July 22, 1958 W. E. THOMAS 2,844,370

PAPER EJECTOR

Filed May 6, 1955 3 Sheets-Sheet 1

Fig. 1

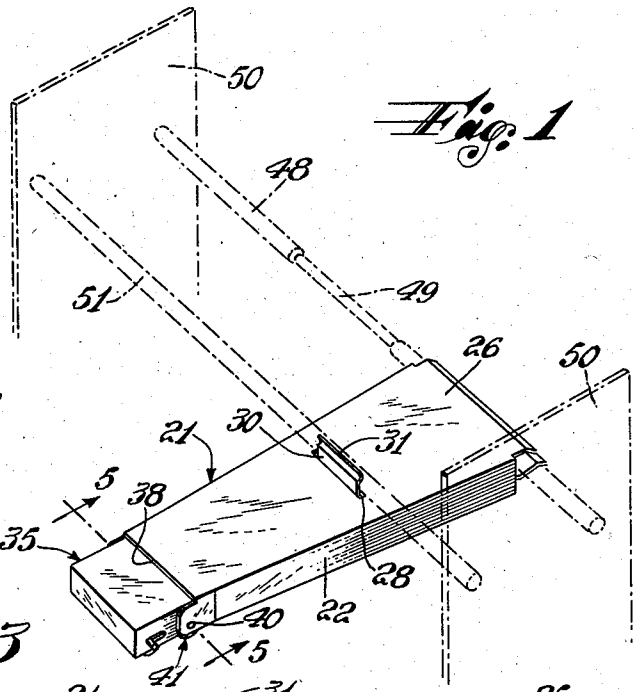


Fig. 2

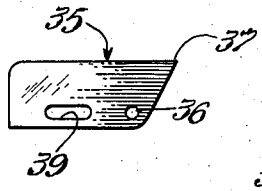


Fig. 3

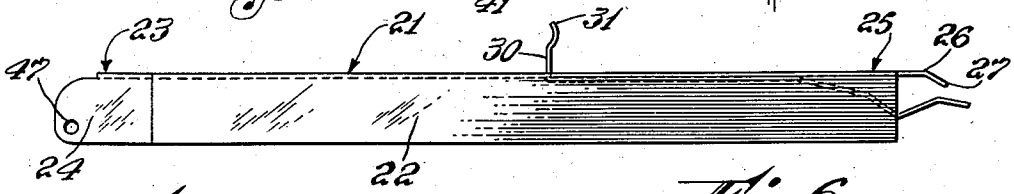


Fig. 4

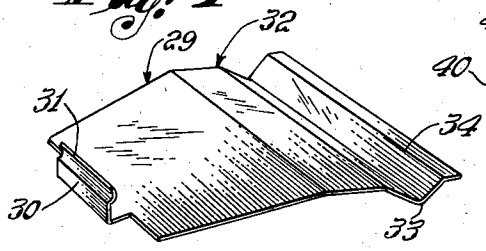


Fig. 6

Fig. 7

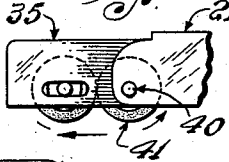


Fig. 8

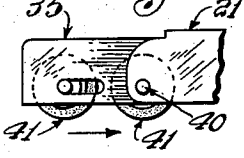
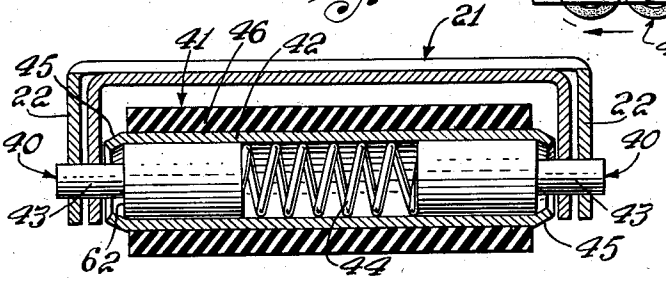


Fig. 5



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PAPER EJECTOR

Filed May 6, 1955 3 Sheets-Sheet 2

Fig. 9

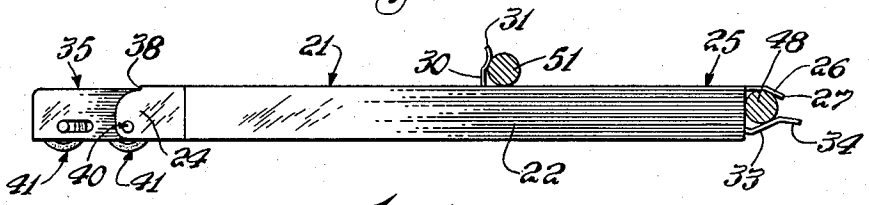


Fig. 10

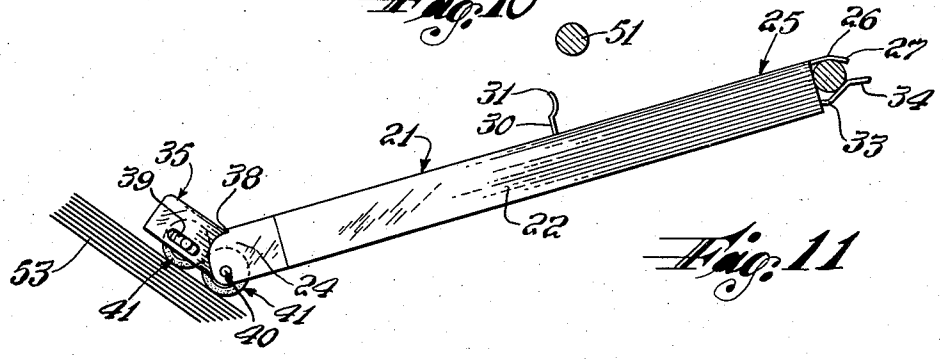
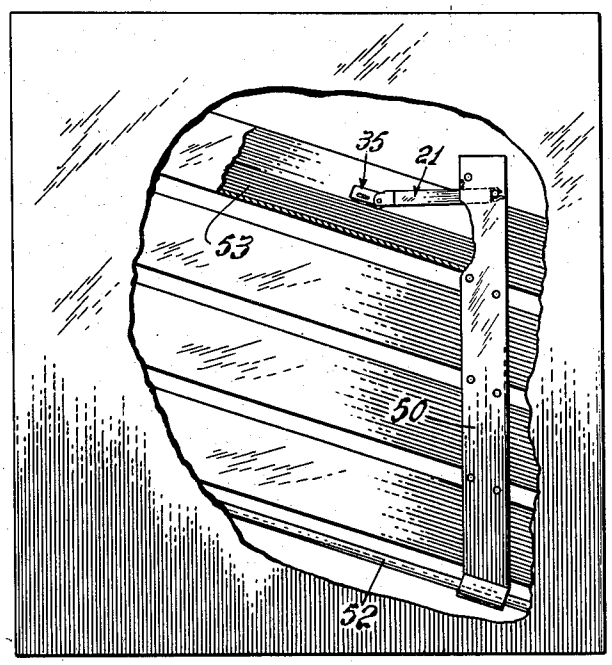


Fig. 11



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PAPER EJECTOR

Filed May 6, 1955 3 Sheets-Sheet 3

Fig. 12

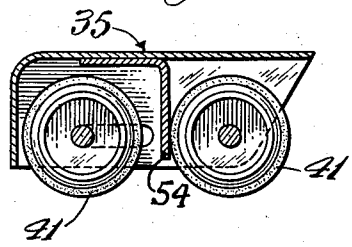


Fig. 13

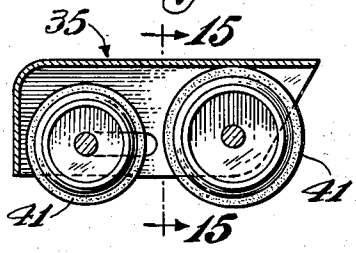


Fig. 14

Fig. 15

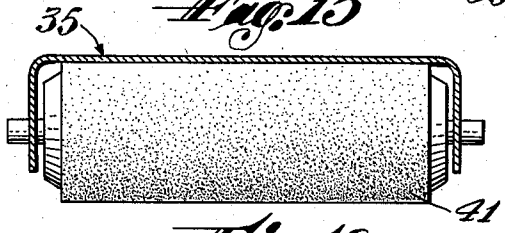


Fig. 16

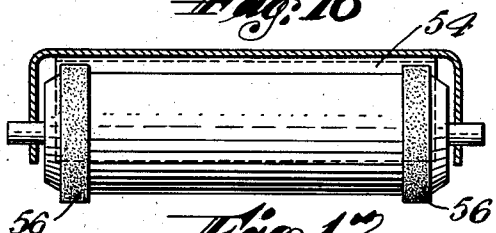
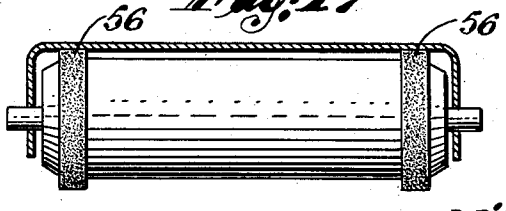


Fig. 17



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2,844,370

PAPER EJECTOR

Wilbur E. Thomas, Wayne, N. J.

Application May 6, 1955, Serial No. 506,411

19 Claims. (Cl. 271—42)

My invention relates generally to paper ejectors, and specifically to a paper ejector intended to accomplish unidirectional movement of paper.

It is among the objects of my invention to provide a paper ejector which can handle large or small sheets of paper.

Another object of my invention is to provide a paper ejector which can be provided with interchangeable rollers, having varying coefficients of friction.

Another object of my invention is to provide a paper ejector which can be easily replaced, repaired, or interchanged.

Another object of my invention is to provide a paper ejector which may be moved from one operating position to another, snapped into place, or be operated cooperatively with other paper ejectors.

Another object of my invention is to provide a paper ejector which may be made inoperative at will by a latching operation.

A further object of my invention is to provide a paper ejector which will not skid on paper, but will feed paper for the entire extent of its forward movement, thereby eliminating irregular extension of different papers in a group.

Another object of my invention is to provide a paper ejector which permits easy loading of papers in collator trays, as well as replenishing, addition, or withdrawal of papers.

Another object of my invention is to provide a paper ejector that will not "heel" and thereby miss ejecting a sheet.

Another object of my invention is to provide a paper ejector which will not mark the paper, smudge wet ink, or heel over in such a manner as to mar the paper to be ejected.

Another object of my invention is to provide a paper ejector which will immobilize its rotating elements on the forward stroke, but permit them to easily and freely roll on the back stroke.

Another object of my invention is to provide a paper ejector of great flexibility and interchangeability in which it is possible to increase or decrease the frictional value of the rollers in a speedy manner.

These objects and advantages, as well as other objects and advantages, may be achieved by the device illustrated in the drawings in which

Figure 1 is a view in perspective showing my paper ejector latched in inoperative position;

Figure 2 is a side elevational view of the ejector shoe;

Figure 3 is a side elevational view of the ejector arm;

Figure 4 is a view in perspective of the double latch;

Figure 5 is a cross-sectional view taken on the line 5—5 in Figure 1;

Figure 6 is a front elevational view of the roller;

Figure 7 is a side elevational view of the rollers in binding engagement;

Figure 8 is a side elevational view of the rollers disengaged;

Figure 9 is a side elevational view of the paper ejector latched in inoperative position;

Figure 10 is a side elevational view of the paper ejector unlatched in operative position;

Figure 11 is a side elevational view of a collator with the side wall exploded away showing the ejector mechanism about to perform a paper ejecting movement;

Figure 12 is a side elevational view showing a modified construction;

Figure 13 is a side elevational view showing another modified construction;

Figure 14 is a front elevational view showing a further modified construction;

Figure 15 is a cross-sectional view of the construction shown in Figure 13;

Figure 16 is a front elevational view showing another modified construction; and

Figure 17 is a front elevational view showing an additional modified construction.

Referring now to the drawings in detail, my paper ejector has an ejector arm **21**, preferably formed of metal and having down-turned sides **22**, giving it a U-shaped latitudinal cross-section. The front end **23** of the ejector arm **21** has side portions extending beyond the top to form a pair of opposite ears **24**. These ears have holes **47** to admit a roller axle. The back **25** of the ejector arm **21** has an extended portion **26** which is a continuation of the top of the ejector arm **21** and extends beyond the sides **22**. The end **27** of this extended portion is bent downward slightly. On the top of the ejector arm **21**, a slot **28**, transversely disposed, is located.

A double latch **29** is also provided. The forward end of the double latch **29** has an upstanding portion **30** with an arcuate end **31**. The rear **32** portion of the double latch **29** is bent slightly downward and has a V-shaped, transverse groove **33** and a straight end portion **34**. The double latch **29**, at least insofar as its opposite end portions are concerned, is resilient being preferably formed of hardened and tempered spring steel. The upstanding portion **30** is inserted in the transverse slot **28** in the ejector arm **21**. The rearward, V-shaped transverse groove **33** or depression is thereupon disposed opposite the rearward extension **26** on the ejector arm. The double latch **29** and the ejector arm **21** are secured together, preferably by spotwelding.

An ejector shoe **35** is also provided. This shoe is in the form of rectangular housing, but open at the bottom, and rear, but having side walls, a front wall, and a top wall. The side walls are provided with opposed openings **36** near the rear edge, and are so dimensioned that the ejector shoe **35** will fit between the forwardly extending ears **24** of the ejector arm **21**. When the openings **36** in the shoe **35** are brought into coincidence with the corresponding holes in the forwardly extending ears **24** on the ejector arm **21**, the rear **37** of the shoe **35** will extend under the front-top edge **38** of the ejector arm so that the ejector shoe **35** can pivot upwardly but cannot pivot downwardly below its point of parallelism with the ejector arm, as shown in Figure 9. Immediately ahead of the axle-receiving openings **36** in the shoe **35**, the side walls have elongated opposed slots **39**. The shoe **35** is preferably formed of metal of the same character as the ejector arm.

The opposite openings **36** in the ejector arm **21** and in the shoe, as well as the elongated opposite slots **39** in the shoe, are designed to receive spring pressed pins **40** which constitute the axle upon which the roller **41** revolves. The roller **41** is made of a section of seamless metal tube **42**. Pins **40** are formed having an overall diameter to permit of their admission and insertion into the tubing. Each pin **40**, at its outer end, has a shoulder **62** and an annular extension or axle **43** beyond the

shoulder constituting the axle upon which the roller **41** will revolve. A spring **44** is inserted into the tubing **42** between a pair of the pins **40** likewise inserted at opposite ends of the tubing **42** with the axle portion **43** extending beyond the end of the tubing **42**. The ends **45** of the tubing are then spun over to confine and retain the pins inside the tubing **42**, and yet permit them to be pressed inwardly against the action of the spring so that they may be disengaged. A rubber sleeve **46** is then fitted over the tubing **42**. Although rubber is preferred, any resilient material having a high coefficient of friction, may be used. By pressing the pins **40** inwardly, the axles **43** may be introduced through the openings **36** in the ejector shoe **35** and through the ejector ear holes **47** thereby engaging the shoe **35** and the arm **21** together.

A similar roller **41** may in like manner be inserted in the elongated slot **39**. The ejector arm **21** may then be secured to the cross-rod **48** of the ejector chassis by spreading the extended portions **26, 32** of the ejector arm **21** and the double latch so that they embrace a constricted central portion **49** of the cross-rod **48** on the uprights. The ejector arm **21** may then be laterally moved into position on the cross-rod **48** beyond the constricted portion **49** and is ready for operation. The operation of my device is as follows:

The ejector arm **21** is positioned between the ejector assembly uprights **50** so that the cross-rod **48** is embraced and held by the latch **29** and the extension **27** on the ejector arm. The ejector arm **21** is then raised until the upwardly extending end **31** engages the forward cross-rod **51** and holds the ejector arm in the position shown in Figure 9. A stack of paper is then inserted in the tray and the ejector arm **21** is unlatched from the forward cross-rod **51** so that the shoe **35** is parallel to the paper and the two rollers **41** in the shoe bear directly on the paper.

The ejector carriage uprights **50**, being slideably mounted on the rods **52** are then moved forward. This causes the front roller **41**, whose axle is slideably positioned in the slots **39** in the shoe, to move rearwardly until it bears on the rear roller **41** as shown in Figure 7. Since these rollers are operating in opposition to each other, as indicated by the arrows by the rollers **41** in Figure 7, and since they are covered with rubber which has a high coefficient of friction, they will bind against each other and will not revolve. The lower portion of each roller **41** which bears on the paper **53** will frictionally engage the top sheet of paper and move it in a forward direction, ejecting it.

When the maximum movement of the ejector assembly carriage has been achieved, the movement of the carriage is reversed and the ejector arm **21** moves to the rear as does the shoe, as shown in Figure 8. With this rearward movement, however, the forward roller **41** slides on its axle to the opposite end of the slot **39** and becomes free to rotate as it disengages itself from binding against the rearward roller **41**. Thus the rollers move freely over the topmost sheet of paper and do not frictionally engage it or move it. When the maximum rearward movement of the ejector carriage uprights **50** has been reached, the first mentioned opposite movement is again initiated and the paper ejector performs the same function over again, once more ejecting the topmost sheet of paper by frictional engagement of the rollers which are locked with each other against rotation. The sheet of paper is ejected from the front end of the tray. Ejector arms **21**, such as the foregoing, find a maximum utility in a collating device in which numerous sheets of paper are intended to be ejected and in which the trays are constantly in need of replenishment. Such collating devices frequently, unintentionally fail to eject a sheet and the collated material is thereby incomplete. Frequently, it may be required that the collated papers shall lack a single sheet, in which case, the ejector arm **21** in one of the trays may be rendered inoperative by latching it, thereby preventing the ejection of the sheets in that tray. In the event that heavy sheets are to be ejected, rollers having an extraordinarily high coefficient of friction may be devised so that these heavy sheets may be ejected simply by substituting another ejector arm with such a pair of rollers. Two ejector arms, fastened side by side, on the cross-rod **48** may also be used. Ejector arms **21** made in accordance with the present invention are extremely versatile, readily interchangeable, durable, easily renewable merely by disengaging the rollers from the assemblage and replacing them with new rollers.

The previous description of a species of my invention has dealt with a device in which a pair of rollers are ordinarily freely rotatable, except when one roller engages the other. My invention may take another form in which one roller is permanently immobilized and the other roller in the longitudinal slot is capable of free rotation or may be immobilized pending upon the direction of movement of the ejector. This variant form of construction may be achieved in a number of ways. In Figure 12, a separater **54** is secured to the shoe or housing **35** above the movable roller **41**. This separator **54** is secured to the shoe **35** by welding or in some other suitable manner. The separator **54** is so positioned that it engages the rear roller **41** so that it may not move or rotate on its axis.

In Figure 13, another means for achieving the immobility of the rearward roller **41** is illustrated. It will be seen that the rearward roller **41** is oversized to such an extent that it bears on the roof of the shoe **35** and in that manner is bound so that it cannot rotate. It is apparent that in the form shown in Figure 13, the forward movement of the shoe **35** will cause the forward roller **41** to come into engagement with the rearward roller **41** and during such movement the forward roller **41** will likewise be immobilized by frictional engagement with the rearward roller **41**.

A still further means for immobilizing the rearward roller is shown in Figure 14, where the rearward roller **55** is so long that it engages the side walls of the shoe **35**. In this manner, the rearward roller **55** is not free to rotate. Figure 15 is another view of the species shown in Figure 13 in which the oversized rear roller **41** binds on the top of the shoe.

In Figure 16 a still further species of roller is shown. In this species, instead of a rubber sleeve **46**, annular segments **56** are applied to the tubing **42**. These segments **56** are engaged with a separator **54** so that the roller is immobilized.

Or as an alternative, as shown in Figure 17, the separator may be dispensed with and the segments **56** so dimensioned that they will engage the top of the shoe **35** on the inside and the roller will not rotate.

With the use of two rollers, one immobilized on the rearward stroke and both on the forward stroke, the frictional coefficient of the one rearward roller is sufficient during its rearward movement to restore to original position, any sheet underlying the ejected sheet, which has been inadvertently moved forward. Thus, at the commencement of each forward stroke, it is assured by the preceding rearward stroke that the top sheet will have been restored to congruency with the remaining underlying sheets in the stack, and the ejected sheets will start from the same position in all trays.

In these species, as in the basic type shown in Figures 1 to 11, both rollers are immobilized on the forward stroke, but on the rearward stroke only the rearward roller is immobilized. The additional advantages achieved by this construction, insure restoration of underlying sheets and insure equal ejection of all sheets during the ejector phase, since they all start from perfectly stacked position.

The foregoing description is intended merely to be illustrative of one embodiment of my invention, for many changes may be made in the construction, selection, and arrangement of the various parts, all within the scope of

the appended claims without departing from the spirit of the invention.

I claim:

1. A paper ejector comprising a housing, rollers rotatably mounted on the housing, a dress having a high coefficient of friction on the rollers one roller being mounted in an elongated slot in the housing, said slot being positioned in proximity with a second roller so that the one roller may move lengthwise in the slot into binding contact with the second roller.

2. A paper ejector comprising a device in accordance with claim 1, means for reciprocating the housing over a stack of paper a surface dress with a high coefficient of friction on the rollers whereby motion of the housing in one direction with the rollers in contact with a sheet will cause the one roller in the elongated slot to bindingly engage the second roller.

3. A paper ejector comprising a means for mounting a roller, a roller rotatably mounted in an elongated slot in said means and movable lengthwise in the said slot, a surface dress with a high coefficient of friction on the roller, a roller disposed within contact range of the roller during its lengthwise movement in the elongated slot.

4. A paper ejector comprising a means for mounting a roller, a roller rotatably mounted in an elongated slot in said means and movable lengthwise in the said slot, a surface dress with a high coefficient of friction on the roller, a roller disposed within contact range of the roller during its lengthwise movement in the elongated slot, whereby motion of the said means in one direction with the roller in contact with a sheet will cause the roller in the elongated slot to bindingly engage the said roller.

5. A paper ejector comprising a housing, rollers rotatably mounted on the housing, one roller being mounted in an elongated slot in the housing, said slot being positioned in proximity with a second roller, so that the one roller may move lengthwise in the slot into contact with the second roller, a surface dress having a high coefficient of friction on the rollers, an arm pivotally attached to the housing.

6. A paper ejector comprising a device in accordance with claim 5, a rear top portion of the housing in contact underneath the bottom front end of the arm when the housing and arm are disposed in parallelism.

7. A paper ejector comprising an arm, means for pivotally attaching the arm to a reciprocating means, means for holding the arm inoperatively suspended, a housing pivotally attached to the arm, a rear roller rotatably mounted in the housing, an elongated slot in the housing, a front roller rotatably mounted in the elongated slot and also movable lengthwise therein, said slot being disposed in proximity with the rear roller so that the front roller may move lengthwise therein into contact with the rear roller.

8. A paper ejector comprising a tubular roller, axles positioned within the roller at each end and extending therefrom, an enlargement at the inner end of each axle, downturned ends on the tubular roller engaging the enlargements on the axle whereby the same are held against discharge from the roller, a spring positioned in the roller between the enlargements and normally urging the enlargements apart from each other, and a dress having a high coefficient of friction on the roller.

9. A paper ejector comprising a housing, an arm, a first rotatable roller positioned for lengthwise movement in a slot in the housing, a second rotatable roller in the housing, an axle on the second roller pivotally connecting the housing and the arm together, a surface dress having a high coefficient of friction on the rollers, and said first roller being positioned adjacent to the second roller.

10. A paper ejector in accordance with claim 9, a separator attached to the housing between the first and second rollers, said separator engaged with and immobilizing the second roller, and the first roller being movable in the slot into binding engagement with the separator.

11. A paper ejector in accordance with claim 9, said second roller frictionally engaged against rotation with the top of the housing.

12. A paper ejector in accordance with claim 9, said second roller frictionally engaged against rotation with the side of the housing.

13. A paper ejector in accordance with claim 9, said surface dress being confined to the opposite ends of said roller, a separator attached to the housing between the first and second rollers, said separator engaged with and immobilizing the second roller.

14. A paper ejector in accordance wtih claim 9, said surface dress being confined to the opposite ends of the second roller and in frictional engagement with the top of the housing against rotation.

15. A paper ejector comprising an arm, a housing, a roller positioned in an elongated slot in the housing, a second roller rotatably mounted in the housing and positioned for engagement with the first roller when it moves to one end of the slot, said second roller having an axle, said axle engaged with both the housing and the arm to pivotally secure them together.

16. A paper ejector comprising a slotted arm, a housing, a roller positioned in an elongated slot in the housing, a second roller rotatably mounted in the housing and positioned for engagement with the first roller when it moves to one end of the slot, said second roller having an axle, said axle engaged with both the housing and the arm to pivotally secure them together, a resilient latch attached to the arm, corresponding opposed concavities on the end of the arm and the latch, an arcuate end of the latch extending through the slot in the arm.

17. A paper ejector comprising a housing, rollers rotatably mounted on the housing, one roller being mounted in an elongated slot in the housing, said slot being positioned in proximity with the second roller so that the one roller may move lengthwise in the slot into binding contact with the second roller, means for pivotally attaching the said housing to a reciprocating means, and means for holding the housing inoperatively suspended.

18. A paper ejector comprising a means for mounting a roller, a roller rotatably mounted in an elongated slot in said means and movable lengthwise in said slot, a surface dress with a high coefficient of friction on the roller, a roller disposed within contact range of the roller during its lengthwise movement in the elongated slot, means for pivotally attaching the said roller mounting means to a reciprocating means, and means for holding the roller mounting means inoperatively suspended.

19. A paper ejector comprising a housing, rollers rotatably mounted on the housing, one roller being mounted in an elongated slot in the housing, said slot being positioned in proximity with the second roller, so that the one roller may move lengthwise in slot into contact with the second roller, a surface dress having a high coefficient of friction on the rollers, an arm pivotally attached to the housing, a resilient latch attached to the arm, corresponding opposed concavities on the end of the arm and the latch, an arcuate end of the latch extending through a slot in the arm.

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