Feb. 24, 1970 D. M. DUNN 3,496,679

HAND-HELD BELT SANDER

Filed Aug. 14, 1967 2 Sheets-Sheet 1

FIG. 1.

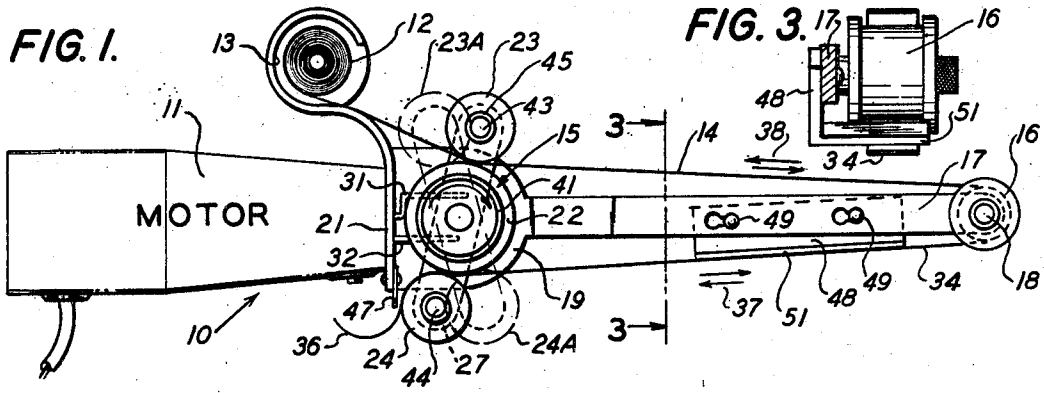


FIG. 3.

FIG. 2.

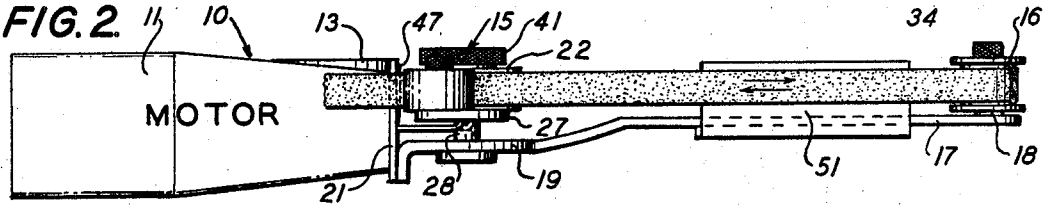


FIG. 4.

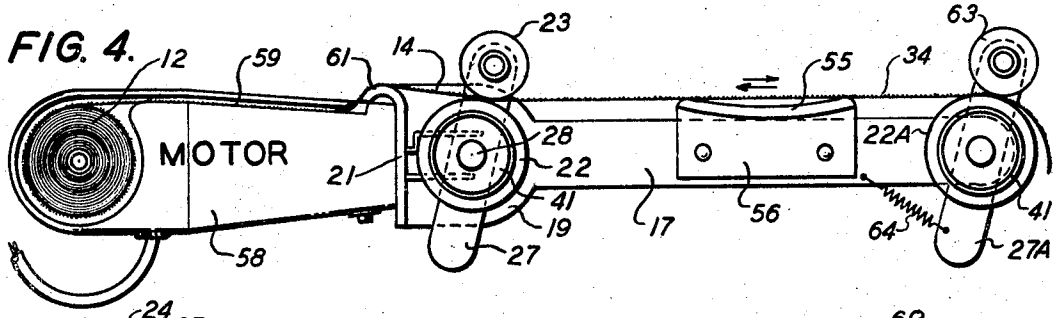
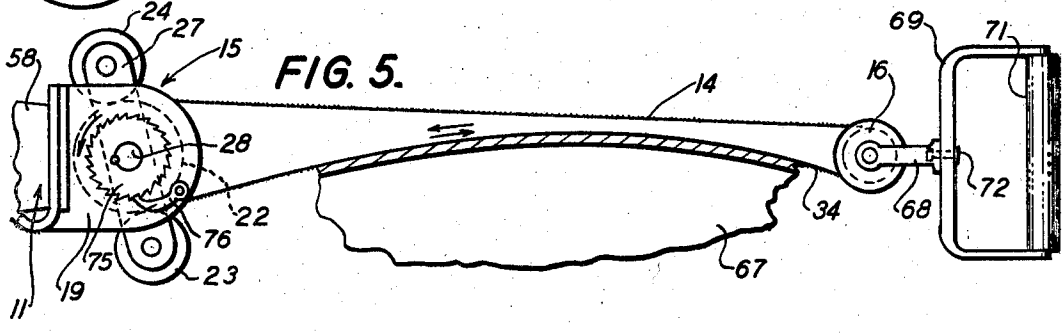


FIG. 5.



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FIG. 6.

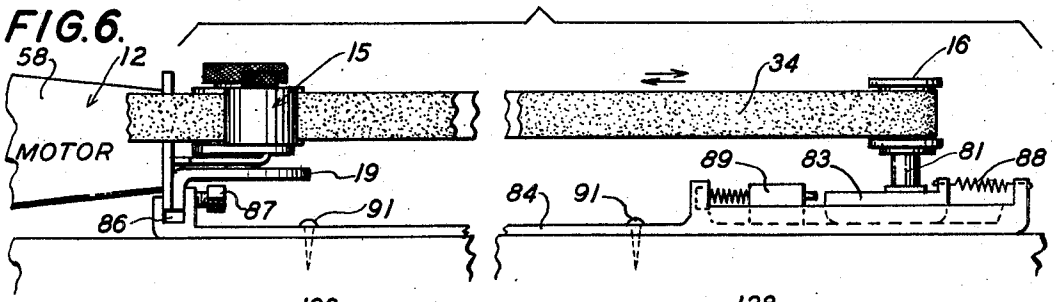


FIG. 9.

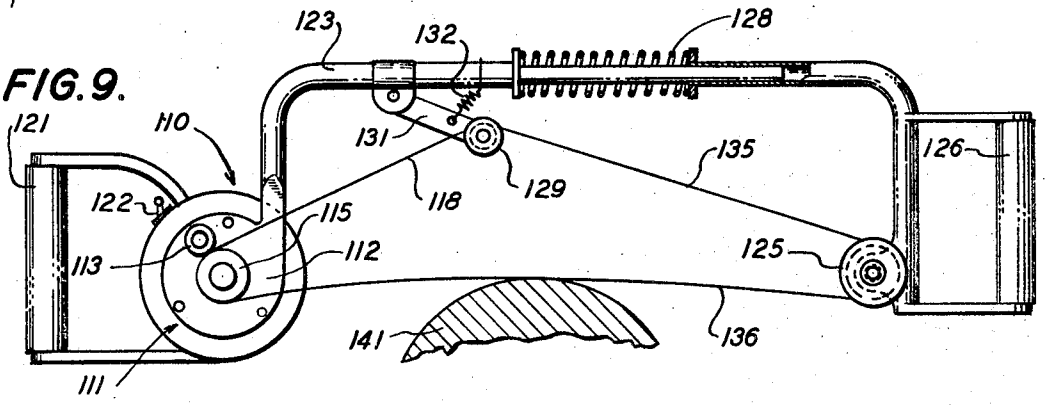


FIG. 7.

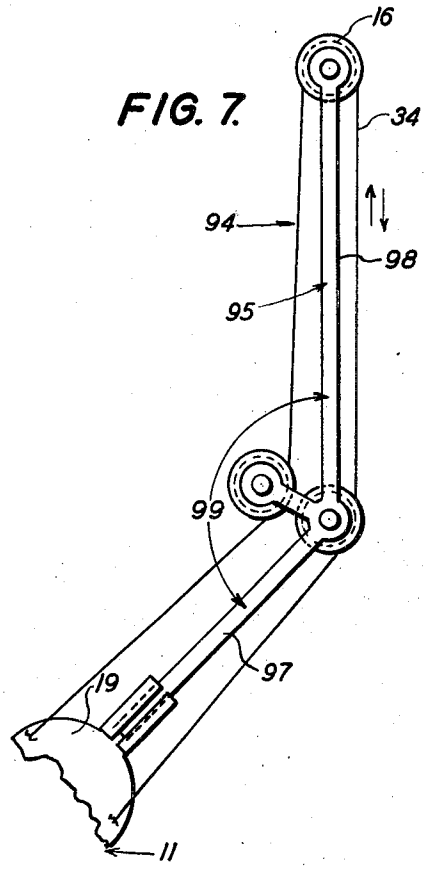
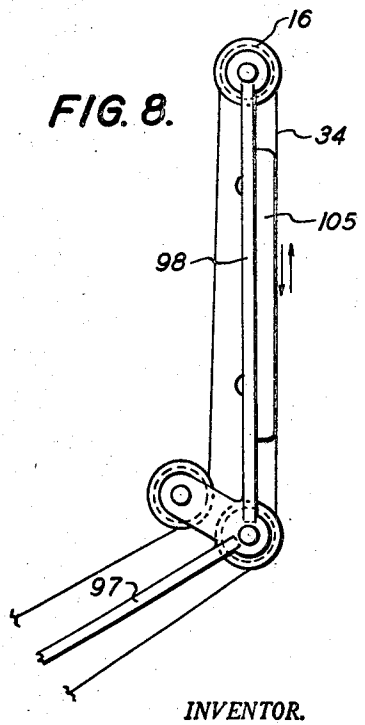


FIG. 8.



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HAND-HELD BELT SANDER

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Filed Aug. 14, 1967, Ser. No. 660,440
Int. Cl. B24b 23/00, 21/00
U.S. Cl. 51—170 4 Claims

ABSTRACT OF THE DISCLOSURE

A reciprocating or continuous belt sander or buffer in which a hand-held motor comprises one hand grip from which a sander belt extends. The belt is driven by a pinch roller unit connected to the hand-held motor. A belt guide member is remote from the motor and drive unit. The guide member is maintained at a distance from the motor handle unit, either by a second hand grip carrying the belt guide member or by other spacer means connecting to the motor unit such that varying degrees of belt slack are possible. Mandrels of various shapes removably attached to the sander may back up the reciprocating or continuously moving belt.

BACKGROUND OF THE INVENTION

Conventional belt sanders are bench-mounted and the workpiece is brought to, and the work performed against, a taut belt. Similar reciprocating, continuous belt and orbital sanders of a portable nature do exist and fulfill a limited function. However, a portable slack belt sander which may be brought to the work has many advantages. First, a belt sander affording an abrasive belt capable of slack enables such a sander to adapt to varying workpiece configurations, and provides for reversing the belt such that the abrasive surface is within the loop of the belt. Workpieces such as doweling, chair rungs, etc. may then be sanded with the grit side of the belt turned inward.

With equal facility polishing operations may be performed wherein the belt, whether reciprocating or continuous, has a relatively soft surface such as is used in polishing and buffing various metals, or shoes.

SUMMARY OF THE INVENTION

The invention contemplates a belt sander or polisher capable of being hand-held and comprising a combined motor and handle unit with a moving sander or polisher belt. A belt surface drive assembly is adjacent the handle unit. A belt guide member is located remote from the handle unit. A guide member mount is supported by spacer means which maintains the guide member mount at a distance from the belt surface drive assembly to afford a working belt surface of some linear extent.

Various attachments, such as specially shaped mandrels, may also be held by the spacer means or the motor and handle unit.

Belt width may vary from one-eighth of an inch to three or four inches. Abrasive tapes or belts are commercially available in this range of widths. The motor unit may be powered from either AC or DC, battery current, or pneumatic power.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a schematic side view of a reciprocating belt sander or buffer in accordance with the invention;

FIG. 2 is a schematic bottom plan view of the belt device of FIG. 1;

FIG. 3 is a sectional elevation taken along line 3—3 of FIG. 1;

FIG. 4 is a schematic side elevation of an alternate embodiment of the invention;

FIG. 5 is a schematic side view of a further alternate embodiment of the invention;

FIG. 6 is a schematic side view of a still further alternate embodiment;

FIG. 7 is a schematic diagram of a further alternate embodiment of the invention having a removable mandrel for special sanding purposes;

FIG. 8 is a schematic diagram of a further alternate embodiment of the invention shown fragmentarily; and

FIG. 9 is a schematic side elevation of an alternate embodiment of the invention utilizing a continuous belt drive.

In the following description the like components are identified by like reference characters.

In the embodiment of FIGS. 1–3 a hand-held sander generally designated **10** comprises a motor and handle unit **11** which supports a sander belt reel **12** in a reel cup **13**. The sander belt **14** extends from the cup through a belt surface drive assembly generally indicated at **15** and over a remote guide roller **16** which guides the sander belt. It is to be understood that the belt referred to can be a buffer belt as well as a sanding belt.

A spool-shaped roller **16** is held by a spacer tongue **17** upon a guide mount pin **18** that extends from a support flange **19** fixed to an end plate **21** of the motor and handle unit. Reel cup **13** may be suspended also by the end plate.

Flange **19** also supports belt surface drive assembly **15**. The drive assembly comprises a central feed roller **22** upon which diametrically opposed pinch rollers **23**, **24** impinge peripherally. The pinch rollers are pivotally mounted to, and actuated by, a rocker arm **27** which pivots with a flange shaft **28** journalled in the flange and that passes through the feed roller. Oppositely reciprocating thrust arms **31**, **32** connect to the rocker arm on opposite sides of its central pivot point. The thrust arms in turn are actuated by motive power within drive and handle unit **11**.

The drive mechanism may be any one of many conventional types, whether rotary or reciprocating, and may be powered by alternating, direct or battery current.

A working segment **34** of the belt passes about guide roller **16** and between feed roller **22** and pinch roller **24**. The end **36** of sander belt **14** may extend a slight distance beyond the periphery of the pinch roller, as shown in FIG. 1.

In operation, the sander belt is caused to reciprocate, as shown by the arrow pairs **37**, **38**, in response to rocking motion of arm **27**. The pinch rollers move between the full line positions shown at **23** and **24** and the broken line positions shown at **23A**, **24A**. The rocker arm and feed roller move together. Since the axes of feed roller **22** and the rocker arm coincide, the motion of the feed roller is rotative. There is no change in the points of contact of the pinch rollers with the feed roller. Therefore, there is no effective advance of the sander belt from the reel, since the contact of the pinch rollers against the feed roller is sufficient to hold the belt fixed at that point. However, the displacement of the pinch rollers from position **23** to **23A**, for instance, causes the sander belt to be pulled about guide roller **16** and then quickly pulled in the opposite direction as the pinch roller changes from position **23A** back to position **23** under the urging of thrust arms **31**, **32**. There is, therefore, a very rapid, short stroke, reciprocation of the sander belt.

As the belt becomes worn it may be advanced from the reel by causing relative peripheral rotation of feed roller **22** with respect to pinch rollers **23**, **24**. This is accomplished by means of a knurled handle **41** which is fixed to

the feed roller. The pinch rollers are secured to their respective shafts **43**, **44** by knurled nuts **45**.

A saw-edged blade **47** may be fixed to the end flange of the motor and handle unit to sever excess length of the used sander belt as it is fed by roller **22** past pinch roller **24**.

Obviously spring roller or other devices of conventional design may be used to reduce slack in the belt between reel **12** and pinch roller **23**. The peripheral tension between the pinch rollers and feed roller **22** determines the amount of slack which may be induced in the belt on either side of guide roller **16**. Obviously if the working surface of the belt is outward either segment of the belt on either side of roller **16** may be used for sanding or polishing. It is also apparent that the grip or work surface of the belt may vary with the usage. Coarser grit is used for that work which requires removal of much material. The belt can be of a fine surfaced cloth if a polishing operation is desired.

A mandrel **48** may be secured to spacer tongue **17** by slip fasteners **49**, if desired. The mandrel has a back-up plate **51** to support the belt after it passes over roller **16**, such that flat sanding may be accomplished by pressing that portion of the belt which is backed by plate **51** against the work.

FIG. 4 illustrates an alternate embodiment of the invention wherein a concave plate **55** is supported by a mandrel **56** on tongue **17** of a sanding unit. The motor drive and handle unit differs from the embodiment of FIG. 1 in that reel **12** of sanding material is housed in a recess at the back of a motor case **58**. A channel **59** in the case conducts the belt over a bent portion **61** of end plate **21** to the juncture of pinch roller **23** and feed roller **22**.

The rocker arm **27** of the embodiment of FIG. 4 carries a single pinch roller **23**. The arm is otherwise mounted and actuated the same as in the embodiment of FIG. 1. A second rocker arm **27A** is mounted at the end of tongue **17** to guide abrasive belt **14**. Second rocker arm **27A** supports a second feed roller **22A** and a second pinch roller **63**. Rocker arm **27A** is biased by an extension spring **64** such that it recovers its original position after each reciprocation of sander belt **14** under the urging of rollers **22, 23**.

The sander belt is advanced by rotation of both feed rollers **22** and **22A** by means of their knurled handles **41**.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The embodiment of FIG. 5 is shown in a fragmentary view which is the obverse of the view of FIG. 4. A motor case **58** which is part of a motor and handle unit **11** is shown fragmentarily. The end plate of the case supports a flange **19** which pivotally mounts a rocker arm **27** with diametrically opposed pinch rollers **23, 24**. A feed roller **22** is shown in dotted lines. A sander belt **14** extends from a belt reel (not shown) between feed roller **22** and pinch roller **23** outwardly from the motor and handle unit shown fragmentarily at **11** out across a convex workpiece **67** and around a guide means or spool roller **16**. Sander belt **14** then extends back toward the motor and handle unit in a belt segment **34** and passes between feed roller **22** and pinch roller **24**.

A guide mount **68** journals a guide roller **16**. The guide mount extends from a hand grip bracket **69** which has a cylindrical handle **71**. Preferably guide mount **68** has a swivel pin **72** so that the attitude of the handle may be adjusted with respect to the work surface of the sander belt.

The handle bracket is used to maintain guide roller **16** at an interval from motor and handle unit **11**. Because there is no rigid spacer between guide roller **16** and drive assembly **15**, any desired amount of belt slack may be obtained to permit the belt to fit the configuration of whatever workpiece is being worked upon. The amount of displacement of one sander belt loop from the other may be increased by increasing the diameter of guide roller **16**. By this means workpiece convexities of various projection may be accommodated.

Shaft **28** of the drive assembly of FIG. 5 has pinned to it a ratchet wheel **75**. A ratchet dog **76** engages the teeth of the ratchet wheel. The dog may be spring-loaded by means of leaf, compression or extension springs. As can be seen from FIG. 5, the ratchet wheel, and therefore the feed roller **22** fixed to shaft **28**, is free to move in counterclockwise direction in response to actuation of rocker arm **27**. However, clockwise rotation of the ratchet wheel and thus roller **22** is inhibited by ratchet dog **76**. There is, therefore, relative displacement between the feed roller **22** and the pinch rollers **23, 24**. Such relative displacement causes the sander belt to feed outwardly from its supply reel (not shown) commensurate with the travel of each pinch roller across the periphery of the feed roller.

The proportions and tooth spacing of the ratchet wheel may be modified to accomplish the amount of sander belt feed necessary to retain an efficient grit surface against the workpiece. Means other than the ratchet wheel for feeding the sander belt as it reciprocates are also comprehended by the invention.

FIG. 6 shows an alternate embodiment of the invention similar in concept to FIG. 5. A motor casing **58** of a handle and motor unit **11** supports a flange **19**, from which a twin pinch roller and feed roller drive assembly **15** is supported. A guide roller **16** has a protruding shaft **81** which seats in a floating guide means mount **83**. The mount resides in an elongate channel in a mounting bracket **84**. The bracket supports the flange and motor case in a bracket recess **86** in which the flange and end plate are secured by a conventional screw **87**. An extension spring **88** biases guide means mount **83** away from motor and handle unit **11**. Belt tension is thus retained or adjusted.

A limit switch **89** is spring-mounted within the channel of bracket **84** between guide means mount **83** and the handle and motor unit. When a workpiece (not shown) is brought into contact with a belt **14**, guide roller **16** is moved toward the motor and handle unit against the pressure of spring **88**. Sufficient motion of mount **83** causes contact with limit switch **89** which is a "normally off" switch. The contact actuates the motor of the drive unit and continues it in actuation despite continuing leftward displacement of guide means mount **83** in FIG. 6. When the pressure of a workpiece is removed from the belt spring **88** moves guide roller **16** away from limit switch **89** and turns off the motor. Conventional means such as screws **91** may be used to fasten bracket **84** to a work bench.

Release of the handle motor unit from channel **86** of the bracket and attachment of a handle to shaft **81** permits the embodiment of FIG. 6 to once again become a hand-held sander.

Many other variations of the spacer means of the sander of the invention may be utilized. FIG. 7 shows schematically a hand-held sander **94** wherein a removable rigid spacer **95** connecting between outer guide roller **16** and the handle and motor unit **11** has two spacer segments **97, 98** forming a dihedral angle **99**, such that the attitude of belt **14** is changed with respect to the initial extension of the belt from the motor and handle unit. Segment **97** is releasably secured to the handle and motor unit by convenient means. Intermediate rollers **98, 99** are supported at the juncture of the two spacer segments. The belt is driven by a reciprocating drive assembly (not shown) similar to the assembly of the embodiment of FIG. 1.

As shown in FIG. 8, spacer segment **98** may receive a removable mandrel or shoe **105** which acts as a back-up plate for belt **14** for use against planar surfaces of a workpiece.

In FIG. 9 a hand-held continuous belt sander **110** comprises a motor and handle unit **111** which has a motor end plate **112** upon which a pinch roller **113** is journalled.

The pinch roller is in perpheral contact with a drive roller **115**. A continuous sander or buffer belt **118** passes between the pinch roller and the drive roller. The motor casing supports a first hand grip **121** which is adjacent an on-off switch **122** of the motor.

A U-shaped bracket **123** comprises a spacer means to maintain a guide roller **124** remote from the motor and handle unit. The bracket has a telescoping stem **125**. A second hand grip **126** is fixed to a leg of the U-shaped bracket adjacent the guide roller. A compression spring **128** opposes telescoping of the stem. Both the second hand grip and compression spring **128** may be used to bias guide roller **124** away from the motor and handle unit.

A slack take-up roller **129** is pivotally mounted by an arm **131** from the spacer bracket. An extension spring **132** or other similar biasing means may be used to load the roller so as to maintain an inner loop **135** of the sander belt away from an outer loop **136**.

The apparatus of FIG. 9 again provides an embodiment wherein the sander or buffer belt may be provided with slack to accommodate the configuration of the workpiece. Workpiece **141** in FIG. 10 is rather abruptly convex. By moving the sander downwardly against the workpiece surface with sufficient force, spring **128** may be overcome sufficiently to give outer loop **136** of the belt enough slack to wrap against the convex surface for polishing or sanding.

The foregoing embodiments are to be regarded as illustrative only. The term "abrasive" is to be understood as encompassing those belts with surfaces adapted for polishing, buffing, sanding and the like operations. Many other variations within the scope of the invention will occur to those skilled in the particular art. I therefore wish the invention to be measured by the appended claims rather than by the illustrative embodiments disclosed herein.

I claim:

1. A hand-held abrasive belt machine comprising a combined motor and handle unit, an abrasive belt, a belt surface drive assembly adjacent the handle unit; said

belt surface drive assembly including a rocker arm, a belt advance roller having an axis coinciding with the pivot axis of the rocker arm, a contact pressure member on the rocker arm bearing peripherally on the belt advance roller, and means linking the rocker arm to the motor for rocking motion about the rocker arm pivot axis; a belt guide member remote from the handle unit, a guide member mount, and spacer means for maintaining the guide member mount at a distance from the belt surface drive assembly.

2. Apparatus in accordance with claim **1** wherein the spacer means and guide member mount comprise a single hand grip carrying a belt guide roller and adapted to be pulled by a user against sander belt tension away from the motor and handle unit.

3. Apparatus in accordance with claim **1** wherein a second contact pressure member is mounted on the rocker arm to bear peripherally against the belt advance roller.

4. Apparatus in accordance with claim **3** wherein the belt passes between the advance roller and a contact pressure member, over the belt guide member and back between the advance roller and the second contact pressure member.

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JAMES L. JONES, JR., Primary Examiner

U.S. Cl. X.R.

51—135

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3 496 679 Dated February 24, 1970

Inventor(s) JOHN MALCOLM DUNN

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

IN THE DRAWING:

Sheet 1, line 1, change "D. M. DUNN" to --J. M. DUNN-- .

Sheet 2, line 1, change "D. M. DUNN" to --J. M. DUNN-- .

SIGNED AND
SEALED
DEC 15 1970

(SEAL)
Attest:

Edward M. Fletcher, Jr.
Attesting Officer

WILLIAM E. SCHUYLER, JR.
Commissioner of Patents

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* U.S. GOVERNMENT PRINTING OFFICE : 1969 O—366-334