

May 16, 1967

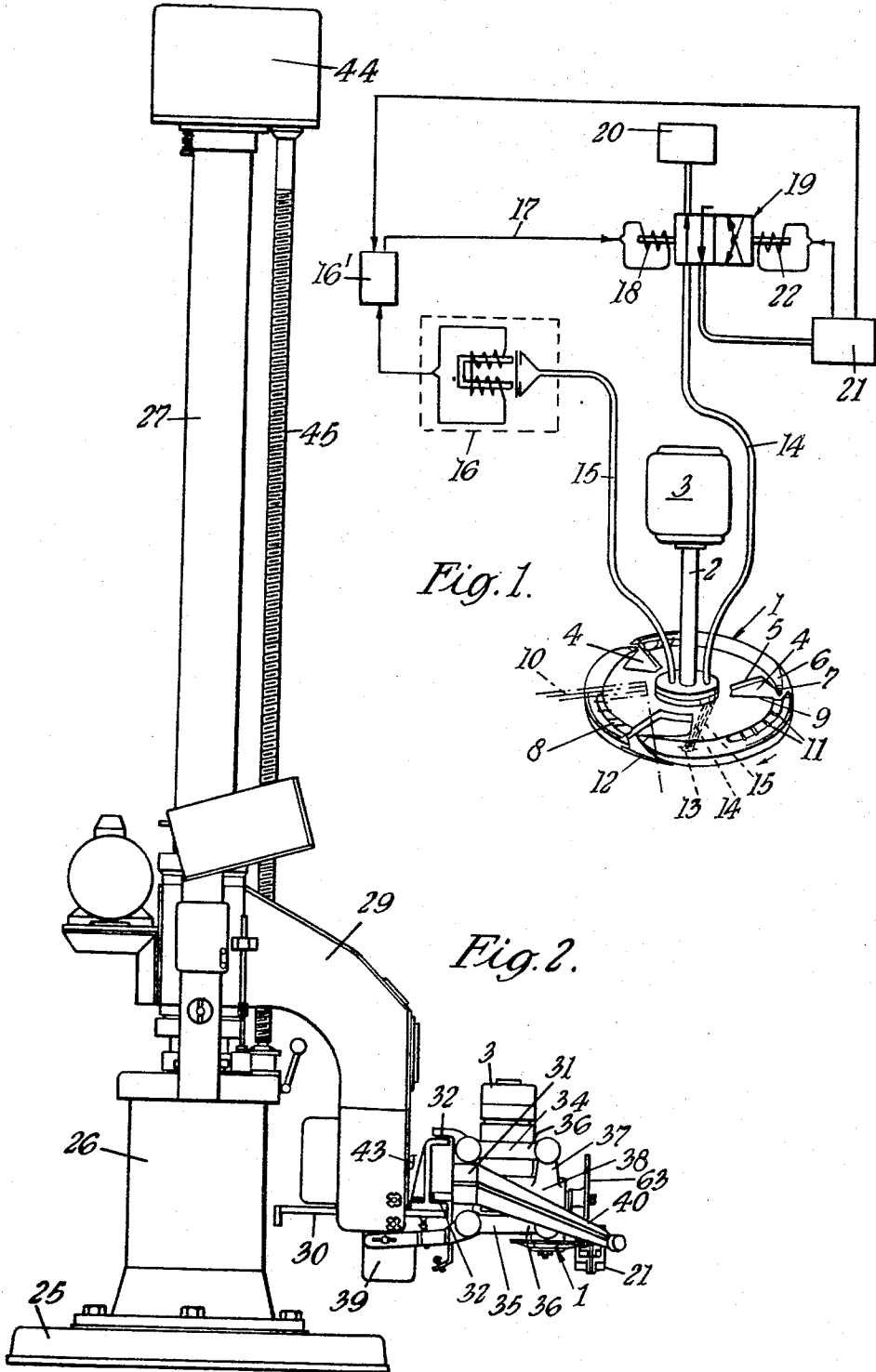
A. L. BERESLAVSKY ETAL

3,319,541

COUNTING MACHINE

Filed Aug. 21, 1964

5 Sheets-Sheet 1



May 16, 1967

A. L. BERESLAVSKY ETAL

3,319,541

COUNTING MACHINE

Filed Aug. 21, 1964

5 Sheets-Sheet 2

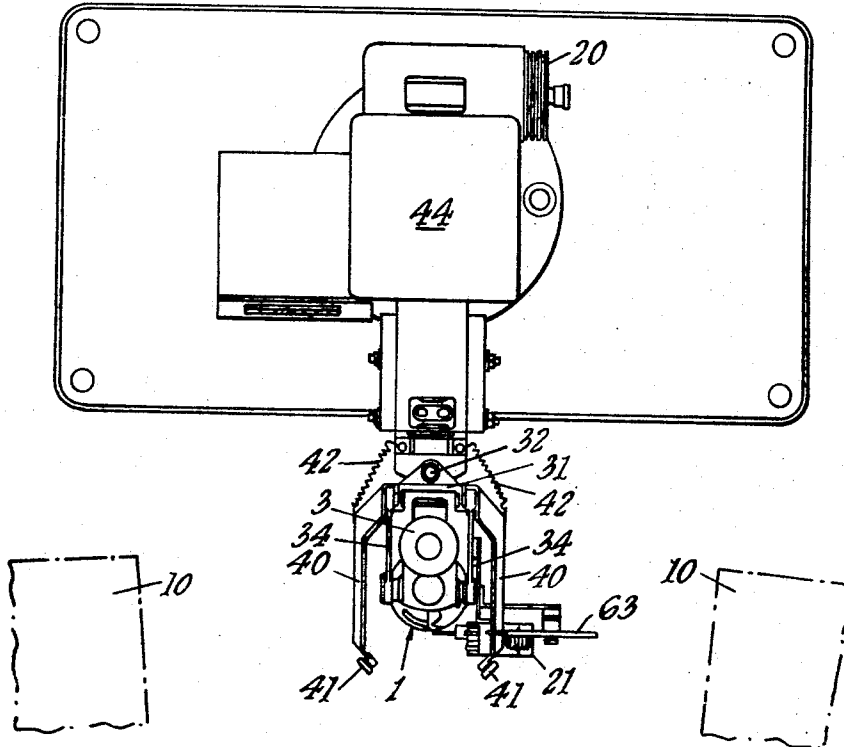


Fig. 3.

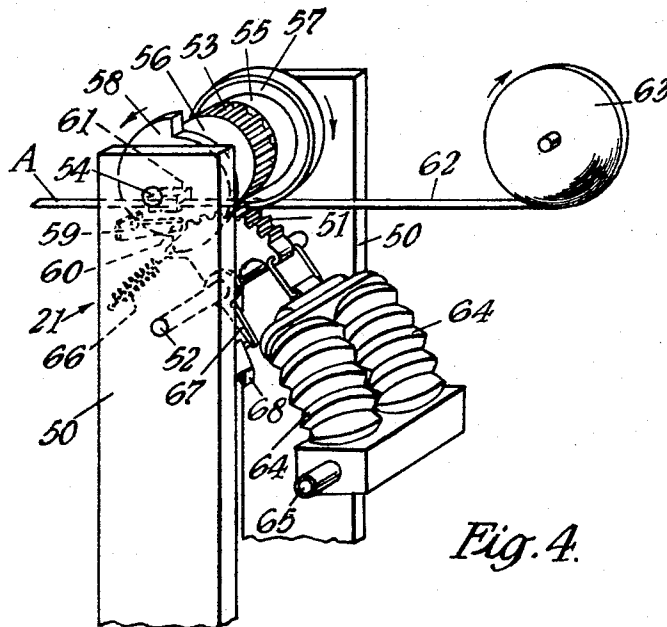


Fig. 4.

May 16, 1967

A. L. BERESLAVSKY ETAL

3,319,541

COUNTING MACHINE

Filed Aug. 21, 1964

5 Sheets-Sheet 3

Fig. 5.

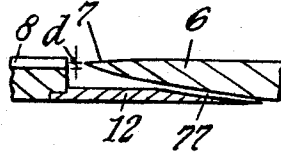
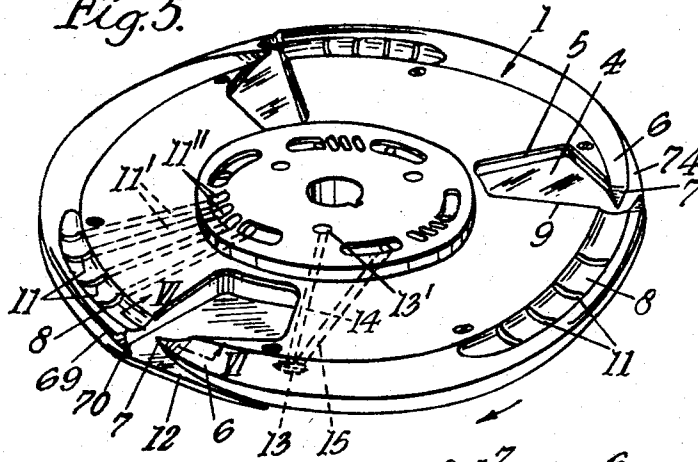


Fig. 6.

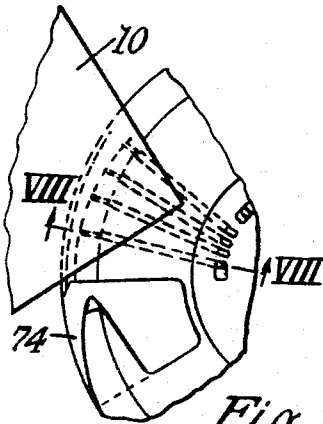


Fig. 7.

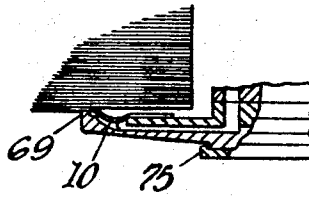


Fig. 8.

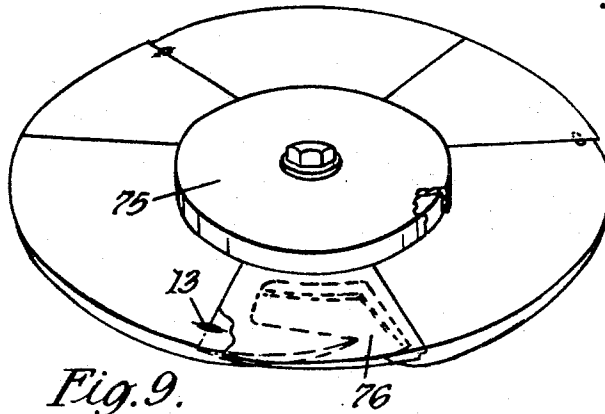


Fig. 9.

May 16, 1967

A. L. BERESLAVSKY ET AL

3,319,541

COUNTING MACHINE

Filed Aug. 21, 1964

5 Sheets-Sheet 4

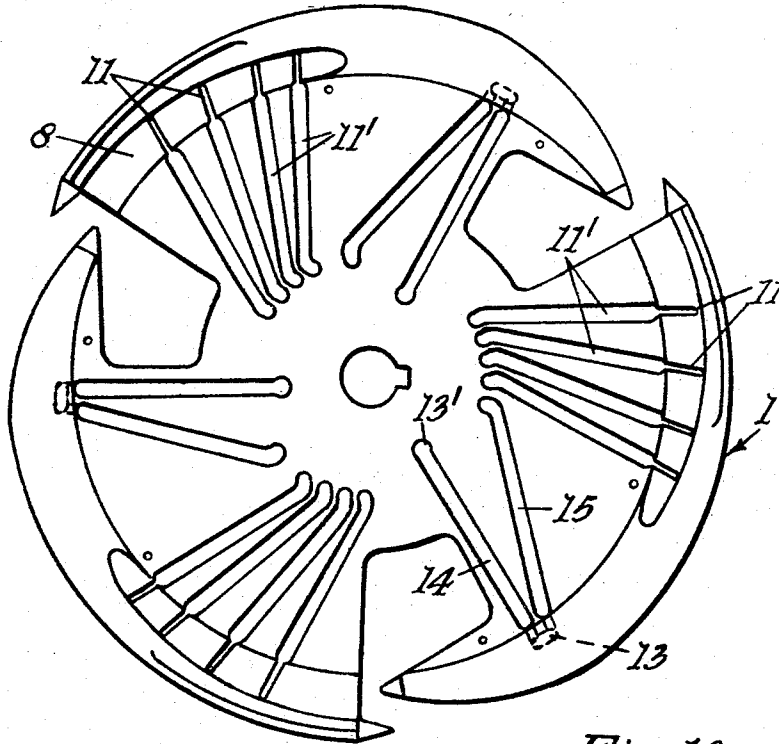


Fig. 10.

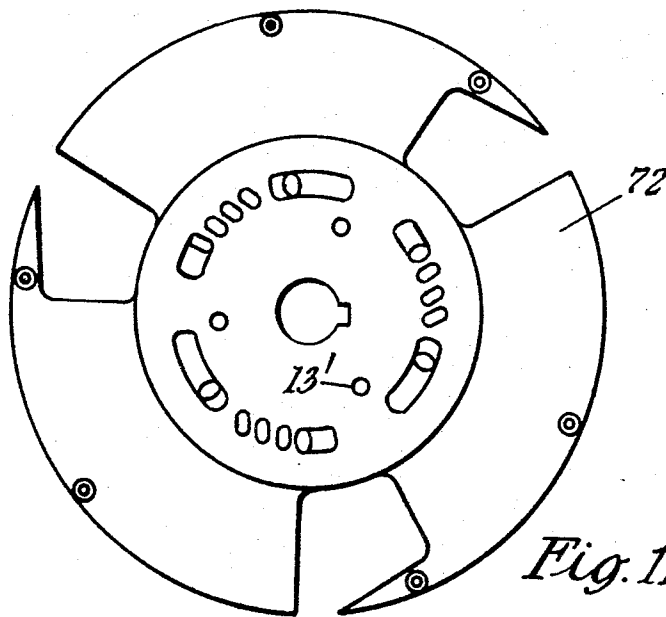


Fig. 11.

May 16, 1967

A. L. BERESLAVSKY ET AL

3,319,541

COUNTING MACHINE

Filed Aug. 21, 1964

5 Sheets-Sheet 5

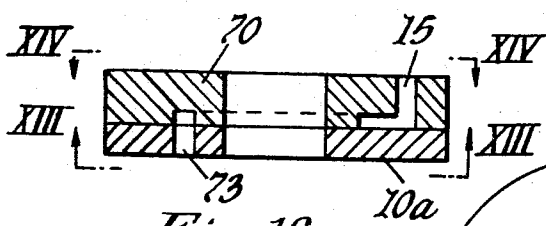


Fig. 12.

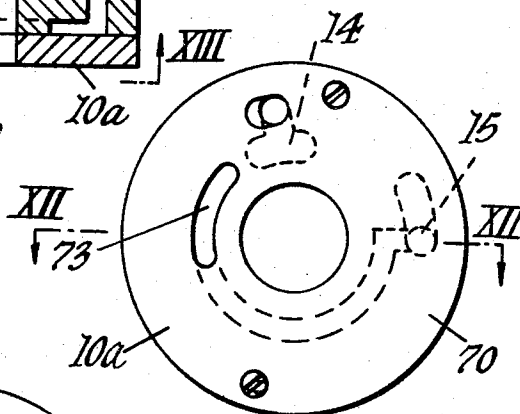


Fig. 13.

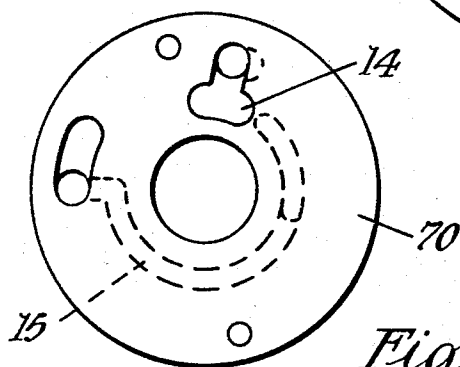


Fig. 14.

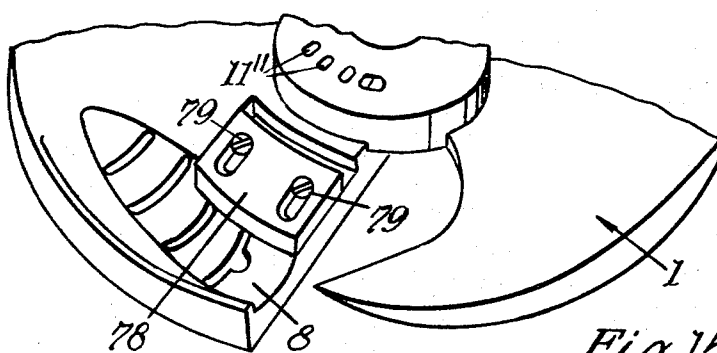


Fig. 15.

1

3,319,541

COUNTING MACHINE

Alexander Lvovich Bereslavsky, Alexander Alexandrovich Nagibin, Konstantin Alexandrovich Chichoogov, Victor Petrovich Gryzhin, and Alexey Pavlovich Koorenkov, Moscow, U.S.S.R., assignors to Vsesoiuzny Nauchno-Issledovatel'skiy Institute Goznaka, Moscow, U.S.S.R.
Filed Aug. 21, 1964, Ser. No. 391,255
13 Claims. (Cl. 93—93)

This invention consists in a sheet counting machine having a rotary disc with a radial slot. The machine is provided with means for causing relative movement between the disc and a packet or bundle of sheets in a direction parallel to the axis of the disc and perpendicular to the sheets, and with pneumatic means for ensuring that as the disc rotates sheets pass from one side of the disc through the slot to the other and are counted, there being a peripheral ridge on that side of the disc which is to engage the sheets before they are counted and this ridge extends from the leading edge of the slot while decreasing in height.

Other features of the invention will be gathered from the following particular description referring to the attached drawings.

FIGURE 1 is a general diagram of the sheet counting machine.

FIGURES 2 and 3 are side and plan views of the machine.

FIGURE 4 shows the marker inserting device from the side.

FIGURE 5 is a perspective view of a counting disc for use with the machine.

FIGURE 6 is a section on the line VI—VI of FIGURE 5.

FIGURE 7 shows the approach of a slot in the counting disc towards a stack or bundle of sheets to be counted.

FIGURE 8 is a section on the line VIII—VIII of FIGURE 7.

FIGURE 9 shows the underneath of a counting disc.

FIGURE 10 shows a disc from above with its cover removed.

FIGURE 11 shows the cover of the disc.

FIGURE 12 is a diametrical section (on the line XII—XII of FIGURE 13) of a nonrotary part of the machine for cooperating with the counting disc.

FIGURES 13 and 14 are views on the lines XIII—XIII and XIV—XIV of FIGURE 12 respectively.

FIGURE 15 shows a modified form of disc.

As shown diagrammatically in FIGURE 1, the sheet counting machine is provided with a rotary counting disc 1 carried on a vertical shaft 2 turned by an electric motor 3. The disc 1 has three radial slots 4 and the trailing edge 5 of each slot as a projection 6 extending in the direction of rotation of the disc. The tips 7 of the projections 6 are opposite the ends of grooves 8 extending from the leading edge 9 of each of the slots 4. As shown in the phantom view, a stack of sheets 10 is placed so that its corner projects over the disc towards the shaft 2. As the disc rotates the bottom sheet immediately on top of the disc 1 is drawn down by suction acting through slots 11 into one of the grooves 8 and as the disc rotates further, the sheet corner which is so drawn down slips under the adjacent projection 6 while the other sheets lying above it are not drawn in this manner. The sheet which is then drawn down passes between the lower surface of the projection 6 and a detachable guard plate 12 through the slot. As it does so the sheet covers an aperture 13 on the underside of the disc 1 and this action causes a duct 14 connected with a vacuum pump 20 to be

2

connected with a duct 15 leading to a pneumatic-electrical transducer 16 which causes an impulse to be fed to an electronic counting circuit 16'. The latter can be set to cause the insertion of a paper marker into the pile of sheets after a preset number of sheets have been counted. Thus when the preset number has been counted the electronic circuit 16' sends an electrical impulse along lead 17 which causes solenoid 18 to pull the plunger of valve 19 to the left with the result that duct 14 is connected with the atmosphere instead of being connected with the vacuum pump 20 while the marker inserting device 21 (to be described below) is connected with the vacuum pump 20. As a result the slots 11 and the recesses 13 cease to be connected with the vacuum pump and sheets are not moved downwards through the slots of the disc 1. Simultaneously the connection of the marker inserting device with the vacuum pump causes a strip of paper acting as a marker to be inserted in the gap in the pile of sheets 10 in which the disc is rotating. When the marker has been inserted a switch is automatically operated which energises solenoid 22 and returns the valve 19 to its original position so that the marker inserting device is again connected to the atmosphere through valve 19 and it is reset by a spring.

Having thus given a brief outline of the main features of the sheet counting machine, the general arrangement of the components of it, as well as the components themselves, will be described in more detail.

As shown in FIGURES 2 and 3, the machine comprises a base 25 having an upright tubular support 26 in which a rotary metal column or slide 27 is carried by a pair of ball bearings (not shown). A swinging arm 29 is attached to this column and carries a pair of rails 30 in such a manner that the rails can move horizontally in a direction which is radial with respect to the column 27. The rails carry, in turn, a bracket 31 by means of a pair of bearings 32 so that the bracket 31 can swing about a vertical axis. On the bracket 31 there are pivoted a top pair of links 34 and a lower pair of links 35. The radially outer ends 36 of these links are pivoted on an approximately vertical frame 37 in which the shaft 2 of the disc 1 is journaled. All the links are equal in length and form a parallelogram linkage so that the shaft 2 of the disc 1 remains vertical as the inclination of the links 34 and 35 is changed. The lower pair of links 35 have extensions towards the tubular support 26 and carry a counterweight 39. The motor 3 is connected with the shaft 2 by a step down gearing contained in a housing 38. As shown in FIGURE 3 the marked inserting device 21 is also carried on the frame 37.

As can be seen from FIGURE 3 a pair of guides 40 carried on the bracket 31 project away from the column 27 to either side, and above, the disc 1. The free ends of the guides 40 carry rollers 41 which engage each side of a corner of a pile of sheets 10 when they are moved towards it. A pair of tension springs 42 serve to align the guide 40 with the arm 29 when the rollers 41 are not engaging the pile 10.

The rails 30 on which the bracket 31 is carried by bearings 32 is urged in a direction away from the column 27 by a spiral strip spring (not shown) but the spring does not become effective until a hand operated lever 43 is pushed down. In its upper position this lever 43 is caused by a helical tension spring (not shown) to engage a drum on which the strip spring is wound. To align the disc with a pile of sheets such as 10 (see FIGURE 3) the arm 29 is swung round on column 27 and the lever 43 is then operated by hand so that the disc 1 and other parts of the machine carried on rails 30 are moved towards the pile 10 by the spiral strip spring until both the rollers

41 engage the sides of the pile. When the pile has been counted the disc is moved back towards the column 27 by hand pressure thus winding up the spiral strip spring which is then held in the wound up position by the lever 43.

The counterweight 39 is of such a size that it urges the disc 1 upwards against the bottom of a pile of sheets 10. It will, however, be seen that links 34 and 35 will only allow a limited stroke of the disc 1 in an upward direction. We therefore provide a limit switch which is operated when the links 34 and 35 have moved a certain distance upwards in relation to the bracket 31. When this limit switch is operated it starts a motor in a box 44 at the top of the column 27 and this motor drives a lead screw 45 which moves the arm 29 upwards with the links 34 and 35 and the disc 1 so that the disc 1 continues to be loaded by the counterweight 39 with a steady force. When the links 34 and 35 cease to actuate the limit switch the motor in box 44 is stopped.

As shown in FIGURE 4, the marker inserting device 21 has a frame 50 with two upright limbs in which a gear segment 51 is carried on a rotatable horizontal pin 52. The gear segment 51 meshes with a pinion 53 carried on a further horizontal pin 54 and it is connected by a pair of one-way clutches 55 and 56 with a roller 57 covered with rubber and a double-toothed cam 58 respectively. The clutches 55 and 56 are arranged to operate in opposite direction of rotation of the pinion 53. The cam 58 is arranged to move an arm 59 connected with a cutting blade 60 which cooperates with a guide 61 in cutting tape 62 supplied from a reel 63 and passing between the roller 57 and a jockey roller (not shown) underneath it. The gear segment 51 is arranged to be moved by a pair of lengths of bellows tubing 64 which are connected with the vacuum supply through a spigot 65. When the marker inserting device 21 is connected with the vacuum supply the lengths of bellows tubing 64 are contracted. However, when the pieces of tubing 64 are connected with atmosphere by valve 18 (see FIGURE 1) they move upwards owing to the action of a tension spring 66 connected with one end of the gear sector, on the one hand, and with the frame 50 on the other. As spring 66 contracts it causes the gear sector 51 to drive the pinion 53 and the roller 57 is rotated through the one-way clutch 55 so that a length of tape 62 is pushed through the guide 61 to take up the position indicated by A in the gap formed in the sheets by the rotating disc 1. When the lengths of bellows tubing 64 reach the top of their strokes in an upward direction a projection 67 attached to the gear segment 51 operates a switch 68 which operates in turn the solenoid 22 (see FIGURE 1) so that both the marker inserter 21 and the disc are again connected with the vacuum pump 20. As a result the lengths of bellows tubing 64 are drawn downwards and this time the rotation of the pinion 53 by the gear segments 51 causes the rotation of the double-toothed cam 58 (while the roller 57 remains stationary) so that the lever 59 is operated and causes the blade 60 to snip off a length of tape in the position A between the sheets. Since the disc 1 is now reconnected with the vacuum pump 20 it continues to move sheets 10 from its upper to its lower surface and counts them as they pass through its slots.

As shown in FIGURES 5 a counting disc for use in the machine has peripheral ridges 69 extending from the leading edges of the slots 4 while decreasing in height. (See also FIGURE 8). The slots 11 are connected by ducts 11' with ports 11'' in a smooth face on the disc which engages a smooth face 10a on a nonrotary part 70 of the machine (see FIGURE 12). As the disc rotates the ports 11'' are connected with a passage in part 70 forming part of the duct 14 connected with the valve 19. When the disc is viewed in plan it can be seen that the slots 11 make an angle of 10 to 15° with a radius such as R in order to avoid paper being drawn down into them.

The grooves 8 extend for about 30° about the axis of the disc. They have their greatest depth at the edge of the radial slots 4 and evenly decreasing depth in the direction of rotation of the disc. Their centre lines (arcs) are aligned with the tips 7 of the projections 6. As shown more particularly in FIGURES 6 the tips 7 of each of the projections 6 is at a distance d equal to between one and three thicknesses of the paper to be counted above the angle made by the junction of the bottom of the groove 8 with the side of the slot assuming that the axis of the disc is strictly vertical. In other words radial planes passing respectively through the tip 7 and the edge of the bottom of the groove are a distance d apart.

As shown in FIGURES 10 and 11 the ducts 11' are made by machining grooves into the recessed central part of the disc 1 and the grooves are then closed by placing the cover 72 (FIGURE 11) in position. Recesses 13 in the underside of the disc are each connected by ducts (14 and 15) similar to ducts 11' with the vacuum pump 20 and they are also connected with ports 13' which are successively connected with a port 73 (see FIGURES 12 and 13) in the nonrotary part 70 made of plastics material. This port 73 is elongated in a circumferential direction about the axis of the disc in order to prolong the time with which it is connected with one of the ports 13'. It is connected with the pneumatic-electrical transducer 16 by duct 15, part of which lies in part 70. The transducer functions electromagnetically. Part 70 is made of two plastic discs stuck together along an interface 70'.

Each of the recesses 13 is elongated in a circumferential direction and has a wire passing along it in order to prevent corners of the paper being counted getting jammed in it.

As also shown in FIGURE 9 the detachable guard plate 12 is fixed on the lower surface of the disc and has three extensions 76 lying under the slots 4 but leaving passages 77 (see FIGURE 6) for the passage of the sheets passing through the slots 4.

FIGURE 15 shows a modified form of counting disc 1 in which the width of a groove 8 can be varied by means of a slide 78 held in place by a pair of set screws 79 passing through slots in it.

The electronic counting circuit makes use of dekatron counting tubes and has a coincidence device for counting preset numbers of sheets.

The speed of counting is over 2300 per minute.

Various modifications may be made in the counting machine described. For instance the marker inserting can be operated by a solenoid instead of pneumatically.

We claim:

1. A sheet counting machine comprising sheet support means for a packet or bundle of sheets, a rotary driven disc provided with at least one radial slot, said disc being adapted to engage uncounted sheets at a corner of each sheet in sequence, a means to provide suction, recessed suction means upon a first side of the disc and terminating at the leading edge of the radial slot and adapted to displace each sheet corner toward said disc, a projection on the trailing edge of the slot in substantial circumferential alignment with said recessed suction means, and a peripheral ridge in the proximity of said recessed suction means, said ridge extending from the leading edge of the slot while decreasing in height.

2. A machine according to claim 1 in which the machine includes a vacuum pump, a vacuum operated transducer, a portion presenting a nonrotating face, and in which the rotating disc has a face portion which engages the nonrotating face on the machine in an air-tight manner and having ducts provided in the rotating disc, and ports provided in the nonrotating face providing connections between the recessed suction means in the disc and said vacuum pump and said vacuum operated transducer by coincidence of said ports as said disc rotates.

5

3. A machine according to claim 1 in which said recessed suction means is a groove on that side of the disc which is to engage uncounted sheets, said groove extending circumferentially from the leading edge of the slot, and said suction means draws air from the groove.

4. A machine according to claim 1 including a marker inserting device and a means to move said marker inserting device in one direction by a spring and in the other direction by suction.

5. A machine according to claim 1 including a solenoid and having a marker inserting device which in operation is caused to be moved in one direction by a spring and in the other direction by a solenoid.

6. A machine according to claim 4 including an electrically operated valve for making the suction means causing sheets to pass through the slot inoperative when the marker inserting device is to be operated.

7. A machine according to claim 6 in which the electrically operated valve has two solenoids operating in opposite directions.

8. A machine according to claim 1 in which a motor is operatively connected to said disc and a parallelogram linkage is provided to support the motor and disc and a counter-weight means is provided to balance the weight of motor and disc.

9. A machine according to claim 8 in which the parallelogram linkage is carried on a vertical slide and is moved

6

vertically along the latter when the parallelogram linkage reaches the end of its vertical stroke.

10. A machine according to claim 1 having guides for engaging adjacent sides of a pile of sheets in order to align the disc in a horizontal plane with the corner of the pile of sheets.

11. A machine according to claim 6 having a marker inserting device and having an electronic counting circuit adapted to be set to count sheets of paper in a stack of sheets selectively in a manner whereby all the sheets in a bundle are counted without insertion of a marker, a pre-set number of sheets in a bundle and a subsequent operation of the marker inserting device, and automatically repeating the counting and marking operation.

12. A machine according to claim 11 having means for supplying pulses to the electronic circuit for checking it.

13. A machine according to claim 11 having means for registering the number of markers inserted.

References Cited by the Examiner

UNITED STATES PATENTS

2,382,998	8/1945	Kleinschmidt	93—93
2,619,883	12/1952	Andren	93—93

25 BERNARD STICKNEY, *Primary Examiner*.