May 30, 1961 A. BÜTTNER 2,986,392

SUCKER BARS

Filed March 25, 1958 3 Sheets-Sheet 1

Fig. 1

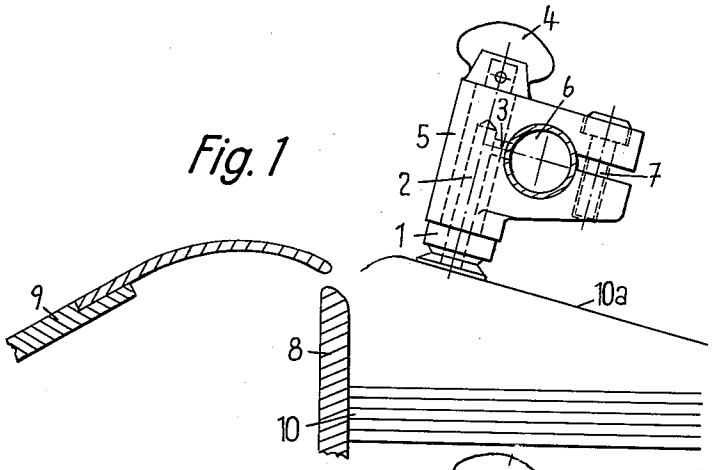
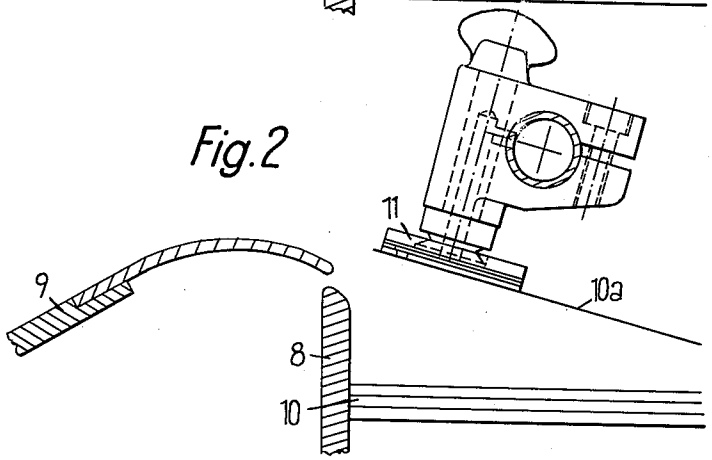


Fig. 2



May 30, 1961 A. BÜTTNER 2,986,392

SUCKER BARS

Filed March 25, 1958 3 Sheets-Sheet 2

Fig. 3

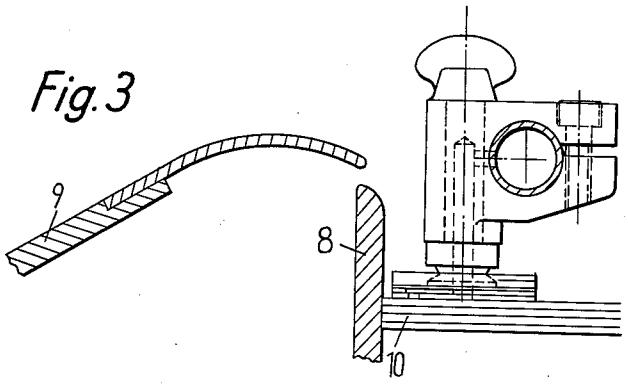
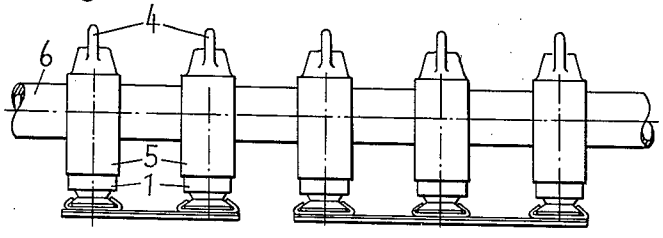


Fig. 4



May 30, 1961 A. BÜTTNER 2,986,392

SUCKER BARS

Filed March 25, 1958 3 Sheets-Sheet 3

Fig. 5

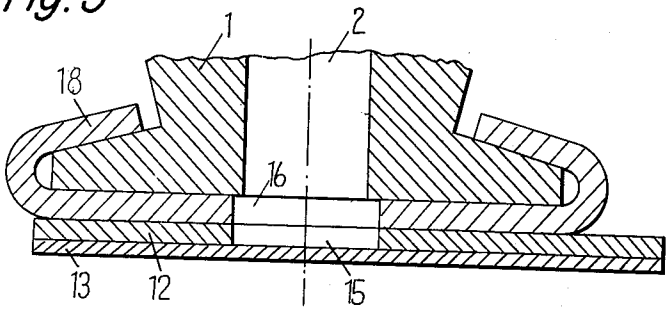
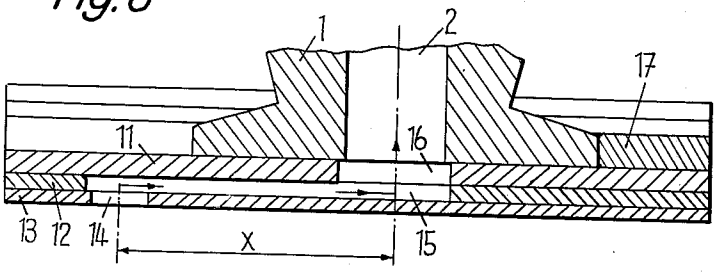


Fig. 6



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2,986,392

SUCKER BARS

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5 Claims. (Cl. 271—26)

The present invention relates to printing machines, paper converting machines and the like and more particularly to suction transfer devices or sucker bars.

In the usual construction of suction bars employed on sheet handling apparatus for picking up the top sheets individually from a pile or stack of sheets and delivering them successively to a feed board or conveying means thereof provision must be made for engaging the sheet, to be picked up and transported, at points spaced from the leading edge. The individual suckers must engage the sheet at a point well removed from the front or leading edge since clearance from the leading edge must be provided in order to allow metallic tips or resilient tips to be placed on the suckers for handling heavy stock such as cards and cardboard sheets. Sheet feeding apparatus of the type feeding individual sheets successively must handle both light and heavy stock and it can readily be seen that since the transfer mechanism operating the sucker bar cannot be readily adjusted for positioning the suckers at selected positions relative the leading edge of the sheets a compromise is made and the suckers engage the individual sheets at an optimum position for handling the various stocks of material. However, when handling light stock, as for example, onion skin paper, airmail paper etc. the suckers cannot pick up the individual sheets without letting the leading end droop downwardly with the result that conveying means or sheet-taking means receiving the individual sheets from the sucker bar will fold the bent portion and damage the paper and sometimes even requiring the stopping of the machine.

Many solutions have been recommended for overcoming the difficulty of picking up light stock without the leading end drooping or sagging; interchangeable suckers and different designs of the sheet engaging surfaces have been recommended and constructed. None of the proposed solutions to the problem have provided an adequate solution. The corrective devices constructed are ineffective in use and require considerable time in making a change-over requiring considerable down time of the machine during which it is not operating.

It is a principal object of the present invention to provide detachable suction tip devices that can be releasably attached to the suckers of a sucker bar for making it possible for the sucker bar to pick up light stock without the leading edge drooping.

Another object of the invention is to provide simple inexpensive suction tip devices readily attached to the suckers of a traveling sucker bar and readily detached therefrom so that the printing press or the like is maintained inoperative for a minimum period of time during which the suction tip devices are being attached to the sucker bar.

A feature of the suction tip devices according to the invention is that the devices have suction openings which are offset radially of the suction openings of the suckers and are disposed in a direction for engaging the sheets at a point close adjacent to the leading edge. In this manner the individual sheets on a stack are lifted successively without the leading end sagging or drooping.

The offset suction tip devices are made of thin laminated strips of transparent plastic which can be readily slidably engaged on the suckers without much change in the clearance between the stock of sheets and the sucker bar suckers.

The nature, other objects and advantages of the invention will be more fully understood from the following description and claims in conjunction with the accompanying drawings in which:

Fig. 1 is a side elevation view of a suction transfer or pick-up device illustrating a conventional sucker arrangement and how it allows the leading edge of a sheet to droop after picking up the sheet from a stack of sheets of light stock.

Fig. 2 is a similar view to that shown in Fig. 1 and illustrates the sucker bar arrangement of Fig. 1 provided with offset suction tip devices according to the invention so that the sheets of a stack can be successively removed from the stack without the leading end drooping.

Fig. 3 is a side elevation view of a sucker bar provided with offset suction tip devices according to the invention and illustrates the manner in which the suction openings of the devices are adjacent the leading edge of the top sheet, of a stack, when the sucker bar engages it.

Fig. 4 is a fragmentary elevation view of a sucker bar arrangement illustrating how in one embodiment of the offset suction tip devices of the present invention engage the suckers in groups.

Fig. 5 is a fragmentary cross-sectional view, on an enlarged scale, of a suction tip device according to the invention and illustrates the manner in which the device slidably and releasably engages the individual suckers of a sucker bar.

Fig. 6 is a fragmentary sectional side elevation view of the sucker and offset suction tip device shown in Fig. 5 and illustrates stop means for accurately positioning the inlet opening of the tip device in registry with the suction opening of the suction bore of the individual suckers.

According to the drawings individual suckers **1** having an axial bore **2** are rotatably mounted, in known manner, in a housing **5** supported on a hollow suction shaft **6** and removably clamped thereon by a screw **7**. The suckers **1** are each provided with a transverse bore **3** communicating with a suction cup, as shown, and an associated hole in the shaft **6** when in an operative position. A wing **4** is provided on each sucker so that it can be turned through substantially 90° and consequently turned off. The suckers are disposed in spaced relationship on the shaft **6** in the manner shown in Fig. 4 to form a sucker bar in known manner. It will be understood that the sucker bar is operative, by means not shown, between a pick-up position as shown in Fig. 3 and a delivery position as shown in Figs. 1 and 2. Moreover suction shaft **6** is operably connected to a vacuum pump, not shown, or some similar means for creating a suction at each sucker **1** so that individual sheets can be engaged, lifted and transported as later herein described.

The usual sheet feeding apparatus or arrangement is provided with a gauge or stop **8** against which a stack of sheets **10** are disposed and thereby aligned. The top sheet **10***a* is engaged by the sucker bar and transported to a feed board or table **9** directly or usually by means of transfer or conveying means, not shown which receive the sheets individually and successively from the sucker bar. A conventional sucker bar arrangement is provided with means, not shown, for engaging the individual suckers on to a sheet spaced substantially from the leading edge so that in the event that light stock is being transported the sheet droops in the manner shown in Fig. 1. Moreover a conventional sucker bar engages the suckers with a sheet along a line substantially spaced from the gauge

8 since clearance must be allowed for the attachment of either metallic or rubber tips on the individual suckers for handling heavier stocks.

The present invention comprises (Figs. 4, 5 and 6) offset suction devices or slides consisting of laminated plastic strips consisting of an upper supporting strip **11**, a slotted intermediate strip **12** and a lower or sheet-engaging strip **13**. The lower strip is provided with a suction opening **14** communicating with a slot **15** in the intermediate strip **12** which thus provides a passageway providing communication with an associated opening **16** in the upper strip **11**. The opening **16** registers with the suction opening of the bore **2** of an individual sucker **1**. In this manner the opening **14** is in communication with an associated sucker suction opening and radially offset a distance *x* therefrom in a direction directly forwardly thereof.

While the Figs. 5 and 6 show the construction of an individual offset suction device for an individual sucker it will be understood that the strips **12** and **13** can be made continuous so that the device is attached to a group of two or three suckers as shown in Fig. 4. In such a construction there are a group of spaced suction openings on strip **13** and a plurality of slots in strip **12** and a plurality of spaced suction openings corresponding to the opening **16** so that a corresponding group of suckers is placed in communication with the group of suction openings in strip **13**.

The slides or offset suction devices according to the invention have the supporting strip **11** provided with upwardly bent portions **18** which extend radially inwardly of the suction cup and slidably and releasably engage the dovetail tip portion or suction cup of the suckers as shown in Figs. 4 and 6. In order to assure that the opening **16** is placed in registry with the bore opening of the associated sucker stop strip **17** is cemented between the bent portions **18** thereby to engage the sucker as shown in Fig. 6 so that the devices or slides can be quickly slidably engaged on individual suckers or groups of suckers as shown in Fig. 4 without need of aligning the openings. Moreover since the offset suction tip devices or slides can be constructed to engage a group of two or three suckers as shown in Fig. 4 the slides can be employed on sucker bars having different numbers of suckers.

The strips **11**, **12**, **13** are made of clear plastic each about 0.5 mm. thick and are bonded together forming a unit having an overall thickness of about 1.5 mm. so that the suction level of the suckers is not altered very much and the individual sheets can be readily transfered successively to sheet conveying means or to a feed table or board without need of adjustment. Since the strips are made of clear plastic the suction tips can be checked quite readily to see that the slot **15** is constantly maintained clear of obstructions.

The offsetting of the suction openings radially of the individual sucker opening and of the sucker itself in a direction forwardly thereof allows the suction openings of the devices to engage the uppermost sheet **10***a* of a pile **10** closely adjacent the leading edge of the sheet when the sucker bar is in the pick-up position as shown in Fig. 3. This allows the sheet to be lifted clear of the stack **10** and transported to a delivery position(Fig. 2) substantially flat across the entire width of the strip **13**, which is wider than the transverse dimensions of the sucker **1**, and without the leading edge hanging downwardly so that the individual sheets are not folded over when placed on the feed board **9** by the sucker bar or otherwise folded when conveying means are employed as transfer means.

While preferred embodiments of the invention have been illustrated and described, it will be understood that the invention is in no way limited to these embodiments and that many changes may be made within the spirit and scope of the invention as defined by the following claims.

What I claim and desire to secure by Letters Patent is:

1. A traveling detachable offset suction tip device for a sheet handling sucker bar of the type operable to pick-up sheets one-by-one from the top of a pile of sheets and having a plurality of spaced suckers each provided with a suction opening comprising, a first plastic strip having means for releasably attaching the offset suction tip device to the suckers and having openings registering with the sucker section openings, a second plastic strip defining a group of individual suction openings each offset radially of a respective sucker suction opening and disposed forwardly thereof, a third plastic strip defining a plurality of individual passageways each providing communication between an individual offset suction opening of the second strip and its respective sucker suction opening, and the offset strip suction openings being disposed to apply suction to the sheets respectively substantially at a marginal-edge portion thereof adjacent the leading edge of the individual sheets to be picked-up from a pile of sheets and transported by the sucker bar when the second strip engages said sheets one-by-one.

2. A detachable offset suction tip device according to claim 1, in which the three plastic strips are made of transparent plastic whereby it can be determined that each passageway is clear.

3. A detachable offset suction tip device for sheet handling apparatus of the type having a traveling sheet-handling sucker bar operable to pick-up sheets individually and successively from the top of a pile of sheets and having a plurality of suckers each provided with a suction cup having a suction opening, said suction tip device comprising, means for releasably attaching the offset suction tip device in fixed position to at least each sucker suction cup individually, means connected to said attaching means defining an individual suction opening cooperative with a respective suction cup opening offset radially of the opening of a respective suction cup in a forward position for engaging and picking-up sheets successively next adjacent to the leading edge thereof when picking them up from a pile of sheets when said device is attached to a cup, means cooperative with said opening defining means defining at least one individual passageway providing communication between the suction opening of the device and the respective sucker suction cup opening so that upon application of a suction on the sucker bar suckers suction is applied at said tip device suction opening, said tip device suction opening being disposed substantially on a lower surface of a marginal-edge portion next adjacent a leading edge of the device, and said tip device suction opening having less area than the respective sucker opening with which it is in communication.

4. A detachable offset suction tip device according to claim 3, including means for accurately disposing the passageway of the tip device in registry with the suction opening of the respective sucker when the offset suction tip device is attached to a suction cup.

5. A detachable offset suction tip device for sheet handling apparatus of the type having a traveling sheet-handling sucker bar operable to pick-up sheets individually and successively from the top of a pile of sheets and having a plurality of suckers each provided with a suction cup having a suction opening, said suction tip device comprising, means for releasably attaching the offset suction tip device to at least a group of the sucker suction cups, means connected to said attaching means defining a group of spaced individual suction openings cooperative with a respective suction cup opening and each offset radially of a respective sucker suction cup opening in a forward position for engaging and picking-up thin stock sheets successively next adjacent to the leading edge thereof when picking them up from a pile of sheets when said device is attached on said group of suction cups, means cooperative with said last-mentioned means defining a plurality of individual passageways each providing communication between a respective individual suction opening of the

device and a respective sucker suction cup opening so that upon application of a suction on said suction bar group of suckers suction is applied at said tip device suction openings, and the offset tip suction openings being disposed substantially on a lower surface of a marginal-edge portion adjacent an edge of the device corresponding to positions next adjacent to the leading edge of a sheet to be picked-up from a pile of sheets and transported by the sucker bar when the suction tip device engages a sheet thereby to preclude the leading marginal-edge portions of the individual sheets picked-up from depending downwardly from the sucker-bar.

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