

Sept. 21, 1954

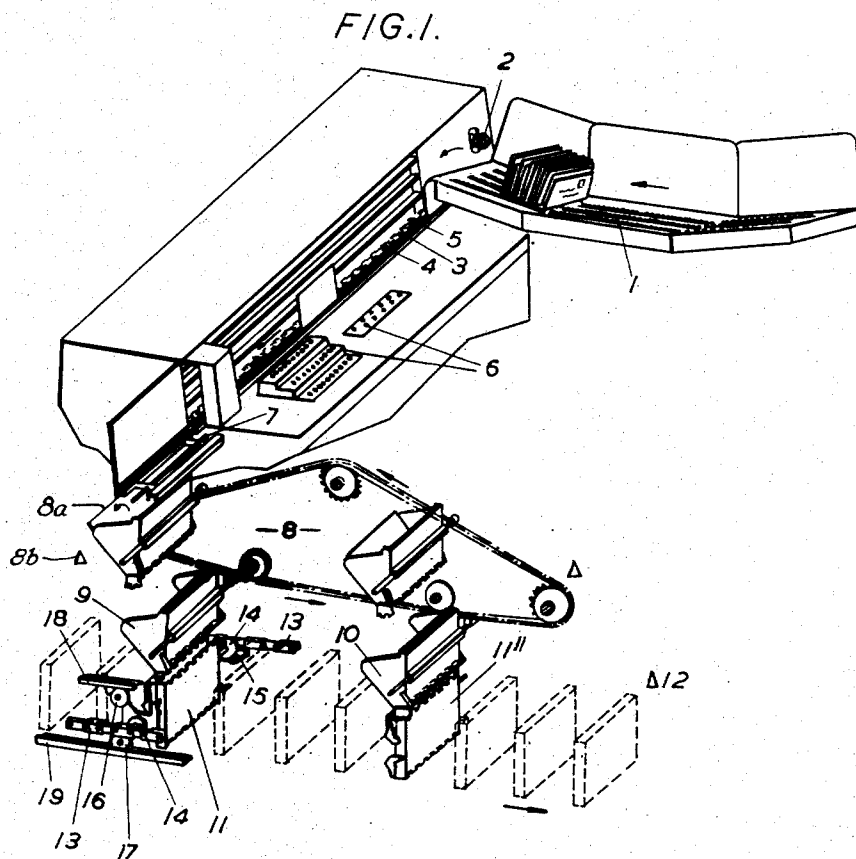
G. X. LENS

2,689,657

SORTING MACHINE FOR LETTERS OR SIMILAR FLAT OBJECTS

Filed Dec. 18, 1951

6 Sheets-Sheet 1



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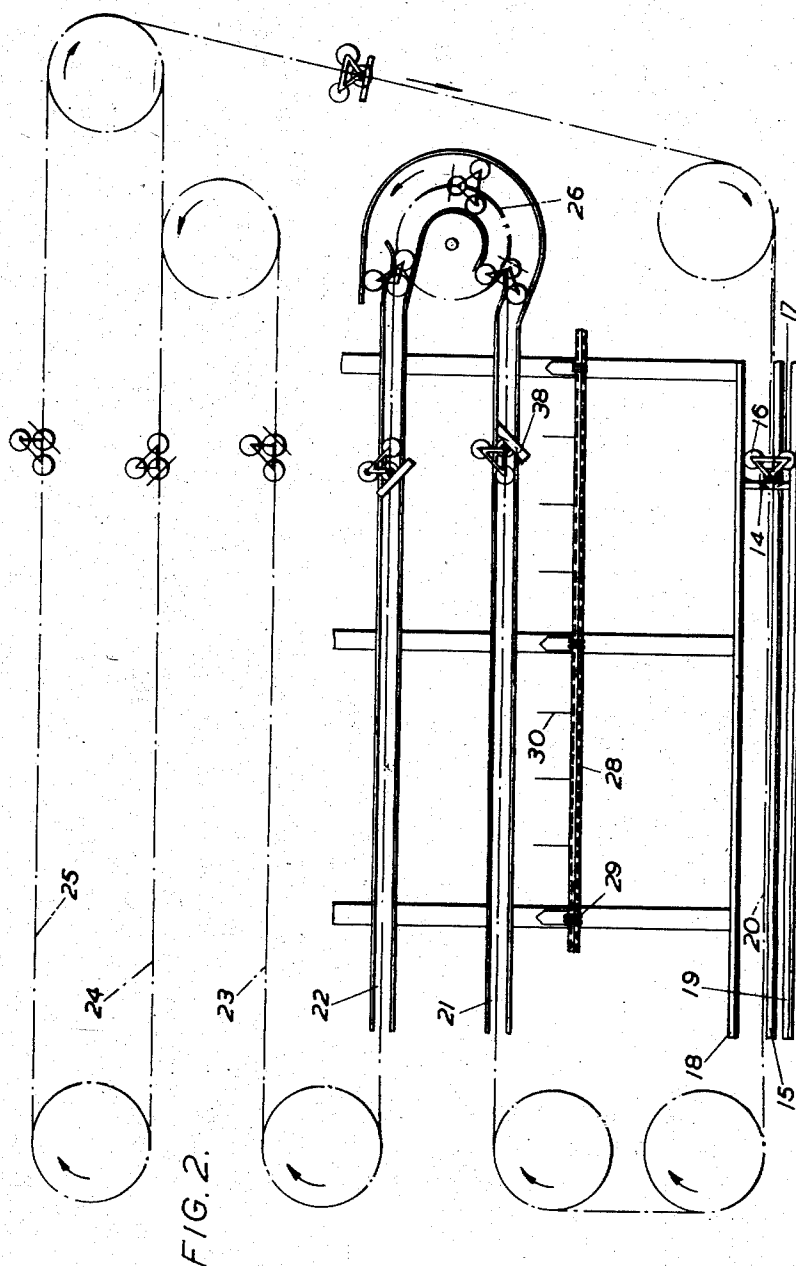
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SORTING MACHINE FOR LETTERS OR SIMILAR FLAT OBJECTS

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6 Sheets-Sheet 2



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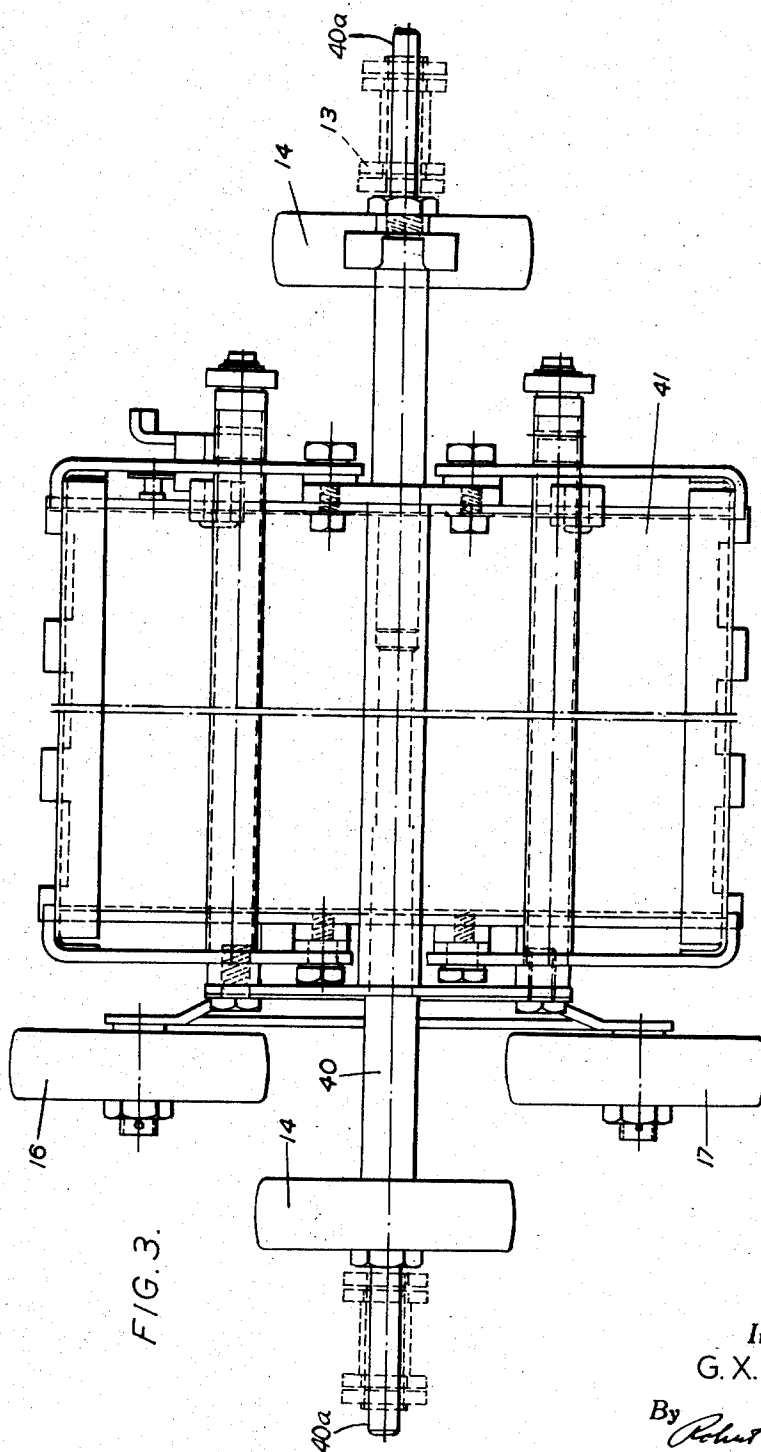
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6 Sheets-Sheet 3



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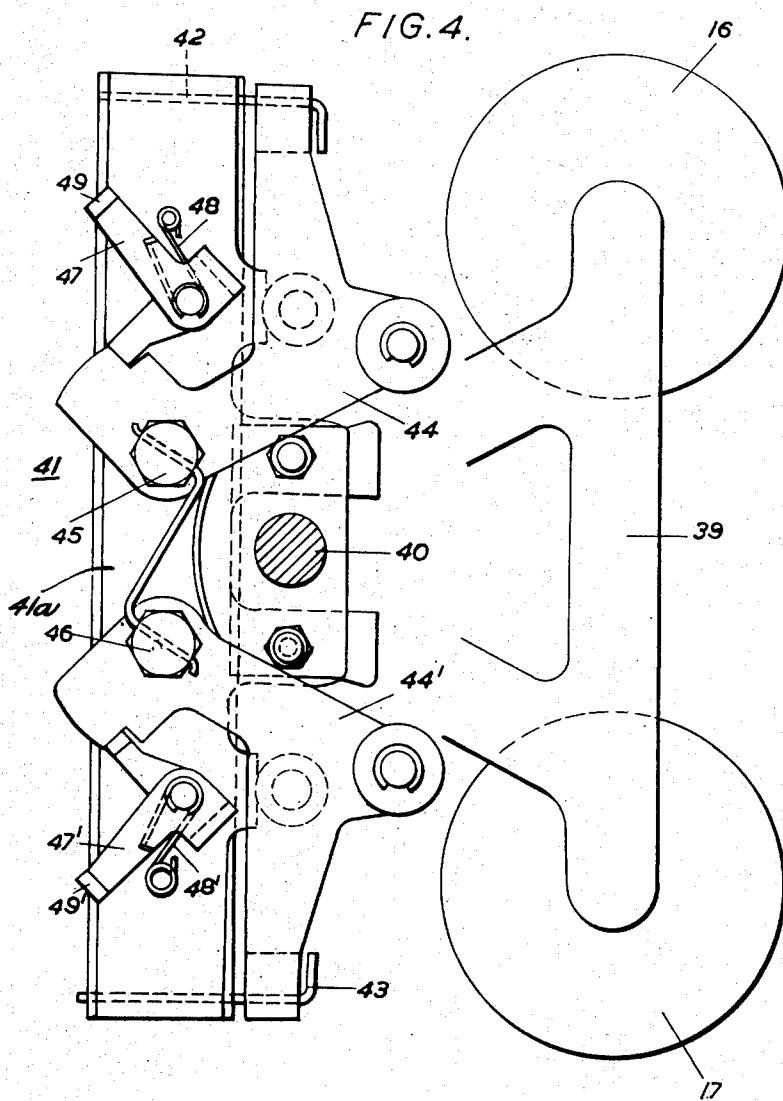
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6 Sheets-Sheet 4



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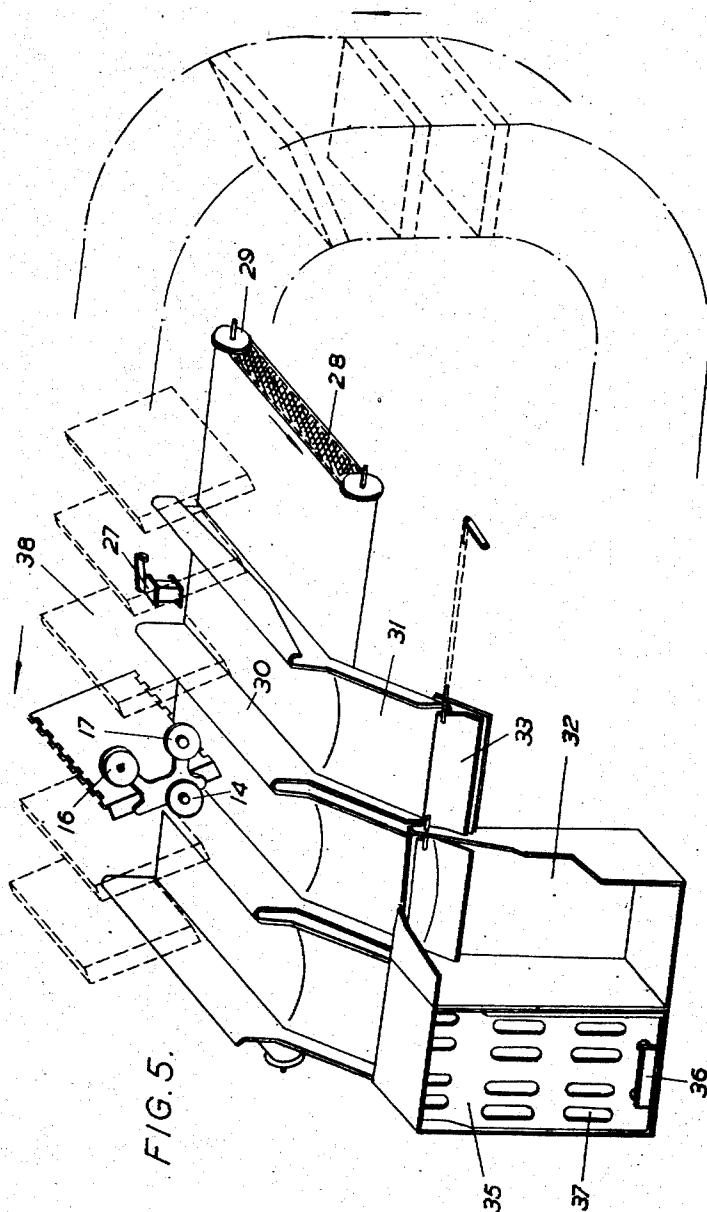
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SORTING MACHINE FOR LETTERS OR SIMILAR FLAT OBJECTS

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6 Sheets-Sheet 5



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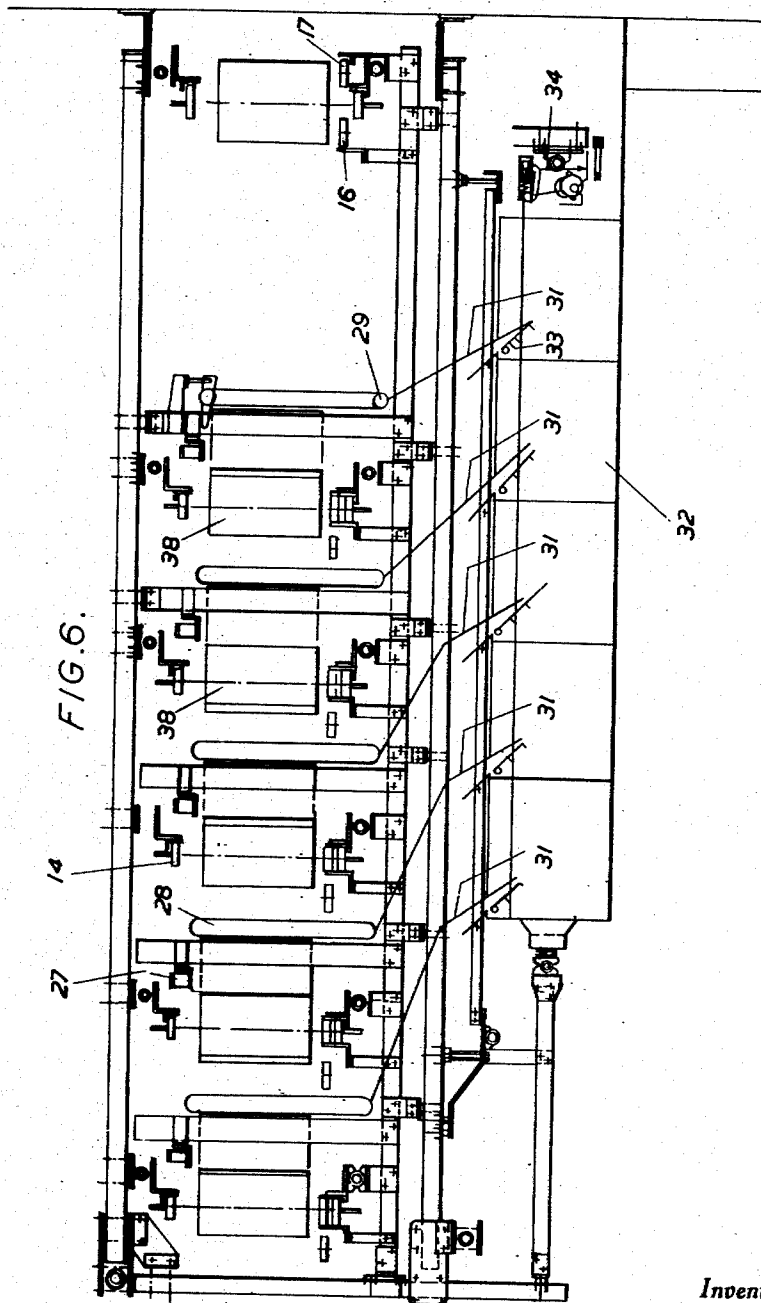
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SORTING MACHINE FOR LETTERS OR SIMILAR FLAT OBJECTS

Filed Dec. 18, 1951

6 Sheets-Sheet 6



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UNITED STATES PATENT OFFICE

2,689,657

SORTING MACHINE FOR LETTERS OR
SIMILAR FLAT OBJECTS

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Claims priority, application Netherlands
December 18, 1950

6 Claims. (Cl. 214—11)

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The present invention relates to a sorting machine for letters or similar flat objects having predetermined marginal dimensions, comprising one or more sorting positions to which these objects are supplied in a pile. Letter sorting machines of this type are known already as e. g. disclosed in the Dutch patent specification No. 61,887 in which the sorting operator takes up letters one by one with one hand and with the other hand records a code number e. g. consisting of three digits and corresponding to the destination, onto a keyboard.

In this known machine as a result of this recording operation, several members on an available carrier, connected with a conveyor chain, were physically set into a position which was characteristic to the destination of the sorted letter. A letter-box in which this letter was finally to be deposited and which corresponded with the destination was also provided with a plurality of members arranged in a fixed position which was characteristic to this destination.

As soon as the carrier had arrived at the place of this letter-box, a flap was opened on the carrier by cooperation of both sets of members now coming into mutual contact, after which the letter arrived via a chute into the desired letter-box.

Such a machine was not only very complicated and expensive but also possessed various disadvantages.

For example, this machine caused unnecessary noise so that it became necessary to completely enclose it by sound damping material, thus making it comparatively inaccessible for inspection and maintenance.

Moreover, in practice it happens that the adjustable members on the carriers provide so many chances for inaccurate operation that a number of maintenance people must always be present to clear the occurring faults.

The sorting speed to be attained is, amongst other things, dependent upon the time needed by the sorter to effect his manipulations and this time is lengthened individually by the necessity for taking up the letters and depositing them manually in an outlet slot. These manipulations must always be terminated at the end of fixed recurrent time-intervals. From a hygienic point of view this manual handling of the letters is also undesirable.

An object of the invention is to improve a machine of the type under consideration. The invention takes advantage of the fact that a higher sorting speed may be obtained if the

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manipulations of the sorter are solely limited to depressing the keys on the keyboard for which the sorter has now both hands free since he does not need to handle the letters.

Moreover the invention is preferably used in a system in which all letter-holders of the main conveyor chain are common to the sorters; are identical in construction and need not include any adjustable members having a physical characteristic indicative of the destination and furthermore all receptacles into which the letters are deposited are also identical and do not include any adjustable members having physical characteristics indicative of the destination of these letters.

While in the above-mentioned well known sorting machine, the sorters had to be located on a high platform, a considerable improvement may be obtained if the sorting positions can be normally provided within the vicinity of the lowest part of the common conveyor chain, which then involves, however, the problem of delivering the sorted letters, via an intermediate conveying device, into those letter-holders of the main chain which successively become available for a sorter under consideration.

A further object of the invention is to restrict the total dimensions of the sorting machine as much as possible, since usually, these machines are installed in existing buildings.

A further object of the invention is to manufacture the sorting machine from light moving components so that an economy in driving power is obtained.

A proper coordination of the various conveying devices forms one of the main problems which has been solved by my invention in a simple and reliable manner.

In an embodiment of the invention, the sorting machine may comprise in combination with a first conveying device individual for each sorting position, which automatically takes off the objects, e. g. letters, one by one from the automatically advanced pile, subsequently moves the letter in front of the sorter and at the end comprises a transfer mechanism, and a second, continuously moved, intermediate conveying device which separately receives the objects from the transfer mechanism and separately conveys them along toward an equal speed, continuously moved, third conveying device; an arrangement, in a fixed zone, for transferring the object from the second conveying device to the third device which delivers it at the place of destination, the third conveying device being common to a plurality of

first and second conveying devices which individually correspond to each other and having no destination indicative indicia thereon.

In accordance with a feature of the invention the carrying members of the second and third devices are constituted by box-shaped letter-holders each having two movable flaps.

In accordance with a further feature of the invention, the conjunction between a letter-holder of the second conveying device and another letter-holder of the third conveying device takes place in a predetermined zone in space, which is identical for each sorter's position and which is sufficiently large to permit the letter-holder of the third conveying device to open the letter-holder of the second conveying device at the conjunction point in order to receive the letter or object contained by the latter.

The chain of the common conveying device extends in serpentine-fashion and reeves so as to present odd and even straight portions, which are mutually parallel, according to the sense of displacement.

In accordance with an important feature of the invention, the letter-holders of this chain are provided with means (e. g. idlers) guided along guiding paths such that the letter-holders passing in the even straight portions are symmetrically inclined with respect to the letter-holders in the odd straight portions and in such a way that this inclination presents an optimum angle with respect to the sense of translation of said letter-holders.

Furthermore, both flaps of these last-mentioned letter-holders are so arranged that depending upon the position of the letter-holder, they may function as an inlet flap or outlet flap, in accordance with a feature of the invention.

An electromagnet is arranged at each destination to control the opening of an outlet flap of the letter-holder of the common conveyor chain when the destination is reached, by operating a latch associated with the flap. These electromagnets are energized under control of signals from the sorters keyboard, to operate the releasing latch at the time the letter holder reaches its desired destination.

In accordance with a further feature of the invention, the said electromagnet operates the latch of that flap which, in the position considered, acts as an outlet flap while both latches are preferably controlled by one common spring.

The invention will be further described with reference to the accompanying drawings for a preferred embodiment of the invention which has been shown by way of example, and in which

Fig. 1 represents a perspective view of the main parts of the sorting machine.

Fig. 2 shows a diagrammatic location of the main chain of the third conveying device.

Figs. 3 and 4 respectively show a plan view and a side elevation of a letter-holder belonging to this third conveying device.

Fig. 5 is a perspective view of the location of the rotating conveyor belt and the receptacles of the destinations, while,

Fig. 6 represents a side elevation of a plurality of receptacles together with an alarm arrangement, common to a group of receptacles.

For convenience, the objects to be sorted will be called "letters," although it should be clearly understood that this invention may be adapted for the sorting of any type of objects having predetermined marginal dimensions.

Since various parts of the sorting machine form the subject matter of inventions to be described in separate copending patent applications, a brief description of those parts is deemed sufficient.

In Fig. 1, the pile of letters is placed at the right-hand side of each sorter and these letters are automatically advanced by means diagrammatically indicated by 1. One letter at a time is brought from this pile into a U-shaped channel 3 by means of a pneumatic suction member 2 whereupon this letter is led through this channel, with the aid of an endless chain 4 provided with fingers 5 mounted at regular intervals, along the sorter in an intermittent movement, wherein each of the letters are halted for a predetermined time in the course of its travel through the channel. During this stopping period, the sorter need not touch the letters by hand, but may read the destination so as to be ready to subsequently record a code number corresponding to the destination on a keyboard 6. In any event, this recording of the code number must be terminated at the moment that the next letter again momentarily stops in front of the sorter.

For a normally trained sorter, the sorting speed of the machine may be increased because this speed largely depends on the time required by the sorter to read the destination, to mentally translate the destination to a code number and to depress the keys for registering the code number in accordance with this destination.

Subsequently, a transfer mechanism 7 arranged as a turnstile, is arranged to receive one letter at a time from the chain 4 and enables the letters to be delivered one by one to a second and intermediate conveying device 8, comprising four letter-holders 9 which are continuously moved around by endless chains.

As soon as the letter-holder 9 whose movable side flap is closed after reception of the letter from the transfer mechanism 7 when a roller (not shown) connected to a movable side flap 8a touches an idler 8b located at a fixed point adjacent to the path of the letter-holders to cause closure of the movable side flap 8a. When the holder 9 comes in register with letter-holder 11 of the third conveying device, the bottom flap of the letter-holder 9 is automatically opened and the letter falls in the same position into the letter-holder 11, then opened at the top and which obviously is closed at the bottom before reaching this receiving point. In this figure, the letter-holder 10 has just broken the contact with the letter-holder 11.

In order to simplify the construction, it was deemed advantageous to make the sorter's position to a certain extent, independent of the main body of the machine. This necessitated the use of an intermediate mechanism having some flexibility. The transfer by gravity of objects to be sorted being most economical, involved the following considerations: (1) The descent of an object was required to be guided; (2) the possible variation in dimensions of objects or letters; (3) the resistance of the air; (4) the course followed by a letter-holder 9 during the dropping of the said letter.

At a predetermined point, here diagrammatically indicated by 12, which may be a slanting strip adjacent to the path of the third conveyor device, the upper flaps of the letter-holders 11 are closed and then the letter-holders commence their displacement along five superimposed levels

each of which has been allotted to feed letters to

60 receptacles, each receptacle representing a different destination.

Since this embodiment has been designed for four sorting positions, it is clear that each fourth, eighth, twelfth, etc. letter-holder is put at the disposal of a certain sorter while the intermediate letter-holders are similarly put at the disposal of the second, third and fourth sorter respectively.

It may be seen from Fig. 1 that, as long as the letter-holders 11 pass the positioning track, they are all in a vertical position. This intermediate transfer conveyor system is more fully described in my copending application, Serial No. 262,209, filed December 18, 1951.

Though the further details of the construction of the letter-holders of the common conveyor will be described with reference to other figures, it may be sufficient to state here that they are carried by two main chains 13. At each side of the letter-holder there is provided an idler 14 rolling along a guide path or track 15 while at one side there are provided two other rollers 16 and 17 respectively, moving along the guide paths or tracks 18 and 19 respectively.

The chains are secured by extensions of the shafts of the inner idlers.

Common conveying device

This conveying device consists of a long, double, endless main chain, which in the embodiment shown, comprises 627 letter-holders which are provided at regular intervals. These letter-holders, as set out above, are all identical and do not carry any settable members having physical characteristics indicative of the destination to which the letter is to be sent. In order to save space the 300 receptacles corresponding to the destinations of the letters are mounted in five horizontal superimposed rows. The main chain in addition to the lowermost positioning track 20 is adapted to be moved along five horizontal paths corresponding to the five rows in serpentine fashion which, in Fig. 2, have been indicated respectively by 21, 22, 23, 24, 25. The tracks 22 and 24 may be called the "even" tracks and 21, 23 and 25 the "odd" tracks.

The chains are externally driven by means of intermediate chains and suitable gear wheels, which at each side are provided with an idler of elastic and sound damping material, while, moreover, two further idlers are provided at one side.

Only while passing the positioning track are the letter-holders in a vertical position for the reception of the letters from the intermediate conveying device. Both carrying rollers 14 roll along the paths 15, while the idlers 16 and 17 roll along the guide paths 18 and 19. These guide paths may, for example, consist of angle irons.

After closure of the top flap of the letter-holders, they may take a different position with respect to the vertical, and they are brought into a slanting position during their movement along each of the paths 21-25, in which they are transported via one idler at each side, one of the guiding rollers 16 or 17 controlling the direction of slant of the holders. This not only results in a reduction of the total height of the machine, since the slanted holder takes up less head room than a vertical holder but at the same time one guide path or rail may be dispensed with. Only when passing the turning points such as

26, are the letter-holders required to be guided by both rollers 16 and 17, after which the slanting position of the letter-holders, upon reaching the next upper path traversed in the reverse direction, is reversed in direction.

After leaving the upper path, the letter-holders are moved downwardly and led back to the positioning track for reloading.

The position taken by the letter-holders during their movement along the entire trajectory is diagrammatically shown in Fig. 2.

Fig. 2 clearly shows the inclination given to the letter-holders 38 with respect to the vertical, dependent on whether they move along the even paths 22, 24, or the odd paths 21, 23, 25. These positions are mutually symmetrical.

This slanting position has been so chosen, that the letters will fall on a conveyor belt (to be described hereinafter), at a suitable, constant angle of incidence with respect to the sense of translation of the letter-holders.

It is further to be noted that when the letter-holders of the main chain reach the track 20, the upper flaps must be opened whereas the lower flaps must be closed in order to retain the letters to be delivered to the holders.

Usually the opening of the upper flaps is controlled by a hook-shaped member along the path of the chain and fixed with respect thereto (not shown) beyond the last receptacle (N°300), whereas the closing of the lower flaps, in so far as needed, is controlled by a wedge-shaped strip which contacts the holder, both opening member and closing wedge being adjacent the path of the chain and fixed with respect thereto. Before the letter-holders leave the track 20, the upper flaps must be closed and this is effected by the contacting of the holder against a wedge-shaped strip placed along the path of the chain and fixed with respect thereto.

It is also shown therein, that between the positioning track and the first superimposed part of the main chain, a larger distance is needed than between the next adjacent paths, because the intermediate conveying device is also mounted in that space.

Upon arrival of a holder at the receptacle corresponding to the destination of a letter transported thereby, the letter may be released by energising an electromagnet individual to the receptacle and indicated by 27 in Figs. 5 and 6. One of each of these relays is provided at each of the receptacles and connected over suitable wiring circuits with the sorter keyboards. Upon operation of the keys to designate the terminal receptacle to receive a letter, signals are despatched which will serve to operate the relay associated with the designated receptacle at the time the corresponding letter reaches it. The timing is properly co-ordinated with the various sorter positions to operate the latch regardless of which sorter despatches the letter. The details of the signal and storage circuits for operating the unlatching relays forms no part of this invention and therefore is not illustrated. For details of such a circuit reference is made to an application of M. Neyt, Serial No. 229,393, filed June 1, 1951. The aforementioned copending application and this application are assigned to the same assignee. The flap which in that position of the letter-holder is the lowermost flap at that moment, is now opened and the letter falls on a horizontal endless conveyor belt 28 provided below the letter-holders and made out of braided metal wire, which is kept tensioned between rollers 29

and is continuously driven by suitable means which have not been shown in a direction transverse to the direction of travel of the chain.

The conveyor belt 28 has such width that it is common to e. g. four adjacent terminal receptacles.

In order to maintain the letters separated on their further travel to their destination receptacles, lateral partitions are provided, indicated here by 30. As soon as the letter has arrived at the end of the conveyor belt it is dropped into a chute 31 terminating into the upper part of the rear wall of the receptacle 32.

Since the receptacles form one continuous front, the bearing and driving of these conveyor belts must be such that as little space as possible is lost in the direction of width.

Since the height of the rectangular receptacles need not correspond with the vertical distance between two successive chains, the chutes of the vertically aligned receptacles are not necessarily parallel to each other.

It will be seen from Fig. 6, which, in fact, should be turned to the right by 90°, that the chutes of the three upper receptacles consist of two contiguous straight portions for a substantially same angle of incidence of the letters.

Before being permitted to fall into the lower part of a receptacle, the letter passes a flap 33 pivoting around a horizontal shaft. The flaps of two adjacent vertical rows, thus for a total of ten receptacles, are connected in common to an alarm indicated by 34 in Fig. 6, which warns the attendant that the flap has been tilted too far in one or more receptacles, in other words that the receptacle is completely filled.

All the cooperating flaps may, for example, be coupled by these rods which control the operation of the common alarm device 34. One of these rods is shown in Fig. 6 connected to a coil of the alarm device.

The letters arrive in the receptacles all in the identical position, i. e. either with the address upwards or with the address downwards and they may be removed by opening the front covers 35, which covers are hinged around their upper edges, and which front covers may be pivoted open by means of the handle 36. This front is slotted at 37 so as to permit the letters to be observed.

The construction of the letter-holders 38 itself is shown in Figs. 3 and 4.

As shown in Fig. 4, the supporting structure of one side of the holder consists of a triangular shaped side plate 39, in which the main shaft 40 is mounted and on which shaft the carrying rollers 41 are secured. The extension 40a of this shaft projects through links of the main chain.

The letter-holders are arranged as flat boxes 41 of rectangular shape, the length and width of which are determined by the maximum dimension of the letters to be sorted.

At the top and bottom, flaps 42, 43 are provided, respectively, each carrying a hook 44, 44' pivoting respectively around the pivots 45, 45', which pivots are affixed to side 41a of the holder. Latches 47, 47' engaging these hooks 47, 47' are kept in the operated position by springs 48, 48'.

A single spring (not shown) may be used to bring the upper or lower flaps in the opened position as soon as a force in the direction of the flap is exerted on the latch, which is arranged as a bell crank, because the bent end 49, 49' of the latch lever is rotated by an armature lever of

the electromagnet 27 (Fig. 5), upon energization of the latter.

For the preferred embodiment, four sorters were accommodated at this sorting machine so that each fourth letter-holder becomes available each time for a given sorter, whose sorting positions are spaced along the positioning track.

After leaving the point where the letters are transferred to the chain for the last sorter and before the letter-holders are conveyed upwardly to the next path, a member as mentioned above is located alongside the track, which closes the upper flaps which remained opened.

The letter-holders which, as stated above, are all identical, may be made as simple and light as possible, since they need only convey but a single letter at a time.

While I have described above the principles of my invention in connection with specific apparatus, it is to be clearly understood that this description is made only by way of example and not as a limitation to the scope of my invention.

I claim:

1. In a sorting device for flat objects, having a continuous conveyor, means for reeving said conveyor back and forth in different horizontal directions, terminal object receivers for receiving objects from said conveyor positioned under said conveyor in each direction of travel, and a plurality of substantially identical object carriers mounted on said conveyor for movement past said object receivers; a construction for assuring proper delivery of objects by said carriers to said object receivers regardless of the direction of travel of said carriers comprising flat sided object holders forming said carriers, means pivotally mounting said carriers to said conveyor, tilting means attached to said holders, means fixed with respect to said conveyor for cooperating with said tilting means, said fixed means and said tilting means adapted to cooperate to maintain the flat sides of said holders at an acute angle to said conveyor whereby opposite ends of said holder will be selectively directed toward said object receivers dependent upon the direction of travel of said conveyor, movable closure means at opposite ends of said holders to retain objects therein during conveyance and means for selectively opening the closure means directed toward a predetermined object receiver upon the desired object holder reaching said predetermined object receiver.

2. A sorting device according to claim 1, wherein said means for selectively opening said closure members comprise separate latch means for the two closure members mounted on said object holders for latching said closure members in closed position and means at each object receiver position selectively operative to release the latch means associated with the lower of said closure members.

3. A sorting device according to claim 1, wherein said object receivers comprise, a terminal conveyor movable transversely of said continuous conveyor and mounted below it, and means dividing the surface of said terminal conveyor longitudinally thereof to provide a plurality of object receiving areas in its transverse dimension.

4. A sorting device according to claim 1, wherein said means for maintaining said object holders at an angle comprise spaced rollers mounted on said holders and guiding means for said rollers mounted on opposite sides of said conveyor along said two directions.

5. A device according to claim 4, further com-

prising other guiding means spaced from said conveyor and positioned at the points where said conveyor reverses direction of travel, said other guiding means co-operating with said rollers to assure proper alignment for the next successive direction of travel. 5

6. A sorting device according to claim 5, further comprising a loading position, said conveyor extending for a distance longitudinally thereof, and loading guide means adjacent said conveyor in said loading position and co-operating with said rollers to retain said holders sub-

stantially perpendicular to said conveyor during traversal of said loading position.

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