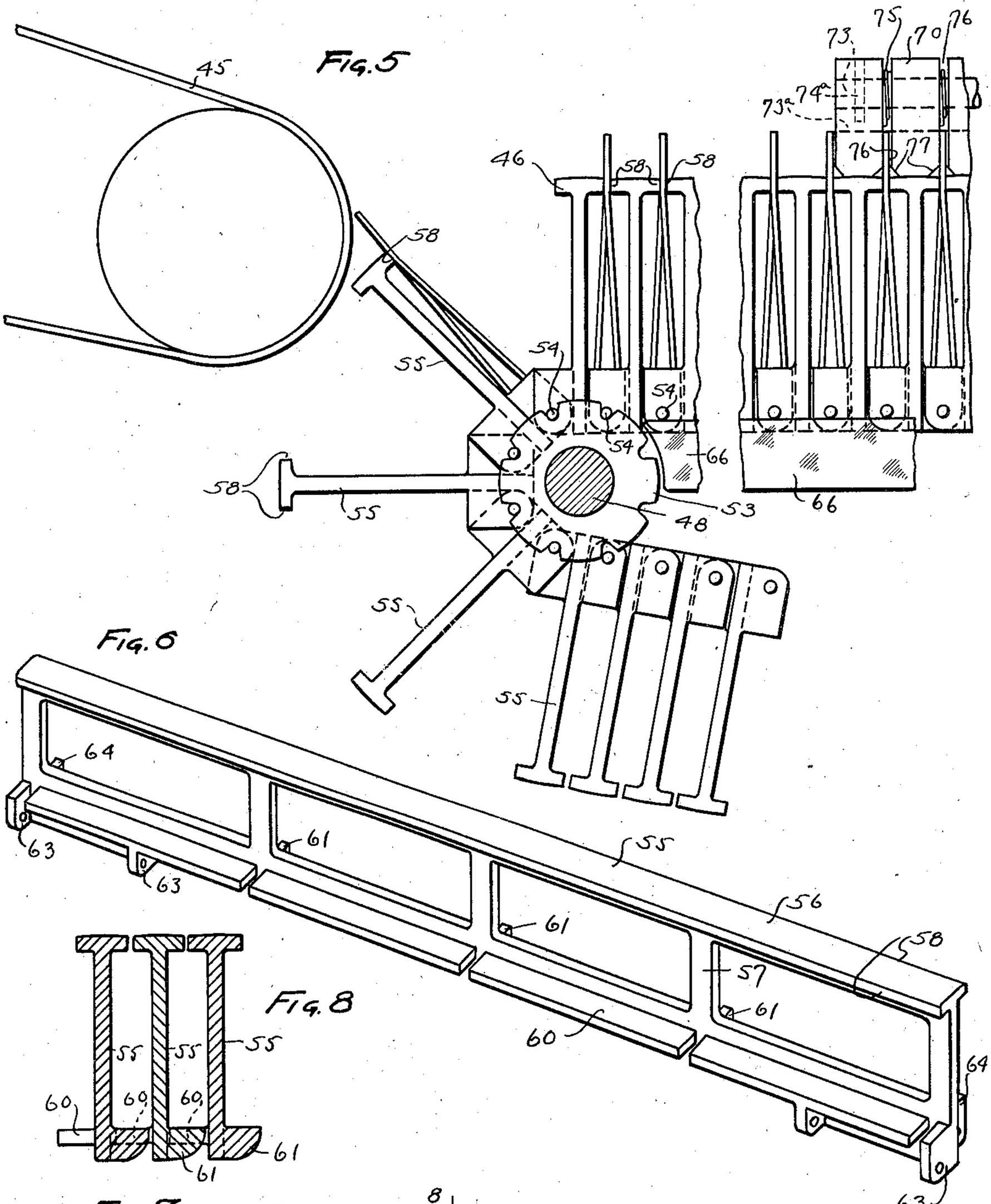
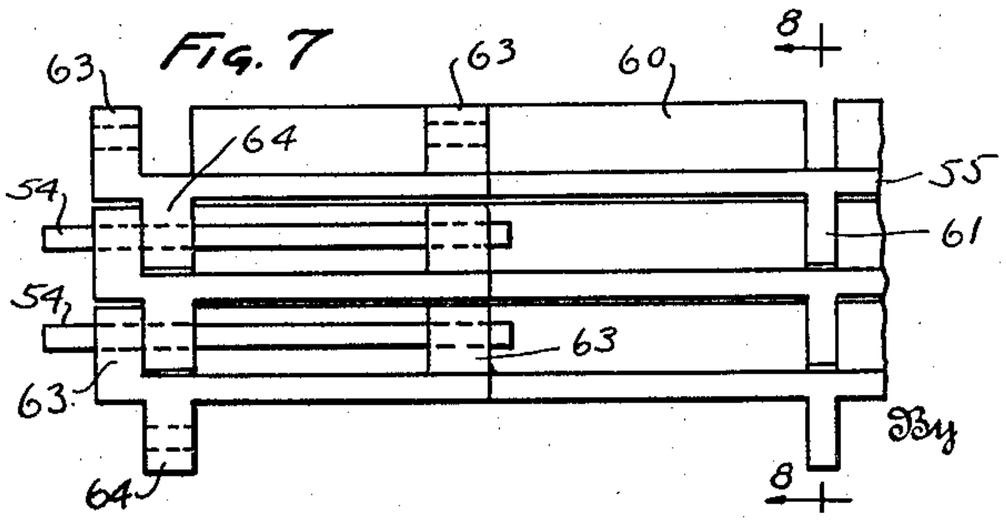


Fig. 6

Fig. 8

Fig. 7



Inventor
Nels H. Nelson

By
Maréchal and Noe
Attorney

Nov. 26, 1935. N. H. NELSON 2,022,088

METHOD OF AND APPARATUS FOR MANUFACTURING PAPER MATCHES

Filed July 24, 1933 3 Sheets-Sheet 3

Fig. 9

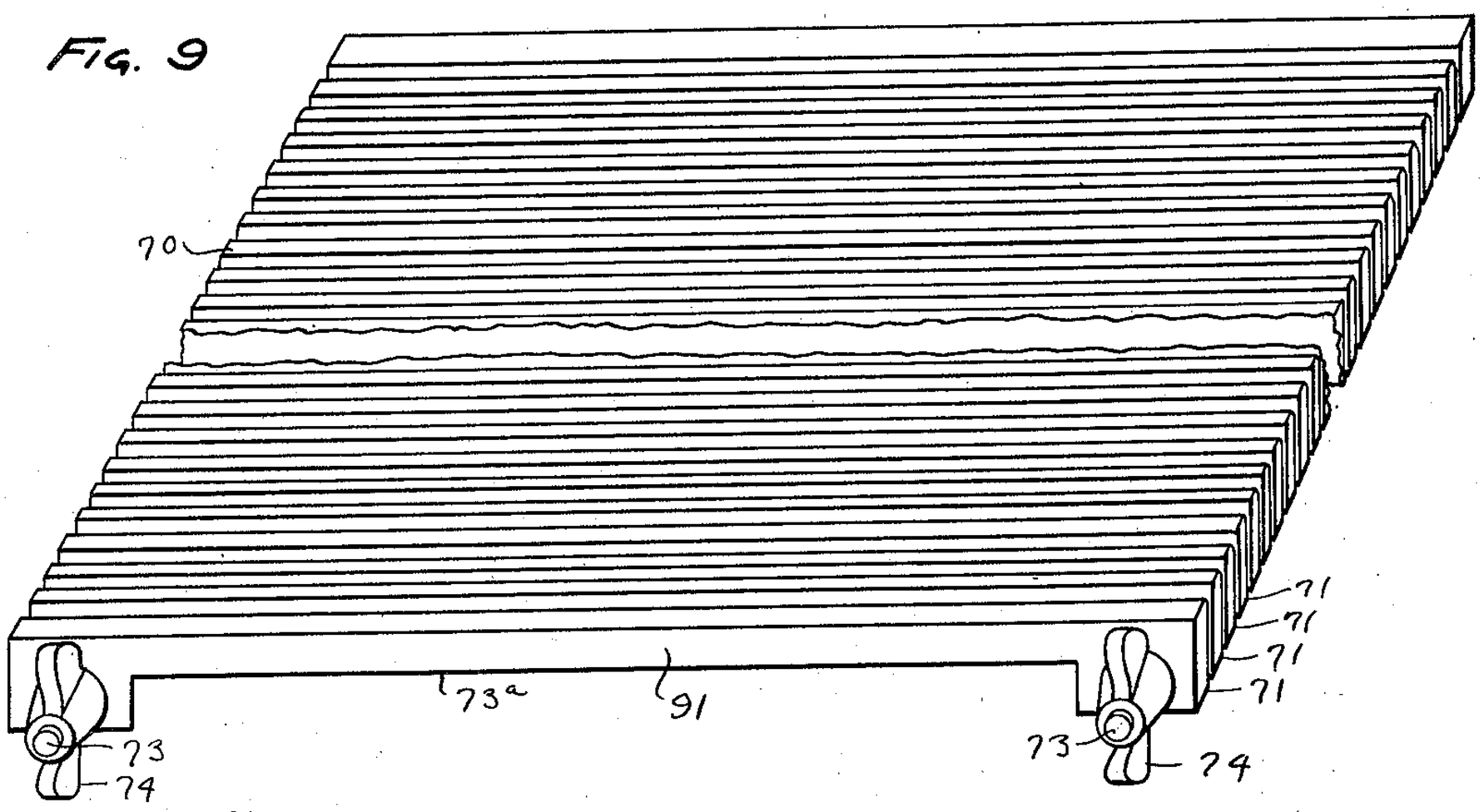


Fig. 10

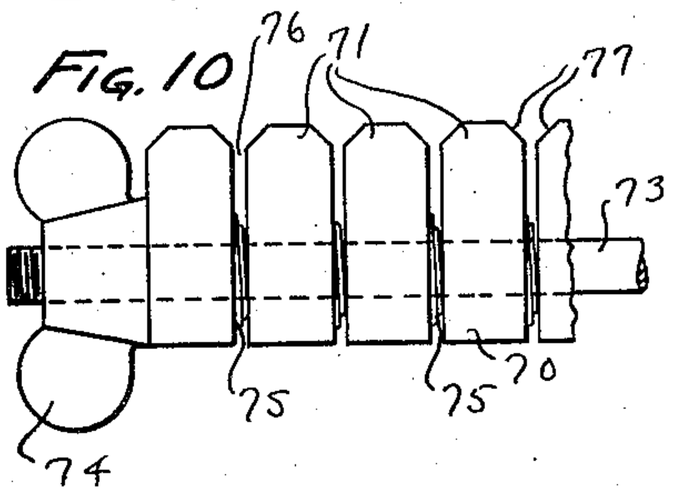


Fig. 11

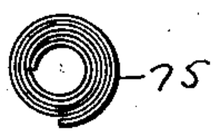
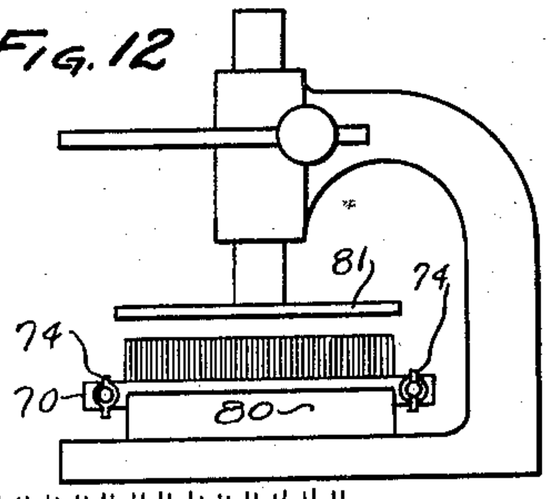


Fig. 12



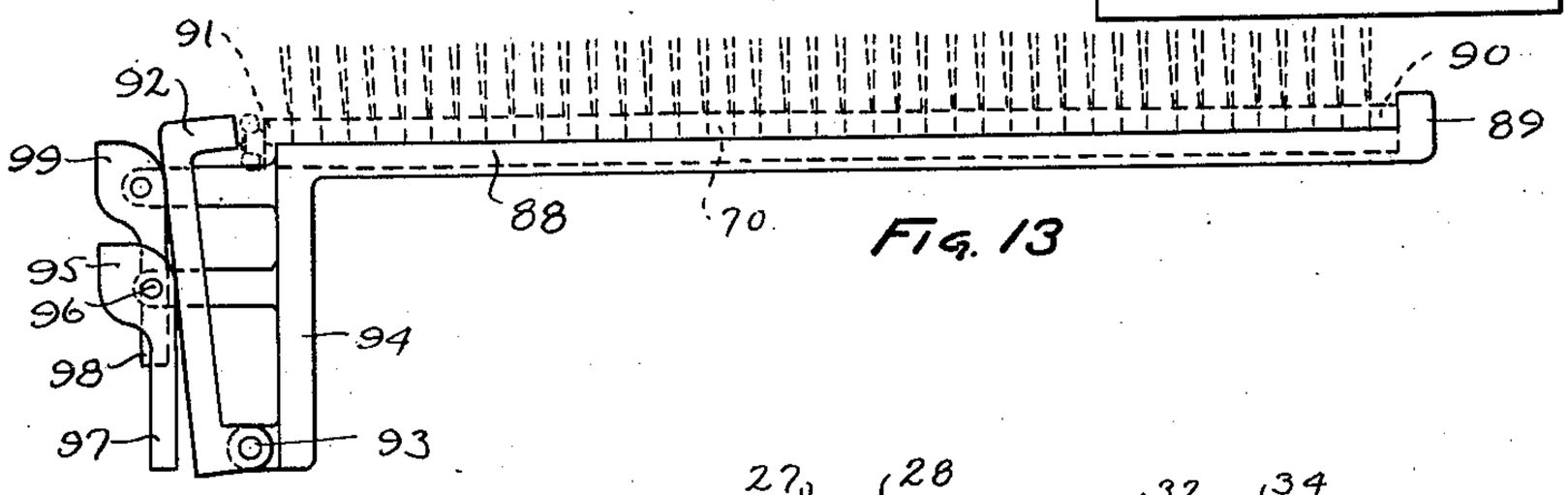


Fig. 13

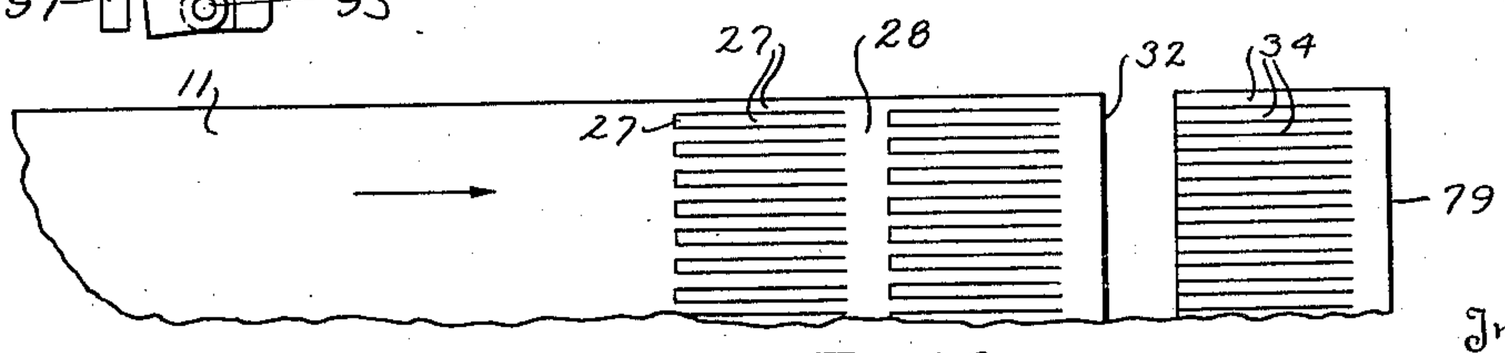
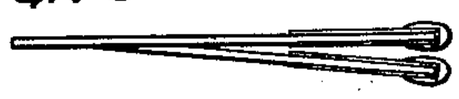


Fig. 14

Fig. 15



Inventor
Nels H. Nelson

By Maréchal and Noe
Attorney

Patented Nov. 26, 1935 2,022,088

UNITED STATES PATENT OFFICE

2,022,088

METHOD OF, AND APPARATUS FOR, MANUFACTURING PAPER MATCHES

Nels. H. Nelson, Dayton, Ohio

Application July 24, 1933, Serial No. 681,872

12 Claims. (Cl. 144—51)

This invention relates to the manufacture of matches, and more particularly matches of the well known paper type.

One of the principal objects of the invention is to provide an effective, efficient and cheap method in the manufacture of paper matches, which permits of greatly increasing the production capacity of the workers.

Another object is to provide inexpensive and yet effective apparatus for use in carrying out said method, which is also simple to operate and maintain in repair.

A further object of the invention resides in the provision, in such apparatus, of a novel form of conveyor mechanism adapted to receive formed strips of paper match splints and arrange them so that the said strips may be readily collected in suitably assembled relation for further treatment.

Another object of the invention is the provision, in such apparatus, of a frame adapted for cooperative utilization with the conveyor mechanism to receive and hold said strips of match splints so that such collected and assembled strips can be easily and effectively removed from the conveyor mechanism and maintained in collected and assembled relation for subsequent treatment.

Other objects and advantages of the invention will be apparent from the following description, the appended claims and the accompanying drawings in which,—

Fig. 1 is a side elevation of an apparatus embodying the present invention for making paper matches;

Fig. 2 is an enlarged side elevation of the portion of the apparatus which cuts the continuous sheet of paper into splint strips and separates the splints at one end from one another;

Fig. 3 is a section on the line 3—3 of Fig. 2;

Fig. 4 is a section on the line 4—4 of Fig. 2;

Fig. 5 is an approximately full sized view of a portion of the link conveyor which receives and arranges the paper strips of match splints;

Fig. 6 is a detail perspective view of one of the links;

Fig. 7 is a view looking upwardly at the end portions of several of the links;

Fig. 8 is a section on the line 8—8 of Fig. 7;

Fig. 9 is a perspective view of the carrying frame;

Fig. 10 is a side view of a portion of the frame;

Fig. 11 is a detail view of one of the frame springs;

Fig. 12 is an elevation view of the arbor press in cooperation with the frame;

Fig. 13 is a side elevation of the frame adjustment device;

Fig. 14 shows several successive steps in the making of match strips;

Fig. 15 is an end view of a strip of matches; and

Fig. 16 is a plan view of the conveyor drive.

The present invention provides a great advance in the art of making paper matches in comparison with the "hand" systems heretofore used in that the production is greatly speeded up and much greater and better production secured from fewer workers. It also provides a great advance in the art as compared with the "automatic" systems, so-called, heretofore used in that large production of superior matches is secured with very simple, rugged and easily operated mechanism which costs only a small portion of the cost of the expensive and complicated automatic machines, which can be operated with an unusually low labor cost and which is simple and easy to operate and to keep in operation.

In the embodiment of the invention as herein exemplified, the numeral 10 represents a roll of suitable paper material from which the strips of match splints are made. During operation this roll of paper is unwound to feed the sheet of paper 11, the paper being fed forward step by step by feeding rolls 12 and 13. These rolls are provided at their ends with circular shearing or trimming knives (not illustrated) adapted to trim the edges of the paper sheet to give exactly the desired width, which in operation will be a multiple of the single book width. In the mechanism shown the sheet is trimmed to give a ten book width. This is an extraordinary width which gives great advantages as will hereinafter appear. As shown the lower roll 13 is provided with a ratchet wheel 14 and is advanced by means of the ratchet 15 carried on an oscillating lever 16. The lever 16 is oscillated by a link 17 connected eccentrically to the crank shaft 18 of a stamping press which may be of suitable conventional character, being shown, diagrammatically, as a single throw crank press. The rolls 12 and 13 may, if desired, be provided with annular corrugations adapted to score the paper sheet along evenly spaced lines spaced apart a distance corresponding to a match splint width.

The crank shaft 18 of the press is provided with a crank throw connected to connecting rod 22 which vertically reciprocates an upper die 23 by means of a suitable guided connection member 24. The upper die 23, as shown more clearly in Fig. 2, embodies a slitting or piercing die 25 having a series of spaced plungers adapted

for cooperation with a fixed lower die 26 and arranged to pierce or cut through the paper on the lines 27 to thus strike out the various match splints (see Fig. 14), as the paper travels through the passageway 29 in the lower die.

By means of this piercing or slitting operation the paper is cut through to provide a number of series of tongues or splints, all splints of each series being connected at one end by the adjacent transverse and unslitted portion 28 of the paper. The lower or entering ends of the piercing plungers may be inclined as shown in Fig. 2 to facilitate clean cutting, and the relative movement of the dies 25 and 26 will be such that the slits are all of the proper determined length.

After slitting the paper sheet is fed forwardly by means of the ratchet drive of roll 13 the forward feeding of the paper taking place after the die 25 has moved clear of the paper, and the amount of feed corresponding to the length of the match splints. As the paper sheet intermittently advances it is cut across, with proper relation to the slitted splint portions, to sever the match splint strips. This transverse cutting is effected by a shearing die 30 which cooperates with a cutting block portion 31 of the lower die, to cut or transversely sever the temporarily stationary sheet of paper along the line 32 (see Fig. 14). The paper is thus cut into successive strips, each strip, as herein shown, being of a width corresponding to ten match books transversely of the machine and of the travelling sheet of paper 11; but, as stated, this transverse dimension may be any other desired multiple of the width of the match book. As the paper is sheared transversely along a line corresponding to the ends of the slits produced by the first die 25, the strips will each have one continuous portion 28 and a series of parallel splints 34 all separate one from another with the exception of their connection to the portion 28.

At the time the strip 35 shown in dotted lines in Fig. 2 is cut or severed from the continuous sheet of paper, the connected portion 28 is held yieldingly between a fixed block 36 of the lower die and a pressure plate 37. This pressure plate 37 is carried by supporting rods 38 which are slidably mounted with reference to the supporting member or bracket 38', carried by or on the plunger or movable die member of the press. Springs 39 normally urge the plate 37 downwardly into extended position. The springs 39 are compressed when the upper die descends and the plate 37 held under pressure against the continuous part 28 of the match strips so as to hold the portion 28 of the strip at the time its opposite end is being sheared. At the same time the shearing action takes place, alternate paper splints are moved out of parallelism by a plunger 40 (see Fig. 4). This plunger has a number of projections 41 extending downwardly and spaced apart a distance corresponding to two paper splints. The various projections 41 force alternate splints downwardly so as to separate the free ends of the splints in order that they may later be treated with combustible material so that the match heads of adjacent splints will not be connected together.

The strip 35 is held between the parts 36 and 37 for a very short time after the upper die starts to move upwardly, and is then released as the upper die continues to move upwardly. As the strip 35 falls it turns to present its slitted edge down and then slides down the guide 42, passing through an opening 43 and moving with the separated ends of the splints directed forwardly.

The strips 35 are received on a belt 45 and are carried one after the other by means of this belt to a link conveyor designated generally 46. The speed of the belt 45 is comparatively rapid so that the strips 35 will be quickly moved away from the press to prevent succeeding strips from falling upon those already on the belt. In this way each strip is moved from the press into a predetermined positioning on the belt and is thereafter not disturbed or injured by succeeding strips and requires no handling by the operator. Furthermore, and to accomplish this very desirable result of non-handling of the match strips, the speed of the belt 45 is coordinated or proportioned with respect to its length and the speed of travel and arrangement of the conveyor 46, so that the spaced and properly positioned match strips will be fed into functional relationship with the conveyor 46 in proper sequential arrangement to be received by the said conveyor 46. In this way the manual handling of the match strips after they have been severed and the splints have been properly separated is avoided, and the distortion of the strips and of the splints which attends upon manual handling, and even upon automatic machine handling, is also avoided. The speed of the belt is such that there will be a considerable space between successive match strips on the belt. As shown, the belt 45 is driven from a separate electric motor 47, but it can be interconnected with the other mechanisms if desired.

The link conveyor 46 is driven in timed relation with the slitting and shearing members of the machine, and the belt 45. As shown in Fig. 16 the shaft 48 of the conveyor is operated by a suitable chain 49 driven from a sprocket wheel 50 on the feed roll 13. The operation of the conveyor is so timed with reference to operation of the press and belt 45 that the strips on the belt will be successively brought forward so that each strip will move or fall from the belt onto the appropriate cross bar strip holder which will be just moving upwardly at that time, and will thus be received and guided into proper position in the conveyor. The shaft 48, which is suitably journalled in bearings 52, carries a small diameter sprocket 53 adjacent its opposite ends, each of which is provided with peripheral notches spaced for receiving the pins 54 which interconnect adjacent cross bars or conveyor links. Each of the links or fingers 55 of the conveyor as illustrated in detail in Fig. 6, is of somewhat I-beam shape in cross section. The top cross members 56, upon the outer ends of the webs 57, have opposite parallel paper engaging faces 58. Adjacent the lower ends of each web is a series of stop shelves 60 projecting laterally and spaced apart to provide openings. Extending laterally from the other side of each web is a series of projections 61, spaced opposite the openings in the shelves 60. The projections 61 on one link, in operation, move into the openings in the shelves of the adjacent link. The projections 61 and the upper sides of shelves 60 lie in a common plane when the links are arranged parallel to one another and these projections and shelves acting together form the bottom of a compartment located between each two links, with the cooperating portions of tops 56 forming the tops of such compartments. Each compartment thus formed between adjacent links as the conveyor moves is adapted to receive and house a match strip. The shelves and projections receive the strips as they

move from the belt 45 and act as stops limiting the downward movement of the strips and causing them to properly position themselves upon the webs of the links as the conveyor moves the links upwardly about the shaft 48 to the upper substantially horizontal flight of the conveyor, and at the same period of movement as the links move upwardly to this horizontal flight, where the links themselves will be substantially vertical in position, the continuous part 28 of the match strips will be engaged between the cooperating faces 58. The strips are thus automatically properly positioned in the compartments.

Adjacent links are connected at each end together by pins 54 which may be suitably held in lugs 63 and which pass through lugs 64 of an adjacent link. The ends of the several pins 54 project laterally beyond the end lugs 63 and ride on a rail or bar 66, such a bar being provided at opposite sides of the conveyor and extending from a point adjacent the sprocket 53. These rails may be carried by bracket arms 67 supported by the pedestals 68 which also provide a supporting means for the conveyor shaft bearings. The diameter of the sprocket 53 is such that but three or four links are accommodated in one-half of its circumference (see Fig. 5) so that in passing over this small sprocket the links are given a wide angular spacing in order that there will be a sufficient opportunity to readily receive a paper strip as it falls from the belt conveyor 45. The link conveyor 46 is adapted to receive the strips and then arrange them side by side in parallel planes while carrying them forwardly, the strips being held so that the connected ends 28 of the strips extend outwardly beyond the ends of the fingers, while the separated ends which ultimately form the match heads are received within the confines of the links. With the described arrangement of links, it will be apparent that they are cut away or recessed so as to receive the separated ends of the splints freely between adjacent fingers without tending to push these separated ends toward one another. The space between successive pins 54 and the distance between the paper engaging faces 58 on the heads or top portions 56 is such that after the paper strips are carried up to the top of the sprocket 53, and when the links are moving horizontally along the straight rails 66, the paper strips will be engaged rather lightly and so that the strips can be moved in the direction of their lengths and transversely of their line of motion in the conveyor without the exertion of disturbingly large forces.

After the movement of link conveyor 46 has caused a suitable number of the paper strips to be picked up and arranged between the links, the strips having their continuous edges held in parallel spaced relation, as shown in the upper portion of Fig. 5, a carrying frame 70 (see Fig. 9) is placed on the upper projecting portions 28 of the various paper strips, the connected ends of the splints being received between adjacent slats 71 of the frame. The top of the frame is pressed down firmly and the slats are then tightened to some extent so that the ends of the strips will be held with sufficient force to permit withdrawing of the frame to remove the strips sideways from within the conveyor. The sidewise removal of the strips from the conveyor is accomplished without damage to the separated ends of the splints by bending them as is common in hand handling. This method and apparatus for handling also permits using strips which are larger, or of more book widths, than those used in the usual automatic machine, since the strips are supported throughout their lengths in proper relative position. When a series of the paper strips are removed from the conveyor the frame with its supported strips may then be readily handled to first treat the splints with a suitable paraffin solution or the like, after which the ends of the strips are dipped into the usual solution of combustible material which forms the match heads.

The slats of the carrying frame 70 as shown in Figs. 9 and 10, are arranged in a longitudinal series joined by rods 73 extending adjacent the slat ends. These rods are held at one end by means of through pins 74*a*, the ends of the rods being thus flush with the side of the end slat, thus avoiding an objectionable projection which would strike the strips in the conveyor. Thumb screws 74 are provided on the threaded ends of the rods so that the slats may be drawn together or moved apart. Coil springs 75 are provided between adjacent slats and on each rod 73. These springs are preferably made of a wire which is slightly less in diameter than the thickness of the paper strip. The springs are preferably of spiral form so that they may be collapsed to slightly less than the thickness of the paper, the opposite ends of the springs bearing against the flat sides of the slats in order to hold the slats all with the same relative spacing. Before applying the frame to the paper strips on the conveyor, the thumb screws 74 are loosened and the springs 75 produce an even spacing of the various slats throughout the length of the series. The slats in this position are spaced apart a distance very slightly greater than the thickness of the paper strips so that when the frame is applied to the strips on the conveyor the projecting edges of the paper strips will readily enter the spaces 76 between slats. The entering of the paper strips is facilitated by the cutaway or angled portions 77 of the slats. Each slat of the frame is cut away, to shallow U-shape in side elevation, as shown in Fig. 9. The depth of the main transverse part of each slat is equal to the depth of that continuous part 28 of the match strips which projects upwardly above the conveyor. Also the slats are larger than the match strips so that the distance between the rods 73, and the transverse extent of the main transverse part of each slat, is greater than the length of the match strips. When the frame is inverted, therefore, to receive the exposed projecting parts of the match strips and is placed down to receive them, the edges of the strips will extend into the frame to approximately coincide with the cutaway edge, indicated by the numeral 73*a*. By pressing down on the strips with the hand, or suitable tool, the operator can thus ordinarily cause the strips to assume a proper position in the frame, with the separated splint ends in substantially the same general plane. This permits of effectively uniform immersion of the splints in the chemical which forms the match heads. After superimposing the frame on the series of strips carried by the conveyor, the thumb screws 74 are tightened up so that sufficient gripping pressure will be exerted by the slats to grip the paper strips so that they may be removed laterally from between the fingers of the link conveyor. Before finally applying the carrying frame 70 on the projecting edges of the strips in the conveyor the various paper strips may be transversely arranged in line

by a suitable straight edge applied to the ends of the strips of the series, and the upper portions of the paper strips may be pressed down as by hand or with any suitable instrument to make sure that all contact with the stop surfaces **60** and **61**, thus bring the upper edges of the strips into a common horizontal plane as will be readily understood. By this means the bending of the strips, which commonly occurs because the cutting or splitting of the paper strips has the effect of tending to expand the slit or splint end of the strip, thus tending to make the edge **79** (see Fig. 14) somewhat concave is overcome and the ends of the splints are all brought into substantially the same plane so that uniform heads will be formed when the splints are dipped into the solution of match tip material.

After tightening the thumb screws **74**, and removing a number of the paper strips from the conveyor, it may be that the strips are not all arranged with the separated ends of the splints in a common plane, the above treatment perhaps having failed to cause such. To straighten out the paper strips and to bring all of the projecting ends of the splints into a common geometric plane the frame may be placed on the platen **80** of an arbor press and the top plate **81** forced downwardly by manipulating the hand lever of the press. Then while holding the plate **81** depressed the thumb screws **74** may be tightened so as to securely hold the strips in position. The frame and its supported strips may, then, be inverted and the projected splint ends dipped in combustible material to provide the match heads, this step preferably being preceded by a treatment with paraffin. In each dipping operation the tank for the fluid material is arranged so that a uniform depth of material is maintained, and the frame with the clamped strips is lowered into the tank until the splint ends are suitably immersed; stops being provided to prevent undue immersion of the splint ends. The preliminary paraffin dip may be likewise controlled.

The strips of matches are then dried, preferably by air drying which takes several hours and produces a uniform and complete drying of the head material. The strips are then removed, cut up into book widths and bound in suitable machines.

In order to facilitate the removal of the dipped strips from the carrying frame, after the combustible material is dried to a sufficient extent, an adjustment device or table is preferably provided having means for determining the length of a series of slats. This board as shown in Fig. 13, comprises a suitable number of longitudinal base pieces **88** at one end of which are upwardly projecting lugs **89** adapted for contact with the end slat **90** of the carrying frame. The opposite end slat **91** of the frame is adapted to be engaged by a suitable number of arms **92** pivotally supported at **93** on a downward extension **94** of the base pieces **88**. A cam member **95** pivotally supported at **96** and having an operating handle **97** may be swung clockwise 90 degrees from the position indicated and when so moved the arm **92** is swung to bear against the end slat **91** and press the slats toward each other, the setting corresponding with the total length of the frame slat series when the slats are in tight engagement with the paper strips. With the arm **92** in its right-hand position and the slats pressed together, the thumb screws **74** may be freely spun back from extreme tightened position as they are not restrained by pressure of the end slats. After spinning back the thumb screws while still holding the end slat **91** in its original position, the handle **97** may then be turned counterclockwise, relieving the pressure of the various springs **75** to some extent and causing a slight increase in slat spacing, under the action of the springs. The end slat **91**, as will be readily understood, moves away from the opposite end slat **90** an amount determined by the position of the arm **92** indicated in Fig. 13. In this expanded position of the slats, the coated and dipped matches may be readily taken out between the operator's hands a group at a time. After all the match strips are removed from the frame, the slats are moved slightly toward one another so that the spacing between slats will substantially correspond with the spacing between the projecting ends of the strips while the strips are in the link conveyor. This is readily accomplished by movement of the lever **98** which controls a similar cam **99**, although the cam **99** has a smaller throw than the cam **95**. The throw of the cam **99** is such as to move the arm **92** the proper amount toward the right, as viewed in Fig. 13, when the cam is moved through 90 degrees, to bring the various slats almost but not quite into tight engagement with the wires of the springs. The springs are still effective, however, in equalizing the spaces between the various slats. It will be understood that the aggregate pressure of the various springs **75** is readily overcome by the single hand lever **98** which operates against the end slat **91**. After properly positioning the end slat **91** with respect to the opposite end slat the thumb screws **74** are readily spun up into engagement with the slat **91**, to hold them in properly spaced position to readily receive the spaced strips within the conveyor.

A single operator may readily oversee the operation of the press, as the press is automatically arranged to continue its stamping and feeding operations in a continuous manner. The feeding of the match strips to the link conveyor is automatic and accomplished by a simple mechanism which may feed the matches in very rapid succession away from the press and in proper sequence to be picked up by the conveyor. The fingers of the conveyor automatically pick the strips up and position them in parallel, adjacent and evenly spaced planes. A large number of the paper strips can be taken simultaneously from the conveyor, as the frame **70** may be about several feet in length, also the strips themselves may be made longer than has been the usual practice. One operator can readily handle the removal of the strips from the conveyor and the manipulation of the frame, taking successive frames and filling them ready for dipping. This same operator, could also accomplish the dipping of the match heads during the time the strips are accumulating on the conveyor to a sufficient extent to fill another frame. However, it is a usual practice for the machine operator to place the prepared books on conveyor frames or trucks which may be readily moved to the solution tanks for dipping. The mechanism for making the matches is therefore of a comparatively simple character, but capable of high speed production and requiring the attention of only one operator, who is enabled to handle the match strips in large groups in the manner herein described. By this mechanism the speed of the press in stamping or slitting the strips of splints may be greatly increased beyond that heretofore used.

Also the number of operators may be greatly decreased, one operator handling more strips than heretofore operated by several with the non-automatic machines above described.

While the method herein described, and the form of apparatus for carrying this method into effect, constitute preferred embodiments of the invention, it is to be understood that the invention is not limited to this precise method and form of apparatus, and that changes may be made in either without departing from the scope of the invention which is defined in the appended claims.

What is claimed is:

1. A machine for making paper matches comprising mechanism for forming paper strips having connected splints which are separated from one another at an end thereof, means for feeding the strips successively from said mechanism with the separated ends of the splints directed forwardly, and a link conveyor for receiving the strips from said feeding means and for arranging the strips in spaced parallel relation and comprising relatively movable gripping fingers cooperating with one another in pairs to frictionally and non-positively grip opposite sides of said strips, said fingers having means spacing their strip engaging portions apart a predetermined distance corresponding to the thickness of the strip so as to permit endwise movement of the gripped strips, said conveyor having means for positioning the strips so that connected ends of the splints project a predetermined distance above the ends of the fingers.

2. A machine for making paper matches comprising mechanism for forming paper strips having connected splints which are separated from one another at an end thereof, means for feeding the strips successively from said mechanism, conveyor means for receiving the strips from said feeding means and having a series of gripping fingers for arranging the strips in a series thereon in spaced relation side by side said fingers having smooth gripping surfaces adapted for impositive gripping effect and providing for endwise slipping of the strips therefrom, and in combination therewith, a carrying frame adapted to be placed to simultaneously receive a series of said strips while carried by said conveyor and adapted to remove the strips endwise from the conveyor said carrying frame having strip gripping means spaced apart in accordance with the spacing of the strips on said conveyor.

3. In a machine for making paper matches and having mechanism for forming paper strips having splints connected at one end, a conveyor means for receiving the paper strips from said mechanism and having a series of relatively movable gripping fingers having flat gripping surfaces which slidably receive the paper strips between adjacent fingers and arrange them in spaced parallel relation, said fingers having extensions for abutting relation with the separated ends of the splints effecting predetermined positioning of said strips so that the connected ends of the strips project beyond the ends of said fingers whereby a number of strips can be simultaneously removed from said conveyor.

4. In a machine for making paper matches and having mechanism for forming paper strips having connected splints, a conveyor means for receiving the paper strips from said mechanism having a series of relatively movable fingers which receive the paper strips and arrange them in spaced parallel relation, said conveyor means having provisions for abutting the splint ends to effect predetermined positioning of said strips so that the connected ends of the strips project uniform distances beyond the ends of said fingers whereby a number of strips can be simultaneously removed from said conveyor.

5. A machine for making paper matches comprising mechanism for forming paper strips having separated splints connected at an end thereof, means for feeding the strips successively from said mechanism, a conveyor means for receiving the strips from said feeding means having a series of relatively movable fingers which receive the said strips, said fingers having portions adapted to arrange the strips in spaced relation side by side and to hold the strips in such arranged positions with a uniform spacing between strips, portions of the fingers being cut away to provide substantial spaces for receiving the separated ends of the splints.

6. In a machine for making paper matches, a conveyor means for successively receiving paper match strips and having relatively movable fingers, means for causing the movable fingers to assume diverging arrangement at the strip receiving location and movable into substantial parallelism to associate the received strips into a series of uniformly spaced parallel strips with the separated ends of the splints received loosely between the fingers, said fingers having means for effecting positioning of the strips so that the connected ends of the splints project beyond said fingers.

7. In a machine for making paper matches, a conveyor means for successively receiving paper match strips and having relatively movable fingers, means for causing the movable fingers to assume diverging arrangement at the strip receiving location and movable into substantial parallelism to associate the received strips into a series of uniformly spaced parallel strips with the separated ends of the splints received loosely between the fingers, said fingers having means for effecting positioning of the strips so that the connected ends of the splints project beyond said fingers and being arranged for endwise removal of the strips, and in combination therewith, a carrying frame for engaging the projecting ends of a series of said strips simultaneously when carried by said conveyor and for removing the strips endwise from the conveyor, said frame having a series of relatively movable strip engaging portions which are spaced apart uniform distances corresponding with the spacing of the strips in said conveyor fingers.

8. The method of making paper matches comprising forming paper strips having connected splints which are separated from one another at an end thereof, feeding the strips successively, associating said strips one parallel to another with a uniform spacing between successive strips, after such association simultaneously gripping a large number of the associated strips and transferring the strips so gripped with the separated splint ends arranged in a substantially common plane for application of match head material.

9. The method of making paper matches comprising forming paper strips having connected splints which are separated from one another at an end thereof, feeding the strips successively, associating said strips side by side in parallel planes with a predetermined distance between adjacent strips and with the connected ends of said splints freely exposed, simultaneously gripping a series of the exposed ends of said strips in

a carrying frame and then lifting said strips in the frame for removal and application of a match head material.

10. The method of making paper matches comprising forming paper strips having connected splints which are separated from one another at an end thereof, feeding the strips successively and associating said strips side by side in parallel planes with a predetermined distance between adjacent strips and with the connected ends of the splints freely exposed, simultaneously gripping a series of the exposed ends of said strips, and then laterally removing the said series of strips for subsequent treatment.

11. The method of making paper matches comprising forming paper strips having connected splints which are separated from one another at an end thereof, feeding the strips successively, associating said strips side by side in parallel planes with a regular distance between adjacent strips and with the connected ends of the splints freely exposed, simultaneously gripping a series of the exposed ends of said strips in a carrying frame, laterally removing said frame together with the series of strips, aligning the edges of the strips in said frame, tightening the strips in said frame, and subsequently treating the exposed ends of the splints.

12. A machine for making paper matches comprising mechanism for forming paper strips with splints connected along one longitudinal edge of the strips, a link conveyor means having gripping fingers movable to relatively diverging relationship for receiving the strips successively from said forming mechanism and movable to parallel relationship for arranging the strips in predetermined spaced relationship, means for moving said fingers to diverging and parallel relationship at timed intervals coordinated with the movement of the conveyor means, and means for feeding the strips successively from said forming mechanism to the conveyor means, said feeding means moving at a speed exceeding the speed of movement of the conveyor means and coordinated with the length of said feeding means to effect the delivering of the said successive strips to the divergent spaces between successive fingers of the conveyor means at timed intervals coordinated with the movement of the conveyor means.

NELS. H. NELSON.