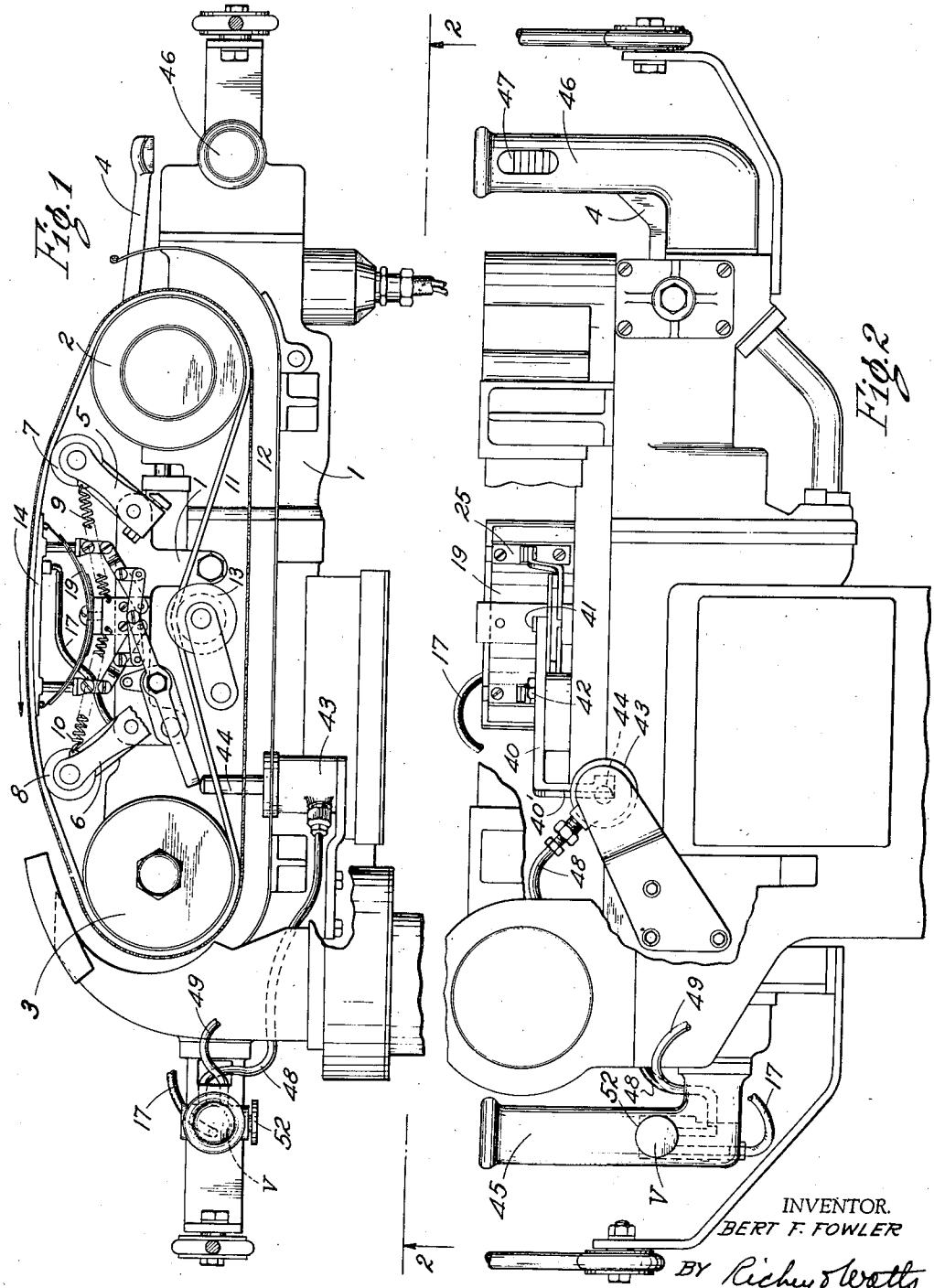
Nov. 4, 1941. B. F. FOWLER 2,261,244

RETRACTABLE SHOE SURFACE FINISHING MACHINE

Filed Dec. 29, 1938 2 Sheets-Sheet 1



Nov. 4, 1941. B. F. FOWLER 2,261,244

RETRACTABLE SHOE SURFACE FINISHING MACHINE

Filed Dec. 29, 1938 2 Sheets-Sheet 2

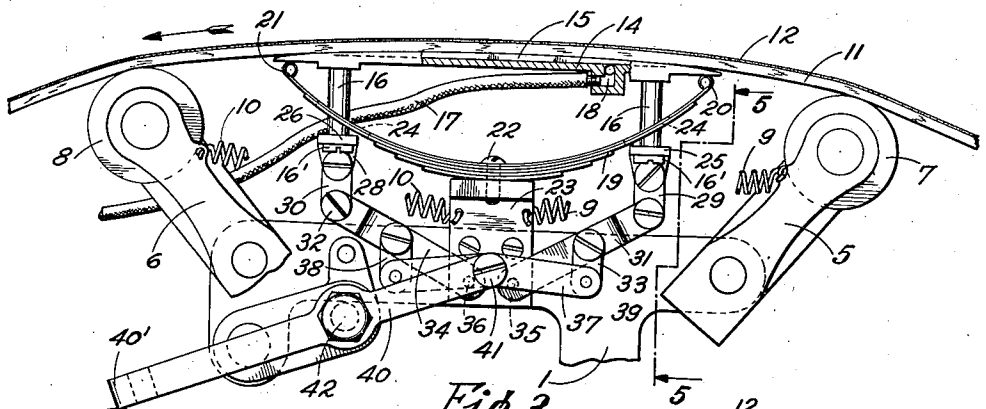


Fig. 3

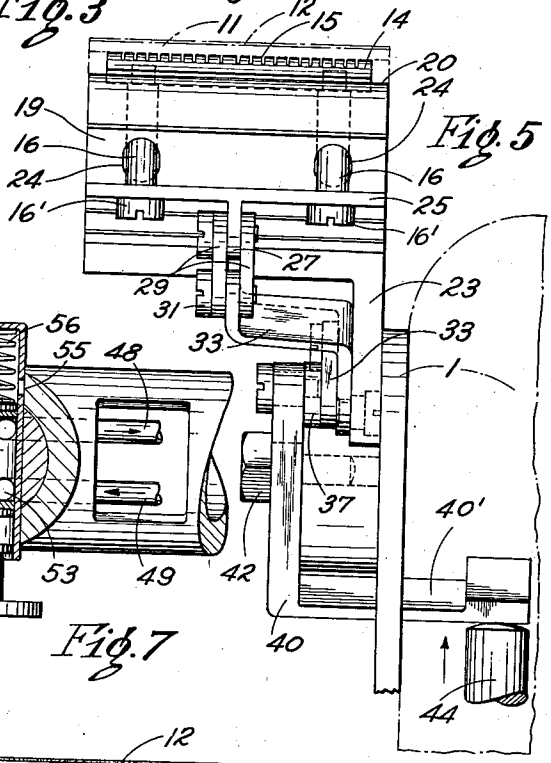


Fig. 5

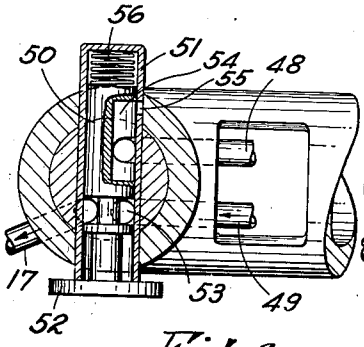


Fig. 6

Fig. 7

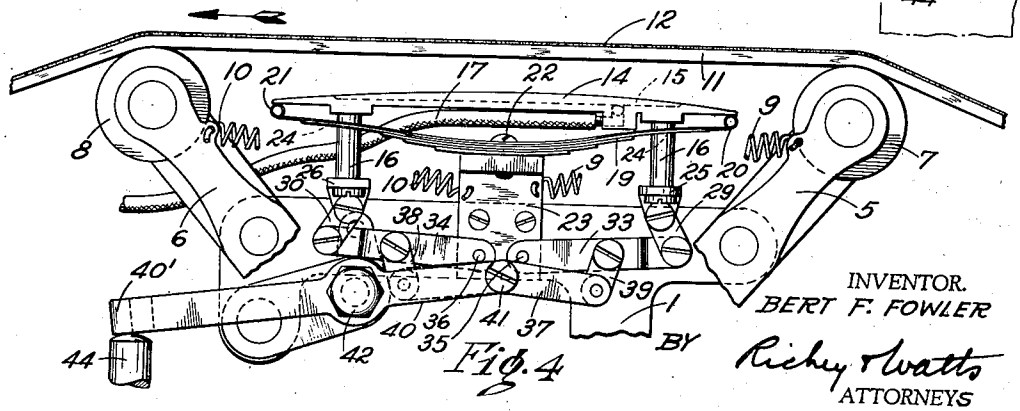


Fig. 4

INVENTOR.
BERT F. FOWLER
BY
Richey & Watts
ATTORNEYS

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RETRACTABLE SHOE SURFACE FINISHING MACHINE

Bert F. Fowler, South Bend, Ind.

Application December 29, 1938, Serial No. 248,279

7 Claims. (Cl. 51—141)

This invention relates to surface finishing and more particularly to an improved apparatus for finishing metallic surfaces by a moving abrasive belt or the like.

In my co-pending United States patent applications Serial No. 139,406, filed April 28, 1937, and Serial No. 190,254, filed February 12, 1938, I have described and claimed metal finishing machines embodying certain novel features and improvements. The present invention is particularly adapted for use with machines of the type described in said co-pending applications, but is, of course, not limited to use only with such machines.

In my co-pending applications I have disclosed sanding machines which consist essentially of spaced belt supporting pulleys, one of which is driven, a driving belt encompassing said pulleys, an abrasive belt supported by the driving belt and driven thereby, and a belt supporting shoe member disposed between the supporting pulleys in a position to back up the belts.

In the metal finishing operations which are necessary in automobile body work and the like, flat, convex and concave surfaces are encountered. In finishing flat or concave surfaces it is desirable to have the abrasive belt supported by a backing shoe member on one of the reaches between the driving and supporting pulleys. However, in some instances, where finishing operations are to be carried out on convex surfaces it is desirable to use the sanding belt only and permit it to sag or bow inwardly between the supporting pulleys so that it may more nearly follow the contour of the convex surface.

Prior to my invention it has been necessary either to provide two different types of sanding machines, one equipped with a backing shoe and one without a shoe, or to stop the finishing operations and go through the usually rather involved process of removing the shoe from the machine when it is desired to work on a convex surface. This latter procedure is impractical in production shops.

It is among the objects of the present invention to provide a surface finishing machine of the type described which is practically instantaneously adaptable to finishing flat, concave or convex surfaces. Other objects of my invention are the provision of an improved surface finishing machine having a backing shoe which may be moved into or out of backing position by the operator without removing his hands from operating position on the handles of the machine; the provision of a resiliently supported backing shoe which may be moved into and out of backing position and which, when out of backing position, will permit the sanding belt to be curved inwardly and assume a concave form between the spaced supporting rollers whereby convex surfaces may be effectively finished; the provision of a retractable shoe in a surface finishing machine; the provision of a resilient, retractable air cushion type shoe having simple and compact operating mechanism whereby it may instantaneously be moved into either operating or retracted position.

The above and other objects of my invention will appear from the following description of one embodiment thereof, reference being had to the accompanying drawings, in which—

Figure 1 is a side elevation of a surface finishing machine embodying my improved retractable shoe.

Figure 2 is a view taken substantially on line 2—2 of Figure 1 and illustrating the control connections for the shoe operating mechanism.

Figure 3 is an enlarged detached side elevation of my retractable shoe mechanism, the shoe being shown in belt engaging or operating position.

Figure 4 is a view generally similar to Figure 3 but illustrating the shoe in retracted position for use on convex work.

Figure 5 is an enlarged fragmentary view taken on line 5—5 of Figure 3.

Figure 6 is a detached fragmentary view showing the control valve and fluid conducting connections thereto, the valve being in position to permit the shoe to be in operating position as seen in Figure 3 and air to be supplied to form the belt cushion thereon.

Figure 7 is a view similar to Figure 6 but illustrating the position of the control valve when the shoe is in retracted position as seen in Figure 4, and the cushioning air supply to the shoe is shut off.

In the drawings the frame of the surface finishing machine is indicated at 1. This frame carries belt supporting pulleys 2 and 3, the pulley 3 being driven and the pulley 2 being an idler pulley which is preferably mounted on a pivotal support and adapted to be moved toward and away from the driving pulley 3 by means of the hand lever 4, as is fully described in my co-pending U. S. application, Serial No. 190,254, filed February 12, 1938.

The frame 1 also carries pivoted arms 5 and 6 which in turn rotatably support the auxiliary rollers 7 and 8. Springs 9 and 10 extend from the arms 5 and 6 to the main frame of the ma-

chine and tend to exert a force on the arms to move the rollers 7 and 8 towards each other and to maintain the driving belt 11 out of its normal straight line path between the pulleys 2 and 3. The surface finishing belt 12, commonly of abrasive material, overlies the driving belt 11 and an idler pulley 13 may be provided to maintain the driving belt 11 out of contact with the finishing belt 12 along one reach between pulleys 2 and 3. The belt supporting shoe 14, as is most clearly seen in Figures 3, 4 and 5, preferably has a grooved belt engaging surface 15 and is provided with four inwardly projecting supporting rods 16. Cushioning air is supplied to the grooves of the surface 15 through a flexible hose 17 connected to a transversely extending header 18 which opens into each of the grooves in the surface 15 and which is disposed at the end of the shoe first engaged by the on-coming belt. This air cushioning type of shoe is also fully described and claimed in my co-pending U. S. application Serial No. 190,254, filed February 12, 1938.

A leaf spring 19, having its ends preferably curled inwardly at 20 and 21, is fixed at its center by a screw 22 to the bracket 23 which in turn is secured to the frame 1 of the machine. The supporting rods 16 for the shoe 14 pass through slotted apertures 24 in the spring 19 and extend down through and have free sliding fits in holes in the transverse bar members 25 and 26. Heads 16' are formed on the ends of screws 16. Inwardly projecting central flanges or lugs 27 and 28 are provided on the bars 25 and 26 and have pivotal connection with links 29 and 30. The opposite ends of the links 29 and 30 are in turn pivotally connected, at 31 and 32 respectively, to the operating levers 33 and 34 and the inner ends of the levers 33 and 34 are pivotally conected to the fixed bracket 23 at 35 and 36.

A connecting yoke 37 is pivotally secured at its ends to links 38 and 39 which are in turn pivotally secured at their opposite ends to the operating levers 34 and 33 respectively. One end of the main retracting lever 40 is pivotally attached at 41 to the center of the yoke 37 and the lever 40 in turn pivotally mounted on the main frame 1 by a suitable stud 42 or the like.

The retracting mechanism power source comprises an air cylinder 43 having a movable member, such as a piston, therein and an operating rod or plunger 44 projecting therefrom. The rod 44 is positioned to engage the end 40' of the lever 40 which is opposite to and on the other side of the pivotal center 42 from the connection to the yoke 37.

Before explaining the control mechanism for controlling the fluid pressure connections to effect operating movement of the piston in the cylinder 43 it will be in order to describe the action of the shoe retracting mechanism.

In Figure 3 the shoe is shown in working or belt supporting position with the outer surface thereof engaging the inner surface of the driving belt 11. The ends 20 and 21 of the leaf spring 19 bear against the inner surface of the shoe 14, adjacent its ends, and exert a force tending to push the shoe 14 outwardly into supporting engagement with the belt 11. This outward movement may be limited by the heads 16'. The shoe is floatingly mounted upon the spring 19 and is restrained from lateral movement, due to the action of the belt upon the surface of the shoe, by means of the supporting rods or pins 16. However, substantially universal tilting or rocking movement of the shoe 14 is permitted because of the free fit of the supporting rods 16 in the slots 24 in the spring 19 and in the holes in the bars 25 and 26. Pressure of the belt 12 against the work will be transmitted to the shoe 14 and opposed by the spring 19.

The spring 19 normally continuously exerts a force tending to move the shoe 14 toward the belts and away from the center line of the pulleys 2 and 3. Although I have illustrated a leaf spring arrangement, it will be understood by those skilled in the art that other types of spring or flexible or resilient supporting means may be employed for the shoe 14 without departing from the spirit of my invention.

When it is desired to operate the sanding machine with the shoe out of engagement with the belt, as for example when it is desired to finish a convex surface, fluid pressure is applied to the cylinder 43, in a manner to be later more fully described, and the piston rod or plunger 44 moved outwardly pushing against the end 40' of the lever 40. The movement of the lever 40 will cause the yoke 37 to be drawn inwardly or in a direction away from the shoe 14. This movement will be transmitted to the operating levers 33 and 34 through the links 38 and 39 and from the operating levers 33 and 34 to the transverse bars 25 and 26 through the links 29 and 30. The inward movement of the bars 25 and 26 will cause them to engage the enlarged heads 16' of the supporting rod 16 and pull inwardly thereon thus compressing and flattening the leaf spring 19 and moving the shoe 14 entirely out of contact with the belt 11 into the position shown in Figure 4. The ends 20 and 21 of the spring 19 will, of course, move apart during this flattening of the spring 19 and will merely slide over the inner surface of the shoe 14. As long as sufficient air pressure is maintained in the cylinder 43 to overcome the spring 19 the shoe 14 will be retained in its retracted position. However, as soon as the air pressure in the cylinder 43 is released the spring 19 will snap the shoe supporting parts back into the position shown in Figure 3 and return the shoe to supporting position relative to the belt. As is seen in Figure 4, sufficient clearance is established between the shoe 14 and the belt 11 to permit the belts to assume a substantially concave contour between the supporting rollers 7 and 8 and it will be evident that the flexibility and adaptability of a surface finishing machine is greatly increased by means of my instantaneously operable shoe retracting mechanism.

In order that the operator may at all times control the position of the shoe and move it into or out of belt engaging position while operating the machine I provide a control valve V which is mounted on the handle 45. On the opposite handle 46 a switch 47 may be mounted for controlling the operation of the motor which drives the pulley 3 and the belts 11 and 12.

The pipe or tube 17 extends from the shoe 14 to the valve V. Another pipe or tube 48 extends from the valve V to the cylinder 43 and a third pipe or tube 49 connects the valve V to any suitable source of supply of fluid pressure, preferably compressed air.

Referring particularly to Figures 6 and 7, the valve V includes a plunger 50 disposed in a tubular sleeve 51 and having an operating head or handle 52 disposed for convenient manipulation by the workman. When the valve plunger 50 is in its inner position, as shown in Figure 6, the air supply pipe 49 is connected through the annular

grooves 53 to the pipe 17 which leads to the grooves in the face of the shoe 14. At the same time the grooved or cut out portion 54 of the plunger 50 connects the pipe 48 leading from the air cylinder 43 to the atmosphere through an opening 55 in the housing of the valve V. The shoe, plunger 44 and the operating linkage will now be in the position shown in Figure 3 with the shoe backing up and supporting the belts 11 and 12.

When the operator releases his finger from the head 52 the spring 56 will move the plunger 50 into the position shown in Figure 7. Now the pipe 17 which leads to the grooves in the shoe surface will be shut off from the supply line 49 and the pipe 48 which leads to the operating cylinder 43 will be connected to the supply line 49 by the groove or slot 54. The atmospheric connection 55 will be shut off from the cylinder 43 by the end of the plunger 50. When the air pressure from the supply line 49 is applied to the cylinder 43 the plunger 44 will be pushed outwardly engaging the lever 40 and retracting the shoe, as explained above, into the position shown in Figure 4. At the same time the valve V shuts off the supply of air to the face of the shoe 14 and thus prevents wasteful discharge of air into the slots in the shoe when unnecessary.

As long as the operator holds the plunger 50 in the position shown in Figure 6 the shoe will be in belt engaging position. As soon as he removes pressure from the head 52 of the plunger 50 the valve will shift to cause retraction of the shoe and shut off the air supply to the shoe. The operator may thus retract the shoe whenever the machine is not actually sanding thus assisting greatly in preventing damage to the sanding belts due to overheating and increasing the life of the driving belt.

It will, of course, be understood that in some instances the spring 56 may be eliminated so that the valve 50 will have to be moved in each direction by the operator and will remain in either shoe operating or shoe retracting position until switched over.

Although I have described the illustrated embodiment of my invention in considerable detail it will be understood by those skilled in the art that numerous variations and modifications may be made in the apparatus employed to operate my retractable shoe and I do not, therefore, wish to be limited to the specific constructions and linkages herein illustrated and described, but claim as my invention all embodiments thereof coming within the scope of the appended claims.

I claim:

1. In a surface finishing machine, a frame, spaced belt supporting rolls carried by said frame, a belt engaging said rolls, a belt backing shoe adapted to engage said belt between said rolls, resilient supporting means for said shoe, said supporting means being mounted on said frame and exerting a pressure against said shoe tending to cause engagement between said belt and shoe, and fluid pressure actuated means for moving said shoe out of engagement with said belt against the pressure exerted by said resilient supporting means.

2. In a surface finishing machine, a frame, spaced belt supporting rolls carried by said frame, a belt engaging said rolls, a belt backing shoe adapted to engage said belt between said rolls, resilient supporting means for said shoe, said supporting means being mounted on said frame and exerting a pressure against said shoe tending to cause engagement between said belt and shoe, fluid pressure actuated means for moving said shoe out of engagement with said belt against the pressure exerted by said resilient support means, and valve means for controlling the operation of said fluid pressure actuated means whereby said shoe may be retracted from or released into belt engaging position.

3. In surface finishing apparatus, a flexible belt, means for supporting and driving said belt, a backing shoe positioned to engage and resiliently support said belt, means for discharging fluid under pressure between said belt and said shoe, fluid pressure actuated means for retracting said shoe from belt engaging position, and valve means adapted when in one position to connect a source of fluid under pressure to said means for discharging fluid between said belt and shoe and shut off the fluid under pressure from said fluid pressure actuated retracting means and when in another position to connect the supply to the retracting means and shut off the supply from the means for discharging fluid between said belt and shoe.

4. In apparatus of the type described a frame, spaced pulleys carried by said frame, a belt supported by said pulleys, a shoe adapted to engage said belt between said pulleys, a spring mounted on said frame and engaging said shoe whereby said shoe will be resiliently urged into engagement with said belt, means for restraining said shoe from substantial movement in the direction of belt travel while permitting movement of said shoe towards or away from said belt, a lever fulcrumed on said frame, operating linkage between said lever and said shoe, fluid pressure actuated means for moving said lever in a direction to retract said shoe out of engagement with said belt, said spring being adapted to move said shoe in the opposite direction, and valve means for controlling said fluid pressure actuated means.

5. In apparatus of the type described, a frame, spaced pulleys carried by said frame, a belt supported by said pulleys, a shoe adapted to engage said belt between said pulleys, a spring mounted on said frame and engaging said shoe whereby said shoe will be resiliently urged into engagement with said belt, means for restraining said shoe from substantial movement in the direction of belt movement while permitting movement of said shoe towards or away from said belt, a lever fulcrumed on said frame, operating linkage between said lever and said shoe, fluid pressure actuated means for moving said lever in a direction to retract said shoe out of engagement with said belt, said spring being adapted to move said shoe in the opposite direction, said shoe having a grooved belt engaging surface, fluid pressure conducting connections for conveying fluid to said grooved surface, and valve means for controlling the flow of fluid under pressure to said shoe and to said pressure actuated means.

6. In a portable sanding machine having a supporting and operating handle and a moving belt, a retractable shoe adapted in one position to back up and support said belt and in another position to be entirely removed from engagement with said belt, means for substantially instantaneously moving said shoe into and out of its retracted position, and means, mounted on said handle of the machine within reach of the hand of the operator without releasing the grasp of said hand on said handle, for controlling said shoe moving means.

7. In a surface finishing machine, a frame, a

supporting and operating handle on said frame, spaced belt supporting rolls carried by said frame, a belt engaging said rolls, a belt backing shoe adapted to engage said belt between said rolls, resilient supporting means for said shoe, said supporting means being mounted on said frame and exerting a pressure against said shoe tending to cause engagement between said belt and shoe, fluid pressure actuated means for moving said shoe out of engagement with said belt against the pressure exerted by said resilient supporting means, and means, mounted on said handle of the machine within reach of the hand of the operator while grasping said handle, for controlling said fluid pressure actuated means.

BERT F. FOWLER.